

SPECIAL ANNIVERSARY ISSUE

02484

CONQUI

OCTOBER 1986 \$3.00

LONGEVITY:

**EXCLUSIVE REPORT ON
YOUTH PILLS
LASER FACE-LIFTS
BORN-AGAIN GENES
SOULS ON ICE
ARTIFICIAL SKIN
SURROGATE BRAINS
AND MUCH, MUCH
MORE!**

**WIN
A
TRIP
TO
OUTER
SPACE
(HONEST!)**



02484



FIRST WORD

By Kathy Keaton

• *Rather than spending millions on studies forecasting a bankrupt Social Security system, the government should channel this money into longevity research.* •

Throughout history we've accepted the inevitable passage of aging, letting our tiny, delicate, frail impulse to slowly exhaust the once vital body to compromise the once active brain. Frankly, we've had no other choice. But soon we may be able to trade the years of debilitating illnesses that we now face for decades of productive health. Across this nation, a group of daring scientists has begun to challenge one of the most basic tenets—that all of us must die.

The burden of finding a cure for the disease called old age weighs heavily upon their complicit shoulders. These brave and visionary men and women are forced to wage two distinct battles: one against old age, the other against insufficient funding. The medical establishment, displaying a naivete so typical of the profession, has long cast a skeptical eye on the field of life extension, and financial backing for even the most conservative of longevity scientists is hard bought. Unfortunately, aging has always been the stepchild of medical research. In 1985 the National Institutes of Health spent \$1.1 billion on cancer studies, \$770 million on cardiovascular disorders. Yet the National Institute on Aging had just \$61 million in its coffers for the most fundamental research on aging. And there's little indication that such funding will increase greatly in the future.

Our gains in life expectancy—from 46 years in 1950 to 71 years in 1995 for the average American male—result from advances against disease rather than the aging process itself. Though these advances have been appreciable, only 86 percent of people over the age of sixty-five suffer from at least one chronic degenerative illness. The cost is staggering, both for individuals and for society. The United States spent \$387 billion on health care in 1994. One-third of this went to care for the elderly. Medicare and Medicaid spent \$49 billion on the aged.

In the year 2030 the elderly will need three times the hospital care they used in 1980. Nearly 2 million will live in nursing homes, up from 1.2 million six years ago. In all, we'll spend \$200 billion a year on health care for the aged. If we continue on our present path, how will we cope, both in economic and social terms, with the fastest growing sector of the population, those over sixty-five? How will we function when a large percentage of our people are living on pensions?

It's clear that politicians are blind to the needs of the future. Instead of spending millions of dollars on studies forecasting a bankrupt Social Security system, they should channel this money into longevity research so that people, even at the age of one hundred and older, would be able to lead fulfilling lives with bodies that are still biologically fit and minds that continue to thirst for knowledge.

Indeed, antiaging breakthroughs act as the only realistic solution to the dilemma

now confronting a maturing American society. Aging, through a series of steps including hearing, lung function, reflexes, and memory, gerontologists can determine biological age, which is, in essence, a measure of how much and how quickly an individual's body has aged. Most consider this an important step in the quest for longer, healthier lives. Other critical breakthroughs are sure to follow. Pioneers like Ray Wolford, author and proclaimer at UCLA, are searching for those few suspected "superagers" that may control the aging process. Other scientists like George Washington University's Alan Goldstein, are focusing on the thymus gland, the immune system's master gland. Some gerontologists believe that thymus may protect us from the diseases of old age. For more radical experiments, under way involve transplanting brain tissue. Someday healthy brain cells may be injected into damaged portions of the brain, rejuvenating both mind and body. Many of these therapies would be employed long before old age takes hold. The most realistic and immediate goal of life extension research is to learn to extend youth.

I strongly believe that one day all of us will hold the power to lengthen our own lives. This philosophy is not new to *Omni* readers—life extension after all, has been one of *Omni's* foremost interests since the magazine was founded, eight years ago. Your keen interest in this topic is one of the significant factors that led us to dedicate our eighth anniversary issue to the quest for immortality.

