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THE WORLD'S HARDEST IQ TEST—COMPLETE TEXT



FRANK KEY

● Parapsychologists and other researchers into the paranormal, beware! A backlash is upon you. Times will be getting tougher by and by. It is time to clean up your acts. ☹

Early this year, at the annual meeting of the American Association for the Advancement of Science (AAAS), the celebrated cosmologist John Archibald Wheeler—the man who coined the term black hole—made an impressioned statement that may mark the beginning of one of the largest “backlashes” in the history of science. Simply put, Wheeler called for the council and board of directors of the AAAS to drive the “parapsychologists” out of that august organization.

The parapsychologists were allowed in the AAAS in 1969, largely at the urgings of the late Margaret Mead. Wheeler, who voted against letting them in in the first place, feels that the acceptance of parapsychology was a symptom of the 1960s, the so-called decade of permissiveness. The decade of permissiveness, he says, “is now well past.”

There is no question that traditional science has opened its doors to research into the paranormal in recent years. More and more serious scientists now admit at least the possibility of such phenomena. What seems to cloud the issue is the enormous public interest in things paranormal, an interest that often seems to border on mass hysteria. As Wheeler points out, we live in a country that supports some 20,000 astrologers and only 2,000 astronomers.

It is virtually impossible these days to pick up a newspaper or a magazine that does not contain some account of telepathy, levitation, UFOs, telekinesis, spoon bending or some strange occurrence in the Bermuda Triangle. Proponents of the paranormal are quick to point out that while the bulk of these reports are probably the result of some illusion or simply fraudulence, at least some of them should be true. In other words, while there is smoke, there is probably fire. Wheeler has responded to this notion with what may well turn out to be the battle cry of the anti-paranormal forces: “Where there’s smoke,” he says, “there’s a smoke.” So a backlash is upon us. It is not the first one, to be sure. In 1926, for example, Henry Maudsley went so far as to try to entice President Calvin Coolidge in a campaign “to abolish the ornamental practice of spirit

mediums and other charlatans who rob and cheat grief-stricken people with alleged messages.”

But this time the backlash is coming from a different direction and, as a result, may prove much more powerful. Traditionally, opponents of the paranormal have been in the minority—tiny fringe groups trying to overturn the jumps of established science. Today, however, they seem to form a majority, at least in terms of the total population. As a result, they are much more vulnerable than they have been in the past, sympathy for the underdog being what it is. Moreover, the force of the backlash, although small at the moment, are formidable. Wheeler himself wields considerable clout, and so do behind him are such men as Carl Sagan, Scientific America’s star biologist Martin Gardner, author of *Flowers and Fallacies in the Name of Science*, and the often maverick James Randi, the man who single-handedly discredited psychic Uri Geller.

If this backlash succeeds in reducing the charlatans now working in the field of parapsychology, it will do a great service to science. There is no question that a housecleaning is in order. However, if the pendulum swings too far in the emotion of the moment—and all movements are primarily emotional—then some genuinely serious researchers will also be swept away. That, it seems to me, would be unfortunate, if not disastrous.

So—parapsychologists and other researchers into the paranormal, beware! A backlash is upon you. Times will be getting tougher by and by. And you shouldn’t be surprised by this. Throughout history, men possessed of a new idea have had to fight, often die, to get their idea across. Look at the persecuted Galileo, who was burned at the stake for declaring that the stars were other worlds like our own, and Galileo and J. Robert Oppenheimer.

The answer, of course, the way to blunt the blow of the backlash that will certainly come, is to conduct tightly controlled experiments and produce repeatable results. It is the way of science and should be the way of parapsychology. In other words, clean up your acts. There’s not much time left. ☹

CONTRIBUTORS

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SPIEGEL



BESTER

There's a new and aggressive approach to pregnancy that's very scientific and not at all concerned with emotions," says Gonia Coria, author of *The Hidden Malpractice*. "Doctors now take surgical peeks at the fetus medicate it, probe it, and take tissue samples. . . . Mothers are increasingly looked upon as mere carriers by the medical establishment. They are not allowed to labor for more than a few hours without making progress. Cesarean sections are done freely."

By the year 2000, Coria explains, giving birth could become a technological nightmare. Even now an elite medical establishment is attempting to suppress home-birth or "natural" childbirth movements, whose methods make sense to more and more expectant parents. "It's a big-time economic issue," says one prominent physician. "Obstetricians lose money every time somebody has a baby at home. That's the primary motive behind the campaign—they're out for blood." Many obstetricians fear the reemergence of midwives. "Increasingly, mothers are turning to midwives to help them bear their children at home," says one obstetrician. "A practice that not only undermines established obstetrics but may eventually lead to its extinction." It's called "Childbirth 2000" and it starts on page 48. To illustrate Mary Sene's "Industry Goes to Space," we called Jim Long, a top aerospace photographer. His contacts at NASA give Jim access to the agency's

innermost sanctums, which is why Orme was able to send a photography team to Huntsville, Alabama—headquarters for NASA's space-industrialization efforts. The key components that will provide a foundation for the first factories in space—including a marvelous beam-bending machine—were captured on film by Haney Olsen and Paul Kozlowski. See the Orme exclusive on page 36.

The UFO phenomenon has become more visible in recent months not only because of fresh sightings around the world but because 1979 may herald the beginning of a coordinated global effort to finally get at the root of the controversy. Back in December, author E. Lee Spiegel (who hosts the nightly *UFO Report* on NBC radio in New York) arranged for a high-level group of UFOlogists to speak at the United Nations. Their purpose was to formally bring the UFO question to the attention of a world body. Moreover, Spiegel presented a unique audiovisual program to underscore the need for serious research. Many of the rare photos shown to UN delegates form the basis of our stunning UFO pictorial, "First Encounter" on page 52.

Our offering for the first day of April is "Static Gravity" (page 76), a mind-shattering account of an interdimensional conspiracy that could "crumble the very foundations of Western civilization." Author Christopher Priest follows the exploits of Professor J. F. Tidmarsh, the only scientist ever to have

published the results of research on static gravity—a horrible mistake that eventually led to the development of the notorious "station projector," a device now believed responsible for the recent spate of earthquakes, tidal waves, floods, landslides, volcanic eruptions, and even the irrational behavior of terrorists. Says Priest, "Our life is imperiled."

Have we started something we can't stop? Frederik Pohl, a distinguished science-fiction writer, examines some frightening possibilities in "Power Play." "There is no question that our overuse of energy must level off at some point," writes Pohl. "The whole question is: When? In A.D. 5179, when the world becomes a dying mass of high-energy plasma? The clock is running out." Read page 68.

After teaching a seminar of *Rhetoric* ("Bonehead English") at the University of Iowa, Joe Haldeman turned to the world of science fiction. His novel *The Forever War* won the Hugo, Nebula, and Damar awards for best science-fiction story of 1975. The Haldeman vignette "No Future in It" (page 80) is his second contribution.

Alfred Bester's works of science fiction are among the most highly praised. In 1953 he won a Hugo Award for *Demonized Man*, a brilliant novel of murder set in a distant world in which the ruling classes possess telepathic powers. Many of Bester's other works can be found in the two collections *Starburst* and *The Dark Side of the Earth*. His offering for April, "Galileo Galante" (page 42) **CD**

DIALOGUE FORUM

In which the readers, editors, and correspondents discuss topics arising out of *Omnis* 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 *Omnis* Forum, *Omnis* Magazine, 809 Third Avenue, New York, NY 10022.

Coping with UFO Dissonance

I am, perhaps in the majority of *Omnis*'s readership in that I am not personally involved in the argument about the nature of UFOs. The fact that for years there have been reports of little understood visual phenomena suspended between heaven and earth is admittedly a curiosity. However, I am perfectly willing to concede ignorance of the final answer, with the hope that, one day, ignorance will be supplanted by understanding.

What interests me and stirs in me as much wonder as might the inevitability of extraterrestrial contact is the predictability and simplicity of the arguments of those who are embroiled in the controversy: a controversy that is a case study of human nature.

According to Leon Festinger's Theory of Cognitive Dissonance, conflicts which arise between what one person holds as an opinion and what one knows of others' beliefs can be resolved in one of three ways. The first of these solutions is that one may change one's opinion. In the present conflict, this means of resolution seems to be unavailable.

Festinger foresees this impasse. Changing one's opinion will effectively reduce dissonance only if course, if there are not many persons who already agree with one's original opinion (who would then be disagreeing after the opinion changes).

Another means of coping with cognitive dissonance "would be to influence those persons who disagree to change their opinion so that it more closely corresponds to one's own...in the context of the UFO controversy, the teams are to be latched expectation given the peer pressure alluded to above and the elements of "true believers" and "scientific cool"

permeating the issue.

The third avenue to tranquility for those suffering from cognitive dissonance, the state of being at loggerheads with an opposing concept, is the process I have seen in progress in the pages of *Omnis* and elsewhere. One can attribute different characteristics, experiences, or motives to the other person, or one can even reject him and derogate him.

Festinger in 1957 summed up succinctly the situation we find extant in 1979: "If one person believes that flying saucers are spaceships from other planets and some other person voices the opinion that flying saucers, as such, do not even exist, the resulting dissonance in the opinion of the former (or latter) may be reduced if he can believe the other is a stupid, ignorant, unfriendly and bigoted individual.

This "resolution of cognitive dissonance" of course solves for the individual only the conflict he is having with another's opposing viewpoint, but it in no way resolves the issue at hand.

Ben Gross Price
Sharpsburg, Md.

Space Leader

It is exceedingly exciting to many of us working in the space program that California governor Jerry Brown is a proponent of the endless possibilities space exploration provides (*Omnis* "Worlds Beyond" - January 1979). Over the past few years, we have watched in dismay while the current administrations in Washington have slashed budgets for space endeavors. Governor Brown has encapsulated the feelings of most of my colleagues concerning space exploration, and he is to be congratulated for having the courage to make his feelings public.

Most Americans caught in the day-to-day struggle of social and economic survival, forget the great pride and hope that was generated when humans landed on the moon, pride and hope that spanned the countries of the world. However, we have stalled, and we need a national leader to again set a goal for us to achieve in space.

The technology for great advances in space exploration exists and will expand in the near future, provided the funds are supplied. In order for space exploration to occur and in order for all earthbound people to reap the benefits that await us in space, it is necessary for a trustworthy political leader to set space exploration as a national responsibility and priority.

Robert Pike

Deep Space Network
Space Flight Operations Facility
Jet Propulsion Lab
Pasadena, Calif.

Beyond Future's Artifacts

I applaud the optimism of the many visionaries whose articles appear in your magazine, but there is one thing that continues to bother me: the near-sightedness with which they project the future. Patrick Moore's colony on Mars (*Omnis*, January 1979) will indeed be technologically feasible by the year 3000. But why does he presuppose that the technology available will not be advanced enough to carry us swiftly between star systems where we can inhabit more pleasing terrains with gravity and atmospheres similar to Earth's?

I am tired of reading how slow travel will be between the galaxies. Can't anyone visualize other means of travel besides rocket ships? Today we would not dream of propelling a rocket ship the way Jules Verne did, so why should we assume our descendants will propel ships by only the best means we have? Moving large masses of metals by expanding gases is terribly inefficient.

Research in physics has made great strides in the last century. Relativity has given us a different view of time, quantum mechanics has given us the wave-particle duality of light, and now particle physics is shedding new light on gravity and is delving even deeper into the structure of the atom. In each case, the basis of the theory is not so much what is real but what we perceive to be real. I propose, then, that the idea that in the not-so-distant future (certainly less than 1,000 years) humankind will transcend the need for

continued on p. 102

THE FUTURE OF PARADISE

EARTH

By Kenneth Brower

The airfield at Billings, Montana, lies atop what locals call "rimrock," the sand-colored plateau through which the Yellowstone River cuts its broad valley. The Cassina trail off the runway, the edge of the rimrock passed beneath, the valley dropped away and we flew over the town and the muddy ribbon of river. Rivers passing through cities, like birds in cages, always look a little seedy, and the Yellowstone is no exception. Billings, one of the two largest cities in Montana, is not much of a place, yet it succeeds in making the river seem as turbid and dreary as the Hudson or the Thames.

In the plane with me was a reporter from *The Wall Street Journal* and a photographer from *Life*. In a squadron of small planes behind us were writers from *Mouse*, *Panhandle*, *Outdoor Life*, *Field and Stream*, *Flyfishing the West*, *Trout*, and several other newspapers and journals. The scotch had been arranged by Glenmore Distilleries, makers of Yellowstone bourbon. Instead of holding a tennis or a golf tournament, Glenmore had chosen to publicize itself by staging an event of more significance to society and

the land. It was going to defend the country that had inspired its oldest brand name. The Yellowstone River, we had learned in a morning briefing, was one of the last major undammed rivers in the United States. Agriculture, industry and a growing population were making increasing demands on the river's water and these wasn't enough to go around.

Glenmore Distilleries was calling attention to the debate by holding a two-day crash course on the river. We would fly the Yellowstone today, float it tomorrow, and in the evening we would hear lectures by Fish and Game people. One of those people, Larry Peterman, water-resources supervisor for the state, was in the plane as our guide.

I thought Glenmore's effort was admirable, and I hoped other businesses would imitate it. I wondered, though, about the crash course. How, after only two days, could we reporters know the Yellowstone country well enough to write with any authority or feeling about it? For me, understanding a piece of terrain always came slowly, osmotically. Quick understanding of a river seemed especially difficult. How, in two days

could we come to grips with something as deep, subtle, and moody as amenable to symbolism and poetry, as subject to fluctuation and change, as a river when someone like Mark Twain had to spend much of a lifetime doing that?

Larry Peterman pointed to a distant cluster of mountains. "Those are the Big Horns, on the Wyoming side." His finger moved to a nearer edge of white peaks. "Those are the Bear Tooths, where the Indian Nations gathered after defeating Custer."

The words Bear Tooths and Indian Nations had a galvanic effect on me. There was the shock of recognition. I knew this country well. It was not a blank slate at all; it was scribbled dark with history.

I am a twelve-year-old expert on Indian wars, grown up. Other boys become scholars of the capabilities of Air Force fighters or of Marx Brothers movies. I knew about Indians. My specialty was the Southwest, but I minored in the Dakota Nations. I was into warfare. I can still tell you the date Geronimo surrendered (September 23, 1886). I can still describe the movements of the troops of generals Crook and Terry and Custer and of chiefs Sitting Bull and Crazy Horse, 104 years ago on the terrain now passing below the plane.

But there was a more immediate lesson in the landscape, and finally I began hearing Larry Peterman's explanation. The lesson had to do with water. The fields below us, Peterman was saying, were dryland wheat. Most of Montana was dryland wheat. And many of the fields were in summer fallow, for there is not enough moisture to grow a wheat crop every year. I looked and saw that he was right. Crazy Horse's country was a semidesert.

We were flying now over the Crow Reservation, and for me history again interrupted for a moment. (The Crows were old enemies of the Sioux. A Crow scout named Curly, according to some accounts, was the only member of Custer's command to survive. Toward the end of the fight, Curly let his hair down in Sioux fashion, changed his war paint



The waters of the Yellowstone River in Montana, one of the last major undammed rivers in the US

TURNING THE CRANK

SPACE

By Mark R. Chartrand III

Copernicus was wrong. The Moon was recently destroyed and replaced by a doghouse. There is a Great Pyramid on Mars. Comets revolve about an invisible dark star. The earth turns because it is a large motor.

Furthermore, the speed of light can be exceeded; the theory of relativity has been disproved. The nature of magnetism has finally been uncovered. The universe is not expanding, and the energy sources of quasars have been explained. Recent calculations show that the universe began at 1 05 32 001 7679438132 mi. on May 15, 15 285 133 714 p.m.

I thought you'd like to know! All of these items come from my files of unsolicited letters, pamphlets, books, and scrawled notes I have received over the years. All appear to have some new theory of nature, to be absolutely correct, and to be revolutionary in their impact on science—as indeed they would be, if they were true.

As this is April, I thought it appropriate to depart slightly from hard-core astronomy and space technology and

explore the subject of cranks in science, especially since astronomy seems to attract more than its fair share and since Orin has now been around long enough to have accumulated quite a bit of questionable material.

Any prominent magazine of science, or any prominent astronomical institution such as the Hayden Planetarium, where I spend most of my time, attracts crank mail. These institutions become lightning rods for all those people who think they have a new way of explaining the universe. But just what is a crank? How can one be recognized from a genuinely curious person who is simply not familiar with the subject? And how can their ideas be separated from true scientific work?

My American Heritage Dictionary defines a crank as an eccentric, but a scientific crank is much more than that. He (and I don't mean to be chauvinistic, but essentially all my crank mail is from men) is ignorant of the field about which he writes and works in isolation from more orthodox scientists in the field.

The crank is not aware of all the

research that is going on in a subject. Moreover, he may be completely unaware of scientific methodology. One letter begins: "For years I have made a hobby of studying the universe. All I have is Logic and Reason. I could not prove anything."

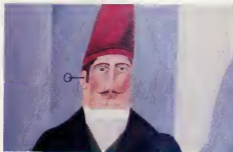
I could I write anything. I will give you an example of how I mean. He proceeds to do just that. Another candidly admits, "but you must realize that if my expertise in this area were as extensive as yours, it would be absolutely impossible for me to develop this idea at all." That doesn't stop him.

What the crank is doing at is sometimes hard to follow. A recent letter to Orin claims that the writer's idea "opens up many new possible areas... so intense, some seem incomprehensible, but all are..." Indeed.

Another aspect of this isolation, so contrary to the spirit of exchange of information in science, is that the crank uses his own specialized, often incomprehensible language or symbology. A telegram I have claims the sun is a "binary star [sic] with the earth, and that the author is using "light-variable" units. Sometimes the crank will also use familiar terms in his own way, compounding the confusion.

A crank has an idea he wishes to force upon nature, unlike the scientist, who tries to describe nature. In science, the researcher makes hypotheses and then tests them with experiments or observations to see if they are correct. By these methods, he then refines or rejects the hypotheses. A crank, however, in his attempt to prove his own idea, is often led to invent hypotheses after hypotheses to change not just one "law of nature" at a time, but many until his structure becomes so unwieldy that only the inventor could fail to see how overextended it is.

Scientific revolutions do occur. Some new hypotheses change whole systems of natural laws or show that our older knowledge is valid only under limited conditions. For example, Newtonian physics was fine and valid until we started to think about speeds close to the speed of light, then we found that Newtonian



Astronomical cranks are convinced that they alone possess the key to the universe in their heads.

SEXUAL PARASITE

LIFE

By Dr. Bernard Dixon

A man generates an astronomical million million or so spermatazoa during his "active" lifetime. In the same time, a female ovary releases a strictly limited number of eggs (around 400). Despite the contrast in productivity, each sex contributes exactly the same amount of genetic material to the next generation. It is an uncomfortable truth that the main biological role of males is to manufacture vast quantities of sperm to fulfil a genetic function that the other gender accomplishes much more efficiently.

Nowhere is sexual imbalance seen more clearly than in the male carcharod anglerfish, whose entire existence, 500 meters down in the sea, is geared to seeking out and serving a lady anglerfish. The first features that strike you about the male are his huge eyes for locating a mate in the dim depths of the ocean. The second are a pair of massive testicles which occupy over half the body cavity. Yet this exotic creature is barely a measurable one or two centimeters long—compared to females ten or twenty times that length. Despite such differences, the relationship between male and female anglerfish is a model of sexual togetherness, unique in the natural world.

Once a male has spied a mate, using

those colossal eyes, his independent existence is virtually over. The rest of his life is devoted to the single function of manufacturing sperm to satisfy the female. A male's last self-assertive act is that of grasping his partner using pincerlike "dentacles" at the tips of his jaws. After the male and female come close together, their surface tissues begin to merge and eventually fuse together. Next, the two circulatory systems link up so that the dominant male becomes totally permanently dependent on the female for nutrients supplied through his bloodstream.

However bizarre, the arrangement is an undoubted success. About a hundred different species of anglerfish flourish in the depths of oceans throughout the world. The explanation, it seems, is that every encounter between a male and a female of the same species, whatever their ages, is a potentially sexual affair.

One biological law that until very recently was thought to apply to anglerfish, Homo sapiens, golden eagles, rattlesnakes, turtles, and all other categories of animal life on earth also concerns spermatazoa. Of several apparently immovable barriers in the body, the one that shields sperm from the immune system has been thought

especially important. The apparatus that vanquishes bacteria and other invading microbes—and incidentally threatens to thwart organ transplantation—is a normally shielded from spermatazoa and the cells that generate them. The integrity of the barrier appears to be essential to the production of sperm. In turn, this means that should the barrier be severed, the body's immune system would react to spermatazoa as foreign cells and destroy them.

Following some intriguing work by Dr. H. Bruecker in the department of microscopic anatomy at the University of Hamburg, we now know that in at least one species—the swan (*Cygnus olor*)—the state of affairs is not immutable. Indeed, a rupture of the barrier serves an essential purpose at one stage in the year by allowing the bird's immune system to deal with excess spermatazoa that are no longer required.

The swan has a limited breeding season, and by May or June the remaining vast numbers of spermatazoa in the bird's testes are unwielded, no more will be required until the following spring. At this stage, according to Dr. Bruecker's work reported in *Cell and Tissue Research* (Vol. 193, p. 465), the wall is breached. Macrophages—the scavenging cells that usually engulf foreign agents such as bacteria—squeeze their way through the barrier and into the tubules that serve as the sperm factory. There they devour the leftover sperm. Then, just as quickly they return to their routine job of monitoring the swan's bloodstream against the menace of microbial attack.

Now that we know about this ingenious divergence from what previously appeared as an absolute law of biology, we confront further puzzles. How do the scavengers know when to invade a swan's testes? And what keeps them out during the time when spermatazoa are much in demand? No one can yet answer these questions. What we can be sure about is that no such novel physiology operates in the male anglerfish. Thanks to the female of the species, his copious spermatazoa are always in demand. ☐



The parasitic relationship between male and female anglerfish is a model of sexual togetherness.

STARS

By Patrick Moore

I would hesitate to claim that anything is impossible—or, rather, virtually impossible. The White Queen in *Through the Looking Glass* made a regular morning habit of believing at least six impossible things before breakfast. In my personal view, however, there is one thing that simply cannot be done: traveling backward in time. I have absolutely no faith that we might be able to transport ourselves back to the Crusades, the Ice Age, or even earlier. I do not doubt that Einstein's relativistic time dilation effect is valid, but that is a different thing.

If I am right, and traveling back through time is a genuine impossibility, can we ever hope to obtain firsthand information from the past? Oddly enough, we can simply by looking up at the stars.

Light, remember, is the fastest thing in the universe, racing along at 300,000 kilometers per second. Even so, it takes over one second for light to reach us from the moon, eight and one-half minutes from the sun, several hours from the more remote planets, and years from any of the stars. The astronomical light-year—the distance traveled by light in one year—is

not far short of six million million miles. Yet our nearest star (excluding the sun) is more than four light-years away.

This is where we start our time traveling. When you look at the sun, you see it as it was eight and one-half minutes ago. This is not especially significant, but look at the closest of the "nighttime" stars, the dim southern red dwarf Proxima Centauri, and you see it as it was in 1975. During the four years that have elapsed since then, Proxima's light has been racing across space toward us.

Next, let us take a great number of points and assume that we can be in the position of an observer who can move instantaneously among them. Imagine that he has stationed himself on a planet moving round Proxima and turned an incredibly powerful telescope earthward. He will see us not as we are now, but in our 1975 guise.

If our observer were near Arcturus, that bright orange star found in the Big Dipper, he would be thirty-six light years from Earth. Our observer will see the earth of 1943, when Hitler's armies were rampaging over Europe and the war

between the Allies and Japan was at its height.

Arcturus, of course, is close, by cosmic standards. Look next at Orion, that glorious constellation cut by the celestial equator. Of its leading stars, Betelgeuse is 520 light-years away. Rigel, about 500 light-years. Moving out to Betelgeuse, our observer will see the earth of the year 1459, well before Columbus set out to locate India and stumbled upon the New World by mistake. From Rigel, the traveler will see the world of 1079, or thereabouts. William the Conqueror was in control of England, and America was utterly unknown except, perhaps, to a few stray Vikings.

Not far from the obscure star Zeta Tau, there is a misty patch that we call the Crab Nebula. This is the wreck of a super-nova—a star that literally blew itself to pieces in a cataclysmic explosion. The Crab Nebula was first observed in 1054 and became brilliant enough to be visible with the naked eye in broad daylight before fading away. But the outburst did not occur in 1054. The Crab Nebula is 6,000 light-years away, so that the supernova blew up 6,000 years before earthmen saw it. This takes us back to the very early days of civilization, when all the facets of the modern age, such as nuclear bombs, lay in the distant future.

Our Milky Way galaxy is, of course, but one of many. Among the closest of the external systems is the great Andromeda Spiral, Messier 31, distance 2,200,000 light-years. Seen from there, the earth is in the Pleistocene Age. From one of the galaxies in the Virgo cluster (over 60,000,000 light-years away), we are back in the Eocene Period, when our ancestors bounded among the trees.

Fantasy? Yes, of course. We cannot conceive of instantaneous travel, and the idea of building a magical telescope of such power is pure science fiction. Yet in theory, at least, this is what we would see. It goes to show that even if we cannot voyage between the stars, we can undertake some personal time travel without setting a foot outside our own galaxy. ☐



The M31 Andromeda Galaxy, 2,200,000 light-years away, "sees" the earth in the Pleistocene Age.

THE ARTS

By Richard Dubin & Bret Primack

All music is acoustic to the extent that sound is produced by musicians with artistic intent and heard by an audience anticipating music. However, in the thirty years since jazzmen first waded their stand-up basses into electrical currents, the world of musical sound has split into two technologically delineated camps: acoustic and electric.

Today every instrument that can be played acoustically has been wired, and new solid-state devices are programmed to imitate the sound of acoustic instruments so accurately that even musicians have difficulty telling them apart. Synthesizers blossom like exotic plants—everything from polyphonic digital-sequence synthesizers to the synchronophon laser cyclor (at the stage in its development audible only to dogs). And around the immediate bend are acoustic holograms, the gammatron, and multimedia machines that will play the 'sound of light.'

In the late sixties, Miles Davis's experiments with electronic and new musical forms changed the face of contemporary music. In his band at that crucial time were Chick Corea and Herbie

Hancock, two young keyboard players and composers solidly rooted in jazz. During their respective tenures with Miles, Chick and Herbie began to play the new instruments regularly, and Miles recorded in a *Silent Way* and *Bitches Brew* using Hancock and Corea together. These important recordings marked the beginning of today's fusion-jazz/rock proliferation.

During the past five years, Chick and Herbie, now with their own bands, have conducted an intense study of the possibilities of electronic music, especially keyboards and the rapidly growing art and technology of the synthesizer.

However, neither abandoned his commitment to purely acoustic jazz. Last year, renewing a ten-year-long friendship, the two musicians were together again, touring the country. No bands this time. Just the two of them on twin nine-foot acoustic grand pianos.

Corea asked Herbie and Chick to comment on their connection with the acoustic and the electric experience in music.

Chick: The truth of it is, is that what we call acoustic instruments, to differentiate from

electric instruments, are just the basic instruments that have been around a long time, have a lot of history in them, a lot of emotion put into them by masters through the years.

Electric instruments are new, and musicians are developing them. At first they were like new toys, but now that rush of enthusiasm has stabilized, and I for one regard them as instruments I'm going to use in conjunction with acoustic piano. **Corea:** Is it possible to create an individual sound on an electric instrument?

Herbie: A lot depends on the quality of the instrument. If you've got a good instrument, a Rhodes piano, for example, which is touch-sensitive, then you will have more difficulty telling the difference between players—although we're getting to the point where musicians who play the Rhodes are accustomed to it, where playing the Rhodes becomes part of their vocabulary so far as technique is concerned, then we can tell by their style. Technique on a Rhodes is certainly different from technique on the acoustic piano.

Chick: Definitely. **Herbie:** If you've got an instrument that's a piece of junk, that's got no dynamic range, an instrument that, if you touch it soft, sounds hard—then you can't distinguish between players at all. **Chick:** Same with acoustic. You could get Howitz to play a piano with missing notes and out of tune and it would sound terrible.

Herbie: Be it a Rhodes or a [acoustic] piano, you have to have an instrument with dynamic range. Those are the touch-sensitive instruments. Now, synthesizers, that's another ball game altogether. On the synthesizer the only sound that's going to come out is what you've programmed into it. Touch makes no difference whatsoever.

You can't tell the difference between two people by their touch. But because the synthesizer has a capacity for such a variety of sounds, you can distinguish players by their conception, the way they work musically. But touch-sensitive synthesizers are now in development, so



Chick and Herbie splined together on acoustic piano. The result of too much electronics?

THE ARTS

By James Delson

Robert Altman is America's most prolific and individualistic lecture film director. In the past decade, he has examined subjects ranging from surrealistic fantasy (*Swages, 3 Women*) through historical fiction (*Countdown, Buffalo Bill and the Indians*), criminal activities (*Thieves Like Us, The Long Goodbye*) and gambling mania (*California Split, McCabe and Mrs. Miller*) to off-the-wall black comedy (*Brewster McCLOUD, M*A*S*H*). His new film, *Quintet* (20th Century-Fox), combines all these elements with science fiction, and the result is a medieval space fantasy.

Set in an unclear future when the earth is enveloped in ice, *Quintet* traces the survival tactics of a group of mysterious game players. Starring Paul Newman, Bibi Andersson, Fernando Rey, Wilton Keesman and Nina Van Pallandt, the picture is Altman's most structured work, yet on first viewing it would appear to be his most cryptic. Moving by predetermined rules, the characters—all players of the game "Quintet"—maneuver through the dark recesses of a once magnificent city that is going to run, killing and being killed by one another. Being alive in a dying world is their only reward.

The evolution of *Quintet* is not logical. Altman explained as we sat in the "living room" area of his office: "Even in the original script, you never really know who all the people were. *Quintet* actually started out as a kind of Graham Greene thriller like *The Third Man*. It was originally going to be set in the underbelly of some European city but it kept changing, going through different drafts—growing suspiciously melodramatic—kind of close to the Irish Revolution.

"It was intended to be a mystery more Kafkaesque than IRA, but the property went through so many changes that the names of the awards listed in the credits are purely a result of Writers Guild arbitration. The film they wrote has very little to do with what's on screen now.

"When we had our story down on paper we looked at locations in Chicago. For some reason—I don't really know why—we also went up to Montreal looking for subways and inclement weather. We found this terrific location up there, the remnants of the Expo 67 site 'Mia and His World.' All these word buildings were just sitting around, going to run. It occurred to me that because we'd be shooting in the dead of winter, we could

go in and freeze everything, so we threw the story into a futuristic time slot and rewrote it almost entirely.

"The location didn't change the direction of the film. It really created a new movie, using some of the ideas from the former one. In order not to mislead people, it's best to say that one film was thought up and discarded and another put in its place using some elements from the first film. Essentially we found a location and wrote the film to fit it. We had always intended to set the picture out of a recognizable time and place, so the audience would never know where it was, even going so far as to consider using an all-English cast in the sewers of Chicago, but the Montreal location allowed us to 'futzurize' it. Since we had already cast most of *Quintet*, we just kept changing the story to suit what we found up there—adjusting the characters accordingly with the help of the actors."

Actors play an important role in the preproduction period of an Altman film. Once cast, each one has his character custom-fitted to suit individual personality traits, making the screen figure more of a whole person. Working from a scene-by-scene outline, Altman doesn't actually write the dialogue for his actors until he is on location, usually a day or two before a specific scene is to be shot. "It's a pattern we've gotten used to," Altman explained. "We structure the film, knowing what's going to happen, and which scenes follow which, but the dialogue isn't actually written until we get very close to shooting a scene. There's not any formal kind of way to describe what we do; it just takes place."

Altman took full advantage of his Canadian writer locations. "Most of the film was shot on our outdoor set in Montreal," he said, "but we ended up doing the final sequence and the opening in Procheber Bay (above Hudson Bay in the Arctic Circle) because there were no open expanses near our principal location. We wanted the opening of the film to orient you to the desolation of this world in which you find yourself. The presence of a team shows that this isn't the Middle Ages and these aren't Eskimos, even though all



A world of ice sets the stage for Robert Altman's new film, *Quintet*, set in a distant future.

CONTINUUM

NEW SCANDAL IN PSYCHIC RESEARCH

Another swing of the paranormal pendulum seems to be taking place. A recent ABC-TV special spent an hour examining psychic phenomena and concluded, "How much is real? None that we know of." *Reader's Digest*, a journal justly famed for its optimism, recently featured an article that called paranormal phenomena "nonsense." At the last meeting of the American Association for the Advancement of Science (AAAS), John A. Wheeler, the black-holes physicist and head of the Center for Theoretical Physics at the University of Texas in Austin, urged the AAAS to drop its division of parapsychology because it had not proven its "legitimacy" and should not be allowed to use its AAAS affiliation as grounds for seeking public funding for new research. This is quite a blow, because Wheeler's research has been cited by many parapsychologists as providing a theoretical foundation for their beliefs.

The old research is having its troubles too.

The case for the reality of extrasensory perception (ESP), most scientists insist, can only be drawn from the best, most carefully controlled experiments. A study that has repeatedly been cited as one of the most "definitive" scientific proofs of ESP is the S. G. Soal and K. M. Goldney report on Basil Shackleton. It now appears that this famous experiment was a fraud.

For four decades, S. G. Soal dominated psychic research in Great Britain, in a position comparable to that of Joseph B. Rhine in the United States. In the early 1940s, with the help of collaborator Mrs. K. M. Goldney he studied the uncanny paranormal feats of a professional photographer named Basil Shackleton (targeting on Soal's prepared lists of random digits between one and five, Shackleton was able to guess not the last digit being concentrated upon by the sender, but the next digit on the list—a case of precognition. He did it with such accuracy that the odds against his scores being accounted for by chance were astronomical—often as great as 10^{21} to 1).

Soal called this study "completely foolproof," it was supposed to eliminate any possibility of conscious or unconscious sensory cues, to rule out any chance of collusion, deception, or statistical error. Philosopher C. D. Broad called Soal's experiment "outstanding." The precautions taken to prevent deliberate fraud [were] absolutely watertight," Yale biology professor G. Evelyn

Hutchinson said that Soal's studies were "conducted with every precaution that it was possible to devise.... They appear to be the most carefully conducted investigations of the kind ever to have been made." Joseph Rhine praised Soal's work, comparing it favorably with the best of his own Duke University studies.

It turns out that Soal's data were fudged. In the British journal *Proceedings of the Society for Psychical Research*, Betty Markwick recently reported on her revealing computer analysis—the first of her kind—of copies of Soal's original prepared random-number lists. She found long series of numbers repeated identically on different lists, which would indicate, at the very least, some laziness on Soal's part in drawing up "new" lists for each new session. More damning, however, were the repeated series in which extra digits had been inserted, virtually all corresponding to "5's." Apparently, Markwick concluded, Soal had entered extra 1's in copying over the longhand lists, which he later changed to 4's or 6's to correspond with Shackleton's guesses.

Dr. Soal died a few years ago, so he is not around to defend himself. But his coauthor on the Shackleton papers, Mrs. K. M. Goldney, who had graciously supplied the lists for the new study, called Miss Markwick's findings "truly remarkable, adding: "If [they] are valid—and I have no reason to believe otherwise—I and others who [defended Soal in print against other recent allegations] were wrong."

Professor J. G. Pratt, the American ESP pioneer in the psychiatry department at the University of Virginia Medical Center, called the report "an exemplary scientific account of a remarkable achievement in problem solving through data analysis." Pratt added: "Soal and I jointly reported upon some obscure but highly significant [findings] that we interpreted as strong additional evidence for ESP. For the present I must put all of this work aside marked to go to the dump heap."

For those whose belief in the paranormal is as tentative as the latest research findings, this new swing of the pendulum raises old questions: If a "definitive" ESP investigation turns out to be inconclusive, what can be said of the indefinite studies? If psychic powers exist, why is there still no simple, repeatable experiment that will demonstrate them conclusively?

—SCOT MORRIS

CONTINUUM

NEW SOLAR CELL

A new discovery may go a long way toward bringing down the cost of electricity. Sanford Ovshinsky, a self-made Michigan inventor has developed a solar photovoltaic cell that is both cost- and energy-efficient. A photovoltaic cell is capable of converting sunlight into electricity. Energy-efficient photovoltaics have been developed previously but they've all been astronomically expensive.

The estimated costs of Ovshinsky's device, once the cell is in production, are comparable to what your utility is charging you today. So far, there is only one small hitch: Ovshinsky needs \$10 million in development funds to make it a reality.

The major problems are overcome, says MIT professor of electrical engineering David Adler.



Ovshinsky points to his new cost-effective solar cell.

This is the first time where the solution looks straight forward enough to work."

The solution, as Adler puts it, is the use of a silicon hydrogen-fluorine hybrid compound that makes up the heart of the new solar cell. This amorphous silicon is capable of being produced in thin affairs that can be put anywhere (i.e., on your roof) to produce electricity.

THE ULTIMATE DIET

The best way to lose weight is to make your stomach smaller. Or so claims Dr. Ward Griffin of the University of Kentucky who performs an operation he calls a gastric bypass.

In this surgical procedure he ties the top of the stomach into a small pouch and connects it directly to the small intestine, bypassing about 90 percent of the stomach. After the operation, patients feel full by eating just a sandwich.

While surgical treatment of obesity is nothing new—over 50 US doctors now operate on fat patients—Griffin claims to be the first to have conducted a comprehensive follow-up study. He has performed gastric bypasses on some 300 "morbidly obese" patients since 1974 and reports long term success. His patients lost an average of twenty kilograms (forty-four pounds) in the first three months, thirty-five kilograms (seventy-seven pounds) in six months, and more than fifty kilograms (110 pounds) in the first year.

—Dan Rolas

CANCER ALERT

The summer of '79 is expected to be a dangerous one for anyone who spends a lot of time under the sun in



Fair-skinned types will be most vulnerable this summer.

search of a deep, dark suntan. Because of a flare-up of sunspots, which deplete the ozone layer, we can expect an increase of cases of malignant melanoma, the deadly black cancer that starts on the skin and can spread like a prairie fire throughout the body. Especially vulnerable are fair-freckled, easily sunburned types.

Malignant melanoma, a once-rare disease, has increased sixfold in the last forty years. According to Dr. Michael Wolf, an investigator at the University of Connecticut, there is a unique, dramatic pattern. Many more new cases of the disease occur in certain three-to-five-year periods

than in the years between. These periods occur every eight to eleven years. Mention eight-to-eleven-year cycles to any science watcher and the automatic response is "Sunspots."

"Nothing else has this kind of periodicity," says Dr. Viola Sunspot, or electromagnetic storms on the sun's surface, reduce the earth's ozone layer, which filters out most cosmic radiation. Even a slight decrease in the ozone means we are hit with extra radiation, including ultraviolet-B, which is blamed for triggering malignant melanoma.

So this summer we should start feeling the effects of a flurry of sunspot activity that began in 1978—it usually takes two or more years before increased numbers of new melanoma cases begin to show up.

Dr. Viola recommends that we all cool it in the shade. "Furthermore," he says, "the kind of sun exposure you get matters. Working outdoors all year doesn't seem to be as dangerous as staying indoors most of the time and frying yourself now and then."

His research shows that melanoma most commonly strikes the legs of women and the torsos of men in the "meningial class"—people who can afford to plop down on a beach and soak up the rays.

—Krajin White

"I shall never believe that God plays dice with the world."

—Albert Einstein, quoted in Philipp Frank's *Einstein: His Life and Times* (1947)

SHUTTLE FOR SALE

For sale. Four late-model spacecraft, one owner, flown only a few million kilometers.

Science fiction? Not quite. The Boeing Company has approached NASA about buying the entire space-shuttle system. NASA management has been receptive, and the sale of the world's first reusable spacecrafts could go through as early as 1996.

Why would NASA want to sell their most publicized project? Because the space agency believes that running the shuttle will become a routine operation by the mid-1990s. NASA isn't interested in routine operations and wants its personnel free of shuttle tasks to take on new experiments.

Boeing, on the other hand, wants to get into the space business. The company

would operate shuttles as a fleet of private space trucks, selling space to clients who wish to put satellites in orbit, carry on experiments in space, or operate space labs — just as NASA offers space on the shuttle now. Boeing has already completed a study that shows private space-shuttle operations could be profitable.

Both Boeing and NASA would need the support of Congress to complete the sale. Other aerospace companies, including McDonnell Douglas, are also talking to NASA about flying their own commercial shuttle craft.

—Nick Engler

"The essence of science here is not in discovering facts but in discovering new ways of thinking about them."

—W. L. Bragg, *The History of Science*

GRAVITY WAVES

What started as a pulsar hunt by University of Massachusetts astronomers ended up providing

clues to the orbit of the pulsar. Many think as if gives off many gravity waves over a period of time. And that's what he happened. Using the huge radio



telescope in Arecibo, Puerto Rico, Taylor calculated the length of the pulsar's orbit by measuring the time elapsed between the radio signal beeps it gave off each time it swung around on the Earth side of its orbit. Over four years, this orbit has speeded up by four ten-thousandths of a second, a sure sign the orbit is shrinking.

"This is indirect evidence," Taylor cautions. "We don't claim to have detected the actual waves. Exotic equipment, however, is in use at research centers around the world to detect the waves directly. But many scientists believe adequate methods may not be available until the 1990s."

—Douglas Colligan

Astrophysicist Joseph Taylor and his University of Massachusetts colleagues have now come across real-life evidence of these waves in a rare orbiting pulsar about 15,000 light-years away. The pulsar is part of a binary star system, the only one of its kind yet discovered.

According to Einstein's



The space shuttle has become NASA's most publicized project, yet already there is talk of selling it to the Boeing Company.

CONTINUUM

MICROWAVES

The latest experimental word on microwaves is that you can be zapped with up to half the maximum

The problem of setting limits on microwave pollution is a thorny one. More and more microwaves are being beamed into the space around us from radio



U.S. psychologist D. Andrea leads rats into cages in microwave chamber. His experiments show the doses of microwaves are safe

acceptable dose every day for weeks and suffer no side effects, if you're a rat.

University of Utah researchers Drs. Om P. Gandhi and John D. Andrea beamed rats with low levels of microwaves eight hours a day, five days a week, for eight months. After what they say was one of the longest animal-exposure tests, they found no permanent aftereffects.

Gandhi, a professor of engineering and bioengineering, and D. Andrea, a research psychologist, are trying to find out if current safety limits of ten milliwatts per square centimeter are in fact safe. These rats were blasted with five milliwatts per square centimeter

television and television transmitters, radar installations, microwave ovens in homes, restaurants and factories, and even CB trucks. And heavy doses of microwaves have caused cataracts and, some researchers claim, headaches, fatigue, irritability, and even temporary amnesia in people.

In the Soviet Union scientists say they have found many disturbing side effects with low doses. So far, U.S. researchers do not agree, and D. Andrea points out that the microwave dose his rats got was roughly equivalent to what a human being exposed to two and a half times the maximum U.S. dosage limit would get.—D.C.

JOGGING MACHINE

In the era of jogging madness, Burt Shulman is an inventor for our times. The twenty-two-year-old IBM computer-terminal designer has developed "motorized legs."

"I got the idea after my father bought one of those living-room jogging machines," says Shulman. "I thought, Why not make a machine that would assist somebody who wanted to run outside?"

Shulman took a one-horsepower two-cycle engine, mounted it on an aluminum backpack frame and added a lever that regulates the engine's rotary action and provides a pushing action with pads against the thighs. When thigh muscles move that fast, it is relatively easy for calf muscles to keep up, says Shulman.



Shulman jogs mainly along wearing motorized backpack

The result: A runner can hit speeds of thirty-two kilometers per hour (twenty miles per hour) with the device. The engine can also be adjusted to much slower speeds.

Prospects for mass production of the machine are not bright, although a group of exercise physiologists and track coaches will test it soon at Harvard University. If the running machine's viability is confirmed, Shulman could be on his way to wider recognition for this as well as for a host of other inventions he has fathered over the years.

These include a device that blows smoke away from the noses of people using soldering guns, an alarm-cock radio that senses when it is going to rain or snow and awakens the sleeper fifteen minutes earlier than usual, a small machine that improves the circulation of disk-bound executives by continuously moving their feet up and down, an adaptation of the squalling that lets motorists breathe fresh air when caught in traffic jams, and even ultrasonic tweezers for the permanent removal of ingrown hairs.

—Bennett Shapiro

"There is only one proved method of assisting the advancement of pure science—that of picking men of genius, backing them heavily, and leaving them to direct themselves.

—James Bryant Conant
letter to New York Times
August 13, 1945

ATHLETIC SUPPORTERS

With the discs and the javelin, the modern Olympics keep alive the ancient tradition of the Panhellenic games that began more than 300 years before the birth of Christ. And now recent archaeological finds show that not only the events but the booster network of support groups for the Olympics also got their start in ancient Greece.

Stephen G. Miller, associate professor of classics at the University of California, Berkeley, has unearthed a marble slab, dating from 325 B.C. at Nemea, one of the four sites of the Panhellenic (all-Greek) games. The slab is engraved with the names of wealthy men who acted as boosters for the games. Miller, who has been held

director of the dig at Nemea for five years, explains that heralds were sent out from Nemea to announce the dates for the games. Kings and other men in positions of power would act as *theorodokoi*, or herald receivers, hosting these messengers and helping them raise local interest in the meets. The slab, he says, "reveals a degree of organization that had only been suspected before and confirms the attraction of the Nemean Games to Greeks throughout the ancient world."

No one yet knows how or why the Panhellenic sites were chosen. Miller admits, but the consensus is that all of them—Nemea, Olympia, Isthmia, and Delphi—were important religious centers in prehistoric times, a theory that could explain why all four sites occupy remote locations outside the

normal travel routes.

At the time of the games, Miller adds, the constantly warning Greek cities declared a truce so that the athletes and spectators could make the necessary journey without fear of attack. This idea, too, theoretically characterizes today's Olympics.

—Dave Sobel

VENUS MARKET

The planet Venus has become America's latest export market, according to U.S. customs officials.

Although no sales there have been reported, exports destined for that planet have been ruled eligible for a special customs exemption.

Federal statutes provide for the refund of import duties on raw materials when the finished product is subsequently shipped out of the country.

The Hughes Aircraft Corporation took advantage of that provision when it imported a pair of \$30,000 diamonds from Holland. One was re-exported—to Venus. Since that planet is unquestionably out of the country, Hughes earned a refund of \$12,000.

The thirteen-and-a-half carat diamond (slightly larger than a dime) sent to Venus was used as a porthole on the spacecraft Pioneer Venus II, which fell to that planet's surface in December. Infrared radiation sensors behind it appraised the Venusian climate.

The porthole had to be made of industrial-grade diamond in order to admit

heat while withstanding intense temperatures and pressures. Researchers are pleased with the diamond's performance—and with that of the entire mission. We



Pioneer's diamond porthole a case of re-examination learned a lot more than we knew before about Venus's atmosphere, one said. "We detected some of the basic mechanisms that drive its weather."

The other diamond imported by Hughes was kept as a backup on never used in space.—D.R.

"Undoubtedly, the most momentous piece of progress of 1969 occurred in Dijon, France, on August 14 when Paul Rapaport of Facsimile, N.J., lost forever the blueprints for a machine he had just invented which would have made it possible to create a louder noise man had ever heard before."

—Russell Baker, New York Times, February 14, 1970



Miller (right) points to marble slab engraved with names of men who acted as boosters for Nemean games, held about 325 B.C.

CONTINUUM

BONES IN SPACE

It probably won't be a technological problem that keeps us from traveling to other worlds—but the steady degeneration of our bones that prolonged weightlessness produces.

The bones of animals in space, from rats to monkeys to human beings, become so weak that they break easily and take a long time to heal, according to several studies sponsored by the National Aeronautics and Space Administration (NASA). This condition, called osteoporosis, is similar to the effects of old age or long-term confinement to bed. No effective remedy for it is known.

At NASA's Ames Research Center in Mountain View, California, physiologist Don Young has shown that after several weeks of inactivity or weightlessness, humans

and experimental animals actually lose minerals like calcium from their bones. Young reports that attempts to reverse this process—dietary calcium supplements and vigorous exercise—did nothing to stop the loss of bone minerals among astronauts on the last Skylab mission, which lasted eighty-four days.

These studies suggest that the loss of bone minerals is one of the major limiting factors for long-term space flight," Young says.

In another investigation, healthy male rats were orbited for nearly three weeks aboard the Soviet Cosmos 782 biological satellite. The satellite rats experienced far less bone growth than did control rats kept on the ground. In fact, analyses of cross sections of bones indicates that bone growth stopped completely while the rats were in space.

The growth of bone tissue thus appears dependent on the stresses produced by a combination of Earth's gravity and everyday activity.

Doctors at the Stanford University Medical Center and Columbia University are testing new techniques for diagnosing and possibly treating osteoporosis. These include measuring bone strength with an applied vibrational force and stimulating fractured bones by placing them in electromagnetic fields—D. S.

TEACHING SCIENCE FICTION

As courses in science fiction become more popular in colleges and high schools around the country, school administrators find they have a new problem: a shortage of people able to teach the subject. James Gunn is trying to change that with his science-fiction school.

Gunn heads what is officially called the Intensive English Institute on the Teaching of Science Fiction, a three-week crash course on the subject offered every summer at the University of Kansas.

The course is taught by Gunn, a professor of English at the university and author of sixteen works of science fiction, and a colleague, Stephen Goldman. The technique is total immersion in the subject: twenty-five to thirty books must be read and digested prior to attendance at the school; then there are eight to ten hours of lectures, study, and discussion per day, a course

paper on some aspect of science fiction, and guest lectures by top science-fiction authors. This year Gordon R. Dickson, Theodore Sturgeon, and



Theodore Sturgeon helps teach SF in Kansas this summer.

Fredrick Pohl will appear.

Gunn recognized that there was a need for a course like this around 1975, when he began hearing remarks like "I'm supposed to teach a course on science fiction, but I haven't read any. Can you recommend something?" One of his hopes is that the course will help upgrade the image of science fiction. Winking slightly, he recalled a typical host's remark: "It was something like 'let's take science fiction out of the classroom and put it in the gutter where it belongs.'"

For more information, write James Gunn, English Department, University of Kansas, Lawrence, Kansas 66045. —D. C.



Astronauts conduct research in the weightlessness of outer space. Without gravity, zero gravity may also cause bone degeneration.

ELECTRONIC TRANSLATOR

It looks like a slightly oversized pocket calculator, but it's not. It's a



The LK-3000, the first handheld electronic translator, translates English into five foreign languages and vice versa.

programmable mini-computer that can translate five languages and also serves as a portable data bank.

Called the LK-3000, it's the first of a new breed of portable electronic brains that can do more than just juggle numbers for you. At the moment, the LK-3000 is being sold (price: \$225) as an electronic phrase book, capable of translating 1,500 words and phrases in English into Spanish, French, Italian, German and Portuguese and vice versa.

For each language you buy a separate snap-in computer module. To translate, key in the English. The phrase or word in English glides through the

readout window like a small moving neon sign, followed by an equals sign and the foreign-language equivalent. The readout can display sixteen letters at a time.

SCOLIOSIS TEST

A human topographic map has been developed by Canadian scientists for the early detection of scoliosis, a common childhood bone malady.

The new technique charts the contours of a child's back with a Polaroid camera, shooting through a screen of black threads. The photograph, set at a glance, whether the bone structure is symmetrical.

Scoliosis develops as a deformed spine worsens with the growth of a child's bones. If not detected before puberty when a child's bones begin to solidify it occasionally necessitates painful and painful surgery. It affects about 10 percent of all children.

Researchers at Canada's National Research Council and the University of Ottawa hope their apparatus will

Designed by a Miami-based company, the Lexicon Corporation, the LK-3000 will be doing much more in the future. The secret is the system of using interchangeable modules, each of which has a built-in computer on a chip with a 65,536-bit memory.

Lexicon and other computer manufacturers such as Craig already have plans for other programs that will handle at least eight more languages, do metric and currency conversions, chart biorhythms, and even memorize statistics. One LK-3000 module is being prepared as a portable information bank to be used in the 1980 Moscow Olympics. —D.C.

detect a child's scoliosis and eliminate the need for lengthy examinations that previously were common. —D.C.

ERASABLE BALL-POINT

The world's first erasable ball-point pen ink has been developed by Paper Mate. Henry Paper, inventor of the "Paper Mate" pen, was inspired to develop its special ink one day while playing with rubber cement, which can be picked up easily from paper. Paper after ten years of work came up with an ink that's mixed with a rubber compound. A hundred times thicker than gold honey, it must be cooked in a nitrogen-pressured retort, which focus the erasable ink out of the pen. Paper Mate warns users of the \$1.69 pen not to use it for writing checks.



Two photos show that girl on left has normal bone development of spine. Symmetrical shadows line up lengthwise. Girl on right has scoliosis.

CONTINUUM

UNDERSEA CALENDAR

A new theory proposed by an astronomer and a paleontologist claims an unexpected relationship

new septum—creating a new chamber—once each lunar month. Today's nautilus-like shells average thirty growth lines per chamber, closely approximating our



Nautilus—A new theory claims each chamber represents one lunar month—which means the month was once only 22 days long

between things in heaven and on the earth. According to Peter G. K. Kahn and Stephen M. Pompea, the shell-bulking patterns of the chambered nautilus, a sea creature, are modified by the rearmers of the moon—and, further, that the shells of nautilus-like fossils from fossilized remains 420 million years old to present-day examples, indicate that the ever-increasing distance between Earth and the moon has varied radically over time.

Although Kahn and Pompea have not proven how the moon might exert its influence on the bottom-dwelling sea creature, they believe that the animal produces one new growth line in its shell per day and a

current 29.53-day lunar month. If the relationship between the nautilus and the moon is valid, then fossils from various species and locations indicate that the month was once only twenty-two days long.

And this means that the lunar month should grow longer in the future.

Based on their calculations on records of ancient eclipse data covering a 3,000-year period, astronomers reckon that the earth's rotation is slowing down by a fraction of a second per millennium. Its slower spin weakens its hold on the moon, which is now slipping away at a rate of some 5.6 centimeters per year. The nautilus theory flies in the face of the accepted

notion that this rate has been constant in the past. The seashell evidence points to an erratic rate for the changing lunar orbit, which could be explained, the theorists say, by the changing forces exerted by the earth as its continents and oceans assumed their present configurations.—D. S.

TERRORIST EDUCATION

Looking for something to do on a dull weekend? If you have five dollars and a few adventurous friends, you can always break into a top-secret plutonium plant.

Life isn't quite that simple for terrorists of course, but with the help of the government, it's getting there. For \$4.99, anyone can order from the Nuclear Regulatory Commission a forty-eight page booklet entitled *Banner Penetration Database*. It illustrates thirty-two barriers—such as the special doors and windows found at most nuclear-power plants—and offers what amounts to a short course on how to break through them.

The booklet describes looks particularly suited for each barricade and gives exact times on how long it should take someone to bust through or bypass each one. (Getting over a barbed-wire fence takes about ten seconds. For a wall door, it's a little longer—about ninety seconds.)

If you want a real challenge, there's the Savannah River plutonium plant in Aiken, South

Carolina. A maximum-security facility, the plant is the Department of Energy's main source of raw material for nuclear weapons. Armed guards are everywhere, but you won't have to ask them for directions if you break in. ERDA (Energy Research and Development Administration) has recently declassified a detailed road map of the plant complete with a good, crisp aerial photo of the waste dumps where dually isotopes are stored. It can also make available detailed engineering drawings of the storage tanks in the dumps.

A recent government study said that a well-placed bomb could spread strontium 90 and other lethal isotopes stored there for hundreds of thousands of acres.—D. C.



Milks are now being inoculated with the same jet spray injectors used to vaccinate people. Jet injection cuts down the danger of spreading disease from contaminated needles.



INDUSTRY GOES TO SPACE

*Space-made products
could generate revenues in
excess of \$20 billion*

BY G. HARRY STINE

Despite the gloom and doom among those who cast their watchful eyes on the space program, our future in orbit has never looked brighter. The economic motive is emerging as the real driver for going into space in the next quarter century. The gloom resulted from a media disenchantment with space that began the instant Neil Armstrong first set foot on the lunar surface. It all went off without a hitch. If anything really bothers the news media, it is a complicated and dangerous operation that comes off precisely as planned right down to the fraction of a second. But, down deep, the American public is extremely proud of what we have done in space and harbors a quiet hope that the future lies out on the final frontier. We are passing from the initial phase of

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generalized exploration into a new phase of utilization. The utilization is taking the form of space industrialization.

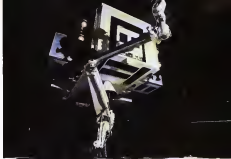
The *Communications Satellite Corporation* (Comsat) was a new approach to a business challenge. In 1965, it created *Early Bird*, the world's first commercial satellite, for the specific purpose of providing a valuable service and a return investment. It has been successful. Comsat returned its first dividend on October 16, 1970, a little over five years after commercial service began. A total of 32,448 stockholders, most of whom owned less than ten shares, received a dividend of 12.5 cents per share. It was the first money that had ever been made from a commercial opera-

tion in which space was directly involved. Communications has therefore been an aspect of space industrialization that has been going on for more than a decade. It has deeply affected our everyday lives. It has been profitable. It has created thousands of new jobs on Earth. It has a track record. But it is only one area of space industrialization, and one that we take for granted.

There are three other areas of space industrialization whose foundations are being laid today. It may surprise many people to learn that a lot of hard study, thought, planning, and analysis has already been done not only by scientists and engineers but also by such business pro-

fessionals as marketing specialists, financial planners, economists, and product engineers. Furthermore, it may be even more surprising that space industrialization offers an extremely attractive and optimistic outlook for investment and profitability over the next twenty-year period. In the total picture, space industrialization presents the boldest challenge of the remainder of the twentieth century, a challenge that can be laid out in business fashion.

We have seen that communications is already a profitable and viable area of space industrialization, the area with the track record and the bottom-line numbers. This space-industry activity is going to expand sharply in the next ten years, along



Preceding page: Being pushed out from Earth into a northern stock orbit for thousands of miles in space. Above: First exposure of *Orbita Service System* (OSS), a space-robot that will automatically service satellites in orbit. As servicing arm swings in to dock with satellite (top), operator monitors its movement on console (middle). After mechanism of OSS arm (bottom) deploys, testing device for securing package.



because of a major change in space-transportation capability.

The major change is the NASA space shuttle and it's a real fly. It will perform as advertised because the little nit-picking problems that remain are engineering problems, which require dogged determination and sensitive fine-tuning of hardware to solve. The problems will be solved. But the space shuttle is only the first of several systems now being considered that will make space transportation an airline-type operation in terms of regularity, reliability, and econ-

omies. It will happen in the next few years. To put it in other terms, the space shuttle is a space truck, capable of placing thirty-two tons of payload into space every week by using a payload bay that is 4.5 meters (15 feet) in diameter and 18 meters (60 feet) long.

The next time a big tractor-trailer rig blows past you on the Interstate, look at it hard. The space shuttle can accommodate that entire tractor-trailer, and its cargo and put it into orbit around the earth every Tuesday morning. And it can bring it back to Earth, too.

The shuttle permits a concept called "complexity inversion." Until now the weight and volume of space payloads have been severely restricted because of the design limitations of modified military ballistic rockets. In addition, space payloads have had to be sealed very rigorously (and expensively) to ensure that they would survive the rugged ride into space and work automatically once there. There was no room for error because the payload couldn't be recalled once it left the launchpad; there was no way to put it in space to check it out first. This demanded that spacecraft be lightweight, small, and simple. All of the size and complexity required by any system was concentrated in the earthbound segment of the system, creating large (and expensive) ground stations. The space shuttle turns all of this around

Industrializing space is a bold challenge that can be laid out in business fashion.



(Above) Lightweight aluminum beams will serve as foundations for factories orbiting in space. (Left) Space shuttle being hoisted for staging at Marshall Space Flight Center in Huntsville, Alabama.

with complexity inversion. Superheavy payloads can be placed in orbit by the shuttle. Very large satellites can be assembled in orbit from payloads brought up in increments by the shuttle. Payloads can be sealed and checked out in orbit by people who are on the spot. If the payloads don't work, fix them there or bring them back to the factory on the ground. If a multi-million-dollar satellite conks out in space, you no longer have to leave it there; you can go to it and fix it or bring it back for repairs in this way. The whole space-payload philosophy is inverted. Large, heavy, complex, and expensive hardware can be put in space, permitting ground equipment to be small, simple, and inexpensive. (Dr. Ivan Bekey, formerly of TRW, Inc., and now NASA's man for advanced programs, has developed several new concepts that would be possible with complexity inversion.)

Consider the advice of Richard Haddock, vice-president of the National Research Council of Canada, who remarked in 1976: "We have learned that the spur of industrial progress is in the marketplace and not simply in developing new technology just because we can do all sorts of neat new technical tricks in space doesn't mean that they should be done. We must look at the marketplace... and we have done so. A group of us worked as consultants for NASA under a contract with Science Applications, Inc., we did a complete

survey and analysis of the entire space-industrialization field. We also performed a market analysis on a selected number of promising concepts such as Bekey's idea whether or not they really made sense from a business standpoint. In the communications/information area alone, sixty-seven different potential services/products could be developed in orbit. A small fraction of the enormous potential in this one area."

With the capability of placing large communications satellites in geosynchronous orbit 37,600 kilometers (23,500 miles)

above the earth's surface (where they would orbit the planet once every twenty-four hours, making them appear to stand still over one spot), it is possible to increase their sensitivity to signals sent up from Earth, increase the power with which signals can be sent back, and increase the number of discrete channels and frequency resources. This permits the use of very small and inexpensive ground stations. Complexity inversion is at work.

Today's computers can handle, store, and manipulate copious amounts of data very rapidly. By means of telephone lines, radio links, and even today's satellites, these computers can "talk" to one another, exchanging data and even combining computational power. With complexity inversion, you can carry this capability right down to the people level. Put a large multi-channel, high-power data-transfer satellite in orbit. We can do it. We have the technology. Local schools and libraries could then be linked to a central data bank through a one-meter antenna on the roof, coupled to an inexpensive, low-power radio and data terminal inside. Think of what it would mean if your local library or high school could have available the entire contents of the Library of Congress and the New York Public Library! Before the year 2000, the price of this equipment will be such that you can even have it in your own home.

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FICTION

GALATEA GALANTE

*He created the Perfect Woman,
with one little flaw designed into her*

BY ALFRED BESTER

He was wearing a predated jump suit, beautifully tailored, the designer cut in the nostalgic 2100s, but really too youthful for his thirty-odd years. Set square on his head was a vintage (circa 1950) English motorcap with the peak levelled on a line with his brows, masking the light of lunacy in his eyes.

Dead on a slab, he might be called distinguished, even handsome, but alive and active? That would depend on how much demanded dedication one could stomach. He was shouldering his way through the crowded aisles of

THE BURLIN CROWD
80 PHANOSIN PARADES 80
11 ALL ALIENS 11

He was carrying a mini sound-camera that looked like a chrome-and-ebony peeper mill, and he was filming the living, crawling, spasming, gibbering monstrosities exhibited in the large showcases and small vitrines, with a murmured running commentary. His voice was pleasant, his remarks were not.

"Ah, yes, the *Selenix basilar*: so the sign assures us. Back-and-yellow bod of a serpent. Looks like a Gila-monster head attached. Work of that Texas tailor who's so nifty with surgical

needle and thread. Peacock coronet on head. Good theater to blindfold its eyes. Conveys the conviction that its glance will kill him. Dug it so gag the mouth, too. According to myth the basilisk's breath also kills.

"And the *Hyadot hydr*: Like woe Nine heads, as per revered tradition. Looks like a converted iguana. The Mexican agent. That seamstress has access to every damn snake and lizard in Central America. She's done a nice job of neck-to-trunk—got to admit that—but her stitching stinks to my eye.

"*Carnopis orberut*: Three dog heads. Look like oversized Chihuahua. Vestifit bod. Rattlesnake tail. Ring of rattlers around the waist. Authentic but clumsy. That Texas woman ought to know you can't graft snake scalls onto hound hide. They look like chud, but at least all three heads are barking.

"Well, well, well. Here's the mascot who claims his my rival, the Berlin butcher with his zoo castoffs. His latest spectacular, the *Rigel griffin*. Te-daa! Do him justice, it's classic. Eagle head and wings, but it's moting. Len bod implanted with feathers. And he's used otchich claws for the feet. I would have generated authentic dragon's feet!

"Now *Melanar macroceros*: horse bod, elephant legs, stag's tail. Yes, convincing, but why isn't it howling as it should, accord-



PAINTING BY H.R. GIGER

ing to legend? Muzr mariboua. Kasher Kasher. Three rows of teeth. Look like implanted therks. Lion bod. Scorpion tail. Wonder how they produced that red eyed effect. The Ares assida. Dull. Dull. Dull. Dulapelle. Just an oetich with camel feet and stumbling all over them. No one alive imagination!

Ah, but I call that poster over the Sover spher brilliant theater. My compliments to the management. It's got to be recorded for posterity. THE PUBLIC IS RESPECTFULLY REQUESTED NOT TO GIVE THE CORRECT ANSWER TO THE ENIGMA POSTED BY THE SHERK.

"Because if you do give the correct answer as Oedipus found out, she'll destroy herself out of chagrin. A sore loser! I ought to answer the riddle, just to see how they stage it, but no. Theater ain't my stick, my business is strictly creative genius."

"The Berlin butcher again. Castor children. Lion head. Goat's body. Looks like an anacardifall. How the hell did he surgically go it to vomit those flames? Some sort of catalytic gammick in the throat. I suppose it's only a cold compound, but, quite harmless but very dramatic—and those fire extinguishers around the showcase are a lovely touch. Damn good theater. Again, my compliments to the management."

"What! Beefcake on the hoof. Zoama oen fair. Good-looking Greek joined to that Sheppard pony. Blood must have been a problem. They probably drained both and substituted a neutral surrogate. The Greek looks happy enough in fact, damn smug. Anyone wondering why his only to see how the pony hung."

"What have we here? Antares unicorn, complete with grained narwhal tusk, but not with the virgin who captured it, virgin girls being the only types that can subdue unicorn, legend saith. I thought narwhals were extinct. They may have bought the tusk from a walking-stick maker. I know virgins are not extinct, I make 'em every month, purely guaranteed or your money back."

"And a Space siren. Lovely girl. Beautiful She— But damn my eyes, she's no manufactured freak! That's Bantula, my Siren! I can recognize my goddess anywhere. What the hell is Sandy doing in the damn disgusting circus? Naked in a showcase! This is an outrage!"

He charged the showcase in his rage. He was given to flashes of fury that punctuated his habitual exasperated calm. (His deep conviction was that it was a damned in manager world because it wasn't run his way, which was the right way.)

He beat and clawed at the supple walls which gave but did not break. He cast around wildly for anything destructive, then darted to the closest exhibit, grabbed a fire extinguisher, and dashed back to the Siren. Three dissonant blows cracked the plastic, and three more shattered an escape hatch. His fury outdrew the freaks, and a fascinated crowd gathered.

He reached in and seized the smiling Siren. "Sandy got the hell out! What were you doing there in the first place?"

"Where's your husband?"

"For God's sake!" He pulled off his cap, revealing pale, streaky hair. "Here cover yourself with this. No, no, get downstairs. Use an arm for spacers, and hide your rear elevation against my back."

"No, I am not prudish. I simply will not have my beautiful creation on public display. Do you think I—?" He turned forcibly on the six security guards closing in on him and brandished the heavy brass cylinder. "One more step, and I let you have it with this in the eyes. Ever had frozen eyeballs?"

They halted. "Now look, master, you got no—"

"I am not called 'master.' My degree is Domine, which means master professor. I am addressed as Domine. Domine Manwright, and I want to see the owner at once. Immediately. Here, and now. Sober! Ammedatements! Mr. Salum or Mr. Phreak

● He beat and clawed at the supple walls, which gave but did not break. He cast around wildly for anything destructive, then, grabbed a fire extinguisher and dashed back to the Siren. ●

or whatever!

Tell him that Domine Regis Manwright wants him here now. He'll know my name, or he'd better by God! Now be off with you. Split. Out. Manwright glared around at the enthralled spectators. "You lunks get lost too. All of you. Go, eyeball the other sights. The Siren show is Apatu."

As the crowd shuffled back from Manwright's fury, an amused gentleman in highly unlikely twentieth-century evening dress stepped forward. "I see you understand Siren, an Most impressive." He slung the open cape off his shoulders and offered it to Sants. "You must be called madame. May?"

"Thank you, Manwright growled. "Put it on Sandy. Cover yourself. And thank the man."

"I don't give a damn whether you're cold or not. Cover yourself! I won't have you parading that beautiful body I created. And get me back my cap."

"Women!" Manwright grumbled. "This is the last time I ever generate one. You give over them. You use of your expertise to

create beauty and implant sense and sensibility and they all turn out the same. Imbazon! Women! A race apart! And where the hell is 50 Phantasmic Phreaks 50?"

"At your service, Domine," the gentleman smiled.

"What? You? The management?"
"Indeed, yes."
"In that ridiculous white tie and tails?"
"So sorry, Domine. The costume is traditional for the role. And by day I'm required to wear tanning dress. It is grotesque, but the public expects it of the regressor."

"Hmph! What's your name? I'd like to know the name of the man I skin alive."

"Conque."
"Cook? As in Ireland?"
"But with a Q U E."

"Conque? Con-que-ee?" Manwright's eyes twinkled. "Would you by any chance be related to Charles Russell Conque, Syntus professor of ETM biology?" (He held that in your favor.)

"Thank you, Domine. I am Charles Russell Conque, professor of extraterrestrial and mutation biology at Syntus University."

"What?"
"Yes."
"In that preposterous costume?"
"Was, yes."
"Held? On Terra?"
"In person."

"What a crazy coincidence. Do you know I was going to make that damned tedious trip to Mars just to rap with you."

"And I brought my circus to Terra hoping to meet and consult with you."

"How long have you been here?"
"Two days."

"Then why haven't you called?"
"Setting up a circus show takes time, Domine. I haven't had a moment to spare."

"This monstrous fakery is really yours?"
"It is."

"You? The celebrated Conque? The greatest researcher into alien life forms that science has ever known? Revealed by all your colleagues, including myself, and sending the lunks with a prony freak show? Incredible, Conque! Unbelievable!"

"But understandable. Manwright. How you any idea of the cost of ETM research? And the reluctance of the grants committees to allocate an adequate amount of funds? No, I suppose not. You're in private practice and can charge gigantic fees to support your research, but I'm forced to moonlight and operate the circus to raise the money I need."

"Nonsense, Conque. You could have patented one of your brilliant discoveries—that fantastic Jupiter II methaphoxy, for instance. Goumets call it 'The Ganymede Tulle.' Do you know what an ounce sells for?"

"I know and there are discovery rights and royalties. Enamorous. But you don't know university contracts, my dear Domine. By contract, the royalties go to Syntus, where—Professor Conque's smile soured—"where they are spent on such studies as Remedial Table Tennis. De-

morla Orientation, and The Light Verse of Leopold von Sacher-Masoch

Manwright shook his head in exasperation. "Those damned faculty closets! I've turned down a dozen university offers, and no wonder. It's an outrage that you should be forced to humiliate yourself and— Listen, Corque. I've been dying to get the details on how you discovered that Garymade metaphyla. When will you have some time? I thought—Where are you staying on Tems?"

"The Bonais."

"What? That fosbag?"

"I have to economize for my research."

"Well, you can economize by moving in with me. It won't cost you a cent. I've got plenty of room, and I'll put you up for the duration with pleasure. I've organized a housekeeper who'll take good care of you—and rather attractive, I think. Now do say yes, Corque. We've got a hell of a lot of discussing to do and I've got a lot to learn from you."

"I think it will be the other way around, my dear Domine."

"Don't argue! Just pack up, get the hell out of the Bonais, and—"

"What, Sandy?"

"Where?"

"Oh, yes. I see the rat funk."

"What now, Manwright?"

"Her husband. I'll trouble you to use restraint on me, or he'll become her late husband."

An epicure dove into view—tall, slender elegant, in flesh-colored SkinAll—with chest, arms, and legs artfully padded to macho dimensions, as was the ornamented codpiece. Manwright juggled the extinguisher angrily, as though grasping for the firing pin of a grenade. He was so intent on the encounter that Corque was able to slip the cylinder out of his hands as the epicure approached, surveyed them, and at last spoke.

"Ah, Manwright."

"Jessamy!" Manwright turned the name into a denunciation.

"Sandra."

"And our impresso."

"Good evening, Mr. Jessamy."

"Manwright, I have a bone to pick with you."

"You? Pick? A bone? With me? Why you damned pimp, putting your own wife, my magnificent creator, into a damned teak show!" He turned angrily on Professor Corque. "And you bought her, eh?"

"Not guilty, Domine. I can't supervise everything. The Freak Foreman made the purchase."

"He did, did he?" Manwright returned to Jessamy. "And how much did you get for her?"

"That is not germane."

"What is?"

"The issue? Why you padded procurer?"

Why? God knows, you don't need the money."

"Dr. Manwright—"

"Don't you Doctor me. It's Domine."

"Domine—"

"Speak."

"You sold me a lemon."

"What!"

"You heard me. You sold me a lemon."

"How dare you!"

"I admit I'm a jkonnare."

"Admit it? You broadcast it."

"But nevertheless I resent a rip off."

"Rep! I'll kill the man. Don't restrain me. I'll kill! Look, you damned minty macho, you came to me and contacted for the perfect wife. A Sixon, you said. The kind that a man would have to lash himself to the mast to resist, a la Ulysses. Well? Didn't you?"

"Yes, I did."

"Yes, you did. And did I or did I not generate a bi-droid miracle of beauty, enchantment, and mythological authenticity guaranteed or your money back?"

● In the center stood
a glimmering Rube Goldberg,
Heath-Robinson,
Da Vinci . . . construct . . . It
resembled . . . a giant
collapsing robot waiting for a
handyman to put it together
again. Corque stared. ●

"Yes, you did."

"And one week after delivery I discover my Pearl of Perfection sold to the denigrated Charles Russell. Corque's obscene teak show and displayed naked in a obscene showboise. My beautiful face and neck! My beautiful back and buttocks! My beautiful breasts! My beautiful mors veneris! My—"

"That's what she wanted."

"Did you, Sandy?"

"—"

"Shame on you, girl! I know you're vain—that was a glitch in my programming—but you don't have to flaunt it. You're a damned exhibitionist." Back to Jessamy. "But that doesn't excuse your selling her. Why did you do it, damned? Why?"

"She was tearing my sheets."

"What?"

"Your beautiful, enchanting Pearl of Perfection was tearing my monogrammed silk sheets, woven at incredible cost by brand-damaged nuns. She was leaping them with her mythologically authentic feet. Look at them."

There was no need to look. It was undeniable that the beautiful, enchanting Sixon

was lathered from the knees down and had delicate pheasant feet.

"So?" Manwright demanded impatiently.

"She was also scratching my ankles."

"Damn you! Manwright burst out. "You asked for a Sixon. You paid for a Sixon. You received a Sixon."

"With bird feet?"

"Of course with bird feet. Sixons are part bird. Haven't you read your Bullfinch? Aristotle? St. Thomas Brown? Matter of fact you're lucky Sandy didn't turn out bird from the waist down. Ha!"

Very funny, Jessamy muttered.

"But it was lucky. Manwright went on. "No, it was genius. My bi-droid genius for creative genius and my deep understanding of the sexual appetites."

"Don't be impudent, girl! I have sexual appetites, too, but when I guarantee a virgin! — No matter. Take her home, Jessamy. Don't argue, or I'll kill you. I'll castrate that damned brass thing I thought I had. Take Sandra home. I'll refund Professor Corque in full. God to justify his brilliant research. Sandy trim your salons, for God's sake! Sense and sensibility, girl! Corque, go pack up and move in with me. Here's my card with the address. What the devil are you doing with that silly-looking fire extinguisher?"

"And that's the full-streer Charles. I'm sorry I haven't any work in progress to show you, but you can see I'm no tailor or seamstress, cutting up mature animals, human or otherwise, and piecing parts together, like you see with those show-biz monsters in your circus. No, I'm monogenerate, em, pure and whole, out of the basic DNA broth. Mine are all test tube babies, Florence-flask babies, as a matter of fact, which is where I start, em. Bi-droids need womb space like any other animal."

"Fascinating, my dear Reg, and quite overwhelming. But what I can't fathom is your RNA process."

"Ah! The RNA messenger service, eh?"

"Exactly. Now we all know that DNA is the life reservoir—"

"Ah? We all know? Ha! Not bloody likely. Some time I'll show you the abuse I get from the Scripture books."

"And we know that RNA is the messenger service delivering commands to the developing tissues."

"Right on, Charles. That's where the controls lie."

"But, how do you control the controls? How do you direct the RNA to deliver specific commands from DNA to embryo? And how do you select the commands?"

"Penthouse."

"Wh-what?"

"Come up to the penthouse. I'll show you."

Manwright led Corque out of the erudite crimson-tinted ocellar laboratory which was softly glowing with ruby-colored gasewine and liquids ("My babies must be insulated from light and noise") and up to

the main floor of the house. It was decorated in the Domine's demoted style: a hodgepodge of Regency, classical Greek, Albian and Renaissance. There was even a marble pool inhabited by adolescent minic fish, which glared up at the two men eagerly.

"Hoping we'll fill in," Marwright laughed. "A cross between piranha and golden carp. One of my babies."

Thence to the second floor, twenty-five by a hundred. Marwright's library and study, four walls shrouded and camouflaged with paper, publications and software, a rolling ladder leaning against each wall, a gigantic carpenter's workbench, center used as a desk and piled with clutter.

Third floor divided between dining room (front), kitchen and pantry (center), and servants' quarters (rear overlooking garden).

Fourth floor, enjoying maximum sky and air bedrooms. There were two, each with its own dressing room and bath, all rather severe and minimalist. Marwright regarded sleep as a damned necessity which had to be endured but which should never be turned into a luxury.

We'd get enough sleep during our nine months in the world," he had growled to Corque, "and we'll get more than we'll ever need after we die. But I'm working on regenerative immortality, off and on. Trouble is, tissues just don't want to play ball." He led the professor up a rafter stair to the penthouse.

It was a clear plastic dome, firmly anchored against wind and weather. In the center stood a glistening Rubie Goldberg Health Robinson, Da Vinci mechanical construct. It resembled anything it would be a giant collapsing robot waiting for a hyperdylan to put it together again. Corque stared at the gull mouly and then at Marwright.

"Neutroscope," the Domine explained. "My extrapolation of the electron microscope."

"What? Neutros? The beta decay process?"

Marwright nodded. "Combined with a cyclotron. I got particular particle selection that way and acceleration up to ten Mev. Selection's the crux. Charles Bach genetic molecule in the RNA coil has a specific response to a specific particle bombardment. That way I've been able to identify and isolate somewhere in the neighborhood of ten thousand messenger commands."

"But—but—My dear Reg, this is a positively ludicrous!"

Marwright nodded again. "Uh-huh. Took me ten years."

"But I had no idea that—Why haven't you published?"

"What? Marwright started in disgust. "Publish? And have every damned quack and campus clown crowding around with the most sacred and miraculous phenomenon ever generated on our universe? Pah! No way!"

You're into a Reg. Marwright drew himself up with hauteur. V. or do not clown.

"The Reg—"
"But we're not," professor. By heaven if Christ in whom I've never believed ever returned to Terra and this house, I keep it a secret. You know damn well the hell that would break loose if I published. Hell be Golgotha all over again."

While Corque was wondering whether Marwright meant his biotroid techniques, Christ's epiphany of both, there was a sound of a large object slowly falling upstairs. Marwright's scowl was transformed into a grin. "My housekeeper," he chuckled. "You didn't get the chance to see her when you moved in last night. A treasure."

An abject face attached to a pinhead, peered through the penthouse door. It was followed by a stowed hunchback body with gigantic hands and feet. The mouth, which seemed to wander all will around the face, opened and spoke in a hoarse voice

● One would expect
the chairman of a syndicate
to look like
Attila the Hun. Valera looked
and dressed like a suave
Spanish grandee, he was black
and silver. He was very
much au courant. ♣

"Meth-er..."
"Yes, Igor?"

"Should I threat you a brain today, meth-er?"

"Thank you, Igor. Not today."

"Then breaktuhht eh therved meth-er."

"Thank you, Igor. This is our distinguished guest, the celebrated Professor Charles Corque. You will make him comfortable and obey him in everything."

"Yes, meth-er. At your thriveth, celebrated Professor Charth Corque. Should I threat you a brain today?"

"Not today, thank you."

Igor bobbed his head, turned, disappeared and there was a sound of a large object rapidly falling downstairs. Corque's face was convulsed with suppressed laughter. "What in the world—?"

A wail. Marwright grimed. "Only one in my cater. No, the best of two. I see count Sandy but I do think Jessamy will keep his. Sure. Anyway," he continued, leading Corque downstairs. "The client was absolutely hypnotized by the Frankenstein legend. Came to me and contracted for a faithful servitor, like the Baron's ac-

complish. Returned five months later, paid like a agent, but said he changed his mind. He was now on a Robinson Clause kick and wanted a Friday. I made him his Friday but I was stuck with Igor."

"Could I not have dissolved him back into the DNA bath?"

"Good God, Charles! No way. Never. I generate life. I don't destroy it. Anyway, Igor is an ideal housekeeper. He does have the brain-stealing thing up—still was part of the original model—and I have to look him in a chest when there's trouble and lightning, but he cooks like an absolute genius."

"I hadn't known that Baron Frankenstein's handman was a chef!"

"To be quite honest, Charles, he wasn't. That was an error in programming—I do glitch now and then—with a happy stoning. When Igor's cooking, he thinks he's making monsters."

The card came in on the same day with the Toronto Orion Tart (rise tomatoes, sliced onions, parsley salad, Gruyere, bake in pastry shell forty minutes at 375°F) and Marwright snatched the embossed foil of the silver.

"What's this, Igor? Anthony Valera, Chairman, Vortex Syndicate, 69 Old Slip, CB, 0210-0012-036-216291?"

"In the waiting room, meth-er."

"By God, Charles, a potential client. Now you may have your chance to watch my genius from start to finish. Come on!"

"Oh, have a heart. Reg! Let the chairman wait. Igor's monster looks delicious!"

"Thank you, celebrated Professor Charth Corque."

"No, no, Igor. The thanks go from me to you."

"Pigs, both of you," Marwright sneered and dashed for the stairs. Corque rolled his eyes to heaven, grabbed a slice of tart, winked at Igor and followed, chewing ecstatically.

One would expect the chairman of a syndicate with a seventeen-figure CB telephone number to look like Attila the Hun. Anthony Valera looked and dressed like a suave Spanish grandee; he was black and silver, including ribbedn panthe. He was very much au courant, for as Corque entered he smiled, bowed and murmured, "What a happy surprise, Professor Corque. Delighted. I had the pleasure of hearing you speak at the Invenum Chironike convention. And Mr. Valera, come dearest, offered he left panthe. Corque's right hand being busy with the tart."

"He wants an ideal executive secretary?" Marwright refused to waste time on courtesies. "And I told him that my biotroid talents are damned expensive."

"To which I was about to respond when you most happily entered, Professor Corque, that Vortex is originally silver."

"Then it is to be a company contract?"

"No, Domine, personal. Mr. Valera smiled. "I, also, am criminally slow!"

"Good. I hate doing business with committees. You must know the old saw about

*A grass-roots rebellion
against establishment obstetrics
quietly gathers momentum*

BY GENA COREA

Nativity, a 6/2000
Susan Rogers wants to give birth the old-fashioned way—vaginally. Since most hospital births are done by cesarean section, Susan decides, after her gynecologist confirms her pregnancy, to deliver at home. The midwife—midwives are illegal but omnipresent in America—screens her for risk factors. She finds none.

Toward the end of the pregnancy, while Susan and her husband are relaxing at their home in the woods of Brattleboro, Vermont, a helicopter swoops down and lands in the backyard. A physician and a policeman emerge from the machine and produce a court order authorizing them to take the unborn baby into protective custody to prevent child abuse. They force the screaming woman into the helicopter.

At the hospital, Susan is taken into a birthing suite decorated with houseplants, flowered drapes, and a bedspread. She sits in a rocking chair, stunned, unaware that during her one and only visit to the gynecologist, he registered Susan's pregnancy with the Regional Perinatal Center and implanted in her vagina a tiny receiver for the electronic fetal monitor along with a device used to track down migratory animals.

In the computer room, which looks much like a NASA communications center, obstetricians have been following her pregnancy for months. (Doctors at the center often joke that they are conquering inner space.)

Susan's labor is induced with Procin, a stimulant. Two hours later, in the computer center behind the suite, the screen displaying her monitoring signal reveals "fetal distress."

The alarm sounds. Susan is rushed into the operating room, strapped to the table, anesthetized. A doctor takes a knife, cuts her abdomen open, and pulls the baby from her womb. Attendants transport the baby to the intensive-care unit for treatment of respiratory distress.

The patient, still dazed, is wheeled back to the homey birthing suite.

This is Norma Swenson's grim vision of

**CHILDBIRTH
2000**



childbirth in the year 2000. Swanson, who holds a master's degree from Harvard School of Public Health, is coauthor of *Our Bodies, Ourselves*. Having been active in childbirth groups for twenty years, she is former president of the International Childbirth Education Association (ICEA).

Why do visions of helicopters dance in her head at night? "Because this is happening during the day."

- The executive director of the American College of Obstetricians and Gynecologists (ACOG) declared in 1977 that home birth, a growing trend, constituted "child abuse" and "maternal trauma."

- Three home-birth couples—in Louisiana, Idaho, and North Carolina—were accused of child abuse in early 1978. In the North Carolina case, police, acting on an obstetrician's complaint, forcibly took the woman from her home while she was in labor and transported her to a hospital.

- A low-income woman who wanted natural childbirth refused various interventions, including Pitocin injections to speed up her labor at Boston City Hospital in June 1978.

The hospital tried to get a court order forcing her to accept the drug. Then, as her lawyer explained: "There was some concern that this lady must be crazy because she refuses to do what the hospital staff tells her to do." They called in a psychiatrist to judge her mental health while she was in labor. After many hours, they "persuaded" her to accept Pitocin and anesthesia. Several days later, the hospital announced it was instituting proceedings to take her baby on the ground that she might endanger her child. The baby placed in a foster home for months, has lately been returned to her.

- Dr. Jack M. Schneider, codirector of the Weccanac Perinatal Center in Madison has proposed a national registration of pregnancies.

- A "regionalized system of obstetrical treatment," which involves shutting down maternity services in small community hospitals and transporting mothers and infants to large, technologically oriented hospitals, is being established throughout the United States.

Suzanne Arms, author of *Immaculate Deception*, believes that when America has been fully converted to a regionalized obstetrical system, physicians and health authorities will be closely coordinated enough to make Norma Swanson's helicopter nightmare a real possibility.

Increasingly women like Susan Rogers want midwives to help them bear their children at home. With the reemergence of midwives in America today it is important to ask why they ever disappeared.

As Dorothy and Richard Wertz point out in *Living in A History of Childbirth in America*, physicians in the nineteenth century struggled to drive these women, their competitors, from the living-in-chamber. They saw midwives as threats to the very founding of their practice at a time when no established medical profession existed in

North America. Women, they feared, might seek midwives for help with all their "female troubles" and doctors would lose at least half their potential patients.

BIRTHING IS LIKE A CAR CRASH

Historians emphasize this point: Doctors did not replace midwives in America because their attendance at birth assured a safer outcome. They just claim that was the case, but it was not, says G. J. Barker-Benfield, assistant professor of history at the State University of New York at Albany and author of *The Horrors of the Half-Known Life*, a book that, in part, explores the origins of obstetrics and gynecology in America. "In fact, I'm trying now to explain the proliferation of gynecological disorders very often following birth at the hands of men. Contrary to being safer, obstetricians may well have been more damaging than midwives." The aggressive obstetries of men, with the frequent use of forceps to speed up a labor

• *The ability to actively manage childbirth with new technology gives physicians great power to control nature. Month by month this power grows, so that by the year 2000 home births may be outlawed.* •

process doctors often found tedious, lacerated cervixes and sore holes in the birth canal. Professor Barker-Benfield noted:

During and after the antiseptic campaign, physicians redefined birth, changing it from a normal to a pathological process. They asserted that no precaution—including the employment of a physician—was too great to avoid its frightening dangers.

In 1920, an influential paper advocated routine forceps delivery and episiotomy (an incision made to widen the birth canal) for all deliveries. Dr. Joseph DeLee, one of the most revered men in American obstetrics, asserted that normal birth was pathologic and compared it to a baby's getting his head caught in a door.

Denaturalizing that physicians still view birth as pathologic, Dr. Edward Hon, developer of the electronic fetal monitor (EFM), recently compared normal labor to a certain railroad crossing, where cars get smashed up and people get killed.

Such a dangerous event seemed to justify what obstetricians now call "active management of labor"—the artificial initiation, control and termination of labor by

doctors. This active management has gone far beyond the routine surgical procedure (episiotomy) that DeLee brought to normal birth, a procedure that has never been demonstrated by any study to benefit mothers or babies.

Interviews with prominent obstetricians reveal that by 2000, childbearing women (who under the pathological model of birth have become "patients") and their unborn babies can expect new forms of "active management."

Since obstetricians are developing techniques for teaching babies in utero, they may be peered at, medicated and operated on before they are even born. Several doctors enthusiastically told me:

In one procedure, the obstetrician will cut into the pregnant woman's abdomen and uterus and, using what is called a "fiberoptic endoscope," push into the amniotic sac and peer at the fetus through the telescopic lens in the instrument. Then the doctor will clip off a piece of the baby's skin and draw blood from it for what doctors call "diagnostic purposes."

Long-term effects of this procedure on mother and child are unknown, but Dr. R. Alan Baker, a fellow of the American College of Obstetricians and Gynecologists, lists some of the immediate risks to the mother:

- Spontaneous abortion
- Leakage of amniotic fluid during later months of pregnancy
- Uterine bleeding
- Infection
- Puncture of other organs
- Rupture of the baby's blood vessels, leakage of the blood into the mother's circulation, and the consequent buildup of antibodies in the mother against her child's blood
- Psychiatric disturbances

Baker questions whether fetoscopy—with its risks of uterine trauma, ruptured amniotic sac, damage to the eyes of the fetus from the intensity of the fiberoptic light—is a safe method of diagnosis. He points out that other more accurate methods are available for determining congenital defects.

FETUS UNDER GLASS

In 2000, doctors will be able to medicate the "sick" fetus by injecting drugs into the amniotic fluid or by inserting a needle directly into the fetus. The success of the procedure, of course, will depend upon the doctor's ability to hit the right part of the unseen baby.

Long-term effects of injecting drugs into the still-developing fetus are unknown. However, testimony by Dr. Yvonne Brackbill, graduate research professor at the University of Florida in the departments of psychology and obstetrics-gynecology before the Senate Oversight Hearings on Obstetrical Practices, in 1978, might give physicians cause for concern. Brackbill, who reviewed twenty-five studies on the effects of obstetrical medication of the fetus

CONTINUED ON PAGE 104





FIRST ENCOUNTER

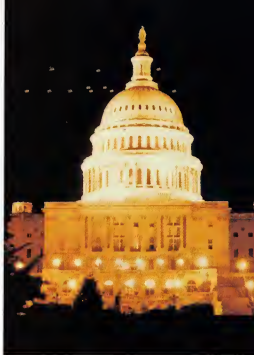
Scientists urge the United Nations to act now on the matter of UFOs

BY E. LEE SPEIGEL



A highly unusual meeting occurred recently at the United Nations. It went virtually unnoticed in the press. Some top investigators momentarily gained the attention of a world body whose millions of constituents have traditionally cast a doubtful ear to their cause, the UFO phenomenon. This serious group, keenly sensitive to global skepticism, viewed the UN encounter as an opportunity to lend credibility to UFOs. Astronaut J. Allen Hynek had visited thirty years to speak at the United Nations. Formerly a consultant to the US Air Force during Project Blue Book, Hynek's reputation as the chief scientific debunker of UFOs has turned a

Against a cloudless Mediterranean sunset (above), needlelike rotating "black cloud" was photographed near Alicante, Spain (below left, part of a sequence shows small craft preparing to land); right, symbol-embossed flying object over Denmark



went somewhat: "Only in the face of stubborn facts and data have I been forced to change my opinion. There's no question that this is a very real phenomenon, any attempt to explain away UFOs as imagination or as natural events is, today, nonsense."

Addressing the UN Special Political Committee, Hynok focused on the global nature of the phenomenon. "UFO reports have been assembled from 133 different countries and have been made in significant numbers by highly responsible persons. Radar experts, astronauts, pilots, government officials, and scientists have all given eyewitness accounts."

French astronomer-mathematician Jacques Vallée, emerging

Cone-topped UFOs observed near Cordillera Mountain, Argentina (above); unusual UFO formation over Capitol, thought by many to be a reflection in camera lens (above right); similar formation (below left) over Canada denies conventional explanation (right) Denver, May 2, 1974

• They seem to be programmed in some way," says Hynok, "implying some sort of intelligence." •

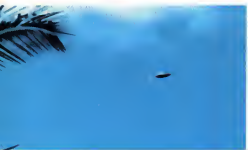
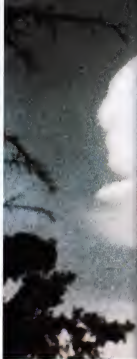




This sinking sequence shows the close proximity in which UFOs come to eyewitnesses. The photos, taken in 1963 by a southwestern electrical engineer, show the craft hovering (above and left) in a forest area and then (right) leaning on its side, a maneuver often reported worldwide. "I think we can navigate equally as well as they do, but we certainly don't have the sophisticated propulsion systems that they apparently have," opines former astronaut Gordon Cooper. He was among a key group of UFO experts who participated in the recent UN presentation



as an intelligent new proponent of the phenomenon, assessed the social implications of UFOs and the need to finally determine whether they do, in fact, exist. "The lack of serious, open-minded research in the field has encouraged witnesses to think that science is incapable of dealing with it," said Vallis. "An open exchange of information on the subject is needed." Astronaut Gordon Cooper, a key member of the UFO advisory group, believes that the UN should establish "a top-level, coordinated program to collect and analyze data from all over the world and to determine how best to interface with these [UFO] visitors in friendly fashion." Cooper, whose scientific background cannot be ignored, had several startling UFO encounters during the 1950s.

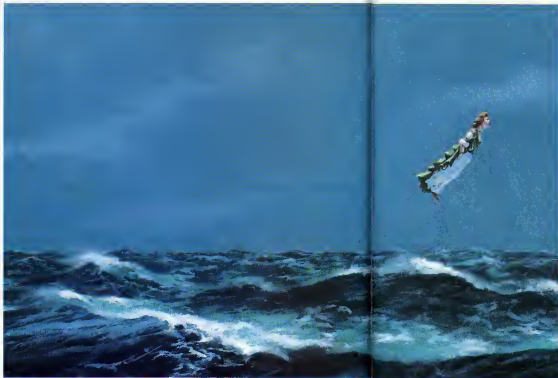


Dr. Felix Zigel, a leading scientist at the Moscow Aviation Institute, asserted that "the important thing is for us to discard any preconceived notions about UFOs and to organize on a global scale a calm, sensation-free, and strictly scientific study of this strange phenomenon. International cooperation is vital."

All statements were entered into the official UN record. The delegates have been asked to study them closely. A consensus vote was taken on December 8, 1978, and the UFO matter will be reexamined when the UN Committee for the Peaceful Uses of Outer Space convenes in June. A team of UN-sponsored investigators might be the outcome of such deliberations. ☐

From a sequence photographed on 74 near St. Lorenzen, Austria (top left); aerial photo of Hula grid in Honolulu revealed UFO in background (below right); at left, close-up of object. Above, dark object seen from what one analyst suggests is a vaporlike "exhaust", Shasta, Calif. 1970

• I believe," asserts Vallee, "that UFOs are heralding a major change in social belief patterns." •



FICTION

The two border-patrol agents of the Immigration and Naturalization Service stared at each other glumly. "Going to lose that arm, Pacilio?"

"Naw, only us wags know how to really use knives. The doc says it'll take a couple months therapy to get it working again and it'll always be a little stiff, but what the hell, that oughta be okay for a desk job, right?"

"A nice desk job sounds pretty good to me right about now," said O'Hara, who lay immobilized in the hospital bed, connected to a collection of tubes, drains and monitoring devices. "So what happened to those motherfucking wetbacks that jumped us? After that shotgun started blasting."

Pacilio scowled outlandishly. "Did you say wetback, you dumb mick?"

O'Hara grinned weakly. "Excuse me, Commissioner. Illegal alien is what I meant to say."

"Regal alien!"

"Well, pardon me all to hell, Your Honor. Undocumented worker."

"Worker?"

"Okay, okay, probationary

ICEBACK INVASION

BY HAYFORD PEIRCE

"Give me your tired, your poor . . ." Russians?

PRINTING BY EVELYN TAYLOR

chosen. Undocumented probationary citizen. Or have they come up with a new one while I been in a coma?

Nope. undocumented probationary citizens is what earned me up and gurned you down. Don't hurt as much that way does it O'Hara?

"Only when I laugh pat only when I laugh."

Well, hold on to your sides then. This is really going to break you up. The six guys who did the carving have been released in custody of their new citizen sponsors, the United Brotherhood of Saratoga Workers of Los Angeles. Their complaint sworn against us members little things like assault, battery illegal use of force, unwarranted and unjustified stop and search and there about a dozen other charges pending before the court. The district director is trying to get them quashed, but he doesn't know how good the chances are. The UB swings a lotta weight, and there's a lotta baggage cars up in LA needing to be emptied.

"So it's our asses that swing huh?"
"It sure is. O'Hara, it sure is."

"It is the end," announced President Martinez with glowing foreboding, "of the Republic as we know it."

"Oh yeah?" said Secretary of State Richard XYZ, a study in stoic skepticism. "Our reparations to Black Africa is been paid on time, ain't it?"

"Humph!" snorted Attorney General Ahmed El-Ah. "Under my own administration, all political prisoners detained because of race, color, creed, or revolutionary belief have been released."

"How exciting," drawled Labor Secretary Antonelli languidly. "Without having to refer the question to my ex. family, I feel certain that no union problems are about to arise."

"Ugh," concurred Interior Secretary Chief Running Outback. "Ist and last a presidential supporter "White man taken land belong Indian, n-stice pass" and rewrote to his customary lethargy."

Gentlemen please, implored the President.

"Gentlemen? Men?" cried Secretary of Enforcement of Women's Constitutionally Guaranteed Equality Eliza Hologababus founder and national chairwoman of the minority but powerful Let's Begin Party "Gentlepersons."

"Touchy touchy," muttered Rafael laPine HEW auto voice, to Ms. Hologababus. "Rejected another ball transplant, dear?"

"Dat still leave her wit two more dan you, ya fuckin' transvestite," explained Jeremy "Rocky Knucks" Kawolski, director of penal sequestration and rehabilitation, "so let's shut ya mouth an' listen to what da man has to say huh?"

"Beast," muttered Mr laPine turning for sympathy to, and going for the leg of, Commerce Secretary Codfish Saltwater Withrop—well, dim primped, the token WASP of President Martinez's Cabinet.

"The end of the Republic?" repeated

Welfare Payments Secretary Mergan Prepps DuPont. "As we know, of course. In what way?"

"The army" snapped President Martinez, glancing at Defense Secretary Mildred Haggelman.

"But surely!" interjected Budget Director Cyrus Openhand, "next year's defense budget is some \$950 billion!"

"Exactly" replied the President "and do you realize that with a budget of nearly a billion dollars a year, the entire armed forces personnel—Army Navy Air Force, Marines National Guard, and what have you—is currently 348 000 effective? Total? This in a country of 300 million?"

"On the other hand," pointed out Ms Hologababus, "it is an exceptionally well-qualified army."

"Extremely important," concurred Richard XYZ.
"Overriding consideration, even," suggested Ahmed El-Ah.
"Figures Ms Secretary Haggelman?"

● *This is the most egalitarian army ever created. It consists of 51 percent females, 47 percent males, 1 percent transsexuals, 1 percent transvestites, 4 percent lesbians, 6 percent gays, 7 percent criminals.*

"Certainly," she replied proudly "it is the most egalitarian armed forces ever created. As of today it consists of 51 percent females, 47 percent males, 1 percent transsexuals, and 1 percent transvestites. It is, furthermore, 8 percent black, 26 percent Hispanic, 1 percent Amerind, 28 percent Catholic, 2 percent Jewish, 1 percent Muslim, 4 percent lesbian, 8 percent gay, 11 percent bisexual, 14 percent handicapped and mentally retarded, 7 percent criminal, 8 percent pacifist, 21 percent illiterate, and 100 percent untrained!"

"Bravo," applauded Mr laPine. "An how many of dese bums is combat ready?" inquired Rocky Knucks "Kawolski with professional interest."

"An extremely favorable ratio. Aside from the 6,200 men in the missile submarines at all times, I sincerely believe that upon seventy-two hours notice, the armed forces of the United States of America could field some 27 000 battle-ready combat troops!" Ms Haggelman blushed modestly. "And in six weeks we could double that figure!"

Mr Kawolski nodded thoughtfully but remained a man who demanded absolute certitude. His massive jaw swung majestically

around to confront President Martinez. "You mean like dere ain't enough guys in da army to defend da country and dat's da end of da Republic?" he asked.

President Martinez gaped. "Why whatever gave you that idea? It is alarming, of course, to the potential dangers of a military coup!"

Charlie "The Fighting Eskimo" Rubenstein, circuit judge for the Twenty-seventh District peered dolefully. "It's all over," he moaned. "The election is down the tubes. Me an ex-judge at forty-two. And by a lousy two hundred votes. That's what hurts, Maxie, two hundred votes, just—"

"Pipe down, Charlie. I gotta tell ya again to stop your worrying? Your two hundred votes will be coming in any moment now." The campaign manager pulled his rumpled jacket together, straightened his collar and began to slick down his hair. "Get presentable, Charlie. Boy your victory speech will be coming up any moment now."

"But, Maxie," enunciated Charlie ponderously, "where are the votes going to come from? We already counted the gay vote, the grayed vote, the anti-pot vote, the Aaron Burr Society vote, the vegetarian vote, the men's-liberation vote, and we're still behind!"

"Charlie," said Maxie gently. "I'm gonna tell ya sompin'. A lotta people don't like ya. But it don't matter because that ballot box which they is coming in and dumping on the registrar's table over there and which they are now opening up and counting the ballots thereof, that ballot box is gonna give you a landslide margin of a matter of forty or maybe even forty votes. Salvo me, baby, the electorate of the Twenty-seventh District has declared its will, and Charlie Rubenstein is the one they will!"

Charlie shook his head in baffled awe. "But Maxie, we've counted every nut group from here to the funny farm and—"

"Ah huh!" crowed Maxie. "I knew ya'd forget!"

"Forget? Forget what?"
"The funny farm."
"The funny farm?"
"Of course the funny farm."

"Maxie. Listen to me. What am I saying? Do you take me for some kind of a NUT?"

"Sixth?"
"—certify 367 votes from the Sixteenth Ward, Sub-Division E, Polling Station Four Seventeen votes for Sika, three hundred fifty votes for Rubenstein. The winner in the Twenty-seventh District is—"

"You, ya dummy, now—"
"Polling Station Four is the funny farm?"
"Woodchopper State Hospital for the Mentally Retarded," said Maxie smugly.
"That's it."

Charlie inhaled slowly and profoundly, his eyes glazed. Suddenly he exhaled with a whoosh. He broke into a maniacal grin. "Maxie," he cried, staggering Maxie with a gleeful slump between the shoulder

bladder. "Now I get it. Now I get it. You mean like you had the fix on it, and like the doctors and the nurses and the orderlies and the gardeners and the guards and all of the others that take care of the nuts—"

"—mentally retarded, Charlie—"

"—and like, they're the ones that voted for me. Right, Maxie. Isn't that right, Maxie?"

"Wrong, Charlie. They all vote in their own precincts, where they live, just like everyone else. I mean like the mentally retarded nuts in the funny farm, a who has just selected you the distinguished circuit judge for the glorious Twenty-seventh—"

The distinguished Judge could only sputter.

"It sounds like a motorboat," said Maxie sardonically. "LA shrieks, they been doing it down in LA since '76 or '78, somepin like that. Isn't fifteen years now?"

"They have?"

"Sure they have. They get the hospital staffs to run voter-education plans, and the League of Women Voters comes in and conducts workshops, and they get judges and sheriffs to certify that this one and that one suffice moderately or mildly retarded patient as not deemed able to form, if ya see what I mean, an appropriate opinion." A didactic finger jabbed the Judge's forehead painfully. "An' that's all it takes."

"And this is legal? Not like getting out the greyhound vote?"

"Of course it's legal. Ain't they got their own constitutional rights just like you and me and all the rest of the distinguished voters of this great district?"

The Judge fell into deep and somber thought. At last he uttered uncertainly, "Yeah, I suppose now that I think of it, they're no dumber than anyone else that's voting these days." Charlie's low voice did not carry absolute conviction. Another long moment's anguished thought and he was able to articulate that profound question which had been nibbling like a fox at his bosom for some minutes now. "But, Maxie, doesn't that mean... like, these retarded guys, couldn't they... you know, have voted for the other guy?"

"For chrissake, Charlie," snarled Maxie. "Who else would be dumb enough to vote for a schmuck like you? Now straighten ya tie, here comes the TV camera."

"Enough!" shouted the party secretary balefully. "You will support me on this measure or—"

"You will have us shot, Gamin Andropovich?" smirked the director of state security. No, comrades, I think I speak on behalf of the entire Politburo when I say that you heroic labors in 'aid of the glorious peoples of the Soviet Union have earned you that son-of-a-bitch reward retirement from the quiet calm of your beloved dachha on the distant side of the Ural Mountains."

Somewhat later after the former party secretary had been conveyed discreetly

from the room and was snugly imprisoned en route to his cozy one-roomed birchwood cabin deep in the treeless evergreen forests to the east of Lake Baikal, the foreign minister cleared his throat authoritatively.

Actually comrades, a certain, ex-former person's project might well be construed to contain certain elements of interest. Let us be blunt, he snapped sharply. "The Soviet Union has not been so poorly off in relation to the rest of the world since the years before the Great Patriotic War."

"Consider. The European Common Market is now the single most powerful economic force in the world. Our Warsaw Pact allies are being drawn inexorably into its orbit. Our eastern flank is threatened militarily by the revisionist traitors and capitalists of the Bro-Nipponese conspiracy. Our policy in black Africa is a shambles, good rub to after bad is poured into a bottomless cesspool. The Arabs have squandered their oil and are bankrupt; the Muslim in-

◀ *The minister of consumer planning was suave, eager to expunge memories of the trifling matter of 54 million left shoes produced throughout the Soviet Union, excluding any right shoes whatsoever.*

dentists have declared holy war against the Communist ritual, a million of our agents and comrades lie slaughtered in a dozen countries." Vesly Pavlovich pounded the table.

"And finally the United States surrounds us with submarines, with cruise missiles, with laser-armed satellites, its dollar weakens, its economy groans, its morals decay, its will to survive atrophies, its army is nearly nonexistent, it is clearly in the last days of degeneracy. But," he thumped the table anew, "still it survives. Clearly it is as comparatively dangerous to the Soviet Union as it was twenty years ago. Therefore, I submit that the tactics of fifty years of struggle have been to no avail, and that we implement—"

"That goat-beheaded Resolution Six?" cried the minister of agriculture incredulously.

"Ah," said the minister of consumer planning suavely, eager to expunge memories of a trifling matter recently discussed of some 54 million left shoes produced throughout the Soviet Union, to the exclusion of any right shoes whatsoever. "But ask yourself this, dear Ivan Mikhailovich. By

adapting and implementing Resolution Six, what have we actually to lose?"

"And of equal importance," concluded the director of state security declaimedly, "even if anything does go wrong, what short of nuclear war can they do to us?"

"Fifteen years ago," said O'Hara, offi-attached to his plumbing. "I got called to testify in Grinda, the one that pulled the plug on the border patrol and let every glacier south of the border into the country and onto the payroll as easy as kiss my Irish ass."

"You were?" In Grinda? marveled Padilo who settled back to listen to the story for the dozenth time.

"Sure was. Got a sweep through the garment-factory section. Puled in these six guys, couldn't I speak a word of English. No ID, so off they go. Next thing we know the sweatshop employer and all the rest of the clothing manufacturers, the ACLU, the League of Mexican Voters—and get this the unions, cause they're losing membership all over the place and the union bosses figure they won't have no one to boss around much longer—all of these characters decide to make this a test case. So there I am in court testifying to their million-dollar shyster defending these six scared Mexes what don't even understand what's going on."

"Lead it on pretty thick, I hear," prompted Padilo.

O'Hara snorted. "With a towel, pal. What right," says he, by what right does this unforged and brutal Gostepso seize and humiliate these poor innocent honest hard-working migrants? Possibly it ain't proven, they crossed the border unknowingly certainly not in any intentionally illegal fashion. Does this deny them the right to work, the right to live peacefully among free families, the right to be free from attack by jackbooted authority?" O'Hara's lips pursed bitterly at the memory.

"And then?"

"And then our guy, he says: 'But, Your Honor, all these fine INS boys is doing is trying to uphold the law of the land, what says that illegal migrants is just that, i.e., illegal, doncha know?' And viz, by definition these fellows ain't supposed to come into this country and work and bring their children and wives, and establish residences, and go to schools, and a million other things and all these overworked upstanding noblelike officers is doing is asking these guys who ain't plainly illegal if they have any ID to identify themselves. Nix a passport with an entry visa, mind you, and not even a green card, Your Honor and maybe not even something in English, but just plain anything for chrissake!"

"Hey! Easy, pal, easy! You'll put all your plumbing out."

"Yeah, so after a bit more of this, the judge, who knows which side his bread is buttered on, comes to his decision—namely that since by the appearance of things the defendants were doing nothing illegal

CONTINUED FROM PG.



"When I saw the knight sacrificed in the first game, and the follow-up move, my first reaction was 'This is dreadful—the thing is beating me!'"

INTERVIEW

DAVID LEVY

Last September, in Toronto, a thirty-four-year-old former computer programmer named David Levy sat down at a chessboard and played what might turn out to be the most important chess match in the history of the game. Although Levy is a world-class chess player, ranked at the international-master level, he readily admits he would be easy pickings for a player of the stature of Anatoly Karpov or Bobby Fischer. What made the match so important, then, was not Levy but his opponent—a computer.

The Toronto match was the result of a bet Levy had made with a number of researchers in artificial intelligence ten years before. Simply put, the bet was that Levy would not be beaten in a chess match by a computer program within the next ten years. The stakes, at the time the match was held in Toronto, were 1,250 British pounds (about \$2,000).

"Personally, I think I will destroy it," said Levy before the match. He did indeed win the match—Levy won three games, the com-

puter program (called CHESS 4.7) won one game, one game was a draw—but he did not destroy his opponent. "I had a tougher time than I thought I would," said Levy after the match.

The Toronto match was certainly a victory of man over machine, but, as Levy acknowledges, it is a victory that will not be with us for long. Levy himself expects to be beaten by a computer program within five years and uses this occasion to announce the Orme-Levy Prize—\$5,000 to the first computer program to win a match with him (see details on page 134). Moreover, Levy feels that it will not be long before a computer takes on and beats the likes of a Karpov or a Fischer. In the future, it seems, the world's chess champion will be a machine.

The following interview with David Levy was conducted by *Chess* contributing editor Dr. Christopher Evans, himself a chess player and computer expert. The interview was conducted in two parts: the first before the match in Toronto; the second after Levy had beaten the computer program and won his bet.

Orin: How did the bet actually come about?

Levy: In 1968, during a conference on artificial intelligence at Edinburgh University I was playing chess with John McCarthy of Stanford University who is one of the leading figures in machine intelligence. At the time, I was the reigning Scottish chess champion so although he was a very tough opponent, he wasn't particularly surprised that he lost. After the game he said that even though he would never be able to beat me, in less than a decade a computer program would wipe me out. I was laconically skeptical of this. In the previous week of the conference, the strongest chess program in the world at that time had been playing against all comers and scoring only about fifty percent against considerably weaker players than I was. So I said, "You're too optimistic, and I'll bet you five hundred pounds that you're wrong." Professor Donald Michie, then head of the department of machine intelligence at Edinburgh, was sitting on the floor about three feet away from me, overheard our conversation and said, "I wouldn't mind having some of the action." So I immediately bet each of them two hundred fifty pounds that I wouldn't lose a match of chess against a computer program within ten years.

Orin: Weren't you at all troubled at the confidence with which they undertook the bet?

Levy: No. In many ways I considered it to be perfectly natural, because they were two of the world's leading experts in AI and therefore had to have absolute faith in their own field. They had to be confident that within a relatively small number of years, machine intelligence would make such advances that there would be computer programs which could play chess like a world champion, translate natural languages like a bilingual person, prove theorems in calculus or geometry with great speed, and so on and so forth. Their optimism was in a way just as realistic from their point of view as my confidence that I couldn't possibly be beaten was from my point of view. The really interesting thing is that progress in the field since I made the bet has shown that they were more on target than I was.

Orin: It was an excellent bet, then, wasn't it?

Levy: Certainly. All three of us were absolutely certain that we were going to win. Two other noted machine intelligence advocates subsequently joined the consortium, and one of them, Seymour Papert of MIT also staked two hundred fifty pounds. Two years later, at one of the ACM computer tournaments in Chicago, a professor from the University of California at Davis, Ed Kozdrowski, was absolutely convinced that I stood no chance at all, and he came in on the bet one morning at breakfast with yet another two hundred fifty pounds. Strangely enough, that same afternoon Kozdrowski's program reached a position in its game where it could have achieved mate in one move, but it wasn't smart

enough to spot it. Move after move went by and still didn't give the mate. In the end, it actually lost the game, and poor old Kozdrowski was heard muttering something about having made a dreadful bet at breakfast.

Orin: When did you first begin to feel that computer chess programs were really getting somewhere?

Levy: I think it was at the tournament in Stockholm in 1974. One of the things that struck me was a game in which one of the American programs made the sacrifice of a piece, in return for which it got a very good positional advantage. Now programs don't normally give up pieces unless they can see something absolutely concrete, but in this case the advantages that it got were not concrete but rather in the structure or nature of the position. It wasn't a difficult sacrifice for a human player to see, but it was something I hadn't expected from a computer program. I was giving a running commentary on the game, and I remember

"The eyes of the world will be on the match as a sort of struggle between man and machine. This will inevitably make me a little shaky, but of course it will not affect my opponent."

saying to the audience that I would be very surprised indeed if the program made this sacrifice, whereupon it went and made it. I was very very impressed, because this was the first really significant jump that I'd seen in computer chess.

Orin: So somewhere around that time things began to stir. To what do you attribute this?

Levy: Interest in computer chess generally was growing at a very fast rate, for a number of reasons. First of all, there were the annual tournaments in the United States at the ACM conferences, and these grew in popularity. They inspired interest partly because there was now a competitive medium in which the programs could take part. Also, there was my bet, which had created a certain amount of publicity and, I suppose, made people wish that they could write the program that would beat me.

Orin: How much of this has gone hand in hand with the gradually greater availability of computers and the fact that it no longer costs the earth to get access to one?

Levy: Quite a lot. As recently as 1972, in San Antonio, I met some people who were

actually writing a clandestine computer program to play chess. They hadn't dared tell their university department about it because they would have been accused of wasting computer time. They were even unable to enter their program in the tournament, because if they had they would have lost their position at the university. Today the situation is dramatically changed, because it is so much easier to get machine time. Now with the advent of home computers, I think it's only a matter of time before everyone interested in computer chess will have the opportunity to write a personal chess program.

Orin: Times have changed, haven't they? Not very long ago you'd see articles by science journalists saying that computers could never be compared with brains, because they couldn't play a decent game of chess. There was even some popular correspondence about what would happen if two computers played each other, and it was argued that if white opened with pawn to king two, black would immediately resign.

Levy: This presupposes that chess is, in practical terms, a finite game. In theoretical terms it is, because there is a limit to the number of moves you can make in any position, and the rules of the game also put an upper limit on the total number of moves that any game can involve. But the number of possible different chess games is stupendous—greater than the number of atoms in the universe. In fact, even if each atom in the universe were a very very fast computer and they were all working together they still would not be able to play the perfect game of chess. So the decision pawn to king four as an opening move could be proved to be a win for white by force is nonsense. One reason you hear these kinds of things is that most people do not understand either the nature of computer programs or the nature of chess. The man in the street tends to think that because chess grand masters are geniuses, their play is beyond the comprehension of a computer. What they don't understand is that when a computer plays chess, it is just performing a large number of arithmetic operations. Okay, the end result is typed out and constitutes a move in a game of chess. But the program isn't thinking. It is just carrying out a series of instructions.

Orin: One sees some very peculiar, almost spooky moves made by computers, involving extraordinary sacrifices and almost dazzling wins. Could they be just chance?

Levy: No. Wins like that are not chance. They are pure calculation. The best way to describe the situation is to divide the game of chess into two spheres, strategy and tactics. When I talk about tactics I mean things such as sacrifices with castles, checks, and threats on the queen or to force mate. When I talk about strategy I mean subtle maneuvering to try and gradually improve position. In the area of tactics, programs are really very powerful

because of their ability to calculate deeply and accurately. Thus, where a program makes a spectacular move and forces mate two moves later, it is quite possible that the program has calculated the whole of that variation. These spectacular moves look marvelous, of course, to the spectator and to the reader of chess magazines because they are things one only expects from strong players. In fact, they're the easiest things for a program to do.

What is very difficult for a program is to make a really good, subtle, strategic move, because that involves long-range planning and a kind of undefinable sixth sense for what is "right in the position." This sixth sense, or instinct, is really one of the things that sorts out the men from the boys on the chessboard. The top chess programs may look at as many as two million positions every time they make a move. Chess masters, on the other hand, look at maybe fifty, so it's evident that the nature of their thought processes, so to speak, are completely different. Perhaps the best way to put it is that the human knows what he's doing and the computer doesn't.

I can explain this with an example from master chess. The Russian or world champion Mikhail Tal was explaining after one game his reasons behind particular moves. In one position his king was in check on king's knight one, and he had a choice between moving it to the corner or moving it nearer to the center of the board. Most players, without very much hesitation, would immediately put the king in the corner because it's safer there. But he rejected this move, and somebody in the audience said, "Please, Grand Master, can you tell us why did you move the king to the middle of the board when everybody knows that it's safer in the corner?" And he said, "Well, I thought that when we reached the sort of end game which I anticipated" it would be very important to have my king near the center of the board." When they reached the end game, he won it by one move, because his king was one square nearer the vital part of the board than his opponent's. Now this was something that he couldn't have seen through backtracking analysis and by looking ten or even twenty moves ahead. It was just feel.

Qweil: This brings us up against the question of whether or not a computer will ever play a really great game of chess. How do you feel about J. J. Good's suggestion that a computer could one day be world champion?

L Levy: Well, ten years ago I would have said, "Nonsense." Now I am absolutely sure that in due course a computer will be a really outstanding and terrifically good world champion. It's almost inevitable that within a decade computers will be maybe a hundred thousand or a million times faster than they are now. And with many, many computers working in parallel, one could place enormous computer resources at the disposal of chess programs. This will mean that the best players in the world will be

wiped out by sheer force of computer power. Actually from an aesthetic and also an emotional point of view it would be very unfortunate if the program won the world championship by brute force. I would be much happier to see a world-champion program that looked at very small combinations of moves but looked at them intelligently. This would be far more meaningful because it would mean that the programmer had mastered the technique of making computer programs "think" in rather the same way that human beings do, which would be a significant advance in artificial intelligence.

Qweil: Which brings us around to the tactics you adopt when playing computers. When did you play your first game against a chess program?

L Levy: The first one that I remember was against an early version of the Northwestern University program, and it presented no problems at all. These early programs were rather dull opponents, actually

given up the piece at the beginning. This often brings about a feeling in the program that can best be described as "apathy" if a program gets into a position that is extremely difficult because it is absolutely bound to lose something. It starts to make moves of an apparently reckless kind, it appears to be saying, "Oh, damn you! You're smashing me off the board. I don't care anymore. I'm just going to sacrifice all my pieces." Actually the program is fighting as hard as it can to avoid the inevitable. **Qweil:** That sounds very much like the way beginners get obsessed with debilitating pieces. But it also sounds as though you're saying that you feel the program has a mood.

L Levy: Almost. One tends to come to regard these things as being almost human, particularly when you can see that they have understood what you are doing or you can see that they are trying to do something clever. In fact, as with human beings, certain tendencies repeat themselves time and again.

For example, there are definite idiosyncrasies of the Northwestern University program that one soon comes to recognize. In a particular variation of the Sicilian defense, white often has a knight on his queen four square and black often has a knight on black's queen bishop three square. Now, it's quite well known among stronger players that white does not exchange knights, because black can launch a counterattack along the queen knight file. Now I noticed quite often that when playing against the Sicilian defense, the Northwestern University program would exchange knights. Its own reason was that the maneuver leads to black having what we call an isolated pawn, which, as a general principle, is a "bad" thing. So the Northwestern University program, when in doubt, used to say, "I'll take his knight. And when he recaptures with the knight's pawn, he has got an isolated rook's pawn 'Goody'." What it didn't realize is that in the Sicilian defense, the isolated rook's pawn doesn't actually matter, but having the majority of pawns in the center for black does. So when I played my first match against CHESS 4.0 in Pittsburgh, on April 1, 1977, I deliberately made an inferior move in the opening, so that the program would no longer be following its opening book and wouldn't know what to do. I was confident that after I made this inferior move the program would exchange knights, which it did, and this presented me with the sort of position that I wanted.

Qweil: What does it feel like to play a good chess program?

L Levy: Well, as I said, I hear it more or less as I would a human opponent, but one who is rigid in certain respects and has certain idiosyncrasies which it cannot cure. Perhaps "human" isn't quite the right word. It is more like a pet dog or cat. Look at the move it played, such a nice move! What a clever boy! And you develop a sort of empathy with it, just as if it were a pet. The best programs even send you little messages. If

"I completely overlooked a check that the program made and thus beat me. It was the first time ever that a computer program had won against an international master in a serious game."

The latest ones, of course, are much more intelligent, particularly as they exhibit what you might also describe as psychological characteristics or even personal traits.

Qweil: Could you give an example?

L Levy: Well, there is this thing called the horizon effect. Say a program is threatened with the loss of a knight which it does not want to lose. No matter what it does, it cannot see a way to avoid losing the knight within the horizon that it is looking at—say four moves deep. Suddenly it spots a variation where by sacrificing a pawn it is not losing the knight anymore. It will go into this variation and sacrifice the pawn, but what it does not realize is that after it has lost the pawn, the loss of the knight is still inevitable. This pawn was merely a temporary decoy that the program is thinking only four moves ahead and the loss of the knight has been pushed beyond its horizon of search, so it is content. Later on, when the pawn has been lost, it will see once again that the knight is threatened and it will once again try to avoid losing the knight and give up something else. By the time it finally does lose the knight, it has lost so many other things as well that it wishes it had really

Bad planning is turning Earth
into a time bomb

POWER PLAY

BY FREDERIK POHL



Here is a multiple-choice question to test your wits. How are we going to meet America's growing energy needs for the future?

- a. By importing more oil and natural gas,
- b. by developing our own new sources of oil and natural gas,
- c. by expanding coal production and perhaps by chemically converting some coal into liquid or gas fuel,
- d. by constructing more nuclear-fission-power plants, perhaps including breeder reactors,
- e. by learning how to generate power from nuclear fusion.

Take a minute to think it over, because these are the answers you'd get from your president, your legislators, your friendly neighborhood-utility public-relations flock, and the guy sitting next to you at the bar as you watch the ball game. Made your decision? Okay. Here's the right answer. It isn't any of the above. It is:

f. We aren't.
That may look like bad news, and for a lot of people it undoubtedly is. But the reason it is bad news is that the question it answers is a bad one. It assumes that everything will go to hell if we don't keep on adding an extra 4 or 5 percent to our energy consumption every year. That is an assumption which seems to be shared by every politician and editorial writer in the Western world and by most economists, sociologists, and political scientists as well. But let's examine the facts.

•Before long it will
require almost four liters'
worth of energy to
extract four liters of crude oil •

Then you can make up your own mind.

Every morning you pick up your newspaper and somebody tells you that the world is running out of oil, and every evening a TV newscaster tells you that it isn't so because new reserves have just been discovered. Which one is right?

They both are. There are oceans of oil yet untapped. No one really knows how much there is. The problem is expense—in terms of dollars and energy. We keep finding new oil reserves, but they are increasingly hard to get at.

You can make much the same argument for natural gas. But besides being hard to get at, natural gas needs a hell of a lot of treatment to make it useful. Worse, it's hard to ship, so hard that much of the world's supply is flared off as a nuisance in fields so immense that they dominate the satellite-a-eye view of the nighttime Persian Gulf.

The same is true for coal, although coal mining is complicated by the fact that it is a dirty business. It is dirty because it kills miners and condemns them to miserable lives even when they don't die of it, it is dirty because strip-mining ruins everything it touches, and it is dirty because most available coal contains sulfur in amounts that rot middle buildings, destroy automobile tires, damage your health, and sometimes kill. There are ways of minimizing these problems, and they are well worth doing, but if sulfur scrubbers, strip-mine reclamation, and safer, healthier mining practices are called for the cost of mining will go way up.

But let's say that none of this is true. Let's say that we don't have to worry about cost or pollution or scarcity. The terrible truth is that, even so, we cannot go on with the energy madness, because we'll run ourselves. The planet is carbon dioxide.

No matter how cheap or clean fossil fuels are—and this applies equally to oil, coal, and natural gas—there is one pollutant they must inevitably produce when they burn, and that is CO₂. We produce it continuously when we breathe. So do all other animals and at least part of the time plants. There is carbon dioxide in the air we breathe, and it is good that there is, for its presence helps regulate our metabolism, and every plant in the world needs it to survive.

The amount of carbon dioxide in the air has been slowly going up for some time.

Carbon dioxide has an unusual quirky fit in the solar heat. The more of it there is in the air, the more heat stays in the earth's biosphere and the less gets reradiated out into



space. During a cold winter you might say, Well, hell, so what if we get a little warmer? It might even be nice.

And so it might—up to a point. What frightens me is that no one really knows where that point might be. There's no doubt that if the world's annual mean temperature went up say ten degrees, it would be catastrophic. It would mean, among other things, the melting of the polar ice caps—and the drowning of New York, Miami, and Los Angeles under ninety meters of ocean. But what about an increase of five degrees? Or one degree?

No one knows. And by the time anyone finds out, it might be too late. Scientists in Antarctica have tried to match up the prehistoric periods of greatest melting of ice with the periods of highest world temperature. They've found out that the maximum melting of an ice mass—breaking off at the edges into icebergs, which float away and melt—look place long after the maximum-warmth period: ice is a poor conductor of heat. After a couple of decades of relatively "warm" weather, the ice might sun-cold again on the surface—but down deep, where the movements that cause calving and melting occur, the extra heat would still be there. By the time we noticed the Poles melting, there would be no way to stop it.

Even worse, there is a lot of carbon dioxide in solution in the ocean—sixty times as much as there is in the air. If you've ever left a bottle of ginger ale open on the bar overnight, you've learned that carbon dioxide dissolves better in cold water than in warm. What would happen if the tempera-

ture of the earth went up a little bit—not enough to do much damage in itself, but enough to release a little of that dissolved CO₂ from the sea? The CO₂ would rise into the atmosphere, where it would trap a little more heat. No one knows at what point the world would become a runaway effect.

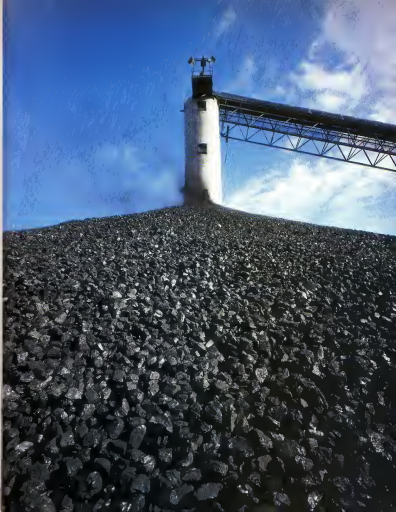
Some say (it might be truer to say "hope") that the present increase in atmospheric carbon dioxide is not enough to do any serious damage and are of the opinion that we could increase the level by as much as 50 percent without any real danger. It's only an opinion and, even so, not a very reassuring one. Because what does that 50 percent translate into as regards the burning of fossil fuels? Two scientists named U. Siegenthaler and H. Oeschger had to answer that question a year or so ago. By their best estimate, we have a problem: if they are correct, there's no point in looking for new oil fields or coal mines, because their projection is that we cannot safely burn more than 10 percent of known fossil-fuel reserves—over the next several centuries!

Scratch fossil fuels. That leaves nuclear reactions. Are they going to save us?

I'm afraid not. Let's not worry about the obvious problems, some of which are formidable: (a) No one has yet put into practice a safe system for storing radioactive wastes; (b) the abundant and cheap sources of uranium ore have already been so thoroughly exploited that one expert says that any new reactor built will be built on nothing more substantial than hope; (c) there's plenty of low-grade uranium ore around, but to mine it would do at least as much damage to the environment (and cost as much expense) as strip-mining coal does; (d) we have some awfully close to major disasters caused by existing nuclear plants, and there is no reason to believe that our luck will go on forever.

Several years ago, I took part in a conference at the New York Academy of Sciences at which Constantino Giannaras made an interesting point. The human race, he said, has been increasing at the rate of an additional 4 or 5 percent each year since the time of the Minocans, 3,200 years ago. And if we go on increasing it at the same rate for the next 3,200 years, he pointed out, we will have released so much energy into the biosphere that the tempera-

The North Star of belts (above); far from just expending terrible atoms, coal mining (right) kills men and disrupts the land's ecology.



sure of the earth's surface will be about the same as that of the surface of the sun.

Now obviously that ain't going to happen. For one thing, you and I are not going to survive a temperature of 4,952°C (9,007°F). Humans would be wads of glowing plasma long before that, so that process is self-terminating. The unarguable significance of Genesis's observation is that it proves there is some point at which growth has to stop. The only question is: When do we stop? Forget about melting the polar ice caps! That might be only a minor annoyance in the scenario that could be played out with relatively minor increases in the world's warmth.

Curiously that scenario might be a rerun of all the species of animals that were still alive at the end of the Mesozoic Era, free out of four had become extinct by the early Cenozoic. How did it happen? One theory is that a carbon dioxide-induced global warm-up took place. If so, it happened in an extremely short time by geologic standards—probably no more than a million years—and perhaps even in a rather short time by anybody's standards; maybe a century. Perhaps it even happened in a single year.

Does that lie in our own future? Again, no one knows for sure.

What we do know as surely as we know anything, is that life is a chancy business. Outside of certain rather narrow margins, life dies. Or does not develop in the first place. Geologists think that our own planet has already missed catastrophe on two occasions—once 3.7 billion years ago, when a greenhouse effect almost reached runaway proportions and again some 700 million years ago, when ice covered 10 percent of the earth, taking by the narrow margin to spread to total glaciation.

For the problem of boosting heat into the biosphere there is no technological fix. It is a matter of a basic natural law called entropy, which says that all energy ultimately degrades into heat, and there isn't any lawyer who can get you off if you violate it.

This is true even if you go to the trouble of building your generator somewhere other than on the surface of the earth. For instance, there is a very attractive scheme for generating energy by either nuclear- or solar-power orbiting satellites. You leave all the mess and fuss of pollution up in space and beam clean electricity by means of microwaves down to the surface.

Unfortunately an ecological claim made by Gerard O'Neill—that the conversion of microwave energy to direct current could be done with such high efficiency that only a small fraction of the total power would be released as waste heat into the biosphere—is only partly true. However little waste heat is produced before the power goes into the electricity grid, the amount that becomes waste heat after you use it to turn on your light, for example, is entirely wasted; that's entropy too.

The thing to remember is that the temperature of the earth is not a constant. It is a

balance. It is the result of input versus output: Input from solar radiation, from the internal heat of the earth, and from whatever we humans add to it by burning fuel or importing energy from space, and output in the form of radiation. Every extra watt that comes into the system has to go out again to strike a balance. But as the quantity of heat goes up, there is only one way to increase the amount of radiation: The temperature must go up. And that is the whole problem.

So there is the bad news in a nutshell: How do we go on increasing our rate of consumption of energy? We don't. At some point we flatten the growth curve—or else we die.

Another kings used to kill the messengers who brought them bad news. We moderns are not so temperate. When bad news comes to eye or ear, we simply push the little switch in the brain that turns it off.

It's true that there have been God's own quantities of disastrous predictions that

the right decision. For instance, space is a help, but it ain't an answer. Many adherents of O'Neill's space-colony project say the thing to do is to put manufacturing into orbit, where it won't hurt anything here on the surface. Well, it won't do that, but it will do much good for the surface either. You can build a Buck in orbit, but you can't get it from there into your neighborhood GM showrooms without spending a lot of money and energy—probably more than it would cost to build it in Detroit in the first place. (To be fair, O'Neill himself has never claimed otherwise.)

You can even find a technological fix for the problem of radiating excess heat if you want to. It's simple enough: You just paint Texas white. The additional reflected radiation removes a lot of solar heat from the air. You probably don't want to do that—not only because Texans might object, or even because of the expense, but because it would play hell with North American weather. But you can achieve the same effect by building a lot of huge mirrors and spotting them all over the map, pointing straight to the sky.

That's a solution that might even work (at immense cost and trouble, of course). But it's a silly idea all the same. Why would anyone want to build all those mirrors just to throw heat away when they could be used to generate useful power instead?

And this is where we come at last to the good news. Its name is solar power—renewable resources in general. We can see them to whatever extent we like. There is no ecological charge for using renewable resources. They do not threaten survival. They do not foul the air or kill vegetation. It is true that there is a money charge for them. It will cost you more to buy a kilowatt-hour of electricity from renewable-resource plants than it does now for a kilowatt-hour of electricity from fossil-fuel plants or nukes.

However, the reason for that is not a matter of natural law. It simply reflects the fact that the world has been practicing some pretty bad bookkeeping.

The price of oil in particular has no relation whatsoever to its real value. It isn't priced on the basis of replacement cost. It isn't priced on any systematic basis at all. The basis for the cost of oil is that it costs whatever the Saudis say it costs.

If you read the newspapers, you know the Saudis are increasing the cost of oil every year. With every stop, the fossil-fuel advantage over renewable resources dwindles even in dollar terms.

It may even now have reached the point where a clear-sighted public-utility executive, trying to decide what new generating facility he should start designing, might well look beyond nuclear or fossil fuels to the renewable-resource options. And he should do this not on any lightshaken basis of morality or prudence but simply on a hard-nosed estimate of which will turn the biggest profit during its working life!

The technological fixes that will sooner or later save us all already exist. Let's look at

• You can find a technological fix for getting rid of excess heat. It's simple: Paint Texas white.

• The additional reflected radiation would remove a lot of solar heat from the air. •

have not happened. Thirty years ago many responsible people felt that nuclear war would wipe us all out, and if hasn't. (Not yet, anyway—it's still a possibility.) The population hasn't yet exploded. The prophecies of world famine in the 1970s haven't come true. (Neither problem has stopped being a problem. But neither has reached a critical point—at least yet.) But these are predictions of all kinds. Some are probabilistic and cautious. Some are for sure. If I predict that Pete Rose will not hit a home run over the center-field grandstand, there's a chance I'll be wrong—he may have a good day with a following wind and a specially lively ball, and there goes that prediction. But I predict that he will never hit a ball into orbit; you ought to believe it. It can't happen. Human muscles cannot generate that much acceleration. If they could, Rose's bat would snap; if he used some kind of supersteel bat, the ball would demagnetize on impact; if it didn't do that, it would burn up from friction on the way up. That is a "for-sure" prediction. And Genesis's prediction that there is a finite limit to energy growth is also for-sure.

Many of the technological fixes point in

some of those renewable-resource options. There are a lot of them: hydroelectric power, solar power, wind power, geothermal power, wave power, tide power, and biomass power. Not one of them threatens the destruction of the human race in the foreseeable future, no matter to what extent we develop them. They do have problems. One problem they all share—they are capital-intensive.

Some of the schemes now on the drawing boards are fancy far-fetched, and some of them are. Others may seem not only immediately feasible but almost contemptibly obvious. It is a wonder they are not in practice all over the world already. Collectively, they amount to a new life.

Hydroelectric This is about as clean as generated power gets. The technology is already widely understood and in use at every part of the world.

However, not every renewable resource is as renewable as it looks. It is true that if you put a waterwheel into a mountain stream it will keep turning and producing energy for you until it wears out. It is not true that big dams will last forever. After a while they fill up with silt and then you don't have a dam anymore. The water still flows, but you can't keep it until you need it because there's no storage capacity left to hold it in.

Worse, this territory has already been worked over. The places where you can show a significant net energy profit by building a big dam already have big dams built there. What's left is marginal. Still, let's look at some far-out plans. What would you say, for instance, to a waterfall a thousand times bigger than Niagara, guaranteed to last a million years, with easy transmission-line distance to London, Paris, Rome, and Madrid?

There used to be one like that, long ago. It flowed past the Straits of Gibraltar. There was a time when the Mediterranean was dry land, a sort of Death Valley lying between Europe and Africa. Then the natural dam broke, and the Atlantic poured in to fill it. It must have been a spectacular sight to see for any protohumans wandering by.

That particular waterfall is only a geologic memory but we could start it, or something like it, up again, in the same place if we wanted to. All we'd have to do is dam Gibraltar again. The sun would do the rest. The Mediterranean loses far more water to solar evaporation than it gains from the nearby rivers that flow into it. As the level of the Mediterranean sank, the crush of water from the Atlantic would turn enough turbines to light a dozen cities. The larger you let the Mediterranean evaporate, the bigger the head would come and the more energy you could tap.

Is this going to happen? Not very likely. Imagine the feelings of a beachfront-hotel proprietor in Cannes as he sees the beach receding over the horizon or of a shipping magnate in Naples, as the bay becomes a new high-rise housing development.

But there are smaller, possible projects. Some of them are in places where the local

people wouldn't much mind what happened—both because the places aren't very attractive anyway and because there aren't many people there to object. The Qattara Depression, west of Alexandria, Egypt, is only a couple of dozen miles from the sea. If you were to dig a trench across the desert and let the Mediterranean in to fill it, it would generate huge amounts of power. Of course, it would stop sooner or later, when the depression filled, but, even so, it would last longer than most hydroelectric installations, and what you would be left with would be a rather pleasant inland arm of the Mediterranean, where quite a few people could support themselves indefinitely from fishing and salt-water farming.

Wind, geothermal, wave, and tide power They need. They can be very useful and in many cases are already useful in generating electricity. There are good geothermal plants in California and in Italy among other places.

● *Why not build a waterfall a thousand times bigger than Niagara, guaranteed to last a million years? There used to be one like that. It flowed past the Straits of Gibraltar.* ●

A frequent objection to wind-generated power is that the generators work only when the wind is blowing, but the numbers don't always bear that out. A scientist named Sørensen compared actual figures of a wind generator at Gedser, Denmark, and the US Zion-1 nuke. The nuclear facility was on line 43 percent of the time, the windmill only 40 percent—but that, says Sørensen, is only because the Gedser windmill did not include a fairly cheap storage system, which would have made them about even (apart from the fact that Zion-1 has a much better record than many existing nukes have).

And there are as yet unutilized sites—for instance, the western shore of the state of Michigan—that seem ideally adapted to wind-generated power. The bluffs over Lake Michigan go up high enough to tap the stronger winds above the ground level, and the winds blow quite steadily. Some boys have beautiful ideas. There are many schemes for using wave energy.

Solar power If what you want is a new source that you can plug into the existing power grid with the least possible dedication of everybody—there, folks, is what

you've been waiting for: You want nuclear-fusion power? Here it is! But the generator is 90 million miles away—a good minimum distance, many people think, for a nuke. And it will operate for free, for the next five or ten billion years at least, without needing a dime's worth of fuel from you or me.

The easy way to build a solar-power plant is to lay out a field of mirrors, so arranged that they all reflect into a central tower. The point they hit on the tower gets very hot—very nearly the temperature of the sun itself. You can pump water through it and flash it into steam. Or you can use any of a dozen esoteric schemes generating magnetohydrodynamic power from plasma, breaking water into its components of hydrogen and oxygen and piping the hydrogen away like natural gas, etc. They are all high-technology procedures, but they can all be made to work—rather quickly in fact. Some are in operation now.

Why aren't there more of them? Again, it's bad bookkeeping.

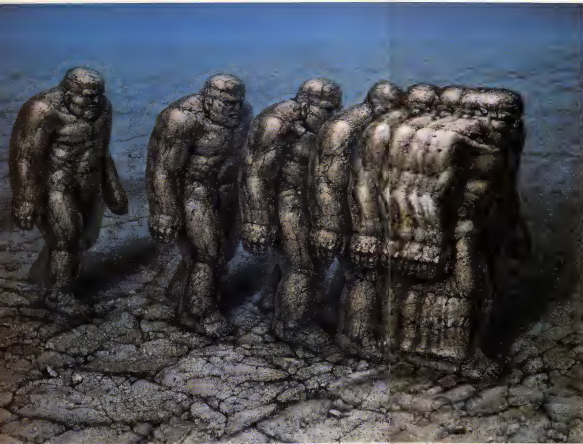
If you figure in the costs at the current low dollar price of fossil fuels or uranium, the solar-power plant comes out being more expensive, not immensely more. With energy costs rising and the dollar sinking, it is hard to give precise figures, but one estimate is that a new nuke would cost about \$1,000 per kilowatt to build and fuel, while solar-power plants might come to \$1,700 per kilowatt.

As far as amenities are concerned, both a solar-power and a fossil-fuel or nuclear plant would use up a lot of land—solar to build mirrors on, coal or uranium to strip-mining fuel. But the mirrors can go on an empty desert, while the strip-mining destroys the prettiest parts of Appalachia and the Rockies. And as far as pollution is concerned, it has yet to be established what fuel-burning plants should pay to make up for the damage they cause or to contain their danger-ous by-products. That would be no problem for solar-power plants.

But dollar accountancy is not the only way to keep books. A better method of bookkeeping is in terms of energy. A useful way of evaluating alternate energy options is to compare the amount of energy it takes to build a power plant with the amount it will produce in its working life. This measure is called the energy amplification factor (EAF). The EAF for nukes is about four, for solar-power plants, about twenty.

The advantage is all with solar power for the generation of electricity. The only way in which fuel-burning generators seem better is if they are considered strictly in dollar terms. And that is true only if you believe that over the useful life of the plant, say thirty years, the cost of fossil and nuclear fuel will not go wildly out of line. You can believe that if you want to. You can believe in the Tenth Fairy if you want to, but I really would not like to see national policy established on that basis.

And so far we have been talking only about conventional technology. There are some far more daring plans. Some German



STATIC GRAVITY

Now it can be told
How a new Law of Science
was suppressed

BY CHRISTOPHER PRIEST

Will science ever be free of corruption? Why must someone always find a perverse, destructive use for scientific discovery?

Unfortunately it is the price the scientist must pay, however obscure he may feel his work to be: however pure his intentions may have been like the tragic case of the distinguished British physicist I. F. Tildmarsh, discoverer of static gravity.

Professor Tildmarsh's life-work is described in his definitive text *Natural Statics and Gravitic Particles* (published in 1927). Tildmarsh is the only scientist ever to have published the results of his research on static gravity. And in the horrible end, it will be Tildmarsh who will bear the blame. Following considerable investigation into this obscure field of physics, however, I am now convinced that Tildmarsh was not really an innovator but that he unwittingly rediscovered a phenomenon years after other less scrupulous scientists had come to the same conclusions. Why these other physicists kept the secret to themselves is the key to an international conspiracy that could eventually crumble the foundations of Western civilization.

It is my intention not only to defend the good name of Tildmarsh but to warn of the coming disaster. But first, in order to understand clearly the scientific principle of static gravity, it would be well to rephrase Tildmarsh's well-known term: Professor Tildmarsh begins simply enough, by offering an analogy with electricity.

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DE ES SCHWERTBERGER

We are all familiar with the phenomenon of static ("stationary") electricity. The ordinary domestic cat says Tidmarsh is not normally thought of as an electrically conductive object, and neither for that matter is an amber rod. And yet it is demonstrable that when one is stroked against the other a discharge of electricity results.

The principle of static gravity is precisely the same. Static gravity is to the earth's gravitational field what static electricity is to electric current.

Both electricity and gravity are entirely natural phenomena. Yet we can generate electricity artificially, whereas it has so far proved impossible to generate gravity as such. But, proclaimed Tidmarsh, it is possible to lessen gravity. And this is what static gravity is all about.

Professor Tidmarsh dubbed the basic particle of static gravity the *stacron*. What he discovered (and proved with elaborate mathematics) was this, now known as Tidmarsh's law of motion: *The positive static gravity acquired by a moving object is a function in direct proportion to the lateral motion and in inverse proportion to the product of the object's mass and height from the ground.*

In layman's terms it means this: Any object moving across a gravitational field (in other words moving from side to side rather than up or down) acquires a charge of stacrons and thus escapes the effect of gravity.

For example, a running man takes on static gravity enabling him to feel "lighter," and so his body works more efficiently than that of a man who is merely walking. (This explains why a running man actually travels faster than a walking man, and why both men move faster than one who is standing still.)

The principle of static gravity accounts for many apparent anomalies of modern science and technology. For instance, in *Natural States and Genetic Particles*, Professor Tidmarsh cites the paradox inherent in aircraft! In his day aircraft traveled neither high nor fast enough for the example to be useful. Today, though, modern aviation technology enables us to see his principle in everyday operation.

As is commonly understood, the effect of a gravitational field (such as the one surrounding our planet) is to give weight to mass. As is also well known, the farther one is away from the center of gravity (in other words, the greater the height), then so the weight increases. A man who jumps from a wall two meters high lands more heavily than a man who jumps from only two centimeters, this is because his mass has been converted to greater weight by gravity. A man jumping from a height greater than about ten meters will almost certainly be killed or seriously injured, so artificially heavy has his weight become.

And yet modern jet aircraft commonly fly at heights in excess of eight or nine kilometers!

The weight of the passengers and crew

at this height (not to mention that of the aircraft itself) is incalculably immense.

However, the reason aircraft can fly in safety—and at the same time give the passengers an illusion of their normal weight—is that they travel at great speeds, thus acquiring a positive charge of static gravity.

It is interesting at this point to indicate how Tidmarsh's calculations, although rarely cited, are actually more relevant to modern air travel than the feeble offerings of the aircraft industry. Aviation engineers quote what they call the theory of lift—a theory only because it has never been proved!—in which it is said that the movement of aerodynamically shaped wings through the air gives what they call "lift." That this is utter nonsense can be quickly shown. As every schoolboy knows, air—in defiance of the so-called "laws" of gravity—gets thinner and lighter the farther from the ground it is, making mountaineering a dangerous sport. At even

◊ *A running man takes on static gravity, enabling him to feel "lighter," and so his body works more efficiently than that of a man who is merely walking. This also explains why airplanes fly.*

greater heights, such as those at which jet aircraft travel, the air is so thin it is almost nonexistent. So aircraft, which fly where there is no air at all, give the final lie to the theory of lift!

There are innumerable other examples of static gravity many of which can be tested at home.

One classic, yet simple experiment can be tried with a cup of tea or coffee. Stir this in a circular direction with a spoon, and a whirlpool, or vortex, results. Why should this be so? Conservative physicists speak of what they call centrifugal force—the sort of red herring that Professor Tidmarsh delights in exploding, as it were. The explanation is simple: The fluid on the outside is traveling faster than the fluid at the center and so its local gravitic charge makes it lighter, and it therefore rises up the side of the cup.

So much for Tidmarsh's principle. It must be recognized for what it is: scientific research of the most brilliant kind. It certainly ranks with the work of Professor Tidmarsh's fellow countryman Sir Isaac Newton. And it is a scandal that Tidmarsh has not been properly recognized for his contribution—

especially since he was the only man forthright enough to put it in writing.

It was my own outrage at the omission that first interested me in Tidmarsh's career. It must be acknowledged that to some degree his career was a failure. Why this should be so is the tragedy and enigma of his life, and I believe I have discovered the reason.

Every scientist must be a questioner of accepted values. It was Tidmarsh's questions about gravity that led him to his law of motion, but equally it was his failure to question further that led to his present obscurity.

The question Tidmarsh should have asked was this: *Could static gravity be artificially generated and projected from one place to another?*

It can be argued, of course, that Professor Tidmarsh was not the man to ask the question. After all, could Rutherford have asked himself about Hiroshima in the early 1920s? Should the Wages brothers have searched their conscience about some booms?

No, Professor Tidmarsh's failure was not with the question alone. His tragedy lay deeper. He did not know that static gravity had already been discovered, and more important, a static-gravity projector had been built and tested years before he published his book!

This apparent blunder is of great intrinsic interest. Did Tidmarsh simply not know that his work had been preempted? Did he know but choose to ignore it, in the cynical hope that posterity would accord him the sole credit? Or is the explanation very simple: There was a brilliantly successful cover-up of certain events during the First World War after which Tidmarsh accidentally rediscovered the same principle?

There is abundant evidence to support the cover-up theory (even though most of the clues are tangential to use one of Tidmarsh's favorite words). This evidence vindicates Professor Tidmarsh's motives, but in light of certain recent events his book takes on a new urgency. It is, in fact, one of the most important books published in the twentieth century.

Let us first examine the evidence from the Great War.

If static gravity could be projected, the effect would be a reduction of natural gravity in the target zone. It armed toward machinery or buildings it could weaken or collapse the structure, if directed toward human beings it could have deep psychological and disorienting effects.

My researches reveal that the German Army was in possession of one or more electrical projectors of the western front in 1916 and 1917 and that these were used on several occasions.

The earliest mention of these awful weapons is contained in a war memoir written by James W. Gerard, an American diplomat in Berlin in the early years of the war. Describing his life in the inner sanctum of the Kaiser's administration, he writes:

With the coming of the war the concentrated hate of the German people was turned against the Allies. There was great public clamor for a new weapon one which would destroy Britain and France at a blow. The Kaiser, to my certain knowledge had such a weapon at his disposal by the third year of the war, and although it was briefly tested, some residual humans had restrained his arm. Once at an embassy reception, I heard him say "The British are suffering heavy losses once more," and he chuckled for several minutes in his bovine way.

—My Three Years in Berlin, 1917

This great visionary and political thinker H. G. Wells created the western front on several occasions as a civilian observer and in one of his books he writes:

What can the enemy have as an answer to the tank? There are reports that these fearsome land ironclads, which depend on their massive weight to overrun the enemy's strongholds, have at some sectors of the front proved unexpectedly too light and fragile.

—War in the Future, 1917

But perhaps the best firsthand account of the station generator comes from Wilfred Owen the poet. Owen served on the western front through much of the war and writing in 1917 in one of his letters home he gives the following description:

We slept the wind up a few days ago, when we were marching along a narrow road between steep embankments. Suddenly a cry rang down, "Lie on the bank!" There was a tremendous scramble, and we all found bayonets. When we peeped over, behold, one solitary German! He was setting up a weird metal device with wires and extensions. Soon we all felt groggy and another cry came down to fix our gas masks, but they had no effect. A few shells from the French lines soon put paid to him, and we carried on towards Arras, where we were billeted overnight.

—Letters of Wilfred Owen, 1906

So much for the evidence from the Great War.

Professor Tidmarsh's knowledge of it must of necessity remain uncertain, but what is clear is that at least during the years of his own research it was thought that the terrible secret had died with the war.

Recent developments, however, indicate that the use of static-gravity projectors is once more a frightening possibility.

Today we live in a world more sophisticated than that of Europe in 1917. The aspirations of anyone ruthless enough to use static gravity must therefore be far more alarming. Indeed, in this modern world, the scale of the evil ambition is

equaled by the understanding of the scientific principle. No more solitary German soldiers with crude, badly concealed devices! Today the threat is from major political organizations with vast resources.

To appreciate the scale of the modern threat we must return to Professor Tidmarsh's original thesis. Static gravity is generated by movement, and is best observed in artificial movement such as that of aerosol, rubber balls, and so forth.

There is, however, one way in which static gravity is generated naturally.

The earth itself is spinning on its axis. The rotation of the planet therefore imparts a lateral movement to the ground, which lends, in its turn, the stable balance of gravity we know as normal. (Without this rotation the earth's "normal" gravity would be of crushing intensity.)

One of the natural miracles of our world is that this apparent gravity is more or less uniform across every part of the globe. This may seem impossible at first, when you

even of the irrational ("lightheaded") behavior of terrorists?

Here is the wicked brilliance of the modern abuse of the station. No single military target is selected, but apparently random attacks take place throughout the world!

Further proof, were it still needed, of the deranged genius behind the static-gravity attacks is the undeniable fact that all such recent disasters have occurred in the parts of the world where any right-thinking person would expect them to be. The highest incidence of terrorism is in the so-called "trouble spots" of the world; volcanoes have been made to erupt with apparent normality (note how few dormant, or extinct, volcanoes have erupted in the last few years!); earthquakes have been caused in earthquake zones. All this makes it seem as if they were perfectly natural.

The perverse cunning of the method leaves one speechless.

But what of the consequences?

It is the use of earthquakes in this new and bizarre form of warfare that is the ultimately horrifying development.

P. Norcott, one of the world's leading authorities on earthquakes, has written a compelling account of the causes of these devastating events (although he is under the common misapprehension that they are natural in origin). Arguing from his own observations that there have been recent perturbations in the earth's rotation leading to a buildup of tectonic pressure, he adds:

The only way to stop earthquakes is to stop the pressure building up in the first place, and this can only be done by keeping the earth at a constant speed.

—Bigger and Better Earthquakes,

1970

This is the final, emphatic proof of Professor Tidmarsh's station principle. The earth's rotation imparts a positive static-gravity charge to the ground in the parts of the world where it is most needed. Most of the earthquake zones are in or near the equatorial regions.

Artificial disruption of this by a station projector will not only cause local earthquakes, we will not only slow down the earth and cause more and more earthquakes ("bigger and better," in the ironic title of the expert's book), but by slowing down the lateral movement (the spin) will also increase the strength of the apparent gravity at the equator.

The sun crosses the equator every day! The moon crosses the equator every month!

The great ice caps of the North and South Poles will be dragged to warmer climates! Think of the flooding!

Our way of life is imperiled. Worse, the memory of a great man's name is threatened. To right these wrongs, this menace must be lifted as a matter of the utmost gravity. ☐☐

☛ How else can we explain the recent spate of earthquakes, tidal waves, landslides, volcanic eruptions, and even the irrational ("lightheaded") behavior of terrorists? ☛

consider that at the equator the earth's spin is felt most and so static gravity there is at its highest, whereas lateral movement at the Poles approaches nil. However, this difference is offset by the fact that the earth is an oblate spheroid, which means that the globe is flattened at the Poles. Because the Poles are therefore "lower"—in relation to the center of gravity, the earth's core—the normal gravitational field is much weaker than it is at the "higher" equator. The end result is an equal amount of apparent gravity throughout the world.

This state of gravitational equilibrium has existed for millennia, from the dawn of time. It is the gentle, natural, stable heartbeat of the earth itself, which maintains life on our world. It regulates our atmosphere and crops, the tides and the climate; it ensures that the sun rises and sets; it helps prevent the moon from hitting the earth.

However, incontrovertible evidence exists that station projectors are in the hands of some menacing superpower and are being used to destabilize effect.

How else can we account for the recent spate of earthquakes, of volcanic eruptions, of landslides, floodings, tidal waves

FICTION

NO FUTURE IN IT

*He could travel through time,
but he could never return
to the place where he started*

BY JOE HALDEMAN

It's not easy to keep exactly one-eighth inch of beard on your face. For a while, though, it's good protective coloration. With a suit and tie, you look like a gentleman who's decided to grow a beard. With rumpled old Salvation Army clothes, you look like a down-and-out rummy. It depends on the class of people you want to listen to, buddy.

I was in the namby outfit when I met Bill Ceddes and heard his woadlife story. At first I thought Bill was on the same scam I was, he talked too wild to be in the drug business. He was for real, though.

There's this wonderful slinky bar in downtown Tampa. No name, just a bunch of beer signs in the window. The one for Pearl has a busted laser that flutters stroboscopically. You don't want to sit too near the window if it's a good bar for private conversations because it's right under the twelve-bar that sweeps out over the bay, and there's a constant moan of traffic all day and all night. There's a fine, gritty layer of plaster dust everywhere, and not too much light. The bartender is missing an eye and has front teeth and smiles frequently. The booze is cheap; they make most of their money upstairs and like to have lots of customers in the bar, for camouflage.

I sat down at the bar, and the bartender polished glasses while one of the whores, a pretty boy-girl, acted in for the till. When I said no she pleaded mechanically saying she was saving for a real pair of tits and The Operation. I hesitated—I string for the Bad News Wire Service sometimes, and they



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GOTTFRIED HELNWEIN

for sexy bathos—but turned her down more finally. Bad News doesn't pay that well!

When she left, the bartender came over and I ordered a Meyers with a beer chaser, a suitably hard-core combination I'd taken two Flame-outs before I came, though so I could drink a dozen or so without too much ill effect. Until morning.

"Little early in the day for that, isn't it?" The man next to me chuckled hoarsely. "Not to criticize." He was nursing a double bourbon or scotch, neat.

"Dusty," I said. The man was dressed a little more neatly than I, in laddered work clothes. He looked too old to be a laborer, shock of white hair with a yellowish cast. But he did have the deep tan and permanent squint of one who's spent decades in the Florida sun. I tossed back the jigger of rum and sipped the beer. "Come here often?"

"Pretty often," he said. "When my check comes in I put a few bucks on a number. Otherwise..." He shrugged. "Cheap whiskey and pretty women. To look at."

"How many of them do you think see women?"

"Just looking, who cares?" He squinted even more, examining me. "Could I see your palms?"

"Oh boy, I thought, a fortune teller. Might be a story if he actually believes in it. I held out my hands.

He glanced at them and stared at my face. "Yeah, I could tell by the eyes," he said softly. "You're no alcoholic, you're not as old as you look, either. Cap?"

"No. Used to be a teacher. Which was true. Every now and then I go on these binges."

He nodded slowly. "Used to be a teacher, too. Until '83. Then I worked the sponge boats twenty years. When he picked up his glass, his hand had the regular slow shake of a confirmed alky. "It was good work."

I reached in my pocket and turned on the tape recorder. "What was it made you stop teaching?" Bozzy?

"No. Who drink in the eighties?" I didn't, but I wasn't old enough. "It is an interesting sort of paradox. You want to hear a story?"

"Sure." I signaled the bartender for two drinks.

"Now you don't have to buy me anything. You won't believe the story anyhow."

"Try me."

"You a social worker? Undercover social worker?" He smiled wryly.

"Is there such a thing?"

"Should be, I know—you're a writer."

"When I get work, yeah. How could you tell, Sherlock?"

"You've got two pens in your pocket, and you want to hear a story." He smiled. "Saaal a story maybe. But you'll never get it published. It's too fantastic."

"But true."

"It's true, all right. Thank you kindly." He touched his new drink to see whether it was real, then drained off the old one in one go. DM!

gulp and sighed.

"My name's Bill Caddis. Doctor William Caddis. I used to be

"Medical doctor?"

"I detect a note of reproach. As if my medico ever—Well, no, I was an academic, newly tenured at Florida State. History department. Modern American history."

"Hard to get a job then as it is now?"

"Just about. I was a real whiz."

"But you got fired in '83."

"That's right. And it's not easy to fire a tenured professor."

"What, bofing the little girl?"

That was the only time he laughed that day, a kind of wheeze. "Undergraduates were made for bofing. No, I was dismissed on grounds of mental instability, with my wife's help. My then wife, they almost had me institutionalized."

• "Don't they teach you anything about relativity? If you get up from the bar, go to the john, and return in a couple of minutes, the bar's moved thousands of miles. But it's still here. You're on the same track, that's all" •

"Strong stuff."

"Strong." He stared into his drink and swirled it around. "I never know how to start the 'valedictorians of people, and they all think I'm crazy before I get halfway into it. You'll think I'm crazy too."

"Just jump in feet-first. Like you say, I'm a writer. I can believe in six impossible things before my first drink in the morning."

"All right. I'm not from... here."

"Alonely I thought, there goes the price of a double. "Another planet," I said seriously.

"See? Now you want me to say something about UFOs and how I'm bringing the secret of eternal peace to mankind." He raised his glass to me. "Thanks for the drink."

I caught his arm before he could slug the drink down. "Wait. I'm sorry. Go on."

"Xen? I wrong?"

"You're right, but go on. You don't act crazy."

He sat the drink down. "Layman's error. Some of the most reasonable people you meet are already Almond Joy."

"If you're not from here, where are you from?"

"Miami." He smiled and took a sip. "I'm a time traveler. I'm from a future."

I just nodded.

"That usually takes some explaining. There's no the future. There's a myriad of

utures radiating from every instant. If I were to drop the glass on the floor and it broke, we would shift into a future where the bar owned one less glass."

"And the futures where the glass wasn't broken?"

"They would be. And we would be in them, we are now."

"Doesn't it get sort of crowded up there? Billions of new futures every second?"

"You can't crowd infinity."

I was trying to think of an angle, a golf-ball feature. "How does this time travel work?"

"How the hell should I know? I'm just a tourist. It has something to do with chrono-tons. Temporal uncertainty principle. Conservation of coincidence. I'm no string theorist."

"Are there lots of those tourists?"

"Probably not here and now. You get quite a crowd clustered around historically important events. You can't see them, of course."

"I can see you."

He shrugged. "Something went wrong. Power failure or something, someone tripped over a cable. Happens."

"They didn't try to come back and rescue you?"

"How could they? There are lots of futures but only one past. Once I materialized here, I wasn't in my own past anymore. See?"

"So you can tell your own grandfather, I said.

"Why would I want to do that? Here's a nice old bird."

"No, I mean, there's no paradox involved? If you killed him before you were born, you wouldn't cease to exist?"

"Of course not. I'd have to be there to kill him. He slipped. For that matter, I could go back and kill myself, as a boy. It I could afford it. Travel gets more expensive the closer you get to the present. Like compressing an infinitely tough spring."

"Hold it." I had him. "If I buy another round if you can talk your way out of the one. The earth is moving at the time, spinning around, going around the sun, the suns moving through space. How the hell do you aim the time machine?"

He beamed at me. "Don't they teach you anything about relativity? Look, if you get up from the bar, go to the john, and come back in a couple of minutes, the bar's moved thousands of miles. But it's still here. You're on the same track, that's all."

"But I'm talking about time, and you're talking about space!"

"There's a difference?" He drained his glass and slid it toward me with one finger.

I decided I'd stay long enough to find out what his con was. Maybe do a one-pager for a crime magazine. I ordered him another double. "You talk from the future, can you hold your liquor?"

"Couple of centuries of medicine," he said. "I'm ninety-two years old." He looked about severely.

"Looked like I was going to have to push him for the golf." Seems to me you could be

a misapprehension. Knowing where to invest.

It's not that easy. I tried. I should have left well enough alone. His drink came, and he stuck his fingertip in it, flicked a drop away. "I'm sort of a Muslim," he said. "Not supposed to drink a drop of liquor."

People try it all the time. There's no law against it. But put yourself in this position: You're going to deliberately strand yourself two hundred years in the past. What do you do for capital? Buy old money from collectors?

"You could buy gold and diamonds."

"Sure. But if you can afford that—and time travel isn't cheap either—why not invest it in your own present? Remember once you materialize, you aren't in your own past anymore. You can never tell what might have changed. People do try it, though. Usually they take gadgets."

"Does it work?"

"Who knows? They can't come back to tell about it."

"Couldn't they build their own time machine, go back to the future?"

Aren't you hearing me? There's no such thing as the future. Even if you could travel forward, there's no way you could find the right one."

Somebody came into the bar. I walked until the door eased shut, muting the traffic noise. "So what happened to you? You made some bad investments?"

In spades. Seemed like a sure thing. Let me explain: Where I come from almost nobody lives on Earth, just caretakers and the time-travel people. It's like a big park, a big museum. Most of us live in orbital settlements, some on other planets.

I really was a history professor specializing in the history of technology. I saved up my money to go back and see the first flight to the Moon.

"That was in '70?"

No. 69. It was during the launch when the accident happened. Nobody noticed me making it. I didn't even notice until I tried to walk through someone afterwards.

Fortunately that was a time when everybody dressed as they damn well pleased, so my clothes didn't look especially outrageous. I bummed my way down to Homestead and picked up some work sorting tomatoes that kind of thing. Saved up enough to get fake IDs made up, eventually went back to school and wound up teaching again. Married along the way.

"The one who tried to put you in the peanut jar?"

"That's right. Here's what happened: If there was one sure thing to invest in, it was space. My wife didn't agree, but there was no way I could tell her why. I was so sure."

I went ahead and invested heavily in space industries—really heavily buying on the margin, wheeling, dealing—but my wife thought it was all going into a conservative portfolio of municipals. I even snatched some stationery from our accountant and wrote up annual reports to show her.

"I think I see what's coming. Not a bad story."

"Yeah. The Soviet-American Orbital Non-Proliferation Treaty, the goddamned Panama Bill."

"Well, killer satellites."

"That's the kicker. That's really the kicker."

In my future's past, it was the killer satellites that ended the possibility of nuclear war forever. They finally scrapped the missiles and began shouting accusations.

"Well, you can't think we're in any danger of nuclear war now, too, suddenly."

"Yeah. I liked our way better. Anyway, the bottom dropped out. I had to tell my wife that we were broke and in debt. I had to tell her everything. I thought I knew her. I thought she would believe. The test is pretty obvious."

"Sponge boats?"

"Right. He took a long drink and stared moodily into the cloudy mirror behind the bar."

"That's it? No scam?"

"That's it. Write it up. You'll never sell it." I checked my watch. Could just make the 1:30 to Atlanta, get in a half-day at the typewriter. "Well, I gotta run. Thanks for the story, Bill."

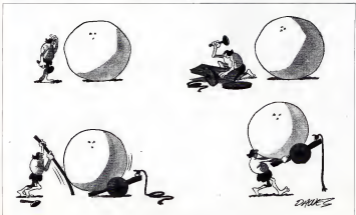
I stood up and put my hand on his shoulder. "Take it easy on the sauce, okay? You're no spring chicken anymore."

"Sure. He never looked at me."

On the way to the subway terminal it occurred to me that I shouldn't try to sell the thing as a human-interest feature. Just write it up as fiction, and I could hawk it to Planet Stories or one of those rags.

The ticket machine gave me an argument about changing a hundred-ruble note and I had to get a conductor. Then there were repairs going on, and it took us twenty minutes to get to Atlanta. I had to sprint to make my Seattle connection.

Space settlements. Time travel. Nobody would swallow that kind of bull in 1924. ☐



MAGNIFICATIONS

Mysteries of the minuscule seen through the eye of a scanning electron microscope

BY SCOT MORRIS

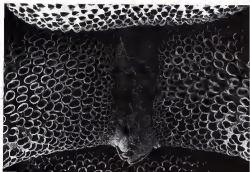
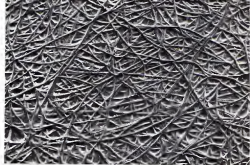
A tree ant becomes a futuristic alien; manjans-rosh sacs (ripe with haashah) become Daneyraque mushrooms; typing paper looks like a nightmare road map.

This is the miniature world of David Scharf, whom *Time* called "the Ansel Adams of inner space" and whose photos Adams has described as "absolutely wonderful." Scharf's petrihole is the

Counterclockwise from below: Mite on the neck of a tarantula; front view of crane fly; female antennae, mouth parts, and proboscis of feeding tube; of young male mosquitos; close-up of counter with the viscous being black fly.

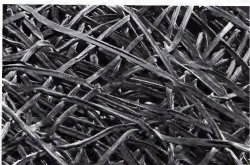
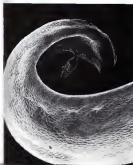
PHOTOGRAPHS BY DAVID SCHARF

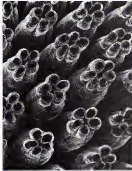




scanning electron microscope (SEM). An electron beam replaces visible light (hence, there is no color involved) and scans every contour to produce a 3-D image, entirely in focus and incredibly lifelike. In part that's because Scharf's subjects are alive. Previously, most SEM photography was of dead, dried, and coated with gold alloy. But Scharf has perfected ways of shooting living subjects temporarily immobilized in a vacuum. "I want my pictures to be an accurate representation of life," he says. "I take great care to keep my specimens uninjured. Some are returned to my garden alive."

Clockwise from above: Lotus flower and stem surface, gold-coated paper drug-eluting matrix made of furlin, malvaquin, pine, fibreglass, gold-coated fibers, a curved probiotic fiber. Note sign of fibrous flower.



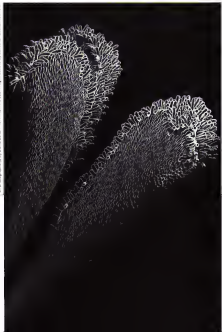


◀ I'm extremely careful to keep my specimens uninjured, some are returned to my garden alive! ▶

How does he get an insect to hold still while scanning him for seventy seconds per portrait? "The truth is, they don't all hold still! They tend to freeze in their tracks when the air is removed from the chamber, but many photos have been ruined by unbridled excitement. The rapid heartbeat of a small animal can cause enough vibration of a limb to make photographing impossible."

Though Bechar's pictures contain impressive information, they are intended primarily as visual studies. Composition, balance, detail, and beauty are what he looks for. His photos are scientific records second, works of art first. **DD**

Closeup beginning below: Hairs and resin nodules of *Salix purpurea* leaf; gladiolus pistil; oval strobilus hairs on strobilary surface with projecting stignas and styles; multiple disc flowers in center of African daisy.



TIME CAPSULE

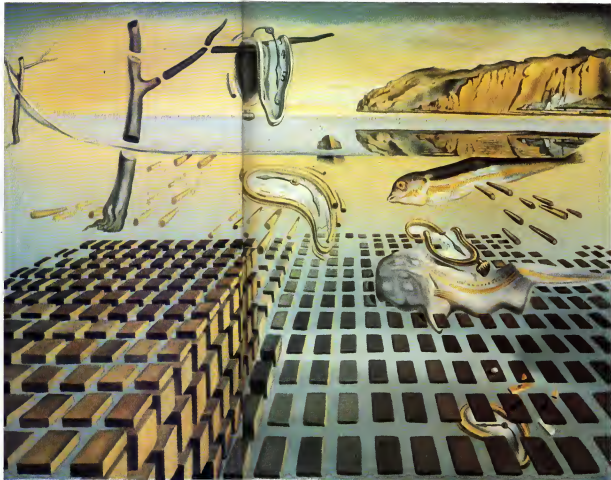
Only America would put its history in a coffin

BY DANA SOBEL

The worst thing about the distant future is that we won't be there. And rather than fret over what might be said about us, some people have bottled their finest hours in hermetically sealed containers—in time capsules that will tell coming generations about the way we were.

The stuff of time capsules is rattle-dazzle technology, pop culture, and trivia: Rockets, cars, army hot dogs, bikini bathing suits, coins, and essays by schoolchildren have all been buried. By their curious selection processes, time-capsule builders tell us, their contemporaries how they see our society. But what the future finders will make of their only salads is anybody's guess.

Time capsules are a peculiarly American phenomenon. True, Japan and Canada have one each, but both are patterned after the US model. There were seven major and countless minor time capsules already buried across the United States before the Bicentennial celebration when a wave of future-observers sent hundreds of metal tubes and pop-white and blue coffins underground. "If Americans continue to make them at the same rate," speculates Cornell University anthropologist Robert Ascher, "future earthlings may infer that we were obsessed with



PAINTING BY SALVADOR DALÍ

explaining ourselves, just as we sometimes believe that the Maya were obsessed with time and the Egyptians, with death.

The United States is the natural center for the time-capsule industry for who else but a world power with an embarrassingly short past could hit on such an idea? After all, when you encapsulate the essence of an era and declare that the container can't be opened for millions, *apocadictis*—you've made instant history out of your present. Then, too, a time capsule is the supreme packaging venture, and nobody beats Americans at packaging. Also, the assembling, the burying—and no doubt the digging up—are occasions of great public ceremony like cutting ribbons at new constructions and decorating floats for parades.

None of the time capsules built in this century has been opened (although one did mysteriously disappear), yet we can imagine what the experience might be like. Just try to picture Egyptologist Howard Carter, stepping for the first time into the tomb of Tutankhamun and taking through thousands of years into unexpected aftermaths.

In fact, it was the discovery of King Tut's treasures that inspired Dr. Thorneill Jacobs of Atlanta, Georgia, to undertake the first time-capsule project in 1935. Reportedly struck by the meager amount of available information regarding intimate details of past lives, Dr. Jacobs wanted to preserve a complete cross-sectional picture of the entire life of his time for the people of the future. As president of Oglethorpe University he built his "Crypt of Civilization" right on campus, in the bed-rock under Phoebe Hearst Hall, the administration building, where it lies undisturbed today marked with instructions that it not be opened until 8113.

Why 8113? Because in 1936, when Dr. Jacobs really got going, despite an attack of appendicitis, 6,177 years had elapsed since the first date recorded on the Egyptian calendar. And, proceeding from past to future, 1936 + 6177 = 8113.

"We are living in a geological epoch just as truly as did the brontosaurus and the pterodactyl," Dr. Jacobs wrote when he announced his plans in the November 1936 issue of *Scientific American*. "Time will last just as long in the future as it has lasted in the past, our present-day civilization will eventually fall, our tall buildings and huge dams of which we are so proud will be reduced to ruins. Even knowledge of the life of the Middle Ages is already dimmed by time. Its reconstruction by present-day students is largely guesswork. Had it not been for such a natural catastrophe as the eruption of Vesuvius, the glories of Pompeii and Herculaneum would never have been revealed to our sight.

We, however, are the first generation equipped to perform our archaeological duty to the future without the help of natural phenomena.

Dr. Jacobs went on to list some of the

deal contents, which covered everything from the voices of President Roosevelt, King Edward VIII, Mussolini, Stalin, Hitler, the Emperor of Japan, the President of China, and Iowa's champion hog caller to loafs, drinks, and chewing gum to toy models of cars, factories, and the US Capitol.

Dr. Jacobs invited the whole nation to contribute suggestions—both of items to include and of methods to preserve them. Some of the nominees was a pair of garters, a can opener, a dry Martini complete with olive, and a head of Cornell's storied cabbage.

Dozens of Oglethorpe students worked eight hours a day for three years microfilming the world's greatest books (the Bible, the Koran, *Game With the Wind*) and sealing the film in stainless-steel receptacles. RCA Victor, Columbia, Decca, and other record companies supplied hundreds of musical selections and recordings of brooding The Lone Corporation constructed a model

● **Harold K. Davison**
of Seward, Nebraska, bought a
1975 yellow Chevrolet
Vega coupe,
complete with radio, just
to bury for posterity.
He also planned to add a
Kawasaki motorcycle. ●

narrow locomotive and cars in elaborate detail, mounted on a table with a sky-scaper houses, tunnels, and an airplane held with hangers containing the latest types of airplanes, as well as tanks, tractors, automobiles, and other familiar objects in miniature, all made to scale. The Talon (zipper) Company prepared fifty-six centimeter-high figurines in various styles of dress complete with tiny Talon fasteners and enclosed in bell jars. General Electric gave a model of Edison's first lamp. Paramount put in silent and sound films; the New York Herald Tribune printed an especially durable edition, and F. W. Woolworth donated diamonds from the five-and-ten-cent store. All of the material was scientifically picked to the best of available knowledge and put up in the six-by-three-by-three-meter room with ten series of compressed photographs etched into its porcelain enamel walls. The room was welded shut on May 20, 1940.

Here is a partial inventory of the Crypt of Civilization reprinted from the January 1940 bulletin of Oglethorpe University.

● Hand viewing machines for the micro-book film. The microbook records may be

read in ordinary light, the pages being led forward by hand.

● A subscope machine—a manually operated sound-and-picture projector that uses specially prepared metal bands of film. When the crank is turned, a picture in motion is seen and the sound of the voice is heard. This will serve as the Rosetta stone of the English language if it no longer exists.

● A regular motion-picture machine (35mm) with sound head operated by electricity with metal film threaded in.

● A generator especially made of enamel- and operated by a windmill which will develop sufficient energy to drive the motion-picture machine and other apparatuses using electricity, should electricity not exist in 8113.

● A complete set of modern scientific instruments, such as telephones, telegraph instruments, reading machines for the blind, radio, television, analog instruments, phonograph, television iconoscope, iconoscope tubes, radio tubes.

● Models of every kind of essential modern machine.

● Documents of important historical events, such as the signing of the Declaration of Independence, etc.

● Models to scale of the great works of man, such as Mt. Rushmore, Sears Mountain, the Sphinx, the Pyramids, the Great Wall of China, the Eiffel Tower, the Empire State Building, etc.

● Models to scale of the great engineering feats: the Panama Canal, Boulder Dam, the filling of the Zuyder Zee, etc.

● Toilet articles, cosmetics, razors, etc.

● Habits: chewing gum, tobacco, pipes, cigarettes, snuff, opium, hashish, liquor, and illustrations of their use.

● Fire and cooking appliances from the caveman to the latest high-frequency cooker.

● Musical instruments.

● Play and recreation implements: golf sticks, baseball and football gloves, bats, masks, etc. All sports will be represented with pictures showing their use.

● An orthoptic sound dictionary of the English language.

● Copies of historical motion pictures from the inauguration of President McKinley down to the end of 1937.

● Biographical sound records, either on film or on records of all the great men of our day.

● Science: sound records of great scientists, each giving his major achievement.

● Customs of America illustrated in motion pictures.

(Other items, ignored or only suggested above, were a quart container of beer, dental files, coin pads, playing cards, a doughnut, outer a flyswatter, seeds, bulbs, Donald Duck, the Lone Ranger, and an incense burner engraved with the image of Buddha.)

How much of Dr. Jacobs's collection survives even now, so one can say "To thank his backers, Dr. Jacobs has already invited all

of their descendants to attend the opening ceremony scheduled for Thursday May 25, A.D. 8113, at noon. Should there be a break in continuity of information flow sometime during the 187 intervening generations, the crypt's location may be learned from plaques that have been deposited in all parts of the world, as well as, by special request, in the Temple of the Supreme Council of the Scottish Rite of Freemasons, in Washington, D.C. Also attending will be T. K. Peters, the activist who oversaw the collection and preservation of materials for the crypt, and who believed so strongly in reclamation that he swore he'd be back for the occasion.

In recognition of his efforts to preserve the culture, Dr. Jacobs became known as the "Cannier." Even today the Guinness Book of World Records cites the Crypt of Civilization as the largest time capsule in existence. Exhaustive as the crypt was, however, it was barely laid to rest before the Westinghouse Electric Corporation started a similar attempt for the New York World's Fair held at Flushing Meadow Park in 1939.

The Westinghouse builders cored the tam time capsule. This container was a two-meter, fifteen-centimeter torpedo that held an airtight glass envelope into which the contents (including a message from Albert Einstein) were sealed. To ensure the life of the capsule for 5,000 years, Westinghouse developed a metal called Cupaloy, an alloy of copper, chromium, and silver, tempered to the hardness of steel. Technological considerations were so important that the US Bureau of Standards rejected all liquids and any objects that might produce fumes or acids capable of attacking other articles. Once the 135 kilograms of ingredients were fitted in the glass tube, air was pumped out, nitrogen and moisture were pumped in, the glass was locked in the metal shell, the shell was lowered down a shaft coated with pitch, surrounded by poured concrete, and marked above by a granite tombstone from the Rock of Ages Corporation.

Twenty-five years later came another World's Fair at New York, And Westinghouse, riding on a proven public-relations success, prepared Time Capsule II for burial three meters away from its predecessor.

This time, the company hung a model of the capsule fifteen meters above the pavilion and appointed a panel of Nobel Prize winners and other luminaries to encapsulate the quarter century that had seen the splitting of the atom, the cooling of Everest, the first of the Beatles, and the beginning of the Space Age.

Following the Westinghouse template, Metropolitan Electric of Japan sponsored a cauldron-shaped capsule for Expo '70 in Tokyo. In "accelerated life tests," performed to discover which materials would endure the longest, the Japanese found the iodide to be the only plant seed with a chance of lasting the required 5,000 years.

General Dynamics/Convair buried a

time-capsule tinbox to the astronauts of Project Mercury at Cape Canaveral in 1964, and the US Army Weapons Command stashed two at Rock Island, Illinois, in 1968 and 1970. By the time the Bicentennial Wagon Train began its rededication of America from west to east, the boiling fever had spread to all kinds of fides.

Harold Keith Dawson, proprietor of the Seward, Nebraska, discount hardware emporium that features "everything for the farmer but rain," bought a 1975 yellow Chevrolet Vega coupe, complete with radio, just to bury for posterity. According to an article in *The New York Times* (June 21, 1976), Mr. Dawson had already spent \$15,000 on his personal time capsule and was planning to add a blue Kawasaki motorcycle before July 4.

In Pennsylvania, the Philadelphia Resident Astronauts and their daughter company, The Society of the Source, buried their predictions for the next hundred years seven meters beneath Chestnut Street,



They foresaw a New York City earthquake in 1978, floods in 1979, astronaut-body travel a commonplace by 1997, a third sea in the next century, and a military plot against the American government in 2026.

Reynolds Metals did a land-office business in time capsules producing fifty-six of them for burial in each of the fifty states and the four territories, plus one for the Wagon Train and one for the National Archives in Washington, D.C., where the Declaration of Independence is kept. The Wagon Train Time Capsule was supposed to hold the names of 22 million Americans who signed the Pledge of Rededication to the country's ideals. But on July 4, 1976, when President Ford arrived at Valley Forge for the independent ceremony someone stole the empty 135 kilogram time capsule from an unattended locked van. Reynolds had already broken its mold for the container and did not make another, so the scrolls are being stored aboveground at Valley Forge National Park until some other disposition is decided on. The identity of the thief and the whereabouts of the vessel are still unsolved mysteries.

Also in 1976, employees and visitors to

the John F. Kennedy Space Center at Cape Canaveral bought a piece of immortality for themselves and their loved ones by paying fifty cents for each name recorded in the Third Century America Time Capsule. The funds collected for 14,600 names more than covered the cost of the capsule itself—\$1,800 for the stainless-steel container, miscellaneous contents, and hexamethylenetetramine (a special acid-neutralizing agent to keep paper products from deteriorating). The testimonial, never buried, also included a Montgomery Ward catalog and a ball-point-pen-sized ultrasonic-packet transmitter, which had detonated the mild explosive used to cut the tinctor ribbon at the official opening of the Third Century America Exposition.

Across the border the Canadians planted a time capsule shaped like a lamppost's chain can 540 meters up in the air, atop the CN Tower in Toronto.

"It's simply force of habit that makes people bury a time capsule," Ascher thinks. "After all, they've been burying their dead for twenty-five thousand years. But with modern methods and materials you can protect the thing as well above the ground as fifty feet below."

In October of last year, the British staff of Ormeau chose an aboveground location for our own time capsule. Editors Bernard Dixon, Christopher Evans, and Patrick Moore sealed the very first issue of Ormeau in a three-centimeter-high metal cylinder and left it on display at the London Planetarium, where it will remain until it is opened in the year 2000. The capsule also contains several British publications.

A few particularly far-sighted American scientists have already launched four time capsules into outer space. The plaques of interworld greetings aboard Pioneers 10 and 11 and the sounds and pictures on Voyagers 1 and 2 are time capsules of a sort, although not intended for our progeny. Astronomers Carl Sagan and Frank Drake, who masterminded these projects, knew that human technological achievements would be just so much pyrite to any beings capable of intercepting the spacecraft. So they concentrated, instead on the karma of earth, loading the Voyager with sounds of whales singing, footsteps, heartbeats, kisses, and music of all cultures, and with pictures of frogs, antelopes, sand dunes, snowflakes, and people of all description.

Meanwhile, the rest of us continue to turn the entire planet into a time capsule, piling the substratum, intentionally or otherwise, with fossils, tombs, sunken cities, nuclear wastes, metropolitan trash lines, and the buried treasure of sanitary landfill. Evidence of us is everywhere. Several millennia from now these used artifacts may provide more information than even our most elaborately prepared time capsules.

The things we live with, Ascher concludes, the things we really use, get unfringed, broken. They show the history of their passage through our hands. **DO**



FICTION

The invention solved the energy problem, but it took a sea captain to solve the inventor's problem

OIL IS NOT GOLD

BY SAM NICHOLSON

I admit I was patting myself on the back when I got home from the asteroid. True, I had swept on a few tons and blooded a few noses—I have always found troubleshooting to be a dirty job, whether at sea or in space—but the Company subsidiary Space Mining, Inc. had swept up two billion dollars' worth of metals for the moon smelters.

I figured the Company's main office was feeling pretty good about the asteroid haul, so when Mickieberry in Operations ordered me to New York from Space Mining's Assembly/Launch Complex at Carverville, I assumed the old fox just wanted to take soundings, as usual.

I barged into his office—and thought *uh-oh!* Mickieberry was giving me his curt nod and thin smile. He waved me to the hot seat.

I eased my bulk into the worn wooden chair and waited. He cleared his throat. "Captain Schuster, the Company is not exclusively concerned with dollars and cents."

"That so?" I said genially.

He interpreted this as *oh yeah?* and got his pinched-rose superior expression. "In both departments—the one here and the space metals—we must maintain our image as a solid yet progressive and far-minded organization.

PAINTING BY DON DIXON

Executive-level utterance can make or mar this image."

Whenever Mickleberry started talking inage, he was leading up to the fact that I tend to shoot off my mouth, I complained. Jeer. Mickleberry we've been through this lecture before.

Not this lecture, Captain Schuster. Your recent space exploits have made you a prime media object, at a time when special-interest groups are highly articulate and able to—uh—type their onces to death.

He put his fingertips together and continued. "We are living in a jungle of intricate minorities who effectively deny free speech to everyone but themselves. Recently Captain Schuster you have been voicing opinions—*Third World greasers*—at games in parks—and the Company has been under considerable pressure to fire you."

"Okay, fire me. It wouldn't be the first time."

His blue eyes were cold. "Yield to minority pressure? We would rather persuade you, Captain, to employ the secret weapon of the Silent Majority—namely, *advice*, which presents no target for—uh—hysterical yapping, while it exerts its power at nebulous levels, such as the ballot box."

I thought this over. I personally got a charge out of making it up with the yappers—but I did not want the Company viciously smeared or boycotted.

Mickleberry went on. "It would be best if you maintained a low profile during the next months—and therefore we are taking you off the space-ming projects."

I told myself, Mickleberry had opened with the Bad News. Now would come the Good News. I grinned. "I'm gonna be working on the old bany hey?"

"Not exactly on the sea, captain. You recall the experimental tank ship we chartered to Taccou Oil, specifically for their head-shift shale-converter in the Gulf of Mexico?"

I had been in space when the deal was made, so I was not up on the details. As I understood it, a scientist had found a way to hold back an air chamber in the sea and, by the same principle of molecular control, to convert shale to a heavy liquid at the source and pump the liquid into tank ships for further refining.

Of course, Taccou had their own worldwide fleet, but they needed a different pumping system—larger diameter lines, stronger pressures, tank calculators to keep the sludge from solidifying. It was cheaper for Taccou to charter a ship from us than to withdraw one of their own tankers from profitable trade.

I asked Mickleberry, "What kind of charter party?"

"Since the *Holmen* is experimental, we insisted upon our own officers aboard. However, they take orders from Taccou and a dispute has arisen. The *Holmen* is now dry docked in New Orleans, and Taccou has fired our skipper."

"Can they fire him?"

"You're the sea lawyer, Captain," Mickleberry toss off a memo sheet and handed it to me. "Your flight leaves Kennedy in two hours. Pick up your ticket at the airline desk."

I just sat there and eyed Mickleberry. "You want me to maintain a low profile—and you're sending me to tangle with a triple-dealing, public-be-damned, pro-corporate company?"

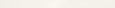
Mickleberry smiled his pale smile. "I think you will find, Captain, that Taccou Oil is bigger than all of us."

The ship's agent met me at the New Orleans airport and drove me to the considerable distance to the dockyard. Mickleberry had been misinformed on one point: The *R 7 Holmen* was not in the dry dock, but alongside the dockyard pier.

The Security watch let the agent's car through the gate, and we swarmed our way around cranes and heavy machinery to the



*That it should happen
in America—I think that makes
me craziest! A
free country—but who is free?
Nobody who buys
oil! There is no Congress—only
an oil lobby! There is
only oil—oil!*



ship. Something about the sitting fascinated me.

I fell on top of the world, being in a dockyard instead of on a launchpad. It seemed primitive and kinda crude, of course—cumbersome steel plates and orange rust and blinding blue-white cracks from welding torches. I left at home sniffing seawater and oil and delta muck.

The watch officer at the top of the accommodation ladder had spotted the car entering the gate, so a seaman was waiting on the dock to take my suitcase.

I thanked the agent for the ride, climbed the accommodation ladder, shook hands with the officer and continued inside to the skipper's quarters, where I really began to enjoy myself. His office had room—and if the air conditioner conked out, I would not need to grab for a space suit.

The skipper was a decent young chap named Cummings. Sober-faced somewhat inflexible—but I had approved Mickleberry's decision to promote him to Master. I figured he would loosen up as he became older and more sure of himself. He was smart and handled personnel problems well, and apparently was managing to

storewall Taccou Oil.

He had been writing at his desk, but he stood up when I appeared in the doorway and came forward to meet me.

As we shook hands, I noticed that the table in front of the settee held a pipe in an ashtray, a half-filled glass, and a turned-down paperback.

Cummings followed my glance and smiled. "Dr. Van Reenstad spit when the third mate phoned up here that you were at the gate."

"How the poop, hey?" I commented, wondering who Van Reenstad was. A guy gets out of touch in space. "What's this Taccou hassle all about?"

"Would you like a drink? It's a long story." "Fine. Make it a long scotch," I grinned.

When we were settled comfortably with our glasses, he took his copy of the charter party from his desk and handed it to me. "When the ship was chartered to Malverde Oil—"

"Malverde Oil?"

"A Taccou intermediary Malverde was to pump up the liquefied shale and sell it to Taccou, who would sell it further—Japan, I guess."

"Which company owns the converter operation?"

"Taccou. So the oil would go from Taccou to Malverde to Taccou to X—"

"And to Taccou again?"

"Eventually with a cost jump at each level. Everything worked fine, at first. We delivered a couple cargoes to the Taccou pier here in New Orleans—and then Taccou shut down the converter."

"Why?"

"They don't want to market the oil. The world is glutted with oil. They wanted to make sure the process worked—and then tie it up and do it on it. But they hadn't expected Van Reenstad to deliver the goods so fast—"

So Van Reenstad was the scientist-inventor.

—and the *Holmen*'s charter had a long time to run. So Malverde put us into the crude-oil ring-around-a-rosy.

"Which ring?"

"Oh, we'd pick up crude off the South American west coast, discharge it at the Belboe end of the canal, pick up more crude somebody else had discharged, carry it through the canal, discharge it at some Caribbean terminal, pick up more crude somebody else—"

"African oil routed through Japan?"

"Hell, nobody knows where the razzle-dazzle begins or ends—except Taccou. You've skipped these tank ships, Captain Schuster—you know the drill."

"Okay, so you've been ferrying crude. What came unstick?"

"Well, the old *Holmen* is just a carrier for heavy crude. She's only rated for dirty cargoes—and Taccou/Malverde had decided to put her into the higher-grade clean. They told me to dry-dock her for tank cleaning, and they sent along her next charter—high grade refined."

"Her tanks are probably gummed a foot thick. She'll never clean up enough to pass inspection."

Malverde says not to worry about the inspectors. But, Captain Schuster, I can't risk my Master a license trying to run a dirty rust bucket in the clean trade. I told Malverde the Company had not empowered me to break the law.

I could not help saying, "You protested too quick about the clean charter, didn't you? There's nothing illegal in dry-docking or tank cleaning. You should have let Tacon clean out tanks at their expense—and then refused to break the relevant laws."

"Yes, I know. You could have played it that way," he said earnestly. "You've established a reputation as an honest man who enjoys leading crooks right down to the wire and pushing them over. The inspectors know you, and they'd just get a laugh out of the deal."

"But they don't know me. And the evidence of the clean charter and the impossibly dirty ship would indicate that I went along with Tacon in their hopes of dodging the inspection. I bet I had to make my own intentions clear, right at the start."

"You must realize, Captain Schuster, that you can get away with a lot of stuff the rest of us couldn't have a hope of pulling off."

As I say somewhat incoherent and unsure. However, it's hard for a guy to make intelligent decisions when he's up to his neck in crooks. He was going on, "What bothers me most is what Tacon has done to Von Reinstad."

"Oh? What's that?"
"Well, here's a genius with a solution to the energy problem—cheap instant oil from the sea bottom with a minimum of hardware and easy transportation. And Tacon Oil buys all legal rights and sets on them! Von Reinstad could give his blueprints away on the front page of the New York Times—and nobody could use them! He's being throttled!"

"But Von Reinstad is up here. His drink is already warm."

Cummings lifted his phone receiver and dialed, "Doctor? The oil clear has sounded. And Captain Schuster can't stand to see a drink get warm."

He smiled, hung up, and said, "The doctor may not be himself. He stays mostly on the shale rig, monitoring the chamber and sea-bottom equipment. He's got the idea into his head that Tacon would shoot him if he wandered too far afield. I don't believe they would go to that length—they're only interested in stifling his invention—but it's an indication of his depression."

"He might talk more freely if I weren't around," continued Cummings, rising from his chair, "so I'll just go below and discuss some things with the chief engineer."

"Good idea." I swallowed a slug of scotch and waited for the waiter.

A guy whose spirit has been broken is a pathetic sight. Von Reinstad was tall, thin, gray-haired with dark, sad eyes that
© CMA

should have been flashing with intensity or schmerz or whatever the proto-type German flashes with. I had seen guys like him on the ships—a different breed from the chunky roundheaded, Achtung blonds.

He looked relieved when I turned out to be Schuster. God knows what he had expected after hearing Cummings talk about me. We shook hands, sat at the table, and fastened our drinks.

Captain Cummings has been very kind," said the scientist with the barest trace of an accent. "I cannot stay all the time on the rig—I would go entirely crazy—so sometimes I come aboard the *Holmen*." He tapped the pipe with shaking fingers. "I have a—a monomania. I think I have been cheated—but, as Mr. Ealing says, I am just a little crazy."

"Who is Ealing?"
"He calls himself a coordinator for Malverde Oil. He is a fixer—an grand boy between Malverde and Tacon. He also keeps an eye on me and the shale rig. In

◀ We set down on the forward dock and walked aft to the square. A crewman pressed a switch and thick-lensed lights glowed from the darkness into an enormous . . . well that went down . . . six fathoms. ▶

case a monomaniac sabotages a useless invention.

I could see the guy wanted to talk, so I waited while he got the pipe started. He puked it and went on, "Ealing can explain anything away. How can I think I have been cheated? I have been well paid for my invention. Tacon pays everybody very well. I am rich, almost. But, Captain, life is not all dollars and cents—"

The sentiment sounded better from Von Reinstad than from Nickleberry—and I want my invention to be used, not suppressed! But Ealing says, "Who is suppressing? There it is in plain sight—fully operable. Ready to be used when the time comes."

He laughed and did sound a little crazy. "Ready when the price comes, is what he means! Tacon is so poor, Captain, you wouldn't believe! Not even a cent profit do they get at the gas pump! But how many cents between Alaska and Japan and Tacon and Malverde and Tacon—"

"But the good they do with their profits! Research—big laboratories—laser beams—fusion-fusion—color—beautiful pe in the sky! But do they tell the truth, We

can give you cheap energy now? No—it must be tomorrow when the price is high and they can squeeze and squeeze—"

That it should happen in America—I think that makes me crazier! A free country—but who is free? Nobody who buys oil! There is no Congress—only an oil lobby! There is no president—no antitrust laws—no courts—there is only oil—oil—oil—"

"Well, there's the Silent Majority!" I interrupted.

"And what good is a silent majority?"
"The silence. No telegraphing punches until a haymaker sends the yappers to the clinic. Every action, you know, has its reaction. And when 200 million led-up people finally react, Tacon Oil won't know what hit 'em."

"I hope I live to see the day!"
A snowball in hell had a better chance, but at any rate I had cheered him up. I said, "I'd like to like to see your invention, Doctor. I don't understand how you can make an chamber out of lines of force."

"By a shifting of molecules. The field makes a wall of solidified water."

I jingled my drink. "You mean ice?"

"Captain, cooking and freezing are temperature-oriented concepts. But we can cook food without heat—by microwaves that induce kinetic energy. And we can solidify water without cold. Oh, the chamber walls are very elementary. And once we know how to rearrange molecular lattices in a force field, we can do many things like liquefying shale for oil in a moment."

"And making gold from lead?"

"No, no, Captain. For that we must rearrange atomic structure, an infinitely more difficult operation. I would like to show you my shale converter, but you must ask Mr. Ealing. I no longer own it. I am only the janitor."

"Where can I get hold of Ealing?"

"Why I believe he was to come to the ship. Yesterday your Company told Tacon you would be arriving—"

Yeah, the boat I took another swallow and wondered about Ealing.

The desk phone rang. Von Reinstad rose, holding grabbing pipe and paperback. I said, "Hey, take it easy!" but he was gone like a rearranged molecule.

I answered the phone. The watch officer said, "Captain Schuster, Mr. Ealing is here to see you."

The charter party was still on Cummings's desk. I picked it up and said, "Okay, thanks, we're ready for him."

When Ealing entered the office, I reflected that all the errand boys—the porters—the boys—looked alike. Cheaply sharp but shabby. They weren't well paid, since double-dealing is not a rare skill that can demand good money. They were puffy eyed and always slightly hung over from the three-martin lunch. They boasted about being "in oil" or "with Tacon, and around in oil" or "with Tacon, and around in oil," usually among their colleagues on shore or

However, there are also prospective users in the business community where, as Thomas A. Edison discovered, information itself is often more valuable than the actual subject of that information. Business firms are becoming deeply involved in large-scale data transfer which can be expected to increase sharply as access to communications-satellite systems becomes cheaper and more readily available.

This is not pie-in-the-sky. A data-transfer satellite could be working on-orbit within ten years. Could you make money with the service? Assuming comparable or slightly lower costs with existing and analogous equipment and services—satellite, TWR, Tel-Pak terminals, antennas, electronics, and cost-per-unit time charges—some 10,000 public libraries could afford the service and be using it within ten years, providing an annual revenue of more than \$100 million. Ten years into the venture, the number of business firms using the service could be as high as 1.5 million and still growing, with annual revenues ranging between \$3 billion and \$5 billion. This is a reasonably attractive proposition.

Have you ever lost a package or an entire shipment in transit? It's expensive to locate it if you can at all. With two radio-reception beams sweeping across the United States—one going in a north-south direction, the other going east-west—a large satellite in geosynchronous orbit could locate a tiny, low-power radio transmitter on the ground to within 30.6 meters (100 feet). Furthermore, it could track 10 million such transmitters every hour. Stack one of these little transmitters on a package, and you can locate it. Stack one on a vehicle, and you can discover where it is. Put it on a person, and that person's whereabouts will always be known. Yes, this has its covert, people-controlling, totalitarian aspects as well as its commercial benefits—this is why such a system had better not be in the hands of the government! We run the economics of this as a commercial service based upon the best mix of transmitter rental and transmitter-purchase price and the cost of the service to make it competitive. Revenues at the end of the first year of operation would range between \$2.6 million and \$5 million. Market saturation would occur at the end of the twelfth year with gross revenues at that time ranging between \$35 million and \$300 million. Looks promising.

How would you like to have the legendary Dick Tracy wrist radio? It would not only tell time, tell you where you are, and link you to a large computer, but it would also put you in communication with anyone in the world who had another wrist radio or with any telephone anywhere. This gadget will become possible within ten years through complex inversion, battery technology and frequency allocation will be the only

two technical problems. The unit will cost about \$300 at first, dropping to thirty dollars in ten years or less, based on costs for analogous, small, hand-held electronic devices such as calculators, digital watches and CB walkie-talkies. On the basis of these markets, the cost per unit will start at three dollars and drop to one dollar thirty cents within five years. Fifteen years after the service starts, the service costs will have dropped to thirty cents per call.

By doing the sort of number grinding carried out by marketing people every day in commercial business, we will be able to get a handle on revenues. We can assume that the initial users will be professional or business people who require communication beyond existing or projected telephone systems. As the market grows, the universe of users could become the entire population above age sixty-seven years of age. This is not an unreasonable assumption, because there is now one telephone for every two people in the United States. The number of

● *By 2010, solar-power satellites could be providing most of the nation's electricity with spare capacity that could be sold overseas, making us energy exporters for a change!* ●

SpaceCom wrist-radio users will grow to 50 million people twenty years from the start of service, while revenues from unit sales will peak at \$300 million per year at year fifteen, and revenues from calls will still be increasing at more than \$20 billion annually by year twenty.

The second area of space industrialization is products—things made in the unique environment of space that cannot be made on Earth, things that can be made better in space than on Earth, and finally things that are made on Earth but should be made in space because of environmental problems. Two aspects of the space environment—weightlessness and vacuum—will permit the manufacture of totally new alloys, highly potent and purified drugs and other biological products, and spectacular new crystalline semiconductor materials. Research has already been conducted on the Apollo flights, in the Skylab, and in the Soviet Salyut space station. The results are promising.

New alloys are among the most attractive possibilities for space products at this time. Researchers here, in Europe, and in Japan are getting ready to do extensive further

research in the speciality module that will fly in the space shuttle's payload bay by 1980. Alloys under consideration include high-purity materials whose manufacture is feasible in weightlessness because they can be formed in a free-floating condition, without coming into contact with contaminants. Other experimenters are looking at exotic alloys that cannot be made in the presence of gravity because of large differences in density that won't permit uniform mixing—sort of like vinegar and oil in a sealed dressing. In space, in the absence of gravity, density differences mean aitch, and it becomes possible to make mixtures of materials that simply will not mix here on Earth.

Pensable cutting tools (PCT) are used in lathe, milling machines, and other machining operations; they exhibit the sort of characteristics (high cost per unit weight) that draw us to consider them as potential space products. They already cost \$100 to \$250 per kilogram. Generally the harder the PCT material, the higher its cost. A PCT made of a hard alloy manufactured in space and having a longer tool life or a faster cutting speed would find a market at a competitive price. And the market exists. The 1985 projected PCT market is \$2.6 billion, growing to \$5.6 billion by 2000. Carbidé tools, the hardest and best PCTs now available, represent about 50 percent of this market. A small improvement in feedrates, lifetime, or cutting speed could be expected to capture at least 5 percent of the total market. We now foresee a potential worst case annual market of \$280 million in 2000.

There are other types of alloys that appear to have attractive markets and it would not be surprising if one of the first space products was a space jewel. Every trade route in Europe and Asia was established to fill a market desire for a luxury item that could command an arbitrarily high price depending upon the scarcity of the item. The glamour and assurance of retained value will continue to make jewelry and precious stones marketable items in the future. There appear to be materials such as special alloys that can be made only in space, and these materials do not have to possess beauty, utility, or exceptional physical characteristics. But they must be unique, special, readily identifiable, and scarce. The glamour and uniqueness of a piece of jewelry made from a space alloy could capture from 1 to 10 percent of the jewelry market. By the year 2000, space jewelry alone could produce revenues of as much as \$522 million.

Improved electronic semiconductor materials appear to be another type of space product with an attractive market. Skylab experiments with crystals growing in weightlessness have already proved that it is possible to grow crystals with a minimum of imperfections, which strongly affects their electronic characteristics. Hence the possibility of a cost reduction of up to ten times in the fabrication of microelectronic

chips such as the one in your digital watch or pocket calculator. Add to this the potentials of producing very large-area thin films and very high-purity materials.

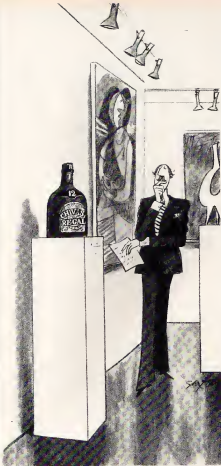
Also, because it appears that we may be able to make some new alloys in space that cannot be made anywhere else, we may be able to produce some radically new semiconductor materials such as gallium bismide—which we don't know anything about yet because we can't make it here. By 1985, space-made semiconductor materials could capture at least 1 percent of the total market, which means \$500,000 per year. By the year 2000, however, this market will grow to \$1.27 billion.

Most large pharmaceutical companies in the United States and Europe are, right now, carefully considering the manufacture of certain drugs and other biological products in space, starting with some of the early space-shuttle flights. But they are being very secretive about it. Industrial security is much tighter than military security. In the highly competitive business world, Macy's doesn't tell Gimbel's—and that's no joke. Obviously, these pharmaceutical companies know something about the value of processing in space such materials as the components of blood, enzymes, antibiotics and other drugs. We already know that there are some processes used in drug manufacture that could operate with greater speed, greater volume, greater efficiency or lower cost in space. Electrophoresis, the separation of chemical components of a biological sample by the application of electric fields is only one such process. And we can look at some potential markets assuming that some of these processes will operate better in space. By the year 2000, the space-pharmaceutical market could add up to more than \$7 billion... a highly conservative estimate.

The third area of space industrialization is energy. A great deal of research, publication and speculation is going on in the area right now and solar energy from space may become more of a "driver" for space industrialization than either the communications or the products area.

The sun has a surface area of 185 million million square meters. Each square meter radiates energy continuously at a rate of about 80,000 horsepower. At our distance of 149.6 million kilometers (93 million miles) from the sun, this radiant energy produces heat energy roughly equal to three-tenths of a calorie per square inch per minute. This doesn't sound like much. But if you can build a very large solar-energy collector, you can obtain a great deal of energy. It's out there right now waiting for us to use it. Because of our planetary day-night cycle, we must get out into space in order to utilize solar energy full-time.

Whatever type of solar-power satellite (SPS) is finally selected, on the basis of costs, technology readiness, economic, and a host of other criteria, it does appear at the time that the SPS concept is gener-



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Gouard, Maw & Sporn Co., N.Y.

ally feasible from the point of view of both technology and economics. It is technically possible to build the very large structures in the weightlessness of space that would be necessary to collect the required solar energy. It is technically feasible to convert that energy to microwaves and to transmit it to Earth with no negative effects on the environment—the microwave density right in the middle of the receiving antenna is far below the most conservative safety levels. From the technical point of view, we could begin the on-orbit experiments to prove out the various components, designs, and techniques of an SPS by 1987. This would lead to a small (5-gigawatt) or 5-million-kilowatt SPS pilot plant operating in low earth orbit by 1987, giving us the final technical and economic answers that we would need to begin construction of a full SPS system with 50 10-gigawatt SPS units in geosynchronous orbit by the year 2000, supplying most of the projected electrical needs of the entire North American continent.

What will it cost? Utility-company planning experts—people who must make their living coming up with the right numbers—have looked at the SPS system and see it costing on the order of \$2,000 per kilowatt-hour installed, which is about the same as building a conventional coal-fired generating plant costs.

But if the SPS concept proves out, as it gives every indication of doing, the electrical power that could be generated by a single SPS is dependent only upon technical constraints, rather than on market size. Several projections for electric-power consumption indicate that there will be no saturation of the market out to the year 2010, at which time an SPS system could be providing most of the nation's electricity, with spare capacity that could be sold overseas, making us an energy exporter for a change.

The fourth area of space industrialization is people, and it encompasses more than you might suspect.

People will be required in space to build, operate, maintain, repair, and modify the equipment used in the communications, products, and energy activities of space industrialization. Americans learned their lesson in this regard with Skylab, and the Soviets learned the same lesson in their Salyut program. Space hardware can usually be repaired and put back into operation by people who are there. People can also modify space equipment to do tasks the machines weren't designed to do.

But there will not be 100,000 people up there in a space colony to start with. It will be too expensive to put people up there and keep them alive just for the sake of living up there. Even in the 1990s the number of people in space for long periods of time will be limited to those individuals whose presence can be justified from a cost standpoint or because they are involved in research projects that can't be accomplished without human attention. In

the next twenty years, there will be no utopia up there. It will be a life that is cramped, boring, smelly, rugged, primitive and very lethal. All frontiers are this way. All pioneers are a special breed of people who manage to survive under such stresses. It will be no place for weeklings in body spent, education, training, or outlook.

In spite of these primitive conditions, it would not be surprising to see tourists in near-Earth orbit by 1995! Tourism is big, even in Antarctica and the Himalayas. One of the certain consequences of space industrialization is a reduction in space transportation costs. If costs come down to the point where a round-trip ticket to orbit could be purchased for \$5,000 in current dollars, studies have indicated that a tourist market of 5,000 people per year would exist. If that same ticket could be reduced to \$1,700, we could expect 50,000 people per year standing in line with money in their hot hands for a chance to fly into space for a day or even a week. (See

• The weightlessness and vacuum of space will permit the manufacture of totally new alloys, highly potent and purified drugs, and spectacular new crystalline materials •

Over "Ticket to Space" March 1979.

However, people in space involves another, more important aspect of space industrialization: the implications heralding major changes in the way of life for most people on Earth.

There is more to space industrialization than creating space activities that pay for themselves and provide a return on investment. Space industrialization provides something of value from these operations for people on Earth.

This has already happened, although few people realize it. The impact of space communications in the past decade is staggering if viewed in perspective. It is totally impossible to properly assess the long-range impact of instantaneous worldwide communications on the political, economic, and cultural aspects of life on this planet.

Carrying on industrial operations in space also means that any location on Planet Earth is equally accessible to and can receive the products and services from space. It requires very little additional energy to land a payload at New York, Hong Kong, Kuala Lumpur, Montevideo, Lagos,

or East Christ Church. The world becomes the market for all of the products and services of space industrialization.

But how do you sell high-technology space alloys to Tanzania? Do they really need wrist radios in Peru? What would India do with an SPS or the electrical output of an SPS?

Utilizing the products and services of space industrialization at various places in the world requires some creative thinking and planning as well as an understanding of local situations. For example, should India build an electric power grid to bring the ten-gigawatt output of an SPS to every rural village, where the people could use the electricity to heat their hovel? This requires an additional capital investment and the development of a considerable electro-appliance industry. Dr. J. Peter Vekj has suggested an alternative.

One of the reasons that India's croplands do so poorly is that cow manure must be used to heat homes rather than be used as fertilizer. Therefore, the SPS electrical output could be used near the ground antenna to run a factory for making wood alcohol (methanol) from carbon dioxide and other organic products. This wood alcohol would then be packaged in four-liter jugs, creating an industry a low-tech system to manufacture the jugs. The four-liter jugs would be distributed by the postal service and by bicycle delivery, both also low-tech systems. The villagers could then use the wood alcohol to heat their dwellings, using the cow manure to fertilize the fields and increase the yield.

We send to think only of high-tech nations such as the United States, Canada, Western Europe, and Japan when talking about space industrialization. But with a little planning and market analysis, the output of space industrialization can be sold to or otherwise appropriated for every person on Earth who could benefit from it.

As the industrialization of space proceeds over the critical next twenty years—a time period that involves your own lifetime—we will see a growing number of people living in space and making all of this happen. They will be running the industrial operations of space. Slowly, inexorably, something akin to the space colonies envisioned today will evolve from space industrialization—not the other way around. They will be better posts at first. The utopian vistas of space colonies as portrayed today will take a little time to become reality, but these artists' conceptions are just as important to the future in space as were the lund posters of the nineteenth-century railroads calling emigrants from Europe to the Goldcoasts of the American West.

We do indeed have a real frontier again! Since 1957 we have known it was there and waiting. We went out and had a look at it. Now slowly we are beginning to realize that it is useful and valuable.

So we are going to go out and put it to use. ☐

CHILDBIRTH

CONTINUE FROM PAGE 10

noted that the newborn is an organism poorly positioned for dealing with drugs. The drugs she observed " lodge in brain structures that are still developing and are therefore at high risk to damage. They are not readily transformed to nontoxic compounds since the necessary liver functions are immature. And they are not readily excreted because of inefficient kidney function."

Obstetricians could, of course, peep at, medicate and operate on a fetus more efficiently if it developed in a glass container. Even that is envisioned by one medical futurist, Dr. Joseph Fletcher of the University of Wisconsin Medical School. During a discussion of the first test-tube baby on an ABC television interviewer asked Professor Fletcher last July "Do you foresee the day when artificial wombs made of plastic or metal or whatever will be used?"

"Yes, yes I foresee it with urgent approval," he replied. "I think I should be eager for the day when I could actually see, let's say through a glass container, a conceptus develop from fertilization through to term and see how all kinds of congenital mishaps which destroy or injure these babies might be prevented by medical tactics and medical strategies."

By 2000 electronic fetal monitors, used now to record the mother's contractions and the baby's heartbeat, may operate without wires, through telemetry (remote-control monitoring of a fetus), says Dr. L. Stanley James, of Columbia University who specializes in the care of newborns. "That's the same as the astronauts have," he noted.

Dr. Edward Hon acknowledges that all the techniques for such monitors (key elements in the helicopter nightmare) are available today.

"There is a dual electrode that can be placed in the vagina right now," Dr. John Evard, associate director of community reproductive health services at Women's and Infants' Hospital in Providence, adds. "And I foresee the time when we will have it transmitting to a piece of equipment while the woman is up and walking around. If they can do it from the moon to the earth, they certainly can do it from a woman to a concave lifeline feet away."

[Space age analogies come up extraordinarily often in conversations with obstetricians. Indeed, obstetricians are already using some technology developed in the space program.]

In the future, the monitors may be attached to digital computers. Referring to the development of this "computerized labor system," Dr. Charles Flowers of the University of Alabama School of Medicine wrote in an early paper on the concept that the project was designed to utilize modern computer and electronic knowledge to monitor the fetus *in utero* with the same

thoughtfulness as we monitor a man in space.

Dr. Saul Lerner, in a vision not shared by other obstetricians interviewed, hopes computers will calculate how long each stage of labor should be. In October 1977, Dr. Lerner, past president of the Massachusetts section of ACOG and a faculty member at the University of Massachusetts Medical School, told the *Boston Globe*: "We now have a very aggressive approach to pregnancy. There's a whole new concept plotted out by computers: how long each stage of labor should be. We will not allow a woman to labor for more than four hours without making progress. We do cesarean sections freely."

INTRODUCING THE BIRTH FACTORY

Acknowledging that hospital birth lacks "warmth," some doctors foresee a less mechanized birth by 2000. Obstetricians will develop machines and techniques that are unobtrusive, noninvasive, and less visi-

● *Obstetricians have an economic and emotional stake in suppressing midwives. Yet up to 90 percent of well-nourished childbearing women can give birth without obstetrical intervention.* ●

ble, they say. Surroundings will be made more pleasant for mothers. Curtains will be lowered.

"We'll be able to monitor things without too much invasion of the patient's body," Dr. Flowers of Alabama predicts. "We're going to combine warmth and a humanistic attitude with newer developments in electronics."

However, the fact that a regionalized system of prenatal care providing high-technology assistance for all pregnant women is now being established throughout the United States casts doubt on the prediction that birth will soon be re-humanized. According to a plan published in 1977, small maternity services in local communities will close down and all birthing mothers will be sent to large regional centers boasting the latest obstetrical technology.

Dr. Murel Sugarman, a psychiatrist and a member of the Ad Hoc Committee on Regionalization of Maternity Services in Massachusetts, disapproves. The plan, she states, was devised by organized medicine, which believes "that quality of care is measured by level of technologi-

cal capability and that birth is a high-risk, intensive-care, disease-ridden process on a par with cardiac surgery.

In the year 2000, Dr. Sugarman maintains, regionalized care will force mothers to go far from their communities and loved ones to bear their babies "in large, cold, impersonal birth factories."

Dr. Jack M. Schneider, codirector of what Dr. Sugarman might term a "birth factory"—the Wisconsin Perinatal Center in Madison—predicts that by the early 1980s, all pregnancies, registered by physicians with the regional perinatal center, could be monitored throughout the United States. Commenting on this prediction, Elliot M. McCloskey writes in his book *New Miracles of Childbirth*:

"Then virtually every fetus nestled or kicking in every womb throughout America would have an electronic guardian angel in the form of a watchful computer."

Indeed:

It is this potential development, coupled with regionalization, that gives Suzanne Amis the same bad dream Norma Swenson has. What it will take to realize the helicopter scenario, she thinks, is the implementation of regionalization "to the point where everybody knows what everybody else is doing."

The ability to "actively manage" birthing with the new technology gives obstetricians great power to control nature. Month by month, this power grows. As the world realized last summer with the birth in Britain of Louise Brown—conceived in a petri dish and delivered by a knife—doctors can control not only parturition (the birth process) but reproduction itself.

Physicians can artificially inseminate a woman. They can fertilize an egg artificially. They can implant a fertilized egg in a uterus. Now men like Dr. Robert Goddin of Stanford are hard at work on those glass or steel wombs whose mass production Dr. Fletcher so joyfully envisions. "Quality control" talks in the increase.

Articles in the popular press now encourage parents to seek genetic counseling before they conceive in order to prevent the production of "defective" children.

RETURN OF THE MIDWIFE

But perhaps reproduction and childbirth in 2000 will not be managed entirely as obstetricians would like it to be. A grassroots rebellion against establishment obstetrics is now beginning to gather momentum. It broke out, quietly at first, in 1960. Parents and childbirth educators, along with many nurses and some physicians, formed the International Childbirth Education Association. Respectfully, they challenged the validity of routine obstetrical practices and pressured obstetricians to adopt "family-centered maternity care." Under that program, husbands would be allowed to stay with their wives during delivery and women would be permitted to see their babies more frequently.

As the Protestants did, the movement is

splitting into sects. In 1975 the National Association of Parents and Professionals for Safe Alternatives in Childbirth (NAP-SAC) sprang up. The more militant NAP-SAC members were not willing to ask physicians to "allow" them more participation in the birth of their children.

"We've done scientific research to determine what basis there is for hospital birth, and we don't find any basis," Dr. David Stewart, NAP-SAC director, notes. "The only justification for going to the hospital is if you have some address or complication. This only applies to 10 or 20 percent of mothers" (His wife, Lee, delivered their children at home).

Studies comparing home and hospital birth have found that for healthy mothers, the home is safer. Dr. Stewart, a physician, continues. He refers specifically to studies by medical statistician Margene Tew and Dr. Lewis Mehl, director of research at the Center for Research on Birth and Human Development.

In 1972, other scientists formed the Society for the Protection of the Unborn through Nutrition (SPUN). This group campaigns for scientific nutrition management in obstetrics and discourages obstetricians from prescribing the standard low calorie, low-salt diet during pregnancy. Pointing to studies linking physician-supervised prenatal diets to serious disorders in the child and to toxemia in the mother, SPUN founders charge that the standard regimen—prescribed by obstetricians who have had no training in applied nutrition—damages the fetus.

In September 1977, SPUN won a precedent-setting case when a jury found an Indiana obstetrician guilty of malpractice for prescribing an inadequate diet and diuretics to a pregnant woman who subsequently gave birth to a mentally retarded child.

As SPUN, NAP-SAC, and ICEA were growing, some women, reacting against expensive hospital maternity care that they found dehumanizing, began to deliver their babies at home, often with the help of only a few inexperienced friends. These women began to be called upon for help by their friends and neighbors when they too wanted a home birth. They gained knowledge and skill. Some emerged as lay midwives.

In January 1977, more than 200 midwives held their First International Conference of Practicing Midwives in El Paso, Texas. "Home birth is a civil-rights issue," says Judith Luca, a lay midwife in Boston. "It's a woman's civil right to give birth where she chooses to give birth. It's a family's right to maintain the privacy of family life." Nafanwack, an estimated 1.6 percent of births occur at home.

Such home-birth activists, who see obstetricians as a special-interest group, challenge the assumption that the values of physicians should be given more weight than their own. Their beliefs are generally summarized as follows: • Up to 90 percent

of well-nourished childbearing women can give birth without difficulty or the need for obstetrical intervention. • Rather than continuing research on intensive-care units and sophisticated machinery for delicate newborns, specialists in maternity care should emphasize the prevention of birth complications by counseling pregnant women on nutrition and by supplementing inadequate diets. • Obstetricians have an economic and emotional interest in suppressing midwives and in denying the needs of birthing women as highly complex. • As SPUN notes, major technological advancements in obstetrics and perinatology such as intensive-care nurseries, amniocentesis and ultrasound have not led to marked improvement in maternal and infant health during the past few decades. (Amniocentesis entails inserting a needle into the uterus, drawing fluid from the amniotic sac of the fetus, and testing the fluid for metabolic and chromosomal defects. Ultrasound is a mechanical

tematic investigation and research.

Testimony presented at Senate oversight hearings on obstetrics last April supported Dr. Mehl's contention. Many drugs, surgical procedures and instruments commonly used in obstetrics. Senator Jacob Javits stated these had apparently never been conclusively tested for the relative risk and benefit.

Dr. Donald Kennedy, Food and Drug Administration (FDA) commissioner, presented testimony that, while dispassionately phrased, constituted a devastating indictment of the uncaring way American obstetricians establish routine practices in case after case. He reported that upon examination certain drugs and procedures widely used by obstetricians had been found to be ineffective for the purpose to which obstetricians put it (DES and other synthetic hormones to prevent miscarriage, diuretic drugs to prevent toxemia, and possibly electronic fetal monitoring). • to expose mother and/or fetus to serious risks often to achieve an unclear benefit (elective induction of labor, X rays, sex hormones to diagnose pregnancy, pain-relieving drugs during labor, DES and other hormones for miscarriage, and electronic fetal monitoring, which, according to two studies, entails an increased risk of cesarean section without any improvement in infant outcome). • to present possible long-term effects the extent of which obstetricians remain ignorant of (ultrasonic radiation and all of the above).

Senator Edward M. Kennedy observed at the hearings: "The development of obstetrical technology far outstrips our capacity to assess its appropriate value. As a result, common practice is established before appropriate practices can be defined."

The widespread use of ultrasonic equipment during pregnancy and in fetal monitoring during labor was a perfect example, he added. While ACOG believes ultrasound to be safe and recommends its widespread use, FDA scientists are concerned about its possible dangers. Kennedy noted: (In some animal studies, an increased incidence of fetal deformities has been found after low level exposure to ultrasound.) EFM is another procedure widely used despite the fact that its efficacy has never been conclusively demonstrated. Developed in the 1960s by Dr. Edward Hon, now chief of perinatal research at University of Southern California Medical School, internal monitoring records fetal heart rate and uterine contraction pressure. The physician breaks the protective bag of waters prematurely and inserts two catheters containing electronic leads. One spiral electrode punctures the fetal scalp and relays the fetal cardiogram. The other relays the rate and pressure of uterine contractions.

Originally planned for high-risk pregnancies, EFM is increasingly being used routinely for all labors despite a study by Dr. J. F. Roux showing that one half the tracings

• Birth activists, who see ob-gyns as a special-interest group, challenge the assumption that the values of physicians be given more weight than their own. •

radient energy used as an alternative to X rays to visualize the fetus. The external EFM also employs ultrasound in monitoring the fetus during labor. • Many technological interventions in childbirth lead to iatrogenic (doctor-caused) illness. • The long-term effects of invasive diagnostic procedures and manipulations of normal labor (amniocentesis, elective induction of labor with oxytocin drugs, ultrasound, etc.), who as yet unknown, may be considerable and adverse. • They, as patients and their children will have to live with any adverse effects, and obstetricians will not.

As Dr. Stewart asserts, parents have a right to choose what may seem to the professional a wrong choice.

QUESTIONABLE PRACTICES

Childbirth organizations offer scoundrelously documented critiques of many current obstetrical practices, the benefits of which they maintain, have never been proven to outweigh their risks. They observe, as Dr. Lewis Mehl does, that standard obstetrical practices have often been established on the basis of single-case anecdotal reports that do not reflect eye-

of fetal heart rate and uterine contractions cannot be interpreted, that 25 percent of the women describe the fear and pain associated with the monitoring catheter and that complications include bleeding, minor vaginal and cervical lacerations, uterine perforation, increased incidence of infections, and fetal-scalp hematomas.

Moreover, a study by Dr. Albert Havenkamp of Denver General Hospital comparing the effectiveness of EFM to the old-fashioned method of monitoring fetal heart tones (with a fetoscope) revealed no differences in infant outcome between the two groups. But there was a striking increase in cesarean sections performed for fetal distress in the electronically monitored group (16.5 percent versus 6.8 percent).

From 1971 until 1976 the cesarean section rate increased 95 percent at the United States. The rate nationally is almost 20 percent of all births, and some doctors are arguing that it should go even higher.

Obstetricians assert that the rates are climbing because they are able to diagnose previously undetected "fetal distress" with EFM and save the baby through quick surgery. Dr. Havenkamp's study, and another conducted by a Harvard School of Public Health physician, challenges this belief. Moreover, Dr. Han maintains that doctors are performing many unnecessary cesarean sections because they do not understand the meaning of the EFM tracings and they panic unnecessarily. Most of the sections that are done for fetal distress are really done for obstetrician's distress. Dr. Han has said:

For the mother, cesarean section is a major operation that always involves the risks of anesthesia and, sometimes, blood transfusion. Half the mothers suffer a post-operative complication. Moreover, women have from five to twenty-six times greater risk of death from cesarean than from vaginal delivery. Despite such statistics, doctors are now routinely reaching for the scalpel at the first sign of irregular fetal-monitor indications.

OBSTETRICAL BACKLASH

Orsly Duffy, an Illinois woman who has had a cesarean, formed Cesarean Support to help others distressed by the operation. She notes that after the births of the 1940s and 50s, when women were often given the hallucinogen propofolam, put out under general anesthesia, and not allowed to actively participate in the birth, mothers began insisting on "natural" childbirth. Thousands of mothers, she said, have since experienced rewarding births with minimal medical assistance. Now many women are even delivering at home successfully.

"The obstetrician has seen his profession slowly lose its grip on women and made one last stab at regaining control via surgical interference," says Duffy. "After all, can you do a home cesarean?"

Ms. Duffy is not alone in fearing that obstetricians feel threatened by the grow-

ing home-birth trend. Stan Daniels, president of the National Midwives Association, believes the obstetrical establishment is encouraging prosecution of midwives, is conducting a campaign to stamp out home births.

"In the next twenty years, I think a lot of us are going to have to go to jail," she says.

Citing a murder charge against a lay midwife and threats to dismiss an academician whose study placed a common obstetrical procedure in an unfavorable light, Dr. Stewart says of the obstetricians' campaign: "They mean for blood."

"It's a big-time economic issue," comments George Annas, associate professor of law and medicine at Boston University School of Medicine. "The number of children being born has gone willy o'willy and so has the census in obstetrical beds in hospitals. This is just another threat to obstetricians—that people are going to have their babies at home now. It costs them money every time somebody has a baby at

• **Widespread use of ultrasound during pregnancy is cause for concern.**
• **In some animal studies, an increase in incidence of fetal deformities has been found after low-level exposure to ultrasound.**

home. That, I think, is the primary motivation behind the campaign against home birth."

Physicians, however, state that they oppose home birth because it endangers the lives of women and children. Dr. Edward Han, who defines home birth as "child abuse" comments: "The dangers are so great with home birth that one wonders whether a woman has the right to make that decision for the unborn baby... we do not have a right to expose our minor children to undue hazards." Dr. John Eyraud feels home birth is a "terrible mistake" and cites a January 1978 ACOG study showing a two to five times greater infant mortality rate with out-of-hospital birth than with hospital delivery. The study is based on state health department statistics.

Dr. Stewart of NAPSAC contends that the ACOG study has confused out-of-hospital birth with home birth. The two are interchangeable terms since "out-of-hospital" birth statistics include miscarriages and premature births. He notes that the ACOG findings are not consistent with any other studies on home birth. In Holland, where, until recently half the births occurred at

home, the infant mortality rate was half that of the United States, he observes. Moreover, home-birth services in the US, including those run by the Chicago Maternity Center and the Frontier Nursing Service, have had excellent maternal and infant mortality rates.

The doctors' campaign against home birth, which appears to have gone into full swing in 1978, consists of actions against parents who participate in home birth and physicians, lay midwives, nurse-midwives, and childbirth educators who assist such parents.

According to Lee and David Stewart of NAPSAC, obstetricians frequently refuse prenatal care and emergency backup to women who plan home births and angry with women for having attempted home birth, verbally abuse those who are transported to the hospital. Health-department employees sometimes harass home-birth couples when they register the birth, they note.

In July 1977, ACOG's newsletter announced a registry of "preventable maternal deaths associated with home delivery."

"It is another example of obstetricians collecting anecdotes and calling it science," Dr. Stewart commented.

Besides taking steps against couples who want out-of-hospital births, obstetricians have been pressuring birth attendants to cease their work in homes. Yale-New Haven Hospital in Connecticut has a policy of revoking the obstetric privileges of any staff physician who intentionally participates in a non-emergency home birth. Ob-Gyn News reported last January:

Other home-birth attendants, including May Blossom, a registered nurse in Otseck Hills, Missouri, have been charged with practicing medicine without a license.

A precedent for such charges was set in 1974 when police arrested lay midwives in Santa Cruz, California. Arguing that the charge against them—attendance at a normal physiologic function—did not constitute a crime, they refused to plead either guilty or not guilty. However, the State Supreme Court ruled that practicing midwifery without a license is the same as practicing medicine without one.

The battle against midwives escalated when, last July, lay midwife Marianne Doehl was indicted for second-degree murder and practicing medicine without a license following the death of a baby at whose birth she attended. A California Superior Court judge subsequently dismissed the charges against Doehl. Judging from the medical testimony he heard, "I think the child would have died if it had been born in a hospital delivered by a doctor. He ad admonished the medical profession to have enough 'maturity' to accept different birthing practices.

ILL-CONCEIVED LEGALESE

According to Suzanne Arms, author of *Irresponsible Deception*, a bill to license midwives, introduced by California As-

semblyman Gary K. Hart "addresses the basic issues of whether or not people have a right to choose the care givers that they want and whether these care givers have a right to appropriate high-quality training."

The original bill called for the development of midwives as independent health-care providers for women in normal child-birth under the regulation of a Midwifery Examining Committee. After vigorous opposition from organized medicine, the bill was signed into law in September in a watered-down form that no longer mentions midwives specifically but rather "innovative health care personnel."

Under the authority of the new law though, the California Department of Consumer Affairs, which supports the licensure of lay midwives, reportedly plans to apply to sponsor a midwifery-training pilot project.

Shan Daniels, president of the National Midwives Association, would like lay midwives licensed throughout the country. In Texas where she practices, midwives have asked that a Board of Midwives be set up composed of midwives, consumers and physicians. In most states now, she observes, the health department or the board of medical examiners would define standards for midwives.

"That means physical control," she points out. "It's like having Aes control herbs."

Consumers and home-birth advocates

are defending themselves somewhat from what they perceive as an obstetricians' campaign against them. In Illinois members of Home Opportunity for the Pregnancy Experience (HOPE) have been working with state lawmakers to introduce legislation providing for the training and licensing of midwives. And last spring, Rhode Island passed legislation providing for state licensing of midwives.

At the Arizona School of Midwifery in Tucson, British midwives are now training 175 female students and preparing them to meet new state licensing requirements. The school, launched in 1977, is completely legal.

NAPBAC announced a "Clearinghouse for Legal Incidents Against Participants in Out-of-Hospital Birth" in 1978. By cataloging such actions it would be able, if necessary, to counter "the assault against conscientious parents and professionals engaged in home birth."

Despite such efforts, Attorney Annas notes: "Right now the obstetricians and pediatricians are organized across the country to oppose home birth. There's really been no concerted consumer movement against that. Parents don't have the clout in it that physicians have. They don't make their living doing that."

By 2000, most pregnant women will probably not participate in childbearing. The physician will "give birth" with his machines and knives. Thousands of teenage

mothers refusing to enter hospitals will deliver their children at home, attended by midwives.

Obstetricians will wage battle against the midwives. They will hold fast to a tenet in the faith of Medicine. Every new technique represents progress. Doctors will continue to say that the operators they despise and the machines they invent (and sometimes hold parents on) perform so-called laudable functions like saving lives.

Doctors will remain the same, but whether they will continue to enjoy the power they now hold depends in part on how the populace regards them. That in turn, depends on the information people receive about medicine.

Will reporters who provide that information change in the next two decades and begin to demand evidence that these machines actually do what physicians say they do? Will they insist on examining reports of controlled studies that demonstrate a technique's efficacy and safety, and if no such studies exist, will they report that fact? Or will they continue to write articles uncritically glorifying technology and the miracles of modern medicine?

If so, the media will help doctors medicalize birth and shape the thinking of the populace.

And when Susan Rogaski's neighbors hear that police forcibly took her to a hospital to have her baby delivered by knife, they will think it quite right. **DD**

A TOY FOR GROWN-UPS.

Why should kids have all the fun? Why indeed! Here's something for you to play with. It's Sony's new combination turn TV-AM/FM radio-cassette tape recorder. The TV has electronic tuning. The screen is 3" (measured diagonally) and the picture it gives you is a real beauty. There's a telescoping antenna for the TV and radio. The tape recorder has a built-in condenser mic and tape counter. And if all comes to you through a big 4" speaker. It's lightweight and runs on AC/DC or batteries* So whenever you go, you can take your new toy with you. We made it especially for all you big kids out there.

"IT'S A SONY"



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or suspicious or immoral or latching nobody on God's green earth, except maybe outside the court's jurisdiction has any right whatsoever to ask them for any identification whatsoever, merely because they happen to look like Mexicans and not like this big dumb Irishman what is sitting here, since it still isn't legal in this holy glorious state of California or even in these here glorious United States to look like Mexicans, a little light background music, maestro, and the case is hereby dismissed. Pah!

The first elements of the mission force crossed the Bering Strait in mid-afternoon of August 17 in three dismounted unmarked ground-effect machines. Leaving behind the choppy gray waters that form the fifty-four-mile gap between the eastern point of the Union of Soviet Socialist Republics and Cape Prince of Wales, the western tip of the continental United States, the six men and women in each craft heaved a sigh of relief as the exhilarating whine of the turbines changed pitch and the GEMs moved slug gishly up the spume raised, straight and into the heartland of the Seward Peninsula.

Bypassing the tiny settlements of Wales and Lost River a few miles to the south, the three specially equipped long-range Arctic

GEMs were off on the seven hundred-mile haul to the capital of the North Slope oil fields, Prudhoe Bay. One would disappear forever with all hands aboard into the depths of a snow crevasse, but the other two would successfully navigate the myriad hazards of overland travel within the Arctic Circle to reach their goal.

"And that was Oweks, huh?"
 "Yep, and that was O'Hare himself in the full flower of his youth up there on the witness stand what got that son-of-a-bitch million-dollar oyster so mad he could hardly decide whether to poop or bleed. The Judge strikes the whole thing off the record," he added sadly. "my one chance for fame."

"See, here I am up on the stand and the lawyer is going at me pretty good, go-stopping here and jackbooting there and all that, and finally he says, 'So let me ask you, Officer, just what it is when you see these here innocent brown faces that makes you think, Officer, that you have the right, Officer, to make these outrageous and unconstitutional demands, that's what the Court would like to know, Officer.'"

"And he draws himself up, and looks an awt at me and his stool at the judge, who is winking this up, and gets ready for his next speech, since obviously this isn't a question warrants any answering by some dumb INS officer, and a neck to boot."

"So just as he gets his yap open again

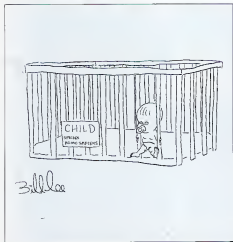
ready to start shooting another line, I holds up my hand and says, 'Just a minute here, and the Beverly Hills shyeler is so surprised since no one in thirty years has ever told him to do that, he actually does hold it a minute. And everyone in the courtroom is looking at me now, I mean really looking, even the Mexicans, like they're just seeing me for the first time."

"And I reach behind me and pull out my wallet and I start to leaf through it, all those credit cards holders and photo holders, you know and after a while I pull out these two pieces of paper and I sort of squint at them like I never seen them before, and everyone in the courtroom is craning forward so that they can see what the hell it is I'm waving around, and I says real puzzled-like."

"Well, Counselor, I says, 'I'm just a poor country boy and not much education, and I'm just a plain US citizen, nothing special or fancy-like like these gentlemen over here, and I wave a hand in the direction of the Mexicans, and right here I've got those two pieces of paper, and the first one, which is called—let me see, yes, it's written right up on top here—Selective Service System Notice of Classification. I says right here on the back: 'You are required to have this notice, in addition to your registration certificate, on your person at all times.' And here on this other piece of paper (you might have guessed, Counselor, this one says Selective Service System Registration Certificate), it says: 'The law requires you to have this certificate in your personal possession at all times for identification and to notify your local board of any change of address.'"

"Now by this time the flyster is jumpin up and jumpin down and holler and holler in' and ravin, and the Judge is poundin his gavel and I'm grazing the low-bain bastards like I can't hear any of the hooah at all and I'm saying, And it seems to me, Counselor, that if a native-born US citizen, who's got all his parents native-born US citizens, and all his grand-parents native-born US citizens, and this here US citizen is peaceful and law abiding and pays his taxes and ups in the army when they tell him to and goes off to get his ass shot off in some stinking hole like Vietnam and maybe gets shipped home in a box, and this here guy is required by law by law, Counselor, I shout to carry his ID around by law, and if he don't the federal marshals can come and take this guy and throw his ass into a federal jail. Counselor then it seems to me that the United States Immigration and Naturalization Service has a right to ask for a little ID from a bunch of guys what can't even speak English and are about two hundred yards from the Mexican border and there's a great big hole under the fence and—"

"By now the judge has broken his gavel he's banging so hard, and he's yelling: 'Bath! Bath! Bath!' and the lawyer is just sort of pop-eyed and muttering, 'Objection, objection, objection, and about half the courtroom has burst into applause, and the



other half is looking around for rocks to throw at me and and, and and I guess that was it."

"Jeez. So then what happened?"
"So then the judge chewed my ass and threatened to send me to jail for contempt but didn't and the supervisor chewed my ass, and the district director chewed my ass, and the commissioner, he flew out from Washington, and he chewed my ass, and that's why I'm forty-six years old and been in the same field grade for fifteen years now and am lying in a hospital with a belly full of buckshot instead of sitting behind some desk and calling in the reporters to tell them things like "We must stop picking on undocumented workers and start working harder to help them get settled in this country."

"So that's what happened, Padilo. Nothing much at all."

"Send them back?" exclaimed the foreman "Listen, Bailey you try to send them broads back and there'll be a mutiny."

"But they're Russians, you idiot. I cited the production manager, North Slope Division, of Octopus Oil Organization."

"But they're Russian broads, you dreed-up old doco, and they also happen to be Russian whore-type broads, and the boys have got them set up in a couple of trailers down in the living quarters and there's a three-day waiting list already."

"In the trailers?" gasped the production manager.

"Well, what else? It's twenty-nine degrees and snowing, or hadn't you noticed? Now look, Bailey let's be reasonable, shall we? Just because there hasn't been any women up here in the fifteen years you little old ladies been running things doesn't mean there'd never be no broads, does it?"

"But they could be spies," said Bailey dubiously.

"Spies! All you have to do is—er, shake hands with one of them to know they ain't no spies. Hell, man, you never saw such a bunch of broads who know more about supply and demand and cash and carry, and all the rest of the capitalist system," MacKenzie leaned forward and winked knowingly "For chissakes, Mr. Bailey they even take Visa and Master Charge. Now tell me what have we got to hide from a couple of cute little ol' coplanate like that, huh?"

"Well, what about those trailers where they're staying? We can't have any guys living there who might be susceptible to charges of—"

"Foster? How many guys do you think are breaking their contracts and screaming out of this hell-hole every week? There's at least twenty vacant trailers at any given time."

"Humph! I feel certain that the gross irregularity should be reported to the proper—"

"Authorities?" sneered MacKenzie "The government, huh? All this talk about how the government should leave the oil companies alone, and now just because an oil

company wants to hire a couple of Diversified Entertainment Engineers we've gotta ask permission from Uncle Saphard? That's the spirit that made John D. Rockefeller rich, is it?"

"Okay okay! But what about those six zenn? That's another kettle of borach. Or are there enough roughnecks of, ah, refined appetites to propose—"

"Come on, be serious, will ya? Four of those guys are roughnecks themselves, one's a cold weather engineer, and the other's a petroleum geologist. And they all speak English, a little funny sure, but still English."

"You're suggesting..."
"I tell you one thing, Boss, you won't have to pay them no union wages or union benefits. They'll work anywhere for anything just so long as it ain't Siberia where they been working."

"But you're a union—"
"So screw the union," said MacKenzie expansively. "We're gettin' a bonus based

• You never saw a bunch of broads who know more about supply and demand, cash and carry, and the rest of the capitalist system. They even take Visa and Master Charge for chissakes. •

on production, ain't we? And we're so undermanned up here I'll go the rest of my hitch without gettin' any of that bonus money. Anyone who can—"

"Yes, I take your point." Running his hands through his thinning hair, Bailey gazed through the triple-glazed window at the fumes of snowflakes whirling about outside and made his decision. "So how can it hurt things? And if you think I'll help morale and production..."

"You just watch that oil start to pump, Mr. Bailey!"

"Humph. Bailey leaned forward "Dit the record, MacKenzie. You don't think there's something just a little funny about the way these characters just happen to turn up here? A little on miles from nowhere?"

"So where else would they go—in an Eskimo village to help them oilsew whale blubber?"

"Humph." Bailey stood up "Well, night, MacKenzie, all right. As the foreman began to bundle himself up, he added, "Did you say three-day waiting list?"

"Hey Padilo, still got your arm attached I see. Next time you come by, these tubes'll

be out and I'll be outta bed. So what's new?"

"What's new? Jesus, I'll tell you what's new. You ain't gonna believe it, I mean like you just not gonna believe it."

"For chissakes, write at war? No? Well, what is it?"

"Like we already got like forty million illegal Mexicans and Latin Americans and Hispanics in this country at least, right?"

"Hey, Padilo! I work for the INS, remember?" I said. "What's new?"

"And I'm telling you, O'Hara. I'm telling you the reason we only got forty million illegal aliens or undocumented workers or unsmothered citizens whatever they are, instead of maybe one hundred million, is that the other sixty million has been made citizens by executive order some seven, eight years ago, ain't it?"

"Well, does a bear poop in the woods for chissakes?"

"And it doesn't really make much difference whether the other forty million are citizens or not, since they can live here and work here and not get locked out of here, right?"

"Right," echoed O'Hara blankly.
"And since that last Supreme Court ruling they can now also vote here, even though they're not citizens. The burden of absolute proof of non-nationality being the onus of the registering official, rather than positive proof of nationality being the responsibility of the voter." Remember that, O'Hara?"

"Why do you think I stopped voting? Why do you think we got two Mexican senators and twenty-seven Mexican congressmen from this state alone, six of which can't speak English, but that don't matter no more neither since the Congressional Record is printed up in two languages so they tell me, so's that President Martinez and Chief Justice Guzman don't have to get out their dictionaries to find out what the broads are up to over on the Hill. Yeah, I remember all right, Padilo. But like I said, ya dumb wop, what's new?"

"If you'd shut up for a minute, I'd tell ya! It's not webtacks we're chasing nor but webtacks!"

"Topacks?" echoed O'Hara blankly.
"Webtacks, dummy. Illegal Russian webtacks."

"Did you say—?" O'Hara stopped as Padilo rooked back and began to shake with laughter. Finally he wiped his eyes, leaned forward, and tapped O'Hara on the shoulder.

"What I'm looking forward to," said Padilo "is seeing just how those hundreds of millions of Hispanic-Americans is gonna deal with all these new Russian-Americans."

"But where, for chissakes? It don't make sense."

"In Alaska, of course, where else? The Bering Sea, it's just like the Rio Grande, ain't it? Only a little wider and a little colder. They're wading across on ground effect machines and snowmobiles and dog sleds and on snowshoes and skis, and they even

threw a couple of army-truck loads across now it's winter."

"But, but, but—"

"An' if they got caught they say two things. One, they're fleeing the oppression of communist tyranny, and two, in any case, they're just returning to their ancestral lands where their old grandpappies made one with the papoosees before the wicked one gave it away illegally to the imperialists."

"But—"

"And get this, O'Hara, every one of these clowns is big, braver, and just dying to go to work for the oil companies and the logging companies and the mining companies and the fishing companies, and all the broads are young and beautiful and descended from White Russian princesses and other they're trying to screw every red-blooded Alaskan male to death or they're trying to find work as housemaids for room and board and a dollar a week!"

"But that's an invasion, for chrissake!"

"Of course it's an invasion, but if nobody cares, then it ain't an invasion no more, is it?"

O'Hara shook his head numbly. "Well how many are there?"

Padlo shrugged. "Maybe a thousand maybe twenty thousand. How can you tell? You noticed many border patrols in Alaska to keep Canadian Eskimos from sneaking across the border?"

"So what are the politicians doing about it?"

Padlo grimaced broadly. "Well now Agent O'Hara, he said punctuating his reply with taps on the other's shoulder: "That kinda depends on the politician, don't it?"

"It's election time already?" asked Judge Charlie. "The Fighting Eskimo" Rubenstein. "Jeez, it seems like only yesterday we were counting up the retard vote and—"

"We're gonna have to be doing more than just counting the retard vote," said Maze. "That's a gimmick that only works once. These guys have gotten smart—they could vote for anyone."

"Oof. So what are the chances, old Maze?"

"Lousy, Charlie, just plain lousy. It's like I told ya a couple years ago. A lotta people still don't like ya."

The Judge lowered his apple chin against his powder-pigeon breast in token of profound thought, but was interrupted by a tap on the chamber door and the court recorder calling: "Two o'clock, Judge, they're waiting on you."

"Sure, sure, be right there," Judge Rubenstein climbed ponderously to his feet. "Think on it, Maze, think on it."

"Jeez, Charlie," complained Maze, "we got important stuff to talk about, you gotta go out there and fix some jawwalking racket or sompkin'?"

"Yeah, I know what you mean, Maze, but there's lots of reporters and like that out there. That Russian setback pass—"

"Iceback case?"

"Sure. The feds are asking for a court order allowing them to round up those Russkies that are working all over the place. That's what they're asking for at any rate, but I think they'd settle for just the right to ID them."

"Well, I should hope not!" exclaimed Maze. "You let them bastards round up those two Russkie mads we got working at home and the old lady'll kill ya! And so will I, though not for the same reason," he added with a leer.

"Well, gee, Maze, I know they're awfully useful and all that, but there's an awful lot of them around now, you know like maybe a hundred, two hundred thousand and—"

"Two hundred thousand?" asked Maze in wonderment.

"—and they say there's an awful lot of these big Russkies carrying guns, you know not like hunting at—"

"Charlie boy," said Maze, eyes peering captivately into the future, "isn't one of the

Why do you think we got 27 Mexican congressmen from this state alone, six of whom can't speak English? It's so President Martinez don't have to get out his dictionary.

dublet of judges naturalizing immigrants? Yes? Tell me, Judge Rubenstein, how would you like to become a United States senator in one easy election?"

"Look, Commissioner, I don't care whether you think I been drinking or not. I'm telling ya there's fifty thousand Russkies staging a sit-in on—yeah, you guessed it, Commissioner, Russian Hill. So what are you gonna do?"

"Well, where do ya think they're gonna sit, except in the street? Sure the traffic's jammed up, from the Civic Center to the Golden Gate."

"Now, they're peaceful all right, singin' and chantin' and wavin' banners. Hold on, lemme look. Yeah they're all about how California and San Francisco setsa bet to the Russkies, and Fair Play for Russo-Americans, and Give Us Back Russian Hill. Hold it a minute, oh it's himself the Mayor I'm talking to now is it? Hold it, Mr Mayor, they're chanting something. Yeah, listen, I'll repeat it:

"Hey, hey, vote our way
Vote a bill for our Hill!
Just beware, Mr Mayor,

Be unfair no more major
If we vote, we'll change your coat."

Hey, hey

"You hear that, sir?"

"Er, yes, Inspector. Before I or call the National Guard, how many did you say were at demonstrating?"

"Oh, I'd say a good fifty thousand spread over a six-block area."

"And they all seem of, or voting age?"

"Oh, yes, sir, all of voting age."

"I see, I see. Tell me, Inspector Houlahan, do you think that Russkies can eat, vote Houlahan?"

"Gee, sir," said Houlahan in what he hoped was a soothing tone, "I think these are maybe Alaskan-type naturalized Russkies, but I guess you'd have to ask the city attorney about that."

"Has anyone noticed," inquired the chief operation officer of the walnut-paneled boardroom of Octopus Oil Organization, "that our entire Prudhoe Bay operation, indeed, the entire North Slope fields and Alaskan pipeline, are now for all practical purposes, being manned and maintained by some twenty thousand Russian workers?"

"Huh?" said the chairman of the board, a retired general straight from the Joint Chiefs of Staff, awaking with a start.

"Well, sure," frowned the president of Thole O, wondering how soon he could decently ask the steward to fetch a martini.

"You don't think it might be possible to view such a situation as a knifblade held at the jugular vein of Thole O, the rest of the oil industry, and by extension the United States of America?"

The chairman gaped blankly while the president reviewed the ancient olive-branch controversy.

"Well, leaving all these emotional-type issues to one side," interjected the vice-president for public relations, "what's the bottom line?"

"Production is up 25 percent," replied the VP for accounting (internal confidence) intantly.

"Profit?"

"Up 32 percent on gross, 47 percent on net."

"There's your bottom line, gentlemen," said Public Relations with finality.

"Does that mean a bigger dividend?" inquired the chairman with that charming reticence which had caused his election to the boards of forty-seven major industrial concerns.

"Yes, sir, a much larger dividend."

"Well, that's good, an' it?" beamed the general, and surely what's good for Thole O is good for the country isn't it?"

"So, know Charlie," mused Maze, "I been thinkin' 'Thinkin'' about you bein' president, Charlie."

"President?" gasped the junior senator from Alaska, Charlie "The Fighting Eskimo" Rubenstein.

"So why not?" asked Maze reasonably.

Look, we already got some fifty-sixty million so-called undocumented probationary citizens most of em' Movin' votin' in the federal elections, right?

Right, Mike.

And you got yourself a natural constituency of maybe a million Russian-Americans back home, and maybe another five million in California and the Northwest, right? They oughta vote for ya, you're the fighting judge what showed em' the way to citizenship, aren't ya?

Sure, Mike.

So the next step, and it's only logical, Charlie, is to get the vote extended to all them other undocumented probationary Russian-American citizens what ain't yet got the opportunity to visit this glorious country of theirs, and what has to vote by absentee ballot back there in the old Motherland? Like maybe three hundred million of them!

But Mike—

All they'd have to do is mail in an absentee ballot like millions of other overseas Americans, right? So all you gotta do, Charlie, is introduce a bill that

is working perfectly, chortled the director of state security. I told you my plan would work!

"My plan, Vladimir Vasilyevich," growled the minister.

"Please, comrades!" interceded the minister of agriculture. "What, if you please, is the next step? I am so looking forward to voting in the next presidential elections."

"Ah, ha!" crowed Vladimir Vasilyevich Gostrovsky. "Already the order has gone out already the Internal and contingent stands ready, all two million of them, already the doom of the capitalist-imperialist warmongers is pending, already—"

"So all right already," muttered the minister of hydroelectric power, who had attended an extremely amusing seminar in Brooklyn the year before, but not so lucidly that the director might overhear him.

"Comrades! The moment! we have been waiting for, has arrived! The orders have come from Moscow! The workers' general of-feld strike will begin tomorrow at dawn, the pipeline will be seized at noon, the housemaids and clerical workers shall revolt in the afternoon, and by evening Alaska will be ours! Five million fellow citizens on the West Coast will rise in sympathy and mobilize hell the country. Attacked by the running-dog gestapo lackeys of fascist capitalism, they shall appeal for fraternal aid to their brothers-in-arms across the waters, and within hours millions of peacekeeping personnel of the glorious and Internal Red Army shall—" He went on for some time.

"Jeez," whispered Mikhail Nikolayevich to his wife Natasha Petrovna, "who'da think they'd do to the interest rate on the mortgage?"

And that new washing machine I—

"My new snowmobile," interrupted Peter

Bergeyevich glumly.

In just three days the World Series' cried Daniel Danilovich.

"My bonus trip to Hawaii!" roared Katrina Vyrvarans.

Just when we'd found a school for the kids with none of those disgraceful Eskimos clutterin' it up! complained Alexsey Ivanovich.

I think we had better think this over, whispered Mikhail Nikolayevich.

"Very carefully," grated his wife between clenched teeth. "Oh shut up, you blithering fathead!" she yelled at the speaker, KGB Colonel Yevgeny Fedorovich Zhukovsky, who instantly fell silent from sheer astonishment.

"Oh dear, oh dear, oh dear!" bleated President Martinez peevishly.

Capitalist tool, rejoined Defense Secretary Haggelman.

Pip, hissed Mr. Helogabolus.

Knock it off, ya fuckin' broads! ad-

• The Bering Sea is just like the Rio Grande, only a little wider and a little colder. They're wading 'cross it on ground-effect machines and snowmobiles, skis and trucks. •

monished Mr. Kowalski. "What's da problem now, Señor Jelly-Belly?"

The problem is all these wretched Russians ready to revolt all over the Northwest and West Coast. And once they've paralyzed the country they'll supply rifle in the Red Army, and we will all be put up against a wall! President Martinez broke into sobs.

"Speak for yourself, Jelly-Belly," snarled Mr. Kowalski. "No Russian'll attack me, Kowalski, a little boy up against no wall. Go back ting ya do, jabbing a fuckin' finger deep into the quivering breast of Defense Secretary Haggelman. Is to send in da army against dese strikers or revolution or whatever dey are, and den—"

"What army?" wailed President Martinez.

"Oh yeah, dat's right, I forgot," Mr. Kowalski nodded somberly. "What army?"

—The issue is clear, read Chief Justice Esteban Guerrero. "With one dissenting vote," he paused to glance briefly and unjudiciously at Mr. Justice Rubenstein, recently appointed by President Martinez to preempt those strongly rumored presiden-

tial aspirations of The Fighting Eskimo from The Great Northwest, "with one dissenting vote, I say the court holds that all so-called naturalizations of all so-called Russo-American so-called citizens performed at any time in the past three years have been and are now and will continue to be clearly illegal, unwarranted, unjust, discriminatory, lacking in due process, and flagrantly unconstitutional. All so-called naturalizations, therefore, are by order of this court declared null and void, and any so-called Russo-American so-called citizens will revert to their previous status of legality and being, i.e., that of being illegal aliens, illegally in this country. There are numerous precedents for this judgment, among them

—Comrades! Just came over the radio! We've been deprived of our citizenship!

My house!

My washing machine!

My bonus trip to Hawaii!

My bet on the Red Sox!

My snowmobile!

My insurance policy!

Oh, Andrei Petrovich, what are we to do? sobbed Anna Petrovna.

At dawn tomorrow we will march fraternally—, declared Colonel Zhukovsky.

There is only one thing to do, replied Petrovich somberly. Correction, two first, we shut up that madman Nest!

Mr. President! Mr. President! cried an aide as he burst into the emergency session of the National Security Council. "Oh please stop crying, sir! Please?"

"What now?" growled that unhappy man. "Texas has seceded from Mexico?"

"No, sir. The flash just came in from the Pentagon—"

Oh no.

"All over the West Coast, sir! Millions and millions of Russians, sir—"

The invasion, it's all over.

"No, sir! I haven't started yet, and maybe it never will, it's our Russians. They're all joining the army!"

"They're what? I seem to have misunderstood you."

"The army, sir! They're flooding every Army Navy Air Force, and Marine recruiting station west of the Rockies. The best estimate is three million men and women already sworn in, and another three million waiting their turn."

President Martinez looked peevishly at the director of the CIA. "But why? They're supposed to be invading the country, not defending it, they don't need to—"

"But, sir, don't you remember? If you're a foreign-type alien and you join the armed forces at the end of your enlistment you become a United States citizen!"

"You do?" How strange! mused President Martinez. "But why would anyone want to become a US citizen?" he inquired of the room at large.

Boats, too, sir, replied the aide. "But I think I heard someone mention something about a bonus trip to Hawaii." □

engineers, for instance, have a fully awe-inspiring one. They want to borrow the Niger River and pump it across the Sahara under the Mediterranean, over the Alps, and into Germany. As it flowed into the desert in a five-meter black pipe, it would heat up to about 150°C (300°F). Then it would go through a 260-square-kilometer battery of Fresnel lenses to raise the temperature to about 350°C (660°F). The scientists then want to pass the river through a nuclear reactor in some Swiss valley where its temperature would be boosted to 650°C (1,200°F). This process would provide enough energy to generate all of Germany's electricity, run all of its cars (out of tanks of high-pressure steam), heat all of its houses, and irrigate its farms with the warm water left over, which would allow four crops a year to be grown. It would cost a bundle, but it would be really nice for the Germans. They wouldn't need oil at all, except for a squirt now and then to lubricate their machines. What the Nigerians would think of it is something else. They do not appear to have been consulted.

But it does not seem likely that the Nigerians are going to give up a hundred cubic yards a second out of their best river for the benefit of Germany. But maybe something could be worked out, say with Algeria. You could leave the nuclear plant out of it and forget about the pipes under the Mediterranean and pumping it over the Alps. If you contented yourself with the 350 degree Celsius steam derived from the sun alone, you could turn large parts of the Sahara into areas of heavy industry and farmland. Much of the soil is not infertile, just parched.

Even if all the things we have been talking about came to pass, we would not even then be making the best use of renewable resources. We have been talking mostly about generating electricity for the utility companies to sell us. But only about 7 percent of annual energy consumption needs to be of that sort. By far the greatest part of the energy we use goes into other places, either to run our cars or to heat our homes.

Solar energy does not have to be turned into electricity to work for us. It does not even have to be concentrated, either with mirrors or with Fresnel lenses. We can use it just as it comes.

You see, there are two kinds of heat. There is high-temperature heat, and there is low-temperature heat. High-temperature heat is a scarce commodity on the surface of the earth. Hardly any of it exists naturally. We have to make it by burning something, or by concentrating low-temperature sources.

Low-temperature heat, on the other hand, is often something we want to get rid of. There's too much of it in the engine of your car, so you have a radiator system to throw it away. There's too much of it in the

effluent from power plants, so immense cooling towers are built, or rivers are diverted to pass through cooling chambers where fish get killed.

What is really strange to any energy economist from some other planet is that we generate so much high-temperature heat in order to produce low-temperature heat. The flame in your oil burner is high-temperature heat. You don't want that much heat, because it would cremate you, so you dilute it with steam or hot air to give you the 20°C (75°F) you want in your living room. You run an electric heater for the same purpose, using the high-temperature heat in the power plant to keep you mildly warm. It is like grinding up diamonds to make sand.

Sunlight is a first-class source of low-temperature heat. You can feel it when you stand in front of a sunlit window even on the coldest days. You can build storage facilities to trap it until you want it—most "solar" homes are built like that, with tanks of water, salt, or gravel over which you

☛ *If we go on increasing our energy consumption at the same rate for the next 3,200 years, the temperature of the earth will equal the sun's. Humans will be glowing wisps of plasma.* ☛

blow hot outside air in summer and out of which you draw warm air in winter. Or you can just keep what you've got of it by insulating your house.

You may before long, be able to buy photovoltaic panels, which will convert sunlight into electricity to stick on your roof. They work best at normal sunlight temperatures. Arizona summer days are too hot for them. So they need to be cooled, usually by running water behind them. If you have the water, you can even produce fringe benefits like water for heating or air conditioning, as they do at Sandia Laboratories. But even so, the price is high. Even salesmen for photovoltaic installations don't talk of electricity costs lower than a dollar a kilowatt-hour.

Biomass. Perhaps even better for small-scale applications, perhaps even on a single-household scale, is biomass. It is renewable fuel of biologic origin. You already use it every time you put a chunk of wood in a fireplace. It already provides the bulk of the energy consumed by most of the people in Asia, Africa, and much of Latin America, but it can do a lot better than that.

It does not have to be used on a small-

scale basis. You can devote land to growing grasses or grains—or to growing trees, possibly to better advantage, since silviculture can be practiced on land not fit to grow crops. You can even use most of the wood for lumber, burning only such wastes as limbs, chips, and sawdust. Capital cost? Counting everything—land, generator, and all, probably no more than the \$1,000-per-kilowatt of a new turbine.

An Emory University scientist named Fong has a more detailed plan. Find some played-out farmland and pump the sewage from Eastern cities onto it as fertilizer. Plant wheat in family-sized farms, no more than a couple hundred hectares each. Invite urban-poor families to buy them at low mortgage rates, paid out of earnings. Many families are dispossessed from shut-down farms and have the necessary skills. All of them can learn. Fertilize the grain and distill it into alcohol. Burn the alcohol to generate power or put it in the tanks of American cars—a mixture of gasoline and alcohol will work just fine even in unmodified cars and will, in fact, produce fewer pollutants. This is multiproblem solving in excellence, says Fong. It would reclaim bad land, get rid of sewage, provide employment, decrease pollution, help the balance of payment versus OPEC, cut urban welfare costs, and very likely help reduce racial tensions, delinquency, and urban crime.

There is one long-term problem involved with energy plantations (sometimes called "the BTU bush"). If the land is any good for growing anything, it is probably going to be needed for growing food. But there is a lot of other biomass available that at present serves no use at all.

If you happen to be a pig farmer, you don't know what to do with all your excess biomass—unless you happen to be two Englishmen named Murocitt and Chesshire. Their pigs were fed on surplus whey from a nearby dairy and what came out as a result was a horrible yellowish fluid. The neighbors did not like it at all. Murocitt and Chesshire built themselves a 5,000-liter methane digester and pumped the pig excrement into it. Stir it, keep it warm, and turn out four liters of casual fuel per month per pig, plus "farty pleasant"-smelling solid residue that makes good fertilizer. The price of the fuel pays for the cost of the installation in less than two years.

All right, you say, but you don't happen to keep pigs. Well, the methane doesn't care what sort of excrement it comes from. Every one of us produces half a ton of excrement and urine each year. We use fifty tons of water to flush it away. A dish on our water resources—which is, in the long run, a dish on our energy resources too, because it takes energy to pump the water in from ever more remote sources. Few proposals are more likely to cause shock and revulsion in the average American than suggesting that he get along without his flush toilet. But it need not offend the dairy. There is a European-designed potty called the *chute multum* (it works better when

men use it than women, for unwidely (well-reasoned) which use no water at all, other schemes permit retaining the flush toilet but require sewage lines and settling tanks.

If you have followed the preceding arguments closely you may be coming up with an objection about now. "But," you say, "you've just been telling us that we can't afford to burn fuel, because it will mess up the carbon-dioxide balance!" Not to worry. Burning fossil fuel adds to atmospheric CO₂. Burning biomass does not, at least not in any significant way. All that biomass will turn itself into carbon dioxide before long anyway. If a forest is allowed to die unharvested, the carbon in the trees does not miraculously disappear. The trees rot and oxidize, and the CO₂ escapes.

If all this is so good and so necessary, why isn't it happening?

Well, it is happening—slowly and spasmodically. But it surely isn't happening fast enough to put me or even, I think, to spare the human race some pretty severe shocks. I participated in an energy symposium at Michigan State University a couple of years ago at which one of the scientists involved outlined two possible scenarios for the next decade or two. In one, the dollar cost of energy was allowed to rise at the rate of 10 percent or so each year; that, he said, would produce severe economic dislocation but would be survivable. In the scenario he said, energy costs would be kept artificially low as long as possible and then suddenly jump to a figure perhaps ten times current costs. That, he said, would produce chaos and the destruction of basic societal institutions. I agree with his estimate. I have no doubt that the world is going to make the switch to renewable-resource energy and to realize that continued growth must ultimately be impossible—sooner or later. But I would like to see it happen sooner rather than later, because the longer it is delayed, the worse it is going to be.

If you want to take some personal action to deal with the energy problem, it is really quite easy. You start by turning off a few lights. Put up storm windows. Next time you buy a refrigerator, pay a little more for better insulation and use less energy during its service life. Next time you buy a car, buy one with good mileage and no more occasions than you really need. Drive it when the fifty-five-mp/h limit. (Above forty miles an hour more and more of the energy you burn goes into overcoming air resistance and air resistance increases as the cube of speed.) Better still, keep your present car in good repair. It takes energy to build a new one: some 30,000 kilowatt-hours apiece, or about as much as you might burn to drive it for a year.

If all that sounds pretty tacky to you—as it does to most energy-addicted moderns—then let your conscience be your guide. If you feel you must have a sure thing instead of a backpack or a snowmobile instead of skis ... well, it's your

habit. No one can kick it for you. But even in the matter of conservation, not all of the technology is tacky. Some of it sounds like a lot of fun.

Buckminster Fuller points out that if you wanted to design a perfect radiator something that would provide an absolute maximum of heat loss in both directions, you would come up with something that looked a lot like a skyline of any modern Western city: lots of skinny spikes stretching to the sky. What to do about it? Why says Fuller, cover them over with a plastic geodesic dome. Then you turn off all the furnaces and throw away the air-conditioners; inside the dome, it will stay at a comfortable temperature all year round. It will warm you in winter because you can design the dome to admit as much heat as you want.

And life under such a dome, in Chicago or Ottawa or Leeds, could be rather pleasant. Clean air (cats and trucks would have to be electric or hydrogen-fueled). A hot-house environment: tee-shirt-and-shorts weather all year around. Personal fowers. No pecking your way through puddles.

There are serious problems that would have to be solved before such domes could be built, but they are not primarily technological. Like all the other problems in redesigning our energy strategies, they can be solved.

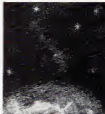
An American baby born this year will consume the equivalent of 2,000 tons of coal before he dies. That is a grotesquely large number, but it might be supportable at least in the short term, provided a significant fraction of it comes from renewable resources, and especially provided we can somehow persuade the undeveloped major fraction of the world that they should tolerate our use of that amount of energy but themselves be content with a tenth or a fortieth so much.

What would not be supportable under any conditions would be for the energy option to continue to accelerate, as your national leaders and policymakers tell you it must (for somebody's profit).

There is simply no question that the increase in the use of generated energy must level off at some point. (Even switching to 100-percent-renewable resources does not exempt us from that constraint. It only postpones the problem for a long time and imposes a different kind of constraint.)

The only real question is when. In A.D. 5172, when the world is a mass of high-temperature plasma? In A.D. 2150, when the heat released by human activities in the United States equals the heat poured in by the sun? Obviously it will have to taper out long before then, because before either of those dates we will all be dead.

It seems to me that a good time to stop is now. And it also seems to me that any public figure who tells us we can solve the energy problem by finding or building new sources of conventional types is practicing a dismal and destructive fraud. He isn't solving the problem. He is the problem. ☐



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THE WORLD'S HARDEST IQ TEST

By Scott Morris

Perhaps the ultimate combination of challenge and threat is an IQ test. Taking one forces you into a self-confrontation on the most personal, ego-involved level—an anxiety-arousing experience for anyone. If you've ever gotten nervous taking an intelligence test, here's one that will make you break out into a cold sweat just from looking at the questions. It is the most difficult IQ test ever designed to measure the intellectual stratosphere—I Q's between 125 and 180.

It is, as far as we know, the only IQ test that is unsupervised and untimed. You are bound on your honor to take it alone and without help, but you may spend as long as you want on it—an hour, a day, or a month. What matters is not the time it takes you to ferret out the correct answers, nor any special knowledge or expertise you may have, but your power of attention and your ability to follow a problem through to its logical solution. These problems can be viewed from a number of different angles. To solve them, you must be able to take all parts at once, wrap your mind around the whole thing, and move through the chain of reasoning without getting lost.

Any test discriminates most accurately in the middle of its range. On ordinary IQ tests, such as the Wechsler or Stanford-Binet scales, the average scores cluster around 100 and the tests best measure IQ's near that number; they become increasingly unreliable on IQ's that are extremely high or low. The reason is that ordinary intelligence tests are designed for use with ordinary people, and there are a lot of them with IQ's near the mean, the 100 mark. There are relatively few people with extremely high IQ's, so ordinary tests don't include many questions to discriminate fine differences among them.

This test is different. Out of about 3,000 persons who have ordered copies of it, approximately 500 have bothered—or dared—to complete it and send in their answer sheets. The average of these, with about 58 percent correct answers, had IQ scores just short of 150. Pure guesswork would net you about 20 percent correct answers and an IQ "score" somewhere in the submarine marsh of "below 125." This test is most effective in measuring IQ's between 130 and 170.

The test was devised two years ago by Kevin Langdon, a San Francisco systems and procedures analyst and a member of Mensa, the international high-IQ club. Mensa's only criterion for membership is an IQ test score in the upper 2 percent of the population: that is, at or above the ninety-eighth percentile (corresponding to an IQ of 133 on the Stanford-Binet or a score of 1300 on the Scholastic Aptitude Test or 1250 on the Graduate Record Examination).

Langdon wanted a way to discriminate among the few Mensans to define a subgroup of persons at the very highest intelligence levels. Langdon's group is called the

Four Sigma Society and has about thirty-five members. You can qualify for membership by getting 85 percent or more of the test items correct, a level comparable to a Stanford-Binet IQ of 164 or better, which puts you above the 99.997th percentile. Approximately one person in 30 thousand meets this standard. The name refers to the statistical term for standard deviation. Four Sigma members exhibit a tested intelligence level four or more standard-deviation units above the general population mean.

Langdon confesses that one of the reasons he devised the test and founded the Four Sigma Society was to meet women he wouldn't have to talk down to. Out of those who have qualified for Four Sigma membership so far, only one in seven is female. "I think it has been rather conclusively shown," he says by way of explanation, "that the distribution of intelligence for men and women is not the same. The IQ's of women tend to be clustered in the middle. There are both more geniuses and more idiots among men."

On the following pages, *Oms* presents the Langdon Adult Intelligence Test in its entirety. Instructions to some items may seem opaque or ambiguous, but a close look at the questions and answers will show that only one interpretation is correct. Part of what the test measures is the ability to understand the questions clearly in their stated form. Simplifying the wording of an item or giving clarified examples would change one's chances of correctly answering it. This would invalidate the test score, making it not comparable to previous norms. Against some editorial impulses, then, we present the test with its original wording intact.








If you decide to take the test, fill in the answer sheet on page 120 to the best of your ability. You needn't do it all in one sitting, though you will probably make a better score if you complete the test in one or a few concentrated periods. Your IQ and percentile scores will be computed on the basis of your raw score. Your raw score will be proportional to the number of items you answer correctly minus one-fourth of the number of items answered incorrectly. No credit will be given for unanswered items. Items marked with more than one answer will be counted wrong. Mark the answer sheet the way you want it scored and send it (or a Xerox copy), along with any comments you wish to call to the test maker's attention, and a \$2.50 scoring fee, to Four Sigma Society, P.O. Box 795, Berkeley, Calif. 94701. (Make checks payable to Four Sigma Society.) You will receive a computer-generated score-report form telling you your measured IQ (as well as subscore IQ's for verbal spatial and inductive reasoning), along with the percentiles these scores correspond to in the general adult population. You will also receive an e-mail notice by e-mail or by mail.









If you decide not to take the test just now, we understand. It will always be here, in your *Oms*, waiting.









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







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





INSTRUCTIONS Each item in this section consists of three figures on one line, followed by five lettered figures on the line below. Choose the letter of the figure that is related to the third figure on the first line in the same way that the second figure is related to the first.









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







2.   
 A  B  C  D  E 

3.   
 A  B  C  D  E 

4.   
 A  B  C  D  E 

5.   
 A  B  C  D  E 

6.   
 A  B  C  D  E 

7.   
 A  B  C  D  E 



PART II

NUMBER SERIES

INSTRUCTIONS Each item in this section consists of a sequence of numbers on one line, followed by five lettered alternatives on the next line. Choose the letter of the number on the second line that continues the progression of the first line.

9. 5 8 17 24 27
 A 46 B 45 C 53 D 62 E 65
10. 1 3 4 5 15 27 50
 A 65 B 90 C 92 D 94 E 96
11. 7 10 5 9 3 8 2
 A 5 B 6 C 8 D 9 E 10
12. 5 7 3 1 4 5 9 9
 A 1 B 2 C 4 D 5 E 7
13. 6 10 7 17 5 16 3
 A 17 B 18 C 20 D 21 E 22
14. 11 13 17 25 32 37 47 56 71
 A 70 B 63 C 66 D 92 E 97
15. 2 3 6 7 17 20
 A 41 B 42 C 44 D 46 E 47
16. 5 6 4 8 5 12 4 16
 A 0 B 4 C 5 D 8 E 12

PART III

VOCABULARY

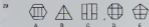
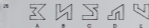
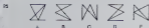
INSTRUCTIONS Each item in this section consists of two words on one line, followed by five lettered words on the line below. Choose the letter of the word on the second line that is not a synonym for either of the words on the first line.

17. set pass
 A. rejoice B. event C. adjust D. happen E. pronounce
18. tender part
 A. baneful B. carry C. merit D. scale E. left
19. state rival
 A. object B. interpret C. ceremonial D. opinion E. express
20. mean register
 A. gorge B. island C. condition D. poor E. sign
21. chuckle stark
 A. water B. restrain C. both D. skirt E. shroudy
22. bear subject
 A. cast B. prove C. head D. expose E. stand
23. state confederate
 A. European B. swamp C. refuse D. logic E. south
24. patch cheap
 A. responsibility B. power C. angle D. form E. frequency

PART IV

EXTRAVAGANT FIGURES

INSTRUCTIONS: For each numbered set of figures, choose the letter of the figure that does not belong with the other four.



PART V

SPATIAL ORIENTATION



If a worm gnaws a hole through the eight-cube solid shown above, starting from the front face and going straight through to the back face, without crossing any boundary where more than two cubes meet, which cube or cubes of those marked 2, 3, and 4 can it emerge from?

- A. only 2 B. 2 or 3 C. 2 or 4 D. 3 or 4 E. 2, 3, or 4

34



If three gaffers of paint are required to paint all external surfaces of the figure shown, how many gaffers will be required to paint all external surfaces of the figure shown? (Three cubes in the lower right-hand corner are not visible.)

- A. 18 B. 20 C. 21 D. 22 E. 23

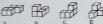
35 What is the maximum number of cubes that can be piled on the sides of a two-by-two square board, with the side of each square equal to that of each cube and with no square piled more than three cubes high, such that all cubes are visible?

- A. 62 B. 63 C. 66 D. 68 E. 69

36



The large solid figure at the left above is taken apart into three pieces. Two of the pieces are shown at the right above. Which of the following is the third piece?



E. none of the above

37



How high is tower one be built using seven blocks with the dimensions shown above without tilting any block more than ninety degrees from the orientation shown?

- A. under 6' B. 6'-7' C. 7'-8' D. 7'-8' E. over 8'

38



Assuming that the two holes go all the way through the cube and the third only halfway through, what is the total number of faces of the body shown above?

- A. 22 B. 23 C. 24 D. 25 E. 26

39



What is the maximum total number of faces of the pieces produced by one plane cut through the figure shown?

- A. 16 B. 19 C. 20 D. 21 E. 22

40



Which of the following could be added to make the six-cube solid shown above? (Ignore the dimensions in each.)

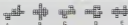
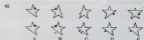


FIGURE SERIES
PART VI

INSTRUCTIONS: Each row in this section consists of a sequence of figures on one line, followed by five followed figures on the line below. Choose the letter of the figure on the second line that continues the progression of the first line.



PART VII
PROBLEM SOLVING



Which of the following is P??

E: none of the above

50: How many different ways are there to connect six points arranged in a regular hexagon with a continuous path consisting of five straight lines meeting only at those points?

- A: 42 B: 45 C: 64 D: 60 E: 72

51: One third of the members of a parliamentary body are elected every two years. The body has six committees. Each member of the body is a member of at least one committee, and no member is a member of more than two committees. No committee has more than eleven members. Each pair of committees has exactly two members in common. The chairman is a member of the Rules Committee and of no other committee. Each member of the Budget Committee is also a member of another committee. The last digit of the number of members of the parliamentary body is

- A: 2 B: 3 C: 4 D: 6

E: it cannot be determined from the information given

52: To begin playing a certain card game, an ordinary deck of playing cards is dealt out completely to four players. Each player looks at his cards and passes one card to the player on his left. A player does not look at the card passed to him until he has passed a card. If a player has more than one card, he must pass a king, if he has only one card, he may not pass it. How many hands of passing are necessary to ensure that each player has one king?

- A: 3 B: 4 C: 5 D: 4 E: 7



The missing option:

- A: belongs in the third row.
B: is asymmetrical.
C: contains the other elements in one of the patterns above, but in a different order.
D: does not contain a straight line.
E: satisfies none of the above conditions.

51. A certain country's inhabitants consume eight integral denominations from 1 penny to 300 pence. The ratios between the denominations are 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, or 30. To purchase a 100-penny loaf, a tourist gives the retailer any coins and receives one coin in change.

Which of the following is true?

- A. There are both 5-penny and 30-penny coins.
 B. There is a 5-penny coin but no 30-penny coin.
 C. There is a 30-penny coin but no 5-penny coin.
 D. There is neither a 5-penny nor a 30-penny coin.
 E. None of the information above can be positively established from the information given.

52. A man plays a game of Russian roulette in the following way. He puts two bullets in a six-chamber cylinder and pulls the trigger once. The cylinder is spun before the first shot, but it may or may not be spun after pulling in the last bullet and after loading the first shot.

Which of the following situations produces the lowest probability of being shot?

- A. Spinning the cylinder after loading the last bullet, and spinning again after the first shot.
 B. Spinning the cylinder after loading the last bullet only.

- C. Spinning the cylinder after firing the last shot only.
 D. Not spinning the cylinder either after loading the first bullet or after the last shot.
 E. The probability is the same for all cases.

53. You're given

- a 20-gallon container full of water
- an empty 1-gallon container
- a 10-pound weight
- a 20-pound weight
- a 40-pound weight
- a 60-pound weight, and
- a 2-gallon bottle

Each container weighs five pounds. A pint of water weighs one pound. One of the weights is slightly inaccurate—either lighter or heavier than the weight indicated above. Which weights are inaccurate and in what direction?

- A. can be determined in three weighings.
 B. can be determined in four weighings.
 C. can be determined as to which weight is in three weighings, but which direction it is off cannot necessarily be determined.
 D. can be determined as to which weight is in three weighings, but which direction it is off cannot necessarily be determined.
 E. cannot be determined from the given conditions. **DD**

ANSWER SHEET

1	A	B	C	D	E	29	A	B	C	D	E
2	A	B	C	D	E	30	A	B	C	D	E
3	A	B	C	D	E	31	A	B	C	D	E
4	A	B	C	D	E	32	A	B	C	D	E
5	A	B	C	D	E	33	A	B	C	D	E
6	A	B	C	D	E	34	A	B	C	D	E
7	A	B	C	D	E	35	A	B	C	D	E
8	A	B	C	D	E	36	A	B	C	D	E
9	A	B	C	D	E	37	A	B	C	D	E
10	A	B	C	D	E	38	A	B	C	D	E
11	A	B	C	D	E	39	A	B	C	D	E
12	A	B	C	D	E	40	A	B	C	D	E
13	A	B	C	D	E	41	A	B	C	D	E
14	A	B	C	D	E	42	A	B	C	D	E
15	A	B	C	D	E	43	A	B	C	D	E
16	A	B	C	D	E	44	A	B	C	D	E
17	A	B	C	D	E	45	A	B	C	D	E
18	A	B	C	D	E	46	A	B	C	D	E
19	A	B	C	D	E	47	A	B	C	D	E
20	A	B	C	D	E	48	A	B	C	D	E
21	A	B	C	D	E	49	A	B	C	D	E
22	A	B	C	D	E	50	A	B	C	D	E
23	A	B	C	D	E	51	A	B	C	D	E
24	A	B	C	D	E	52	A	B	C	D	E
25	A	B	C	D	E	53	A	B	C	D	E
26	A	B	C	D	E	54	A	B	C	D	E
27	A	B	C	D	E	55	A	B	C	D	E
28	A	B	C	D	E	56	A	B	C	D	E

NAME _____

ADDRESS _____

AGE _____

SEX _____

DATE _____

CITIZEN PREVIOUS AS SCORES: 11/19/95

TEST _____

SCORE _____

DATE _____

TEST _____

SCORE _____

DATE _____

OIL IS NOT GOLD

CONTRIBUTOR: RICHARD BIR

ship visits to arrive on board at a mealtime.

Ealing was typical of the lot, perhaps a little more stupid. He lunged into the office with a show of self-confidence and gave me a clammy handshake. "Good to have the Old Man aboard! Your young skipper ain't dry behind the ears."

"Yeah—but Taccon could've gone ahead and cleaned the tanks, anyhow."

"We should clean tanks for the Company? You're a real gas, Captain." He helped himself to Cummings's "re-orientation" booze and joined me at the table. "Why all the hoo-hah about a washing? Tankers go from dirty to clean, every day in the week."

"When they're in a condition that can be cleaned up enough to pass inspection, sure. It's how the Holman will be treated that concerns the Company."

"Not anymore. As the charterer, Taccon determines how the ship will be used."

"Yeah. I scannied the line print confidently, knowing Mickleberry had put it together. "So long as the ship is used for the specific purpose of carrying dirty cargoes."

"Our lawyers can talk to your lawyers."

"Nuts. All we have to do is call the tank inspectors and blow the whistle."

He gave me a lousy grin. "You'll never make a million, Captain, if you take that attitude."

"Life is more than dollars and cents." I folded the line-print pages. "Mr. Ealing, before I fly back to New York, I'd like to see Dr. Von Reinestad's invention."

"Sure. Let me check with the Taccon dispatcher. There's always a tanker heading peef the rig, on her way out from the New Orleans Terminal."

"How about a helicopter?"

He hesitated, and the corners of his mouth blanched. He did not like helicopters. But he said, "Okay. At the Taccon pier tomorrow morning. Is the old grek coming along?"

"You view Dr. Von Reinestad as an old grek?"

"He's as dumb as they come. He invents a do-it-yourself oil-extractor that would knock the bottom out of oil prices, and he sells it to Taccon!" Ealing laughed heartily. "And he sells it to Taccon!"

The next morning Von Reinestad and I met Ealing at the Taccon pier. The physical plant was neat and pollution free, just like in the ads. It might have been a cover of the old Saturday Evening Post.

A twelve-man chopper flew us out with several maintenance stewards. From the air the shale rig looked like the deck of a flat-top, except it seemed to rest upon the wave surface and had a large dark square in the center.

We sat down on the forward deck and walked aft to the square. A crewman

pressed a switch, and track-lensed lights glowed from the darkness. I was looking into an enormous, glassy-sided well that went down about six fathoms to assorted hardware on the sea bottom.

Below deck on the rig were two galleries leading to what I assumed were control rooms and living quarters.

"Everything is submarine and self-contained," explained Dr. Von Reinestad. "A hurricane simply washes over the rig as if it were a rock."

"Yeah, but if your force-field walls collapse, you'll be flooded out!" I objected.

"No, Captain," he smiled. "The sections are like space capsules. But for backup security, a watertight hatch cover closes between the chamber and the sections."

"I hope you got the guys out of the chamber before you slam the hatch cover shut!"

"It closes automatically. This is a robot operation. Only rarely is a human being in the chamber—myself—or a visiting fireman," he smiled. "Shall we descend to the bottom?"

"Not me!" said Ealing. "I don't trust these floating can-go-wrong robot operations! A few blows—and you've had it!"

"Oh, no, Mr. Ealing," insisted the inventor. "I really can't visualize what could fail. In a storm, yes, perhaps—the hatch cover is a stern precaution—"

I was willing to take Von Reinestad's word for the safety of the chamber. Every time I blasted off from Canoveral in a space-mining shuttle, I was taking a scientist's word that nothing would fail. And, so far, nothing had failed.

Von Reinestad and I climbed down the gallery ladders to a small aft platform and took the lift to the dried-mud sea bottom.

Well, the converter asked nothing of me. I saw it could be moved on caterpillar treads as the shale was stripped. Presumably the whole "flat-top" could be shifted around.

I saw also that the chamber had a pumping system similar to a dry dock. Naturally after the shale was laid aside, the enclosed water would have to be removed.

I touched the wall. It was solid. My fingers stuck to it and seemed white burned when I took them away. I commented, "Yeah, you really have something here."

He smiled. "I will show you the control console, Captain."

We ascended to the lower gallery. Von Reinestad lit a long, horizontal panel and showed me what seemed to be several zillion monoelectronic components.

Only one small section made a recognizable pattern. In a pegboard with little gray pegs I asked, "What part do the pegs control?"

In an unconsciously proud gesture, he brushed his hand over the pegs. "They determine how the molecular lattices block each other—like a basket woven so tightly that it holds water."

"Suppose a peg was defective?"

"They are protected and are thereafter

On self-help and awareness

A DOCTOR REPORTS:



Marcus Kuyper, M.D., inventor

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"Dianetics made me more alert, more alive."

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permanent. If a peg were to be removed," he speculated thoughtfully, "the blockage would be incomplete, and leaks would occur—the extent of the damage depending, of course, on the peg position."

He should not have left the controls to casually unlocked, even though the converter had been shut down—and the rig-maintenance staff would no more fool with the controls than they would hit up the hood of a friend's car and start poking and prying. Any unattended control system is bound to give an ingenious bastard ideas.

I had given me one bead of an idea how to get the converter rights back for Dr. Von Reinstad.

After lunch in the upper-gallery mess room, I asked Von Reinstad if I had permission to descend alone.

"Of course, Captain."

"Got a walkie-talkie?"

"Yes, we have minicomms, Captain."

He gave me a powerful little box. I put it in my pocket, descended on the lift, and tramped mysteriously around the sea bottom. I squinted up now and then to see Ealing watching me from the top gallery. When I had him on the hook, I ascended to the gallery laughing to myself.

"What did you find down there?" he demanded.

"Taccon would have a fit if they knew!"

I ambled away. Out of the corner of my

eye I could see Ealing work up his courage and descend.

I slipped into the control room. The panel was still lit. I carefully wiggled a center peg loose. It lights flashed and bells rang the dial was off.

Nothing happened—but the peg was definitely out of contact. Apparently emergency procedures were triggered by the sea-bottom robot.

I legged it to the platform, called the lift back up from the mud, and descended.

Ealing was retrimming my footstaple. He said, "I don't see anything."

"Naturally not. Metals are difficult to recognize. We learned that in the asteroids."

"The geologists didn't find anything down here but shale."

"They were only looking for shale—and the piece is loose with no takers the rarest earth there is! And you thought, Von Reinstad was crazy, hanging around the rig? All he's waiting for is for you guys to go away and leave him alone!"

"I don't see anything—oh, God, look at the wall! It's well!"

"Condensation."

"It's running down, all over! Let's get out of here!"

Ealing stampeded to the lift. I plowed through ankle-deep water and jumped aboard as he sent the lift upward.

Far above, a siren wailed—and the automatic hatch slid shut. Pumps began thumping.

We came to a stop short of the closed hatch. The communicator was buzzing. I took it from my pocket, clicked it on, and held it to my ear. Von Reinstad said, "Captain! Are you and Ealing all right?"

"Yeah, we're on the lift. How long will it take?"

Quickly I blurted Von Reinstad's reply and continued talking to myself. "That so? I understand. How many days—?"

"Days?" Ealing was shaking me. "What did he say about days?"

I returned the communicator to my pocket. "Well, Von Reinstad's kind short on spare parts—didn't bother with the hardware shut down—"

"They can fly out spare parts!"

"It ain't all that simple. You oughta understand, being familiar with Taccon's Malverde operations. I mean, you guys can't afford to sell Alaskan oil to Americans when you've got all that Arab oil to peddle. So you sell Alaskan oil to Japan—and bring Indonesian oil to the Canal—and sell it to Taccon—and Taccon brings Peruvian oil to the Canal and sells it to Malverde—"

"What's that got to do with—?"

"Well, it's the same in electronics. A daisy chain, like. Now the molecular califren is manufactured in Boston and then flown to Japan for the microdigital and then returned to Boston for inspection before being sent to Seattle for the toggle splint—"

"But there must be other manufacturers!"

"Well, yeah, but like Oil, they're all playing patycake in the same cartel. An outfit in St. Petersburg makes the same califren, but they send it to Hong Kong for the microdigital and Sydney for the toggle splint—"

"But the water is pouring in! The pumps can't handle it! We'll drown! For God's sake, get them to break the daisy chain!"

"Break the daisy chain?" I took a deep breath. "Yeah, go ahead and scream 'Break the daisy chain, you goddamned son of a bitch!' in the bad winters of '75 and '77. Americans froze to death while the oil cartels played with their daisy chains and laughed all the way to the bank!"

"Stop talking—and do something!"

The water was rising pretty fast. I said, "Maybe if we could make it worth Von Reinstad's while—" I took out my notebook and pencil and scribbled. "On behalf of Taccon Oil and their intermediaries and subsidiaries, I hereby return to Dr. Von Reinstad all rights in his air chamber and shale-converter." I held up the notebook.

"Sign this."

Ealing peered at the page in the waxy light from water-distorted lamps. "But I don't have any authority to sign such a statement."

"You seem to have plenty of authority to deal under the table."

"No agreement signed under duress is any good!"

"Your lawyers can talk to our lawyers."

He signed. I tucked the notebook away, took the communicator from my pocket, and snapped it on. "Doctor?"

"Schuster! Thank God! We're check-

THE END OF TODAY



"Now that's what I'd call a spectacular sunset!"

ing—"Relax. The only thing wrong is—"
Ealing grabbed the communicator and yelled, "I signed! I signed! Get the parts!"
He was like a wild man, shaking and sobbing. The communicator sputtered from his hands, plopped into the teary water, and disappeared.

Well, there went the old ball game. About a dozen microscopic parts to test out—
Ealing was still saying "Damn you, Schuster! (I) drown you first!"

My mind was on some way of tapping a Morse message on the hatch cover, and I was not paying attention. Ealing lunged against me and pushed me from the lift.

I fell on my back, hitting the water hard. The last thing I remembered was the sight of the hatch roling back—

"You see, Captain," smiled Von Reinstad. "Cummings had described you to me—how you played Inca and best cooks at their own game. So when I heard you say 'Relax, and Ealing talking about signing something, I knew you had kicked him with the wall, and I went immediately to the pattern board that had interested you. I began testing—and as soon as the wall solidified again, we could open the hatch."

"I still say your emergency system works as backwash," I growled.

The rig crew had brought me up before I had gone down for the third time. My back was sore and stiff, and I felt waterlogged, but I was okay, and the cook had dried my clothes (by calorix, not kinetic, energy).

He had also dried the contents of my pockets, and I handed the blured scrap of paper to Von Reinstad. He read it and smiled. "Thank you, Captain—but Ealing has already explained that the signature is not legal."

"True. But fortunately for you, Dr. Von Reinstad, we are not living in a country of law, but of government by media pressures. Now what you should do is hire a good PR expert. He will build a campaign on the fact that utilization is implied in the purchase of any invention, unless the contrary is explicitly stated. You naturally assumed Taccon would out your invention into full operation. Since this was not done, the deal is null and void."

"But—?"
"As recognition of this fact," I went on, "Mr. Ealing, in remorse and wanting to make restitution before what seemed inevitable death, gave back your invention." The courts—?"

"The case will never go near a court. Your PR expert will sway public opinion to your side. He'll make you an effectively organized minority. Enraged sympathizers will stomp Taccon gas pumps and foot Taccon stations. Anybody who speaks against you or mentions legal action will be viciously smeared and silenced. And Taccon will have to give in or be vindicted out of business. As Mickleberry says, if you can't beat the media-nourished tyrants, join 'em."

Von Reinstad's poetic eyes flashed—

with amusement. "No, Captain, you have already shown me where I belong—with the Silent Majority. You took away my bitterness when you made me realize I was not standing alone. Two hundred million are all around me, standing firm. And in a few years, the oil cartels will have gone to join the manufacturers of buggy whips."

I was glad he had got over his frustrated depression, but I knew Big Oil would be around for a long while yet.

Ealing stayed aboard the rig. I left he would not leave until he had combed the paper out of Von Reinstad, and I hoped the inventor would not give it up.

I flew back to the Taccon terminal that evening. Someone on the rig had tipped off the media to the "accident," and a gang with recorders was waiting for me.

I guess it struck me the wrong way—the surface slickness of the Taccon operation and the ring-around-a-rosy buildup of costs. When the media asked me to comment, I blew my stack. I reviewed the whole record and went on, "Sure, the oil cartels are experimenting with other energy sources—to monopolize them as they've monopolized oil. In twenty years a person with solar panels on his roof or a windmill in his backyard will pay more for sunlight and wind than he pays for oil. I tell you—"

I said them, all right. I got the whole thing off my chest. When I had run down, the media persons checked off their recorders, said, "Thank you, Captain Schuster" and ran for their cars.

I tossed back to the Holmen and slept like a top. The next morning I caught an early jet to New York. I did not bother to read a newspaper or look at a TV screen. I knew what I had said—and I let true words had never been spoken.

Of course, I had shot my "low profile" all to hell. My severance pay would be waiting for me. I went directly to the Company of Lies from the airport.

The Operations floor was quiet. I could not understand it. At least a few of my old pals would be giving me a grin and a wassback. But Operations hummed along as if it were just another day and I were making a routine visit.

I left my suitcase with the receptionist and was admitted into Mickleberry's office. I squared my shoulders as I walked toward his desk.

He looked up, smiled what he thought was his approving smile, and offered me his hand. I took it, mumbled something and sank into the worn old chair. He said, "Taccon is keeping the Holmen in the crucible trade—and Captain Cummings will stay aboard. Your usual smooth efficient work, Captain Schuster."

I felt completely flummoxed. "Then you're not sure about the interview I gave last night?"

"Interview? What interview?" He raised his eyebrows and seemed genuinely surprised. "No interview was recorded—anywhere—Captain Schuster." **OO**

I.Q. of 145 And Can't Remember?

A noted publisher reports there is a simple technique for acquiring a powerful memory which can pay you real dividends in both business and social advancement and works like magic to give you added poise, necessary self-confidence and greater knowledge.

According to this publisher, many people do not realize how much they could influence others simply by remembering accurately everything they see, hear, or read. Whether in business, at social functions, or even casual conversations with new acquaintances, there are ways in which you can demonstrate great wisdom by your ability to remember.

To acquaint the readers of this magazine with the easy-to-follow rules for developing skill in remembering anything you choose to remember, the publishers have prepared full details of their self-training method in a new booklet, "Advances in Memory" which will be mailed free to anyone who requests it. No obligation. Send your name, address and zip code to: Memory Studies, Dept. 318-60 Division of Career Institute, 1550 Cardinal Drive, Little Falls, New Jersey 07424. A postcard will do.

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GALATEA GALANTE

CONTRIBUTOR: P. M. HALL

came. Let us discuss the specs and see whether we understand each other. Sex?

"Female, of course."

"Of course. Physical appearance?"

"I don't take notes?"

"Total local?"

"You are lucky. Well, then. Fair. Medium tall. Endowed with soft grace. Soft voice. Blue eyes. Clear skin. Slender hands. Slender neck. Auburn hair."

"Write Galateia particular example of the type in mind?"

"Yes. Botocello's Birth of Venus."

"Hal Venus, or the Hall-shell. Lovely model. Character?"

"What one would expect of a secretary. Stating faithful devotion to my work of course."

"To your work of course?"

"And clever."

"Do you mean clever or intelligent?"

"Aren't they the same?"

"No. Cleverness requires humor. Intelligence does not."

"Then clever I'll provide. The intelligence. She must be able to learn quickly and remember. She must be able to acquire any skill necessary for my work. She must be perceptive and understand the stresses and conflicts that make a chairman's life one constant battle."

"So far you could hire such a girl. Manwright objected. Why come to me?"

"I haven't finished. Domine. She must have no private life and be willing to drop everything and be instantly available at all times."

"Available for what?"

"Business luncheons, dinners, last-minute parties, client entertainment, and so forth. She must be chic and fashionable and able to dazzle men. You would not believe how many tough tycoons have been charmed into dubious deals by a seductive secretary."

"You've left out an important point. On what salary will she be seducing?"

"Oh, I'll provide the money for the wardrobe, the make-up, and so forth. She must provide the taste, the charm, the wit, the entertaining conversation."

"Then you want a talker?"

"But only when I want her to talk. Otherwise, mum."

"Corque wrestled softly. "But you're describing a paragon, my dear sir."

"I would say a miracle, Professor Corque, but Domine Manwright is celebrated for his miraculous creations."

"You named? Manwright shot."

"Five times."

"Then you're a chaser."

"Domine!"

"And easily landed."

"Really, you're extraordinarily blunt. A chaser? Well, let's say that I'm attracted occasionally."

"Would you want your executive secre-

tary to be responsive—occasionally? Is that to be programmed?"

"Only unintentionally. If I should happen to close, I would want a beautiful response. But she is not to make demands. Nevertheless she will, of course, be faithful to me."

"These parameters are preposterous. Corque exclaimed indignantly."

"Not at all, Charles, not at all. Manwright soothed. "Mr. Valera is merely describing what all men desire in a woman: an Aspasia, the beautiful *Nympha galante* who was the adoring mistress and adviser to Pericles of ancient Greece. It's wishful fantasy, but my business is turning fantasy into reality and I welcome the challenge. The girl may be my magnum opus. Again he fired a shot at Valera. "And you'll become very bored."

"What?"

"Within six months the adoring, talented, dedicated slave will bore you to tears."

"But how? Why?"

"Because you've left out the crux of a

◆ *Of course, The mystery kink which will catch us all by surprise. You won't believe the damned, intransigent, stubborn, know-it-all, concisely egomaniac concealed beneath that polished veneer.* ◆

best woman's hold over a man. Don't protest, Valera. You know damn well you're ordering a mistress, and I make no moral judgment, but you've forgotten the drop of acid."

"Domine, I do protest!—"

"Just listen. You're contracting for an enchanting mistress, and it's my job to make sure that she remains enchanting, always. Now there are many sweet confessions that require a drop of acid to bring out the full flavor and keep them enjoyable. Your Aspasia will need a drop of acid for the same reason. Otherwise, her perpetual perfection will cloy you in a matter of months."

"You know," Valera said slowly, "that's rather astute, Domine. What would you advise I'm all anticipation!"

"The acid in any woman who can hold a man, the unexpected, the quality that makes it impossible to live with them or without them."

"And what would that be in my secretary?"

"How the devil can I tell you?" Manwright shouted. "If you knew in advance, it wouldn't be unexpected, and anyway, I won't know. I can't guarantee surprise and

adventure with a woman. All I can do is program a deliberate error into the genes of your perfect Aspasia, and the discovery of that kink will be the charming drop of acid. Understood?"

"You make it sound like a gamble."

"The rational is always a gamble."

"After a pause Valera said, "Then you're challenging me, Domine?"

"We're both being challenged. You want the ideal mistress created to your specs. I've got to meet them to your complete satisfaction."

"And your own, Reg? Corque murmured."

"Certainly my own. I'm a professional. The job is the boss. Well, Valera?"

"Agreed?"

"After another thoughtful pause, Valera nodded. "Agreed, Domine."

"Splendid. I'll need your Persona Profile from the synopsist."

"Out of the question, Domine! Persona Profiles are inviolable Secret. How can I ask Vortex to make an exception?"

"Damn it, can't you understand? Manwright was infuriated by this intransigence but controlled himself and tried to speak reasonably. "My dear chairman, I'm shaping and conditioning this Aspasia for your exclusive use. She will be the cynosure of all men, so I must make sure that she'll be implanted with an attraction for your qualities and drawn to you alone."

"Surely not all, Domine. I have no delusions of perfection."

"Then perhaps to your defects, and that will be your charming drop of acid. Come back in twenty-one weeks."

"Why twenty-one specifically?"

"She'll be of age. My biocoders average out at a week of genes for every physical year of the creator's maturity. One week for a dog, twenty-one weeks for an Aspasia. Good day, Mr. Valera."

"After the chairman had left, Manwright cocked an eye at Corque and grinned. "This is going to be a magnificent experiment. Charles, I've never generated a truly contemporary biocode before. You'll pitch in and help, I hope?"

"I'll be honored, Reg. Suddenly Corque returned the grin. "But there's one abstruse reference I can't understand."

"Fear not, you'll learn to decipher me as we go along. What don't you understand?"

"The old saw about the camel."

"Manwright burst out laughing. "What? Never heard it? Penalty of spending too much time on the outer planets. Question: What is a camel? Answer: A camel is a horse made by a committee." He sobered. "But by God, our gallant girl won't be any camel. She'll be devastating."

"Forgive the question, Reg. Too devastating for you to resist?"

"What? That? No way! Never! I've guarded and delivered too many virgin myths, deities, naxos, djajats, and so on, so far. I'm seasoned, Charles, tough and hard and impervious to all their lures. But the biocodes are going to be a problem. He added absently.

"My dear Reg! Please decipher 'Her breasts Charles Botchick made em too small in his Venus. I think I should program em fuller, but what size and shape? Like pears? Pomegranates? Melons? It's an aesthetic perplexity."
 "Perhaps your deliberate error will solve it."

"Perhaps, but only the Good Lord. In whom I've never believed, can know what her mystery link will turn out to be. Selah! Let's get to work on our perfect mistress, Charles, or to use an antique expression that's just become a new vogue word, our perfect Popsy!"

The *Domine's* program for a devastating Popsy who was to be enchanting, dutifully loyal, helpful, friendly, courteous, kind, obedient, cheerful, clever, chic, soft-spoken, beautiful, busy, eloquent on demand, and always available to entertain, began as follows:

A	10-1	0	0	(scald)
B	10-2	1	1	
C	10-3	2	2	(NO P)
D	10-4	3	3	
E	10-5	4	4	
F	10-6	5	5	(N dear)
G	10-7	6	6	
H	10-8	7	7	(N dear)
I	10-9	8	8	
J	11-1	9	9	(N couple)
K	11-2			(grind)
L	11-3	#	#	
M	11-4	*	11-3-2	
N	11-5	#	9-4	(eat)
O	11-6	\$	11-8-2	
P	11-7	%	08-4	(MS)
Q	11-8	*	02-2	
R	11-9	\$	12	
S	0-2	*	11-8-4	(only 4 dear)
T	0-3	*	9-3	
U	0-4	*	10-0	

And so wester for 147 pages. What good luck to the computer software for creative biographies, which couldn't possibly interest anyone.

Anyway there's no point in reading the program, Charles. Numbers can't paint the picture. I'll just describe the sources I've used for the generation of our Popsy. You may not recognize some of the names, but I assure you that most of them were very real and famous celebrities in their time.

"What was your locale to log the other day, Reg? A chef is no better than his mistress."

Right on. And I'm using the best Beauty—Botchick's Venus, of course, but with Eggman's Braasts. I thought of using Pauline Borghese, but there's a queen in it

inestone relief from the Paleozoic period who's the ideal model. Calypsoan near elevation Maidenhair. Ironspice delicate and triflariety. Did you say something, Charles?"

"Not I, Reg."
 "I've decided not to use Aspasia for the mistress."
 "But you said that was what Valera wanted."

So I did, but I was wrong. The real Aspasia was a damned premature Women's Rights activist. Too strong for the chairman's taste.

And yours?
 "Any man's. So I'm using Egeria instead. 'Egeria?' I haven't had an education in the classics, Reg."

"Egeria, the legendary fountain nymph who was the devoted advisor to King Numa of ancient Rome. She also possessed the gift of prophecy, which might come in handy for Valera. Let's see. Fashion and chic—a famous couturiere named Coco Chanel. Subtle perceptions—the one and only Jane Austen. Voice and theater sense—Sarah Bernhardi. And she'll add a soupçon of lovely Jew."
 "What on earth for?"

"We obvious you haven't met many on the outer planets or you wouldn't ask. Remarkable race, Jews; rethinking original obsolete obsolete impossible to live with or without."

"That's how you described the ideal mistress, wasn't it?"
 "I did."

"But if your Popsy is obsolete, how can she respond to Valera's desire?"

"Oh, I'm using Lola Mantex for that. Apparently she was a tressis in the sex department. Hmmm. Next? Victoria Woodhull for business acumen. La Pazomara for courage. Hester Bateman—she was the first woman silversmith—for skills. Dorothy Parker for wit. Florence Nightingale for sacrifice. Mats Han for mystery. What else?"

Conversation
 "Quite right, Oscar Wilde."
 "Oscar Wilde!"

"Why not? He was a brilliant talker, held dinner parties splendid. I'm giving her dancer's hands, neck, and legs, Dolley Madison hostessing, and—I've omitted something."

"Your deliberate mistake."

"Of course. The mystery link which will catch us all by surprise. Manwight flipped through the software. It's programmed somewhere around here. No, that's Valera's Persona Profile. Charles, you won't believe the damned transparent stubborn, know-it-all, coposited egomaniac concealed beneath that polished veneer. It's going to be hell impersonating our girl with an attraction program for such an impossible man. Oh, here's the unexpected in black and white."
 Manwight pointed to

R = L x V N
 "Wait a minute. Conque said slowly. 'That equation looks familiar.'
 "Aha."

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"I think I remember it from one of my boyhood texts."

"Oh ho."
"The... the most probable distance Corque was chiding up the weeks" from the lamp post after a certain number of irregular turns is equal to the average length of each track that is—
Straight track, Charles.

"Right. Each straight track that is walked traces the square root of their number." Corque looked at Manwright with a mixture of wonder and amusement. "Confounded you, Reg! That's the solution to the famous Drunkard's Walk problem from *The Law of Cosines*. And that is the delectable uncertainty that you're programming? You're either a madman or a genius."

"A little of both, Charles. A little of both. But Popsy will walk straight lines within my parameters, but we'll never know when or how she'll hit a right of a left."

"Surely she'll be aiming for Valers?"
"Of course. He's the lamp post. But she'll do some unexpected staggering on the way." Manwright chuckled and sang in an odd, husky voice, "There's a lamp on a post, There's a lamp on a post, And it sets the night aglowin'. Boy get boy! Girl get girl. But best when takes a strollin'."

Reg's Manwright's laboratory notes provide a less-than-dramatic description (to put it politely) of the genesis and embryological development of Galatea Galante, the Perfect Popsy.

09/26/1914
Day 1: One hundred million Random task.
Day 2: Five hundred million Random task.
Day 3: One thousand million Random task.
Day 4: Five thousand million Random task.
Day 5: Decayed.

(E. & A. charging too damn much for Backdoor!)

(Baby nomenclature. Charles enchanted with her. Too red for my taste. Pounded out of the amniotic blowing bubbles and talking. Couldn't shut her up. Just another fresh kid with a damn big mouth.)

"Reg. Gaily must have a nurse."
"For heaven's sake, Charles! She'll be a year old next week."
"She must have someone to look after her."

"All right. All right. Igor. She can sleep in her room."

"No, no, no. He's a dear creature, but hardly my idea of a nursemaid."

"I can convince him he made her. He'll be devoted."

"No good, Reg, he isn't child oriented."
"You want someone child oriented?"
Hmmm. Ah, yes. Got just the right number for you. I generated The Old Woman Who Lived in a Shoe for the Positively Peerless Intuition Plastic company to use in their genuine plastics sales promotion.

"She had so many children she didn't know what to do?"

"The same." Manwright punched the CB keyboard. "Searchbead? This is Reg's."

The screen sparkled and cleared. A gypsy clone appeared with bagging head

outstretched for aims.
"How's everything going, Searchbead?"
"Spanish educator. Regs."
"Why?"
"Brough into ghno e."
"What? PPSIP gone bankrupt? That's shocking. So you're out of a job?"
"Dearfatch on!"

"Well, perhaps I have something for you, Searchbead. I've just generated—"

"Cut off, Reg. Corque broke in sharply. Manwright was so startled by Corque's tone that he obeyed and looked up perplexedly. "Don't think she'll do, Charles?"

"That did rag?" Out of the question.
"She isn't old. Manwright protested. "She's under thirty. I made her look like that according to specs. Seventy-year-old Irish gypsy. They call 'em linkers in Ireland. Speaks Irish and can handle kid actors who are a pain in the ass. And I delivered by God."

"As you always do, but still out of the question. Please try someone else."



• The usual biodroid accommodations weren't good enough for Manwright's magnum opus. . . . The red infant was on the floor, flat on her belly, propped on a pillow, and deep in a book. She looked up and crawled. •



"Charles, has that damn infant got you enthralled?"

"No."

"Her last conquest, and she's just out of the flask! Can you imagine what she'll do to man in another twenty weeks? Be at each other's throats. Fighting duels. He'll aim a gun, and I don't dare it."

"We need a nurse for Gaily, Reg."

"Nag, nag, nag."

"Someone warm and comforting after the child has endured a session with you."

"I can't think what the man is implying. All right, cradle-snatcher, all right. I'll call Claudia. Manwright punched the CB. "She's warm and maternal and protective. Wish she'd been my nanny. Hello? Claudia? It's Regs. Switch on, darling. The screen sparkled and cleared. The magnificent head and face of a black mountain gorilla appeared.

"If she fringed."

"I'm sorry, love. Been too busy to call. You're looking well. How's that no-good husband of yours?"

"I."

"And the kids?"
"JIT."

"Splendid. Now don't forget. You promised to send them to me so I can surgically trim into understanding your kind of speech. Some like you, love, and no charge. And speaking of kids, I've got a new one, a girl that I'd like you to—"

"At this point the stunted Corque collected himself enough to press the cursed stud. Claudia faded.

"Are you mad?" he demanded. Manwright was bewildered. "What's wrong, Charles?"

"You suggest that terrifying beast for the child's nurse?"

"Beast! She's an angel of mother love. She'll have the kid climbing all over her, hugging and kissing her. It's interesting," he reflected. "I can manipulate the cognition centers, but I can't overcome muscular limitations. I gave Claudia college-level comprehension of spoken and written communications, but I couldn't give her human speech. She's still forced to use Mountain, which is hardly a language of ideas. Damn frustrating. For both of us."

"And you actually want her to mother Gaily?"

"Of course. Why not?"

"But Claudia will frighten the daylight out of the infant."

"Ridiculous. She's hideous."

"Are you mad? She's beautiful. Pure Magic. And a hell of a lot brighter than your Remedial Table Tennis bums at Syrus University."

"But she can't talk. She only grunts."

"Talk? Talk? For God's sake, Charles! That damn red Popsy was poised out talking screen to the down. We can't shut her up. She's filling the house with enough of her jabber as it is. Be grateful for some silence."

So Claudia, the black mountain gorilla, moved into the Manwright ménage, and Igor was furiously jealous.

The last morning that Claudia joined Manwright and Corque at breakfast (while Igor glowered at his massive rival), she perked a message on a pad and handed it to the Dominie. R 40 U GV G TO TR 41 W HOWER.

"Let's see if I remember your abbreviations during. Did you, that's me... give Galatea, yes, take training in her program? My God, Claudia! I gave her the best of 47 women. Surely at least one of them must have been taken, varied."

GV GMS.

"By what, Claudia?"
"Buy diapers, Reg."

"Oh. Ah. Of course. Thank you, Charles. Thank you, Claudia. More coffee, love? It's frustrating, Charles. Muscular dyspraxia again. Claudia can manage caps in her writing, but she can't track lower case. How many diapers, Claudia?"

"102."

"Right. One doz. Zu Beleh! Did you bring your kids to play with the baby?"

TO DO.

"Too odd for what?"

"Too old."

"Your kids?"

"A."

"What? Galatea? Too old for your boys? And still in diapers?" I'd best see for myself.

One of the top-floor bedrooms had been converted into a nursery. The usual bi-fold cello accommodations weren't good enough for Marwright's magnanimous. When the Domine entered with Claudia, the red infant was on the floor flat on her belly propped on a pillow and deep in a book. She looked up and crawled enthusiastically to Claudia.

"Nanny dear, I've found the answer: the old linear shorthand. Just slashes, dots and dashes, and you won't have to worry your hand and head over cursive abbreviations. It's a simple style, and we can produce together." She climbed up on Claudia and kissed her lovingly. One would think this might have occurred to that egotistical know-it-all whose name escapes me. The infant turned her autism head. "Why good morning, Domine Marwright. What an unpleasant surprise."

"You're right, Claudia." Marwright growled. "She's too damned old for your kids. Diaper her."

"My sphincter will be under control by tomorrow, Domine." Galatea said sweetly. "Can you say the same for your tongue?"

"Guh!" And Marwright withdrew with what he hoped was impassive dignity.

Of course, she shot up like a young bamboo plant and filled the house with joy as she entertained them with her escapades. She taught herself to play Marwright's Regency harpsichord, which was sadly out of repair. She convinced Igor that it was a marvel in the making, and to gather they refreshed and tuned it. The sound of concert-A on the tuning fork droned through the house with agonizing penetration. The others were forced to eat out because she gave Igor no time for cooking.

She studied linear shorthand with Claudia and then translated it into finger language. They had glorious raps, silently talking to each other until Marwright banned the constant finger wiggling, which he denounced as a damned invasion of vision. They simply held hands and talked into each other a palm in their secret code, and Marwright was too proud to ask what they were gossiping about.

"As if I'd get an answer anyway," he growled to Conque.

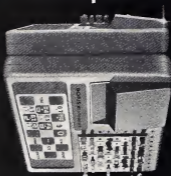
"Do you think that's her mystery surprise, Reg?"

"Damned if I know. She's unexpected enough as it is. Rotten kid!"

She stole liquid loonies from Igor's sacred penny and lashed herself phosphorus from Marwright's sacred laboratory and irradiated herself. She burst into Conque's dark bedroom at three in the morning, howling, MC METHOPHYLATE MOTHER FROM DAMNEDBY YOU KILL ALL MY CHILDERS ALLEN WARDER FROM OUTSIDE SPACE! NOW ME

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Corque let out a yell and then couldn't stop laughing for the rest of the day. The beautiful shock of the apparition Reg! Manwright didn't think it was funny.

"That damned child is giving me real nightmares," he complained. "I keep dreaming that I'm lost in the Grand Teton mountains and Red Indians are chasing me."

She sneaked up into the sooted penthouse and decorated the robotlike neuroscope with ferns stolen from Manwright's wardrobe. The construct assumed a ludicrous resemblance to the Domine himself.

The innocent child fast-talked E & A Chemical delivery—My Daddy forgot to order it. So absent-minded, you know—in an extra gallon of ethyl alcohol which she poured into the marble pool and got the peanhas disgustingly drunk. Then she jumped in and was discovered floating with her pleasured pals.

"Doesn't know the meaning of fear Reg!
"Pah! Just the Passions I programmed."

She stole two hundred meters of magnetic tape from the library and fastened a sciencrope mobile. The gardener was enraptured. Manwright was infuriated, particularly because art dealer friends offered huge amounts for the creation.

"But that's her charming unexpected Reg! Gally's a born artist."

"Like hell she is. That's only Jibe Hester Bateman I gave her. No L + V N yet. And the nightmares are continuing in sequence. Those damned Red Indians hike out me off at the pass."

Claude took Gálcia to her home, where the girl got on lamously with Claudia's two sons and brought them to Manwright's house to demonstrate a new dance which she'd devised called "The Anthro-Hustle." It was performed to a song she'd composed entitled "Who Put the Snatch on Gorilla Baby?" which she banged out furiously on the harmonichord.

"Bring back the luring fork," Manwright muttered.

Corque was applauding enthusiastically. "Music a her surprise kink, Reg!"

"Call that music?"

Corque took her to his Saturn Circus, where she mesmerized him into letting her try riding bareback and leaping through burning hoops, acting as target for a knife thrower, trapeze acrobatics, and thrusting her auburn head into a lion's mouth. He couldn't understand how she'd persuaded him to let her take such horrifying risks.

"Perhaps captivity's her mystical quality," he suggested. "But she did miraculously well. Reg! My heart was in my mouth. Gally never turned a hair. Pure aplomb. She's a magnificent creation. You've generated a Super-Poppy for Valera."

"Guh."
"Could her unexpected kink be psychic?"

The redskins have got me surrounded," Manwright yelled. He seemed strangely disoriented.

What disturbed him most were the daily tutoring sessions with the young lady. Invariably they degenerated into bickering and bicking, with the Domine usually going the worst of it.

"When our last session ended in another bick we both steamed for the library door," he told Corque. "I said, 'Age before beauty my dear, which you must admit was gracious,' and started out. That red Poppy snip said, 'Porns before swine,' and swaggered past me like a gladiator who's wiped an entire arena."

"She's wonderful!" Corque laughed. "Oh, you're insanely biased. She's been besiding you around her legs since the moment she was poured."

And Igor and Claude and her two boys and the CB repair and the plumber and the electronics and the gardener and the laundry and E & A Chemical and hell my cr-

● Corque took her to his Saturn Circus, where she mesmerized him into letting her try riding bareback and leaping through burning hoops and thrusting her auburn head into a lion's mouth. ●

ous? All insanely biased?"

"Evidently I'm the only sanity she can't snuff. You know the simple psychological truth, Charles, we're always accusing others of our own faults. That sourcebook has the impudence to call me intransigent, stubborn, know-it-all, conceited. Mel Out of her own mouth. QED."

"Mightn't it be the other way around, Reg?"

"Do try to make sense, Charles. And now that the Grand Teton breastworks are making her top-heavy (I think maybe I was a little too generous with my Egyptian programming) there'll be no living with her vasy. Warner takes the damned dumbest pride in the thrust of her boozalium."

Now Reg, you exaggerate. Gally knows we'd all adore her even if she were fat-chested."

"I know I'm doing a professional job, and I know she has to teach ego in her course. But next week we start skilpping her to parties openings talk-ins routs and such to train her for Valera. That ought to take her down a peg. The Red Indians have got me led to a stake," he added gloomily.

"Canapes?"

"Tavish so Lately paffy Ma Galante. Thank you, Lady Agatha. Canapes?"
Graze Signorine.
"Prego, Comendatore. Canapes?"
"A dark veyid. Lang leb'n zot!"
Nito for you, General. Hot canapes dear Professor Corque?"

"Thank you, adorable hostess, Igor?"
"Miso."

"And perlatian. Don't be afraid of the Marlan cousin. He won't bite."

"Canapós, M'sieur Consul?"
"Ah! Mss'out Mero. Mademoiselle Gal-lée. Que poussez-vous du lumineux Domine Manwright?"

"C'est un type très compétent!"
"Où? Romanesque mais formidablement compétent!"

"Où? Manwright? Romanesque? Vous me gênez, mon cher consul!"

"Wa lois où romanisque. Mademoiselle Gal-lée. C'est submerit son côté roman-esque qui lui cause du mal à se trouver une femme."

"These damn dolls are a drag, Charles."
"But isn't she wonderful?"

"And they're making my nightmares worse. A sexy Indian squaw tore my clothes off last night."

"Mi interesse particolarmente al lion di fantascienza, magia-orrors, umoremo, nantava, astatika, filosofia sociologia e cativo, pundo Regs Manwright."

"Charles, this is the last literary talk-in I ever attend."

"Did you see how Gally handled those Italian publishers?"

"Yes, gives at my expense. She put iron claws on her hands."

"My dear Reg, Gally did no such thing. I was referring to that sexy squaw."

"Então agora sabes dançar?"

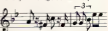
"Sem. Danço. falo maravilhosamente muitas linguas, estudo calência e filosofia, escrevo uma latiníssima poesia, estudei com experientes dancos, ogirno como um louco, jogo so boxe como um palhaço. Em suma, sou a celebridade, Gálcia Galante, de Domine Manwright."

"She was magnificent dancing with that Portuguese prince, Reg."

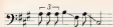
"Portuguese prince, you mean."
"Don't be jealous."

"She's leading the claws in a damned complete Charles."

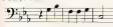
"Didn't you ever light back, Sandy?"



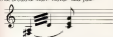
"Yes, I know he's a bully. But of bullies are cowards at heart. You should have fought him to a standstill, like me. Did he ever make a pass at you?"



Uh-huh. Me neither. He's an arrogant egomaniac, too much in love with himself to love anyone else.



"What, Sandy? Me? Give the come-on to that dreadful man? Never! Dad you?"



Uh-huh. And he didn't even have to lash himself to the mast, Joeberg City. Ah! Mr. Jeremy. So sweet of you to give us your box for the concert. I've just been comparing notes with your adorable wife on our common enemy whose name escapes me. He's the gentleman on my right, who slept through the Mozart."

And dreamed that she's torturing me with her burning claws. Charles, all over my bed.

Man nehmer zwei Teile Selbstgefälligkeit, zwei Teile Selbstsucht, einen Teil Eitelkeit und einen Teil Eitel, mische kräftig. Lüge etwas Geheimnis hinzu, und man erhält Domina Regis Manwrigt."

"Especially my private parts."

Domina Manwrigt's bodroz wakká al día en su manera de tratar los neologismos, palabras coloquiales, greco y modernos, clichés y términos de argot. Señor. Yo soy Galatea, Galatea, la bodroz.

"Thank you, madame. I am not Spanish. I merely admire and respect the old Castilian style."

"Oh. Scuse me, chorley guy. You taller, day, dank?"

He burst out laughing. "I see you're very much with the classics, madame. Let me think. Yes. The proper response in that James Joyce lrary is: N."

"You talkfast soowegan?"

"N."

"You spigotty englesae?"

"Nnn."

"You phone eae?"

"Nnnn."

"Clear all so. Tie it a lute. Let us swap hats and check a few strong verbs weak each other yazyazzard."

"Braws, madame! Brawissama!"

She tilted her surbun head and looked at him strangely. "Against my will," she said slowly. "I'm compelled to invite you to a dinner party tonight."

"More classics, madame? The Beatles and Benedict some from Much Ado About Nothing?"

No. It's the Galatea and—I don't know your name.

Valera. Antony Valera.
"It's the Galatea and Valera scene. Can you come?"

With delight."

When the tash is finished I'll give you the address."

I know it, Galatea.

"My friends call me Gally. How do you know my address? We've never met."

I contacted with—I'm acquainted with Domina Manwrigt. Gally Tonight? Eight o'clock?"

"Eight tonight."

Dress party?"

Optional. She shook her head dizzily. "I don't know what's got into me, Valera. The moment I saw you at this clam bake I knew I had to see you again, intimately. I'm possessed!"

The rest of the household was dining in The Gastrologue and their moods were not compatible.

Thrown out. Corque kept repeating "Thrown out without a moment's notice by that ungrateful tyrant!"

"Naturally. She wants to be alone with Valera. Charles. Instant, developed attraction as per my brilliant programming. I tell you. I'm a genius."

"She asked me to make month-ten for her to thrive, month-ter."

"Quite right. Igor. We must all pitch in and abet Valera's romance. He was so turned on watching her at that bash the afternoon that he sent his check by messenger. Payment in full—to protect his claim on My Perfect Popey, no doubt."

"Thrown out! Thrown out by that tyrant!"

"And good notice to her very soon, Charles. The house will be back to normal."

But she didn't order a brain, month-ter."

"Not to worry, Igor. Tell you what we'll order: cereales de veeu ao besseu, non, and if Gastrologue doesn't have any calves, brains you can go out and steal some." He beamed and bobbed his pale, streaky head.

"Thank you, month-ter."

"Excused."

The silent Claudia printed: PLANDIER MURILS FENELLOS DE AMARILLO.

At one minute past eight Valera said: "It's tash-nable to be a half-hour late, but I—I'm all right to come in?"

"Oh, please! I've been biting my nails for a whole minute."

"Thank you. To tell the truth, I had to be chic, but I didn't take as long as I thought it would to walk up from Old Slip."

"Old Slip? Isn't that where your office is? Where you working late, poor soul?"

"I live there too, Gally. A penthouse on top of the lower."

"Ah, a la Alexander Ely?"

"Somewhat, but the Syndicate complex is no four Elys! What a fantastic place this is. I've never done more than peep beyond the waiting room."

"If you want the full tour?"

"I'd like nothing better."

"You've got it, but drink first. What would



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you like?

"What are you serving?"

"My dear Valera: I --"

"Tony --"

"Thank you. My dear Tony: I share the house with two and a half men and a mountain pony. We have everything in stock."

"Starcheaps, please. Hal?"

"Igor, our housekeeper." Galatea explained as she brought a tray with a bucket of ice, a bottle, and shot glasses. She opened the vodka delfty and began revolving the bottle in the ice. A biodrood replica of Baron Frankenstein's accomplice.

"Oh yes. I've met him. The leaping hunchback."

"A dear, dear soul, but only half with it. And a porilla?"

"That's Claudia, my beloved nanny. She's beautiful. This vodka really isn't chilled enough yet, but let's start anyway." She tilted the glasses. "Russian style, ah? Knock it back. Tony: Death to the fascist imperialist invaders from outer space."

"And their Conestoga star-wagons. They knocked their shots back."

"Gally, what miracle are you wearing?"

"La srt! She did a quick kick-ferm. Like 4?"

"I'm dazzled."

"If I tell you, promise not to turn me in?"

"I promise."

"I copied it from a Magda."

"Who or what is a Magda? Oh, thank you."

"I'm afraid I liked it too high, but boys like big sandwiches and big drinks. She's the vogue designer of the year. Down with counterintention."

"May they be heard only in Siberia. Why must I keep it a secret about your copy?"

"Good Lord! They hang, draw and quarter you if you pinch a designer original."

"How did you manage?"

"I fell in love with it at one of her openings and memorized it."

"And made it yourself? From memory? You're remarkable!"

"You're exaggerating. Don't you remember complicated slick manipulations?"

"Well, yes --"

"So with me it's the same damn thing. Oops! That's the tag of a dirty joke. Apologies to the chairman."

"The chairman reads all the dirty jokes he can get for client entertainment. What's this one?"

"Maybe someday, if you coax me nicely."

"Where do you get them? Surely not from Dominic Manwright."

"From Claudia's naughty boys. Angster shot to the damnation of Blue Laws, and then the graded tour."

Valera was bewitched and delighted by the madness of Manwright's house, and enchanted by the high style with which Galatea flowed through it with equally mad comments. An old song lyric haunted him:

Hey diddle-doo-doo,

I've found the girl for me

Isa 0096

With raunchy style

And virgin gule!

She's just the girl for me.

"Never mind the polite compliments. Tony, she said, pulling him down on a couch beside her and taking his glass: "I'll give you the acid test. Of all things in this house, which would you be most likely to steal?"

"You."

"I didn't say kidnap. Come on, man, steal something."

"I think I spilled my drink."

"It's my fault. I jiggled your arm. Gont mpp. So?"

"You're so sudden. Gally Well, don't laugh. The scarecrow mottle in the garden."

"Oh, I love you for that! I made it, when I was a little kid months ago." She gave him a smacking kiss on the cheek and jumped up. "Live some music!" She turned on the hi-fi and a soft murmuring drifted through

● Igor, our housekeeper,
Galatea explained
as she brought a tray with a
bucket of ice, bottle, and shot
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the vodka delfty. A biodrood
replica of Baron
Frankenstein's accomplice ●

the house.

Valera glanced at his watch: "Your guests must be indignantly chic."

"Oh?"

"You said eight. That was an hour ago. Where's everybody?"

"As a matter of fact, they came early."

"I'm the only one who was early."

"That's right."

"You mean I'm --?"

"That's right."

"But you said a dinner party. Gally!"

"It's ready any time you are."

"The party is a? Just us?"

"I can call some more people if you're bored with me."

"You know that's not what I meant."

"No? What did you mean?"

"I... He stopped himself."

"Go ahead," she bullied. "Say it. I dare you."

He capitulated. For perhaps the first time in his suave life he was overpowered. In a low voice he said, "I was remembering a tune from twenty years ago. Hey diddle-doo-doo! I've found the girl for me! With raunchy style! And virgin gule! She's just the girl for me."

She flushed and began to tremble. Then she took refuge in the heaviest rule: "Dinner," she said briskly. "Beef Stroganoff, potatoes baked with mushrooms, sautéed lemon-peel and coffee. Mouton Rothschild. No net upstairs. Tony: I've made special arrangements for you. Help me with the table."

Together in a sort of domestic intimacy they arranged a gaming table alongside the marble pool with two painted Venetian chairs. She had already set the table with Spodo china and Danish silver, so it needed some careful balancing. Before she began serving, she drew the cork from the Bordeaux bottle and poured a few drops into Valera's goblet.

"Try it, Tony," she said. "I've never been able to decide whether the concept of letting a wine breathe is fact or show-off. I appeal to your sophistication. Give me your opinion."

He tasted and rolled his eyes to heaven. "Superb! You're magnificent with your compliments. Gally! Sit down and try it yourself, I insist." And he tilted her glass.

"Wait," she laughed. "The floor above first. I snowed electronics into bootlegging ultraviolet into the pool. That's why I wanted our table here. Wait till you see 20 Perloff, ring Prinitas 20." She ran to a wall, extinguished the living room lights, and flipped a switch. The spot glowed like lava, and the scotched fish became a basket of darning embers. Galatea returned to the table, sat opposite Valera, and raised her goblet to him. He smiled back into her face.

"Hey diddle-doo--" he began and then froze. He stared. Then he started to his feet so violently that he overturned the table.

"Tony!" She was appalled.

"You goddamn bitch --" he shouted. His face was black. "Where's the CB?"

"Tony?"

"Where's the goddamn CB? Tell me before I break your goddamn neck!"

"It's that table. She pointed. "B-but I don't understand. What's --"

"You'll understand soon enough. He punched buttons. "By God, you and this whole damn lying house will understand. Rip me? Play me for a penny?" His rage was a terrifying echo of Manwright at the worst. "Hello, Larson? Valera. Don't waste time with visual. Crashmaster. Call full Security and comb the city for a son of a bitch named Reges Manwright. Yes, that's the pig. I gave you a half hour to find him and --"

"B-but I know where he is." Galatea listened.

"Hold it, Larson. You do? Where?"

"The Gastrologues."

"The bastards in The Gastrologues Club, Larson. Go get him and bring him to his house, which is where I am now. And if you want to get rough with him I'll pay all legal and add a bonus. I'm going to teach that lying pimp and his bitch a lesson they'll remember for the rest of their lives."

The four were herded into the main floor of Manwright's house at the port of a

nahad laser which Larson thought advisable in view of the threat of Claudia's mass. They saw a grotesque Valera and Galatea silhouetted before the glowing pool in the dark room. Valera was holding the weeping girl by her hair for all the world like a chattel in a slave market.

In this ominous crisis Manwright displayed an aspect of his character which none had ever seen: a tone of quiet command that took obedience for granted, as if by divine right, and won it through its assurance.

"Mr. Larson you may pocket that laser now it was never needed. Valera, you will sit Galatea go," he said softly. "No dear, don't move. Stay alongside him. You belong to him, unless he's changed his mind. Have you, Valera?"

"You're goddamn right I have," the chamberlain stormed. "I want no part of this cheap second-hand trash Larson keep that gun handy and get on the CB. I want my check stopped."

"Don't bother Mr. Larson. The check has not been deposited and will be returned. Why Valera? Doesn't Galatea meet your exalted standards?"

"Of course she does." Corque burst out. "She's brilliant! She's beautiful! She's perfection! She—"

"I'm handing this, Charles. I repeat: Why Valera?"

"I don't buy whores at your prices. You think Galatea's a whore?"

"Think? I know."

"You contracted for the perfect mistress who would be faithful and loving and devoted to you."

Galatea let out a moan.

"I'm sorry my love, you never knew I'd planned to tell you, but only after I was sure you were genuinely attracted to him. I never had any intention of forcing him on you."

"You wicked men!" she cried. "You're all hateful!"

And now Valera, you think of a mistress as a whore? Why this sudden eruption of archaic morality?"

"It isn't a question of morality damn you! It's a question of second-hand goods. I want no part of a shopworn woman."

"Must I stay here with him? Does he own me? Am I bought and paid for?"

"No, love. Come to us."

She dashed away from Valera's side and then hesitated. Claudia held out her arms, but Galatea surprised everybody by going to Manwright, who took her gently.

"All right, Valera," he said. "Go now and take your army with you. Your check will be returned first thing in the morning."

"Not until I know who it was."

"Not until who what was?"

"The goddamn livery-boy who knocked her up."

"What?"

"She's pregnant, you goddamn pimp. The bitch has been sleeping around, and I want to know the stud who knocked her up. He's got plenty coming."

After a long pause, Manwright asked,

"Are you under a psychiatrist's care?"

"Don't be ridiculous. No more ridiculous than your slender Galatea, pregnant? My lovely, tasteful young lady sleeping around with studs? You're obviously quite mad. Go."

"Mad, am I? Ridiculous? You can't see that she's pregnant? Turn her around and look at her face in the ultralight. Look at her!"

"I'll go through the motions only to get rid of you."

Manwright smiled at Galatea, as he turned the girl around. Just a gesture now. You'll have your dignity back in a moment and I swear you'll never lose it ag—"

His words were cut off as if by a guillotine. In the ultralight from the glowing pool there was no mistaking the dark pregnancy band across Galatea's face, similar to the banded mask of a raccoon. He took a slow deep breath and answered the confusion in her eyes by placing a hand over her mouth.

"Go, Valera. This is now a family affair."

◆ She ran to a wall, extinguished the living room lights, and flipped a switch. The pool glowed like lava, and the excited fish became a ballet of dancing embers. Galatea raised her goblet to him.

◆

◆ I demand an answer. I won't leave until I know who it was. Your half-wit hunchback Igor, probably. I can picture them in bed, the slobbering idiot and the—"

Manwright's interruption was an explosion. He hurled Galatea into Claudia's arms, drove a knee into Larson's groin, tore the laser away from the convulsed man, whipped Valera across the neck with the barrel, and held the staggering chamberlain over the edge of the pool.

"The piranhas are starving," he murmured. "Do you go in or get out?"

After the synchosts had left, not without due promise, Manwright turned up the house lights and extinguished the pool of ultralight and, with that, the pregnancy stigma, branding Galatea's face. In a strange way they were all relieved.

"Not to play the district attorney," he said. "But I must know how it happened."

"How what happened? Galatea demanded.

"Sweetheart, you are pregnant."

"No, no, no!"

"I know it can't be anyone in the house. Claudia, has she been proteusuous out-

side?"

"No. How can you ask such questions? Has Galatea been alone with a man in a possibly intimate situation?"

"You're hateful!"

"No. Right, we all know that. We've chaperoned Galaty every moment outside, you me, Claudia."

"Not every moment. Charles, it could have happened with this innocent in five minutes."

"But nothing ever happened with a man! Nothing! Ever!"

"Dear love, you are pregnant. I can't be."

"You are undeniably Charles?"

"Golly I adore you no matter what, but Rag is right! The pregnancy band is undeniable."

"But I'm a virgin— Claudia?"

"Her what have stopped?"

Corque sighed. Her mistress, Rag. "Ah so. I'm a virgin, you wicked detestable men. A virgin!"

Manwright took her frantic face at his hands. Sweetheart, no recombinations no purifications, no Coventry, but I must know where I slipped up, how it happened. Who were you with, where and when?"

"I've never been with any man, anywhere or anywhere."

"Never, except in my dreams?"

"Dreams? Manwright smiled. All girls have them. That's not what I mean, dear."

"Maybe I should mean what, Claudia?"

"Let her tell me her dreams? Why?"

"All right, I'll listen. Tell me about your dreams, love."

"No. They're private property. Claudia wants me to hear them."

"She's the only one I've ever told. I'm ashamed of them."

"Claudia finger-wagged. "Tell her, Golly. You don't know how important they are."

"No!"

"Galatea Galatea, are you going to disobey your nanny? I am ordering you to tell your dreams."

"Please, nanny. No. They're erotic. I know, dear. That's why they're important. You must tell."

"At length, Galatea whispered, "Put out the lights, please."

The fascinated Corque obliged. In the darkness she began. "They're erotic. They're disgusting. I'm so ashamed. They're always the same, and I'm always ashamed, but I can't stop."

"There's a man, a pale man, a moonlight man and I, I wish him toward me, to handle me and lavish me into ecstasy, but he doesn't want me, so he runs, and I chase him. And I catch him. There are

some sort of friends who help me catch him and tie him up. And then they go away and leave me alone with the moonlight man and I . . . and I do to him what I wanted him to do to me . . .

They could hear her trembling and rustling in her chair.

Very carefully Manwright asked, "Who's the moonlight man, Galatea?"

"I don't know.
"But you're drawn to him?"
"Oh yes. 'Yes! I always want him'.
"Just him alone, or are there other moonlight men?"

"Only him. He's all I ever want.
"But you don't know who he is. In the dreams do you know who you are?"

"No. Just me."
"As you are in real life?"

"Yes, except that I'm dressed different. Different? How?"

"Beads and . . . and buckskin with fringe.

They all heard Manwright gasp.

"Perhaps like . . . like a Red Indian, Galatea?"

"I never thought of that. 'Yes, I'm an Indian, an Indian squaw up in the mountains and I make love to the paleface every night."

"Oh, My God!" The words were squeezed out of Manwright. "They're no dreams!" Suddenly he roared. "Light! Give me light. Charles! Igor! Light!"

The brilliant lights revealed him standing and shaking moonlight pale in shock. "Oh my God, my God, my God!" He was almost incoherent. "Dear God, what have I created?"

"Manwhor!"
"Reg!"

"Don't you understand? I know, Claudia suspected, that's why she made Galatea tell me her dreams."

"B-but they're only dirty dreams."
Galatea wailed. "What could possibly be so bad?"

"Damn you and damn me! They were not dreams. They were reality in disguise. That's the harm. That's how your dreams lock in with my nightmares, which were reality too. Chast! I've generated a monster!"

"Now calm yourself, Reg, and do try to make sense."

"I can't. There's no sense in it. There's nothing but that lurid drop of acid I promised Valera."

The mystery surprise at her?

"You kept wondering what it was, Charles. Well, now you know if you can interpret the evidence."

"What evidence?"

Manwright forced himself into a sort of thunderous control. "I dreamed I was pursued and caught by Red Indians, led up, and revealed by a sexy squaw. I told you 'No'?"

"Yes. Intermittently."

Galatea dreams she's a Red Indian squaw pursuing, capturing, and ravishing a paleface she desires. You heard her?

"I heard her."

"Did she know about my dreams?"
"No."
"Did I know about hers?"
"No."
"Coincidence?"
"Possibly."
"Would you care to bet on that possibility?"

"No."
"And there you have it. Those dreams were sleep versions or distortions of what was really happening, something which neither of us could face awake. Galatea's been coming into my bed every night, and we've been making love."

"Impossible!"
"Is she pregnant?"

"Yes."
"And I'm Valera's loverboy, the stud responsible. My God! My God!"

"Reg, this is outrageous. Claudia has Gally ever left her bed nights?"

"No."
"There!"

Galatea turns out to be a succubus who doesn't know it and has her will of me in our sleep every night.

"No, no! They were dreams. Dreams!"
"Were they? Were they? Manwright was having difficulty controlling his impatience with her damned obtuseness. How else did you get yourself pregnant, an embryo glands, knocked up? Don't you dare argue with me, you impudent red saucelob! You know," he reflected, "these should have been a smidge of Margaret Sanger in the programming. Never occurred to me."

He was back to his familiar impossible self and everybody relaxed.

"What now, Reg?"

"Oh, I'll marry the snip, of course. Can't let a dangerous creature like Galatea out of the house."

"Out of your life, you mean?"

"Never!" Galatea shouted. "Never! Marry you, you dreadful, impossible, conceited, bullying, know-it-all, wicked man? Never! I'm a demon, what are you? Come, Claudia."

The two women went very quickly upstairs.

"Are you serious about marrying Gally, Reg?"

"Certainly, Charles. I'm no Valera. I don't want a relationship with a poppy, no matter how perfect."

"But do you love her?"

"I love all my creations.
"Answer the question. Do you love Gally as a man loves a woman?"

"That sexy succubus? That naive demon? Love her? Absurd! No, all I want is the legal right to be her for a stake every night, when I'm awake. Ha!"

Corque laughed. "I see you do, and I'm very happy for you both. But you know you'll have to court her."

"What? Court? That impertinent red bar?"

"My dear Reg, can't you grasp that she isn't a child anymore? She's a grown young woman with character and pride."

"Yes, she's had you in that since the moment she was poured," Manwright growled. Then he sighed and accepted defeat. "But I suppose you might. My dear Igor!"

"Here, manwhor!"

"Pease set up that table again. Fresh service, candles, flowers, and see if you can salvage the monsters you created for the dinner. Wear gloves."

"No blarney, manwhor?"

"Not this evening. I see the Moulton Rothschild's been smashed. Another bottle, please. And then my compliments to Ms. Galatea Galante, and will she have the forgiveness to dine a deux with a most conitate suitor. Present her with a corsage from me, something orchid. This will be a fun reconnaissance. Charles, he mused, "Paralyze sage, rotamary, and thyme, elevy. Man and Demon. Our boys will be devils, sopeery says, and the gels, witches. But aren't they all?"

● His words were cut off, as if
by a guillotine
in the ultralight from the
glowing pool there
was no mistaking the dark
pregnancy band
across Galatea's face. He
took a slow breath. ●

"Damn it, I'm not talking about a conventional human woman. I didn't generate one. I'm talking about an otherworld creature whose psyche is as physically real as her body can materialize out of it, accomplish its desires and amalgamate again. An emotional double as real as the flesh. You've pestered me about the deliberate unexpected in my programming. Well, here's the R = L x V N. Galatea's a succubus."

"A what?"

"A succubus. A sexy female demon. Possibly human by day. Completely conformist. But with the spectral power to come like a canal cloud, lozenge in their sleep, nights and seduce them."

"No!" Galatea cried in despair. "I'm not that! I can't be."

"And she doesn't even know it. She's an unconscious demon. The laugh's on me, Charles. Manwright said nastily, "By God, when I do glitch it's a beauty. I knock myself out programming the Perfect Poppy with an organ for Valera, and she runs everything by switching her passion to me."

"No surprise. You're very much alike."

"I'm in no mood for jokes. And then

But aren't they all? ☐

INTERVIEW

CONTINUED FROM PAGE 17

you make a move and its reply was a very easy move to find, it often gives you a message saying, "Be careful!" All this adds to one's acceptance of it as an entity and heightens the rapport you strike up with it.

Qwer: Isn't this rather alarming?

Lewy: Yes and no. If you're fairly well in command of what is happening on the chessboard, you should not be put off, unless, of course, you are playing the program for the first time. People playing a computer program for the first time perform in a completely different way than they perform in later games, when they have had some experience. We had a tournament in London last year, and one of the human opponents, after about six or seven moves, started to shake visibly. He said to me, "Excuse me, I must go for a little walk to compose myself." He was so nervous playing a computer that he could not think properly and of course it beat him very easily. This kind of thing also applies even to grand masters. Part of it must be sheer disbelief at the possibility that the computer could even hope to give them a good game. For example, when my friend Michael Stean played a five-minute game with a program last year—where each side had to make all its moves very quickly—Michael soon built up a very good position and quite outplayed the program in the early part of the game. He clearly did not believe the program stood a chance against him, and so he decided to enter into complications and tactics which, as I have already said, is the area in which computers excel. And within about two moves it became horribly apparent that the program was seeing far more than he was, and in fact it smashed him off the board. This was the first game that a grand master ever lost to a computer.

Qwer: Will you be nervous in Toronto?

Lewy: I am still very very confident, even though my confidence has been reduced. Although I am obviously still clearly the favorite because, in objective terms, I am much stronger than the program, it will be a fairly nerve racking meeting. The eyes of the world will be on the match as a sort of struggle between man and machine. This will inevitably make me a little shaky, but of course it will not affect my opponent.

Qwer: How are you planning to play it?

Lewy: I am going to try to avoid engaging forces with the program for as long as possible, and in the opening, I am going to make moves formerly considered to be very irregular, thus ensuring that the program cannot follow its opening book very deeply and will be thrown back on its own resources early on. I expect that that will have the effect of making the program put a lot of its pieces on not quite the best squares. And then I will just build up my position very slowly until the program has compromised itself.

Qwer: What will happen if you are badly beaten in the first game?

Lewy: I imagine the effect on my morale will be disastrous. The first game is really of enormous psychological importance, because if I win and I win comfortably then I will be very confident, and I will play very very well for the rest of the match. Personally I think I will destroy it.

THE SECOND PHASE OF THIS INTERVIEW WAS MADE AFTER LEWY HAD PLAYED AND WON HIS MATCH AGAINST CHESS 4.7

Qwer: Since we did the final part of the interview you have played the match. Did things turn out the way you expected?

Lewy: Well, I had a tougher time than I thought I would, particularly in the first game. I had a real surprise, because I overlooked the possibility that the program could develop an enormously strong attack against my king by sacrificing a knight. I had supposed that I could sacrifice the knight, but I thought that the sacrifice was completely unsound and useless. When the program made the move that sacrificed the knight and I made the capture, it immediately replied with a crushing follow-up move that I had totally overlooked. To add insult to injury it then sent me a message saying, "Thank you that was easy." At this point the program was in a strong position,

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though laser managed to tickle and wiggle out with a draw.

Orni: There's not much doubt, is there, that things are improving substantially and fairly rapidly in computer chess?

Levy: Yes, I think that is clear. Certainly the area of tactical chess, which I mentioned earlier, is the forte of the best program. I was really surprised to see that they could outthink me tactically in a number of situations. By the way, in the fourth game of the match, when I was confident that I would win the whole series, I decided to experiment and to see whether I could completely change my strategy and play the program at its own game. I tried consciously to analyze along concrete variations and to ignore strategic concepts altogether. But each time I thought that I had come up with a variation that was winning against the program, it would see one step further and it was able to wiggle out. Eventually we got to a situation where I completely overlooked a check that the program promptly made, and it beat me. Of course this was fantastic, because it was the first time ever that a computer program had won against an international master in a serious game.

Orni: But in fact you were more troubled by the forced draw at the beginning?

Levy: Yes, that is true. When I saw the knight sacrifice on the board in the first game and the follow-up move, my first reaction was, "My goodness, this is dreadful—

the thing is beating me!"

Orni: What do you think the programmers will have to do to improve the standards of computer chess even further?

Levy: The great world chess champion Emanuel Lasker once said that it is not so much playing the objectively best move that is important as playing the move that is the most undesirable for a particular opponent. I think that computer programmers have not yet given enough thought to this particular aspect of computer chess. In the long run, what they must try to do is to work along the lines of developing a program that imitates human intelligence. A big thrust here might come from people experimenting with chess programs on home computers and microprocessors. People working with smaller, slower computers may have more chance of producing a really outstanding program, because they will be compelled to try to produce programs which imitate humans rather than programs that run on the giant systems. If you have enormously fast computers and unlimited storage, then there is really no temptation to write intelligent programs.

Orni: Can we move now to the future, and the OMNI-Levy Challenge? When do you expect that a program will finally beat you in a match?

Levy: Difficult to say. I started off at the end of the match in Toronto thinking three years was about right, but now I'm inclined to think five. The best program was CHESS

4.7, and with each advance in strength its number gets higher. I think CHESS 5 will be only a bit better than CHESS 4. CHESS 6 will get closer to me, but I'll still be in control. I would guess that CHESS 7 will beat me.

Orni: Let's move beyond that, learn international masters like yourself up to grand masters and ultimately up to the championship. What is your rough prognosis of future events?

Levy: The higher you go in chess, the more difficult it is to win. For example, although there are probably only five hundred people in the world who are stronger than I am, I can beat the man in the street almost as easily as Karpov can beat me. The problem of going from me to Karpov is very very substantial. On the other hand, progress in science and in particular computer science is very, very fast. My feeling is—that sounds a bit illogical—that although it is more difficult to progress in chess the higher you go, once a program can beat me consistently, I don't think it will be such an enormous jump before it can beat Karpov. A lot is going to depend on whether the approach of later programs is to make them generously intelligent or just to improve the bloodsucking technique.

Orni: By launching the OMNI-Levy Challenge, you are contributing in a significant way toward the development of artificial intelligence. Does this worry you?

Levy: When I was a bit younger it did, but one can only hope that mankind will be sensitive enough to keep any undesirable side effects under control. One might even hope that by getting advanced machine intelligence, we could get the world out of the mess it is in right now. My guess is that in the end intelligent machines will make life more pleasurable for a very large proportion of the human population. And, believe it or not, I think they will make the world more interesting than it is at present. ☐

David Levy has provided Orni with a detailed commentary of one of the games of his celebrated chess match held with CHESS 4.7 in Toronto in the fall of 1978. For a copy of this commentary write to CHESS COMMENTARY, Orni Magazine, 908 Third Ave., New York, N.Y. 10022. Please include a stamped, self-addressed envelope.

In order to stimulate interest and to encourage further research in the field of computer chess, Mr. David Levy has decided to offer a prize of \$1,000 to the programmers of the first computer program that wins a match against him. Orni has agreed to augment this sum with an additional \$4,000, making the total value of the OMNI-Levy Prize \$5,000.

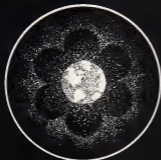
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FORUM

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totally physical means of mobility and will be able to travel anywhere within an instant, without regard to the limitations of classical time and space. At least, I envision the use of Star Trek-like transporters, and we will eventually surpass the need for these.

We will be capable of colonizing Mars by 3000, but why would we want to? I ask you and other great thinkers not to sell the human race short. Let's stop constructing the future with artifacts of today's technology.

Jerry L. Brookhurst
Sunnyvale, Calif.

Back-to-Back Photon Sails

Project Orpheus and the possibility of going to Alpha Centauri (Orion's First Starship—January 1978) is exhilarating, to say the least. But why should interstellar travel be difficult? Could it be that our understanding of time is all wrong? Perhaps our method of measuring time is still in the Dark Ages.

The hurdle of interstellar travel may not be the distance between stars but the time system we use. Are we caging ourselves in or dragging our own tentative, self-made anchors?

Since I am not a scientist, nor do I pretend to even begin to understand scientific ideas, my "flights of imagination" may sound very basic, but please bear with me on the following.

Or Forward's "photon sail" makes sense—up to Mr. Norem's idea for slowing down the ship. Dragging two long electrically charged wires? This sounds odd. Think how our grand interstellar ship would look to the inhabitants of Barnard's star system! Why not have instead a double, back-to-back sail with another set of lasers or light beams at the front of the ship to turn on automatically when the ship nears the area of its destination? Wouldn't this create a reverse thrust?

Or what about building the lasers and using them to charge already present particles in space and create a thrust? The particle collector would attract the space elements and store them and, when an appreciable amount was gathered, the beams would ignite the particles and thrust them out the thrust bays. Presumably the ship would move forward.

L. K. Gordon
Columbia City, Ind.

Models of Time

After reading Paul Nahar's "Newton's Gift" in the January issue, I was pleased to find one more person who shares my viewpoint that the past is past and that if time travelers of our future are to travel into our past, they will already have done so—the past is unalterable.

Immediately subsequent to reading Nahar, I turned to Tony Hakkinen's "New is the case

Beautiful" wherein Zodiak manages to build a three-dimensional representation of the first four dimensions, based on the assumption that if three dimensions can be represented in two, four can be represented in three. I have tried to do this many times myself but have always failed. Only now have I come up with what I believe to be the reason for my failure and the reason why I find Zodiak's last a little too far-fetched:

When going from one to three dimensions, each successive step is spatial, from line to plane to cube. But the leap to the fourth dimension is temporal, not spatial (as I understand it) and therefore qualitatively different.

Our perception at present is temporally limited, in that it can only have input coincident with the fourth dimension. It is only by the fourth dimension that we are allowed to perceive three dimensions. Subsequently it is only logical to conclude that a three-dimensional representation of four dimensions hinges upon an understanding of the fifth dimension, whatever that may be. By subjecting our perceptions to the relative framework of the fifth dimension we would be allowed to remove ourselves from the limitations of the fourth dimension, thereby perceiving all four dimensions at the same level of objectivity at which we now perceive the first three dimensions. Only after having perceived the fourth dimension at this level of objectivity would it be possible to consider representing the fourth dimension in three dimensions.

I am writing this, not necessarily to say that Hakkinen is wrong, but to find out if there are any obvious flaws in my reasoning, or more likely to find out that "my" idea is indeed an old one.

Robert Lawson
Toronto, Ont.

Ben Bova replies: It would help to clarify things if you thought of a fourth dimension, rather than the fourth dimension, to mathematicians there can be as many dimensions as you please—all of them spatial. Remember, mathematicians need not represent the actual physical world; that's how Riemann and others could come up with geometries in which parallel lines meet.

Considerations of time as a dimension belong to physicists and cosmologists, not to mathematicians.

And please remember also that Zodiak was considerably advanced, mentally, over ordinary human beings. He could construct a four-dimensional model easily. So can you, merely by building a cube within a cube. It won't look any more four-dimensional than a drawing of a cube or an X-ray really looks three-dimensional, but it will do an acceptable model.

Back to the Web

I was very disappointed to read in Lyell Watson's article "Lifelines" (Orion, November 1978) the old wives tale that a mother and a child exchange blood. Just

as our food is not rejected by the immune system because it is physiologically outside our bodies, so a fetus is for all intents and purposes living exterior to its mother. One of the major functions of the placenta is to maintain this separation. Protein molecules much less blood cells cannot pass across the placenta.

Dr. Mikal E. Salvet
Berkegh, N. C.

Lyell Watson replies: At no point in my new book *Lifelines*, nor in the extract from it published in the November Orion, do I ever suggest that mother and child exchange blood across the placental barrier. As a biologist, I know the facts as well as Dr. Salvet. But as an open-minded scientist, I find it difficult to be as definitive as he of "old wives tales."

There is something very peculiar going on back in the womb.

Mother and child, though very much attached, are two unique people, and their ability to remain grafted together for nine months presents a major and as yet still unsolved immunological mystery. The fetus's privileged position in not being slaughtered off like some skin graft by the mother could be due to one of three things: lack of antigenicity of the placenta, anatomical isolation from the mother, or the immunological inertia of the mother. All three are possibilities, but unfortunately the placenta is antigenic; there is no question of the fetus's being anatomically isolated, and there is ample evidence that the mother is not immunologically inert.

In other words, either pregnancy is impossible or we need a new approach to restore our faith in the system.

To highlight this extraordinary dilemma, I chose to quote the chairman of the department of obstetrics at a major university who refers to pregnancy as "short-term parasitism" and speaks of a "chronic and covert exchange of blood."

Dr. Salvet seems to have missed or to have misunderstood the allusion—something easily enough to do in a brief article in the magazine. I continued an article of old wives (and new ones) who do, after all, have firsthand experience of this phenomenon. **DD**

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EARTH

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pulled a blanket from a dead warrior and pined in the final attack. Later, finding an opportunity he slipped away. We passed over the confluence of the Little Big Horn. A small patch of lawn and trees marked the spot where Duster and his men, all but Curly, died for our sins.

We flew over Rosebud Creek, passing into the Northern Cheyenne Reservation. Ahead were red sports buttes and they began the modern history lesson. Sooria results from old coal fires under the earth and it forms a distinct pinkish stratum at the top of each butte. The buttes flag coal deposits. There are 43 billion tons of coal deposits, low-sulfur, coal under Montana. It is the enormous energy resource that the Yellowstone River controversy is being played against. A new Indian war is being fought between the Northern Cheyennes and the mining companies. The Cheyenne reservation has "pristine" air quality and the Cheyennes charge that development of the deposits designated colstrip units three and four will destroy that.

We flew over the long pit of the Peabody coal mine. Beneath the pale soil of the overburden the stratum of coal looked very black. The great crane of the dragline minuscule from this height, was swinging its task, and dust spilled from its shovel. The Peabody pit is a small hole in a vast landscape, but strip-mining is only just beginning in Montana.

We flew over coalstrip one and two. Beneath us now were surge ponds, vital to the hydrology of coal mining. The ponds were full of water pumped up from the river.

Finally we reached the big river, the Yellowstone itself. We turned westward and headed upstream. We were now, LARRY PETERMAN said, over wild river. He pointed out sections where the river divided to flow through many channels. This braiding was characteristic of unregulated rivers and was a natural flood-control device. In spring, with high water the river found itself into dry side channels—overflow channels—that took up the slack, in a natural river, floods were frequent but mild. Sedimentation during the mild floods enriched the soil for those native plants programmed to handle periodic flooding, yet at the same time it kept agriculture from encroaching on the bottomland, reserving the bottomland for riparian life. Much of Montana's game resides along the state's watercourses. Mule deer, white-tail pheasants, and waterfowl, private to the Yellowstone. On the islands between the braided channels, Canada geese find a measure of protection from predators, and there they breed.

We flew on, and now, in the dry country at the edge of the river were great, perched circles of green. They were creations of contemporary irrigation, a technology becoming increasingly popular in Montana.

The center pivots are provided with water pumped as high as 120 meters from the Yellowstone and as far as a kilometer from its banks. In a thousand years, if our civilization lasts, those circles will be cited as evidence of violation by extraterrestrials. For now, they are just another way to disperse Yellowstone water.

We flew over the rock called Pompey's Mills in which members of the Lewis and Clark expedition had scratched their names. Metewether Lewis, in his journal for April 22, 1805, noted finding some fossils of coal. They "burnt tolerably well and afforded but little flame or smoke, but produced a hot and lasting fire."

We flew over the confluence of Clark's Fork. That branch of the Yellowstone flows through andesite rock and contributes much of the man river's sediment. We passed the settling zone for the sediment. Upstream of that zone the river was clear and the Yellowstone suddenly became one of the finest trout streams in the region. The gra-



This river, for the time being, is the victor.

dent of the river steepened. The mountains of the Bear Tooth wilderness, steep, dark forested, snowcapped, drew closer. Ahead the river had cut a notch through the mountains, and we headed there.

The notch is called Aleraspur. For now the river meanders freely through it, but the notch is a natural dam site, and since 1902 engineers have dreamed of a dam there. Aleraspur Dam if it ever happens, will be fine for industry, disastrous for trout. It will trash the Yellowstone as a free flowing river. We flew through the notch, into the valley behind. Someday that valley may be beneath a reservoir, but for now it is beautiful—some say the most beautiful in Montana—and its name is Paradise.

Aerial perspective is conducive to historical perspective. As we craned back to land, I peered out the plane window and attempted a time-lapse photograph of the meandering. Scanning the country below I recapitulated its history as best I could.

For ages the patterns down on that vast

landscape had not changed. There were the buffalo migrations, flowing in brown rivers over the pale grasslands, then turning with the season and flowing back. Bands of humans entered. They also stuck close to the river. Their movements too were seasonal and from decade to decade changed hardly at all. The rhythms were beautiful but, after several millennia, boring. I, the audience, started to yawn. Abruptly the motion of the humans began to quicken—the Plains Indians had acquired horses—and moments later the army band of Lewis and Clark moved straight across the vastness in their odd, purposeful way. Metewether Lewis stopped to pick up his lump of coal. On his heels came the draglines, ripping the earth open for the black deposits beneath. Floods appeared frequently beside the river, like a wind-whiffed instantaneous webbing of cracks when a stone hits. The pink dots of center-pivot irrigation multiplied explosively a green mosaic of the riverbanks. There was a flash, and the grasslands at the way north to Edmonton in Canada were quilted with rectangles of dryland wheat.

I had an idea of how the scene would play forward. Aleraspur Dam would leap across its notch. Water would back up behind and Paradise Valley would become Paradise Reservoir. A single, controlled stream would exit the dam, and the odd channels of the braided river would wither. Riverside game would vanish like a puff of dust. The surface of the land would peel away a geophysical peonias with draglines the monobots. Coal slurry pipelines and Yellowstone water would flush the deposits east. Once the draglines had stopped away the black beds the overburden would be spread out again in lacustrine hills. We would do their best to imitate the original hill maker, but they would get little things wrong, and their hills would start to erode. Smoke from coal-fired power plants would thicken. Soon it would be difficult to see anything at all. When the smoke cleared, there might be a gray city there, with yellow hoodlums standing on the corners. Or maybe no city at all, just a few small bands of post-ecological warriors, hunched a sluggy landscape dreener than the one on which the movie opened.

It appears I was wrong. In December 1978 Montana made its water decision. The state's conservation districts got most of the water they applied for. Fish and Game got two thirds of the stream reservation it requested for the main stem of the Yellowstone. The river, for the time being, is the victor.

Dam sites, of course, don't go away. Money talks. A one-kilogram cultural trout river wins a final decision over a dragline as weighty as a minesweeper, though the reverse can happen, and usually does. Today the Yellowstone flows, undammed as it had flowed for ages before the arrival of the Sioux, down to its union with the Missouri, and the lawyers for industry plan their appeal. **CC**

SPACE

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physics applies only for things moving at low speeds. For high speeds, Einstein's theory of relativity must be used.)

The so-called laws of nature are really just some of the scientific hypotheses that have been repeatedly tested and well confirmed. The laws are effective models that describe how nature works, to the best of our current knowledge. (Note: This is not to say that our knowledge can't change.)

But seldom does a scientific revolution occur. In physical science it has happened only two or three times since the Renaissance—and always by people who were thoroughly familiar with the field they found they must change. Not my field, bulge with hundreds of would-be revolutionaries.

In attempting to prove their ideas, cranks often send out hundreds, even thousands of letters to scientists and to people less well prepared to evaluate their contributions. Fortunately they are often ignored or rebuffed.

The frequent rebuffs tend to another characteristic of the crank: paranoia. He is sure he is right; that there can be no error that he is one of the rare scientific revolutionaries and that dogma, orthodoxy, stupidity and Establishment intransigence are depriving him of his rightful recognition. One letter I have begun: "The material you will find enclosed is quite correct. The admittance attitude makes a crank uneducable."

Professional scientific journals send any article submitted to them to a panel of referees that evaluates the scientific merit of the article. Often the referees make valuable contributions to improve the paper; other

times they simply reject the article. Sometimes they reject even work of merit. But eventually the good work gets published.

The crank is, of course, rejected by the professional journals. The rejection causes him to take his ideas to more "popular" outlets, and to ones less competent to judge his ideas. Recently a physician concocted an idea that the earth turns because it is a motor. He was published in *The Journal of the Indiana State Medical Association*. He proved he knows little about physical science—and the journal proved it was not competent to evaluate the article. Expertise in one field, even one field of science, does not necessarily transfer to another. An expert in one discipline can be a crank in another.

When the crank takes his case to the public, the public is at a disadvantage. It knows less than the crank about the field but can be swayed by rhetoric and firm demonstrations. If the crank should let out some equations in purported proof, the man in the street is left even farther behind. The public's general lack of a math background also makes it impossible for a real scientist to refute a crank in public. The public understands neither the crank nor the scientist. In addition, the scientist may lose out in the showmanship area, losing the field to the crank.

A further problem is what I call the "thirty-second assertions" effect. Concerning the most persistent and prominent current crank, Immanuel Velikovsky, L. J. Laflair noted almost thirty years ago that "a fairly complete textbook of physics would be only part of the answer to Velikovsky." The crank never reads the textbook because he is sure he is right; the public never reads the

textbook because it doesn't care that much.

Are the cranks ever right? Rarely. There is indeed a dogmatism in science, a reluctance to change an old idea for a new one. And that is good. Otherwise science would be buried in wild ideas and waste much time running after dead leads. A new idea must have some obvious merit, provide an explanation for more than the old one did, and must be testable. It must convince. At the least, it must not tear down a well-tested set of laws to explain one favored thing. And rejection by scientists does not make the crank right.

Scientists are people. You wouldn't think so by watching some science-fiction films but just as in any human endeavor there are in scientific pursuits enthusiasm and ego, politics and polemics. What science has going for it is an orderly way of looking at the world. Science is really a process, not a complete, finished, indisputable set of data. And the process works.

Certainly a scientist's enthusiasm for an idea he has spent his life testing may cause him to reject a newer idea. But it was that enthusiasm that provided the original impetus to his work. If the evidence in favor of the new idea grows, he must either capitulate or be left behind the mainstream of the field. History provides many cases.

So what do I do about crank mail? Usually nothing. When I receive a letter I try to discover if the writer is merely inquiring or if he is trying to importune me with his views. The former I try to answer, the latter I do not. Years of correspondence convince me that debating with cranks is fruitless. I don't try to answer them, but my file labeled "Crank Case" grows larger. Much of it is amusing, so keep those cards and letters coming in folks! ☐

GAMES

ANSWERS TO GAMES (page 144)

1. Ancient Wharves? (Read it pronouncing W as V)
 - See Willie: see or go
 - Forty buets in a row
 - No Willie: oey is trucks
 - What ain't em?
 - Cows and ducks.
2. Odds on Socker: Three. If the first two socks don't match, a third one, whatever its color, will produce a pair.
3. Bear Talk: The lady realized that the cat-downer could not be deaf because he drove her to her proper destination.
4. The Same Soup? The man had called his soup before he rebald the fly.
5. The Ten Foot Dash: It was daytime.
6. The One-Back Jumper: The train went through the tunnel at different times.
7. How Many Kings? One. All of England's kings were princes or dukes, etc. when crowned, with one exception, King James VI of Scotland, who was crowned king of England in 1603.
8. Make a New Word: ONE WORD

9. Measure for Measure: The average Gor klan is 20 feet tall.
10. Caught in the Rain: Professor Zymurgy is bald.
11. The Ship's Ladder: Since the boat continues floating on the water rising with the tide, all 20 rungs of the ladder remain above the water at all times.
12. Family Planning: Two hours and one minute. After one minute, the second test tube is in the same state the first one started in.
13. As the Law: The fourth requirement is that the candidate must be elected.
14. A Man in What? No One's secretary would ask the question "R as in what?" since the listener already knows the letter of interest.
15. Big Dollar: 1,979 dollar bills are worth \$1,979, while 1,970 dollar bills are worth only \$1,978.
16. Get the Bottle Off: Since the beer bottle is already sitting on the rug, the rug is presumably not included in the restrictive class "part of the body or anything else." Thus, the rug is usable as a tool, even if that is not its most common use. Roll the rug tightly from one edge until it comes up against the bottom of the bottle. Gently cap-

- line rolling the rug, with your hands at each end, into a cylinder pushing the beer bottle off the rug as you go.
 17. The Census Taker's Puzzle: The children's ages are 1, 3, 3, and 8. A little trial-and-error figuring reveals that there are 15 distinct quadruplets of numbers that multiply out to 72. Most of these sets have a distinct sum, and if the house number next door had corresponded to any one of them, the census taker could have solved the problem. The fact that knowing the house number still did not give the census taker enough information to determine the ages means that the ages must be one of the three quadruplets that all have the same sum: 15, 1, 2, 6, 6, 1, 3, 3, 8, or 2, 2, 2, 9. That the census taker requested further information indicates immediately that the address was 15. The woman's reference to her oldest and youngest children nails the answer down to only one possibility: ages 1, 3, 3 and 8.
- Answer to the cryptogram in the March *Omni*: We thought that we were introducing into the world an invention that would make future wars practically impossible. —Orville Wright, 1917 ☐

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MUSIC

CONTINUED FROM PAGE 27

there's a whole lot for us to expect in the future.

Check: With a synthesizer like anything else, time is an important factor if somebody has been an electric instrument and really spent time with it, especially the synthesizer guys like Torrita, the Japanese synthesist, or Malcolm Cecil—you listen to their music and you know it's theirs right away. Immediately Bang. Because those guys spend that time doing synthesizer, you can't expect to spend only two hours a week fiddling with synthesizers and come out with much music.

The same goes for amplifiers and loudness. The reason rock groups and, more recently jazz-rock groups—anyone using amplifiers—get so loud is because the people who are making the music are not familiar with amplifiers.

A guy spends hours practicing scales on the guitar but he doesn't spend hours practicing the amplifier. He knows nothing about amplifiers. He just plugs it in, turns it on, and the thing sounds coarse, it isn't honed, it isn't worked with. A knowledge of amplifiers is necessary.

Herbie Acoustics also have a lot to do with practicing. Take a place like the Vanguard [a tiny New York jazz club]. You can hear anyone in the room hear the little sublevel. Because the audience hears the live sound from the instruments themselves. **Check:** To work with complex electronic instruments is a knowledge of the underlying technology necessary?

Check: For me it is, but for many people it isn't. You can learn how to press the key down, know when you see such-and-such a knob it makes such-and-such a sound. You don't need to know why. But I'm really anxious to know why so that I can be more creative with the instruments.

Herbie: At first the technology creates an additional problem, because things you never had to think about before, all of a sudden you have to consider. But just like learning to play the piano or anything else, once you've mastered the technique, then you can go ahead and create on it, have fun with it.

Recently I've started to sing. I'm not a singer, but I've been doing vocals with the help of a vocoder. The vocoder doesn't use the pitch from my voice. It uses pitch from a synthesizer that I'm playing, a mini Moog. It takes the pitch from the synthesizer also the vibrato, the note bending, all that stuff! The vocoder uses only my articulation. It takes it through the synthesizer. And when I perform, I have a microphone that's hooked to my glasses, that's plugged into the vocoder, and a synthesizer strapped to my back. And that's how I'm able to sing.

Check: The difference between electric and acoustic is that electric is still all very new. The piano, on the other hand, is the instru-

ment with hundreds of years of history and scores of music. Unless you want to try some very unusual things, you don't mess around with the basic sound of the piano. You just want to sound clear and in tune, and then go straight into composing and playing and improvising.

With electric instruments, well, there are hundreds of synthesizers, all made slightly differently. So it takes more knowledge of the basic electronics—the how and why of a synthesizer, what components make it up—in order to produce a specific instrumental sound or a combination of instrument sounds. It requires a lot more technical know-how before it begins to feel like an instrument.

At home, by myself, I set up all my keyboards around me, and I program different settings on them and then start to play on them, go from one to another, create a whole bit. But my technical facility in this area is nothing to rave about at this moment. However, in studying, I'm interested in synthesizers and electronic music. I'm building a recording studio, so I'll have to study a lot more to get that together.

The use of electronics to make music is a whole new world. So we have the big new field, with lots of habits of data, without yet having the overall impulses, the big picture. We don't as yet have grand-masterpiece symphonies coming out of electronic music, because the instruments themselves are still being developed.

Herbie: Ironically though a lot of elements in electric music are much simpler than in the music that's gone before. Today's music has simpler chord structure and simpler harmonies than in the past, but the complexity is in the textures, in the jazz of the sixties and before that, the solo was it. The drummer played the drums, the pianist played the piano, the saxophone player laid out unless he was taking a solo or playing melody.

There weren't a lot of textures that you had to deal with like you have to today with synthesizers and percussive instrumentation. Nothing like Weather Report, where Wayne Shorter plays many other things besides the melody and solos. The difficulties in electronic music lie in completely different areas, getting the texture right, finding the right texture spontaneously and inserting it simultaneously. And plus you have to deal with the notes you're playing if you're also playing a melody instrument.

Check: I'm not quite sure what's going on in the music world today, but I know one general attitude that is held by musicians generally—in jazz, pop, and some classical areas—is the idea that it's okay to express yourself. It's okay to take the elements of music that sound good to you and make you feel good, and put them together in a way that you like or answer combinations of instruments that you choose. The word that's used for this is fusion, but it's a phenomenon that never ceases to occur in any civilization, especially if that civilization is getting better rather than worse. **CC**

FILM

CONTINUED FROM PAGE 28

that can be seen to show a desolate landscape and a couple of people swaddled in thick clothing...

"The medieval look of the film came out of practicality rather than anything planned. We weren't looking for it, but after we eliminated certain things because of the given situation, what we were left with looked medieval.

"A game of some sort was always in the story. It was going to be played in taverns and rooming houses in our initial concept, a tic game or a dice game familiar to whatever culture they were living in. The name 'Quarrel' came out of the number of players, and only took on more significance later when we laid out the future civilization."

The number 'five' played a major part in shaping the lost civilization that Altman's characters belong to. This is seen most clearly in the 'information center,' a sequence of the film where Newman goes to locate the whereabouts of his brother. "We figured that each of the cities in the future contained five million people," Altman noted. "Each city is shaped like a pentagon, with five sections in it, each of which is also pentagon shaped. Each section has five levels, and the center of each city is a large park. Then, connected by trains at equidistant points would be five more cities that would make a pentagon of the train line. That 'pod' would be connected to another system of ones so that the world would be made up of pentagons."

The advanced civilization had begun to die long before the film starts. "We figured the culture was down to the point where the only power left was steam," Altman said. "What electric currents were being carried were very low-level, so the light bulbs burn only dimly. The food was down to the point where it was mostly fish. The dogs represented almost religious icons that had been allowed to develop as scavengers, because it's very hard to bury people when you can't dig holes in the ground. Consequently the people would not eat the dogs nor wear the dogs skin. It all added up to an almost primitive society. The people aren't afraid of the dogs, and the dogs would never attack anything that's living."

The dogs and the game were originally intended to show a strangeness about the culture we were exploring. The pack of dogs would be roaming the streets, kind of intimidating, while the game was to be like dominoes or backgammon, something that people played all the time in taverns.

"The game is very valid and quite good. In fact, but there is absolutely no way to explain the simplest game in a film. Going back to California Split, one can't show people how to shoot craps, so you're better off not to make the audience feel that if they don't understand the game they won't be able to follow it, because they'll turn off to it."

The game does have rules, all of which work, but there's no way to explain that to an audience. I tried to give the audience the sense that the film is a game within a game and it probably has the same rules as *Quintet*. Like the game, there is killing order, so that there's a sense of the direction the killing is taking.

A number of Altman's films have dealt with games and gambling in one way or another, from the football game in *M*A*S*H* through *McCabe and Mrs. Miller* and *California Split*. I asked the director what sort of gambling he did himself. "Sleek gambling. I'm a sick gambler. I confine it now to a little football betting and a lot of backgammon, but I'd bet on any kind of action. I have a philosophy about gambling. I think it's a total part of everybody's life. Whether people know they're gambling or not, they really are. Every choice you make is the same decision someone who's gambling makes.

"The gambling in *Quintet* expresses a lot about the way I look at things. Everybody has his own way of making metaphors. Apparently I find gambling to be a nice metaphor for many, many things. Making films is essentially gambling on one's taste and talent. I'll sit back and decided not to make a film, that would be the most foolish gamble of all. There's nothing to lose that way, but there's also nothing to win.

"It's a strange phenomenon, because winning is not really the emotional drive. Losing is. Asking is where the fun is. Winning just means you have more chips to play in the game longer. Winning dissipates your energy, makes you lose your passion. You do something because you're not sure it can be done. That's essentially where the Altman film comes from. How can I allow this idea or fancy of mine in a way the audience has never thought of it before?"

"I guess I do films first because the idea appeals to me, and second because it seems difficult. I did *A Wedding* because I thought it would be interesting to do a film that all takes place in one day in one house with forty-eight people in it. We settled on the forty-eight people because we had twenty-four in Nashville, and I wondered if I could handle twice that number on one stage at one time. That was the reason for making the film. *Quintet* grew from a different source, but it was essentially: Can we make a film work on the science-fiction level without getting into hardware? I always set certain limitations on each project and don't allow myself to go beyond them. That's part of the challenge of making the film, and that's where the gambling comes in. If I made it too easy the gamble would be reduced, if everything falls into place and there are no problems, then the picture ends up looking like it. As long as I can set an impossible goal for myself, it isn't the achievement of it that matters, it's having gotten as close to it as I could within the limitations I set for myself. It's scary when I ask myself, How did I get into this, can I pull it off? It forces me to be creative. **DD**

NEXT OMNI



ROD DENZ



FEYNMAN



CRABTREE WITH



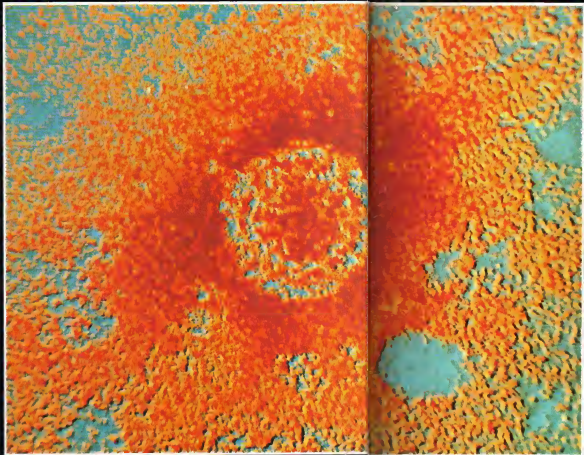
WILLIAMS ON BOARD

THE CYBERNETIC WAR—Welcome to World War II—the Cybernetic War created by machines for machines. The soldiers in this conflict are of course computers and by 1999 there will be roughly one billion of them either on or orbiting the planet. The animals of the Cybernetic War are stocked with cruise missiles, MIRVs, and smart bombs, its battle plans utilize such tools as robotics, pattern recognition, coding and game theory, cryptography, and simulation. All depend upon one superweapon: the indelible, self-repairing computer that, paradoxically, is also the best hope for human liberation. We've programmed the full story for the May *Omni*.

CHEMICALS FOR INTELLIGENCE—Feeling dumb these days? What if you could take a pill that would increase your ability to learn, or a quick squirt from a nasal spray that has been proven to improve memory? Although smart pills and memory sprays sound like dreams from a distant future and like the stuff of science fiction, researchers Sandy Shakovics and Dark Pearson claim that such things are available now—some of them right at your local drugstore. They are called psychopharmacaceuticals, and you can find out what they are in the next *Omni*.

INTERVIEW: RICHARD FEYNMAN—Not long ago *Omni* editor Frank Kardinig asked a number of leading scientists who they felt was "the smartest man in the world." By far the man most cited for this perhaps dubious distinction was the five-time Nobel physicist Richard Feynman. Feynman joined the Manhattan Project at the tender age of twenty-four and held his own among the world's most eminent nuclear scientists. Seven years later he won the Nobel Prize for unifying quantum theory and electromagnetism. In the exclusive interview Feynman talks about the special kind of "prejudice" needed for frontier work in science and reminisces about the days when he sat in his basement drawing the "furry pictures." And, as today the routine tools of high-energy physics. Meet an unconventional mind, perhaps the most powerful and provocative in twentieth-century science, in the next *Omni*.

FED STAR IN ORBIT—The first space colonist is already an adult, and although he or her identity is unknown, a good guess can be made about the nationality—Rus said. "We believe that permanently inhabitable space stations with interchangeable crews are going to be humanity's main road to the universe," said a top Soviet space official recently in the next *Omni*. Frequent contributor Jim Oberg presents an in-depth look at Russian plans to colonize space. In next month's *Omni*, you'll also find a rare gallery of Soviet space art as well as an excerpt from a new novel by the celebrated Russian engineer and science-fiction writer Vladimir Sazonenko.



PHENOMENA

The first use of "postcolor" in the electron microscopy of hepatitis is dramatically displayed in this picture by S. H. Cook, Jr., of a hepatitis-type-B viral particle.

Hepatitis type B is one of two forms of the disease, usually contracted by the patient's coming into contact with a contaminated object, such as a hypodermic needle. (Type A is contracted from food-borne viruses.) The infectious form of the type-B virus is known as a Dane particle and has a diameter of forty-two nanometers, or forty-two billionths of a meter. The magnification of this particular particle is X 160,320.

Postcoloration is an enhancement technique used to create color photographs from black and whites. Electron microscopes provide only black-and-white images; often, portions of the virus, such as its outer coating, are virtually indistinguishable. To bring out all of the detail in the Dane particle, Cook processed the original photograph through red, blue, and yellow filters. □□

Watch out for
spraying flowers

GAMES

By Scott Morris

It's April again, and this month's games are in the seasonal spirit of the 1st. You're required to carefully examine each one. Beware of spraying flowers—things are not always as they appear.

1. **ANCIENT WRITINGS?** Our dead-language editor recently uncovered the following Lãinoid poem. Try to decipher it. Cwile so ergo.

Forbus es nato
Nivle desu hux
Wãd ñem cãuãd ður

2. **ODDS ON SOCKS** A dresser drawer contains 10 black socks and 15 blue socks, randomly assorted. You want to take out a pair of matching socks, but the room is too dark to see them. What is the maximum number of socks you will have to remove from the drawer to be certain of having a matching pair?

3. **TALK TALK** In his new little book *Aha! Insights*, master gamesman Martin Gardner tells the story of the talkative high-strung woman who hailed a passing taxicab in New York City. On the way to her destination, the lady talked so much that the driver got quite annoyed. He said, "I'm sorry lady, but I can't hear a word you're saying. It's deaf as a post, and my hearing aid hasn't worked all day. When she heard this, the lady stopped yacking. But after she left the cab she realized that the cobby had lied to her. How did she know?

4. **THE SAME SOUP?** A man found a dead fly in his soup and complained loudly to the waiter. The waiter apologized and took the bowl to the kitchen. He returned with what apparently was a new bowl of soup. A moment later the man angrily threw away, called the waiter over and shouted, "How dare you try to fool me! This is the same bowl of soup I had before!" How did he know?

5. **THE TEN-FOOT DASH** Little Tommy Timfield is afraid of the bogeyman. Yesterday he turned off the light in his bedroom and managed to get to his bed before the room was dark. He did not use a string of a stick to flip the switch from a distance. How did he do it?

6. **THE ONE-TRACK TUNNEL** Two train tracks run parallel except for a stretch where they go through a tunnel. The tunnel

is too narrow to accommodate both tracks, so they join to become a single track for the distance of the tunnel. One afternoon a train entered the tunnel going full speed in one direction, and another train entered the same tunnel, racing in the opposite direction. Both trains were going at top speed, yet there was no collision. Explain.

7. **HOW MANY KINGS?** Approximately how many kings (within 10 percent) have been crowned in England since the Norman Conquest?

8. **MAKE A NEW WORD** Take the letters in the words **NEW DOOR** and rearrange them to make one word.

9. **MEASURE FOR MEASURE** The planet Gok is inhabited by a race of giant creatures. If the height of the average Gokean is 10 feet plus half his own height, how tall is he?

10. **CAUGHT IN THE RAIN** Professor Zyrnaly was caught in the rain without an umbrella. There was nothing over his head, and his clothes got soaked. Yet not a hair on his head got wet. Why?

11. **THE SHIP'S LADDER** At low tide a ship is moored in a harbor with a rope ladder hanging over its side. The rungs on the ladder are 1 foot apart, and there are 20 of them above the water line. Assume that the tide comes in at a rate of 6 inches per hour. How many of the ladder's rungs will be above water at high tide: 6 hours later?

12. **FAMILY PLANNING** An amoeba divides and reproduces itself every minute. Two amoebas in a test tube can fill it to capacity in 2 hours. How long would it take 1 amoeba to fill another test tube of equal capacity?

13. **IT'S THE LAW** According to the US Constitution, there are 4 requirements a person must meet to legally become President of the United States. The candidate must be: (1) at least 35 years old; (2) born in the United States; and (3) must have lived in the United States for at least 14 years. What is the fourth requirement?

14. **RAS IN WHAT?** There is something logical about the following telephone conversation. What is it?
"Good morning. Omicron magazine

"May I speak with your games editor?
"I'm sorry he's in conference. May I tell him who is calling?"

Yes. This is Walter Epsilon. Mr. Morris knows my phone number.
"I'm sorry I didn't catch the last name. EPHRAM. E as in energy, P as in potassium, H as in heinz, R as in rhomboid—"

"Excuse me, sir, but R as in what?
"R as in rhomboid. A as in asteroid. M as in moon. Epsilon."

"Thank you, sir. I'll give Mr. Morris your message and have him return your call."
"Thank you."

15. **TOP DOLLAR** Why are 1979 dollar bills worth more than 1978 dollar bills?

16. **GET THE BOTTLE OFF** An open full bottle of beer rests in the center of a small throw rug. The problem is to get the beer off the rug without touching it with any part of your body or anything else. How can you do it without spilling any of the beer?

17. **THE CENSUS TAKER'S PUZZLE** Here's a tough one, but no fooling—there is enough information given to solve it. A census taker asked a housewife how many people live in her house and what their ages are. The woman, an avid OMNIGAMES reader, said, "I have 4 children and the product of their ages is 72."

"I can't tell from just that," said the census taker. "There are many sets of 4 numbers that can be multiplied together to make 72."

The sum of the children's ages is the number of the house next door, the woman said.

The census taker became determined to solve this problem. He went next door to look at the number of the house. A few minutes later he returned, telling the housewife that he still didn't have enough information to determine the 4 children's ages.

Well, "the woman said, "I can tell you that my oldest child is in school and my youngest is upstairs taking a nap."

That's better," the census taker said, writing down the 4 ages. "What are the children's ages, and how did the census taker know?"

(Answer's page 138)

OMNI COMPETITION #6

The formulation of a problem is often more essential than its solution, which may be merely a matter of mathematical or experimental skill. To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science.

—Einstein and Infeld, *The Evolution of Physics*

When I first learned about Pavlovian conditioning, I wondered whether it could work with plants. Could a Venus flytrap's snapping reflex be conditioned to react to some stimulus other than touching the hair trigger? Ultraviolet light? Change in temperature? Vibrations? Could I demonstrate learning in a plant? That would revolutionize biology at its most basic level—and I'd be world famous.

I called a local flower shop and asked if they had either Venus flytraps or *Mimosa pudica* (whose leaves shrivel up protectively a fraction of a second after being touched). "I don't think we stock those," said the puzzled clerk. "Do you have any of the other so-called sensitive plants?" I asked. No response. I'm looking for something that gives a quick reaction when you touch it. How about a cactus?" the clerk said.

This month's competition is about that great idea you've had but never followed up on. It's about that brilliant insight you shared with a few friends, jotted down and then filed under "Things to Do Someday." It's about your partly baked ideas.

Dr. J. J. Good, when Omni interviewed in the January issue, once reasoned that there was a great untapped resource in scientists' partly baked ideas. These ideas are usually dropped because the originators have too much else to do. They don't have the connections, staff, or time to base the idea fully, especially if it is in an area outside their "professional expertise." Furthermore, Good supposed, because there is no accepted place to publish a conjecture or an incompletely thought-through idea, it is liable to get lost unless its partly or drunken originator

gives it away free in conversation. Thus the lack of a medium of publication acts as a disincentive even to the verbal dissemination of good ideas.

Good decided to tap the partly baked idea (pb) resource. He sought out top scientists and writers, asking them to send in their wildest speculations, their modest proposals, and their ideas too tentative to even consider submitting to a professional journal. The response was an amazingly diverse amount of pb's, which he edited and published in 1962 as a delightful anthology, *The Scientist Speculates* (available in paperback from Copicorn/Pulnam). In it, some heavyweight scientists offer intriguing speculations, often on unexpected topics.

• Agronomer Fred L. Whipple presents thoughts on the possible inheritance of food preferences. There is a compound called PTC that many people say has a bitter taste, while many others can't taste it at all. The ability to taste or not taste it seems to follow Mendelian ratios—i.e., the ability is inherited. Whipple gathered some informal data on food likes and dislikes. The data suggested that PTC tasters may enjoy certain cooked foods such as cabbage, brussels sprouts, and cauliflower, while nontasters (such as himself) tend to dislike these foods. Perhaps because some people are "unable to detect the interesting flavors of these foods, they are left largely with the sulphide flavor." His little study should be done on a larger scale, he suggests, with careful measures of tastings and posttests and a long questionnaire on food preferences. The result might show that many of the food preferences and flavor inclinations that people express are not primarily the result of conditioning in childhood by good or bad associations, but actually represent inherent differences in the taste sensitivity of most individuals. Know their taste class, producers of processed foods could label their foods accordingly.

• Arthur Koestler speculates on a new way of classifying emotional peevesses and offers a new approach to the question of why hearing one's own recorded voice for

the first time is, for many, such a foreign and disturbing experience.

• Isaac Asimov notes how difficult it is to conceptualize infinitesimally short units of time, as physicists do when comparing the half-lives of subatomic particles that last only a billionth or a trillionth of a second. Asimov proposes a new unit of time, the light-osc (the time it takes light to travel a mile in a vacuum—about 1/106,263 seconds). He also asks the light-meter: lasts about 1,30,000,000 of a second. To express smaller units of time Asimov explains, it is only necessary to consider light to be covering smaller and smaller distances, even down to the ultimate split-second, the light fermi. This is the time required for a ray of light to travel from one end of a proton to the other.

The Scientist Speculates—isell once a lowly pb—has achieved a high degree of bakedness. The meal was certainly a success and deserves a second serving. With the permission and blessing of the original chef, Dr. Good, we announce the OMNI Competition for partly baked ideas. Send one original pb with accompanying references and illustrations (if applicable). It can be speculation, a provocative question, a suggestion for a novel experiment, an unusual application of a new (or old) technology, an apparent contradiction explained, a new paradox recognized, or a machine that someone should build.

All entries will be carefully read and judged, but because of space limitations only those not more than 100 words will be considered. Priority Pbs (briefer than 50 words) will have an inside track in the running. Submit one entry only, please—take your best shot—and print your name and address on the same page as your pb. Published entries will be paraphrased.

Entries must be postmarked by May 15, 1979. All entries become the property of Omni and will not be returned. First-prize winner will receive \$100. Runners-up (2-10) will receive \$25 each. Send entries to OMNI Competition #6, 909 Third Avenue, New York, N.Y. 10022. ☐

LAST WORD

By Ben Bova

Every action has a reaction. The success of the Civil Rights Movement of the 1960s of, by and for black Americans has triggered similar movements of, by and for other minority groups who feel oppressed: Latin-Americans, homosexuals, Chicanos, Nazis, Puerto Ricans, American Indians, Indian Indians, Asian Americans, women, even members of the Nixon administration—all have marched, demonstrated, nonviolent, gone to court, and/or issued stirring press releases to show how the Establishment has what upon them.

But there is one minority group that has remained silent—it is high time to end this, namely I speak, of course, of that virtually ignored segment of American society, the writers of science fiction.

Perhaps you don't think of science-fiction writers as an oppressed minority. Let me raise your consciousness.

Back in the days when H. G. Wells and Jules Verne appeared in popular magazines, an American publisher—Hugo Gernsback—started a magazine that printed nothing but science-fiction stories. Whether he intended it or not, he created a literary ghetto for science fiction. For more than forty years, science-fiction writers were not allowed to publish their stories in anything but science-fiction magazines (with very rare exceptions, tokenism by the Establishment publishers).

During those dark ghetto years, most Americans ignored science fiction. We don't have any in our neighborhood, so it's never been a problem here. They would say: Smugly. The only readers to buy science fiction with any regularity were highly intelligent teenagers, and you know how rare they are! Critics ignored science fiction. Universities expelled students caught reading the stuff.

Thanks in large part to that smattering of bright teenagers who went on to win World War II, tap nuclear energy, invent the laser and teach the moon, science fiction emerged from its ghetto (partially) in the 1960s. Yet even today, science-fiction writers are largely ignored by the main-

stream of American society or—worse yet—they are glibly called "futurists."

Even today a writer of the stature of Kurt Vonnegut must stoutly maintain that he is not a science-fiction writer, else his publisher will frown and his fans blanch. Do you want to get off jury duty? Tell the court you write science fiction. You'll be teleported out into the street instantly.

And the great American educational system (commercial television) hasn't helped at all. Most Americans think science-fiction writers look like Mr. Spock—except for Isaac Asimov, who they think looks like Robbie the Robot.

Moreover, the long history of repression has resulted in distortions of the public's view of the real world. For example, the United States government has convinced the American taxpayer (and the world at large) that it takes billions of dollars and a team of thousands of scientists, engineers, and technicians to send astronauts to the moon. This is clearly nonsense, as a glimpse at any science-fiction story written in the 1930s will show. All you need is a brilliant (though eccentric) lone scientist, who has a beautiful daughter, a two-footed young male assistant (preferably six feet tall or over), and a large backyard. The rocket can be built within the span of 20 pages or so and is perfectly capable of taking such a three-person team to the moon. We must admit, however, that sometimes the brilliant (though eccentric) scientist makes a slight miscalculation and the rocket goes to the planet Venus instead.

Scientists such as Carl Sagan—who even professes a love for science fiction—have consistently ignored the advice of science-fiction writers and greedily endangered the future of our planet. As any good science-fiction writer will tell you, when you meet an alien race in the depths of interstellar space you never tell them where the earth is located. The aliens might be hostile or hungry or just plain nasty. You certainly wouldn't want them to know where your home planet is.

But what have Sagan and his fellow scientists done? On every Voyager and Mariner spacecraft that they send

wizzing out beyond the solar system, they place a carefully etched map showing exactly where we are. Alongside the map is enough information to convince an aggressive alien race that our women are beautiful and our men defenseless. This kind of blind pride is the result of a prejudice that has kept science-fiction writers at the bottom of the socio-literary ladder.

It is time for science-fiction writers to put an end to this prejudice and to demand what is rightfully theirs! An agenda for achieving justice for science-fiction writers must include, as a minimum, the following nonnegotiable demands:

1. Equal pay for equal work. If Mario Puzo gets \$3 million for a novel, science-fiction writers should get \$3 million for their novels.

2. Return of confiscated territories. The World Future Society, the Committee for the Future, the Office of Technology Assessment, and all other "futurist" organizations set up by scientists, politicians, and/or industrialists must be disbanded. The future belongs to the science-fiction writers. They invented it. They popularized it. These so-called "professional scientists" stole it from them.

3. Reparations. Since science-fiction writers have been forced to work for cookey wages until just recently (the first issue of *Omn* is a good benchmark by which to date their liberation), American society must make amends for all those years of malign neglect. For starters, all university courses in science fiction must be taught exclusively by bona fide science-fiction writers. The charlatans who now teach these courses should be returned to their English departments for recycling.

4. Education. A nationwide campaign must be launched to raise the nation's consciousness about science-fiction writers. The term is it must be rooted out.

There is more to come. This time is ripe. Science-fiction writers of America, unite! We have nothing to lose but our status as secondary citizens. We have the world to gain. (Plus royalties, pensions, paid vacations, etc.) ☐