In the past Bob Guccione and I have funded studies of aging. No doubt we will do so again. But the federal government must now take up the cause that's been too long left to concerned private citizens. Only the federal government can supply money and resources on the scale that modern scientific research demands. This month we begin to provide one additional tool for those who seek more years of health and productivity: a reliable, readable source of helpful information for the layman. This month *Longevity* is born. Guided by a board of leading scientists, our monthly newsletter will interview prominent researchers, report their discoveries, and tell you how to speed the effects of age. The news from today's biochemists, plastic surgeons, and gerontologists is that you can stretch out those years of youth. *Longevity* will tell you how. The right to a long and healthy life should be available to all people; it should be as fundamental as the right to free speech. Only through the sustained efforts of scientists with adequate funds and limitless vision can such a right be ensured. ☐

Kathy Keaton's *Woman of Tomorrow* will be released by St. Martin's Press this month in paperback, as well as in several foreign editions. Keaton is the president of *Omni*.

CONTRIBUTORS

OMNIBUS



ACETON



DAVE OF FUTURE PAST



LIFELINES



RACING WITH THE MOON



WENTRAUB

As part of the 1971 Apollo 15 mission, astronaut James Irwin and David Scott found the moon in Rover, the first car to roam the lunar surface. Fifteen years later as part of *Omnibus*'s special eighth-anniversary issue, readers have the chance to design the next lunar vehicle, built to compete in an imaginary road race called the *Omnibus 2000* ("Racing with the Moon," page 170). The entries, moreover, will be judged by an illustrious panel of experts, including Irwin, Mario Andretti, and Leonard Nimoy. The grand prize passage on *Society Expeditions*' Project Space Voyage, a journey that's literally out of this world. During an 8- to 12-hour ride through low Earth orbit, the winner will experience extraordinary views of the earth and dozens of majestic sunrises.

Not only is the moon buggy contest our most exciting reader challenge ever, but this month's special section—*Longevity*, an exclusive report—reflects the most intensive investigation conducted by *Omnibus* writers to date. We sent contributors zigzagging across the country, tracking scientists seeking the secret of longer life. Researchers spent hours on the phone and buried in reams of paper. The question we posed again and again: Can we extend the maximum human life span beyond the current 115 years? The convincing answer is yes.

For millennia human beings have sought a magical potion that would prolong

youth. It seemed a fruitless endeavor—until now. In "Elixir of Youth" (page 60) writer Ann Guicha Fattner and *Omnibus* senior editor Pamela Wentraub report on hormones that will bolster our immune systems, viruslike vaccines that slow cell death, and even unc acid to prevent the destruction of our genes. By 2066 there may also be life extension pills and enzyme drinks to aid in DNA repair.

"After all our investigation for this story," Wentraub says, "I'm convinced there are very real possibilities to increase life expectancy by at least another fifteen years. And it'll certainly be the first in line for the supplements that will do just that."

Research on aging, however, is greatly underfunded. As a result, many dedicated researchers, such as oncologist Bill Regelson, have looked for ways to build their own capital to finance their work. And they often rely on philanthropist Don Yerborough and others to lend support, according to Texas-born Kathryn Coakley, who profiles these and other determined pioneers in "Death Avengers" (page 84). *Omnibus* president Kathy Axtell (First Word, page 6) also strongly urges the government to underwrite the work in this neglected area of medical science.

Even the most optimistic researchers admit that we will remain mortal beings. Is there no way to cheat death? In "Soup on Ice, Cryopreservation" (page 116) freelance journalist Paul Bagnie and *Omnibus* assistant editor Nancy Lucas discuss the efforts of

cryonicists—those technicians who preserve a corpse in liquid nitrogen in hopes of reviving it at a later time. If some insects, shrimp, and other creatures can do it naturally, they say, it should be equally possible for humans. "I had guys attempt to recruit me for the process," Bagnie remarks. "But I'm still unable to reconcile their relationships with their clients. They talk about the loving rapport during life, especially in the final days before dissection. Then they turn around and nonchalantly decapitate the person, saving just the head, which they say will eventually regenerate another body."

The human body and its regenerative powers are miraculous. In "Sentinels" (page 122) writer Leah Wallich describes how the immune system's antibody warriors combat cancer cells, in "Lifelines" (page 91) *Longevity* newsletter editor Susan Ellis describes how man ages and what can be done to stave off the physical effects of growing older.

There are different ways of viewing the future. Stephen King's "The End of the Whole Mole" (page 72), for example, is a tale of good intentions gone awry. It is King's first original story to appear in *Omnibus*. On the other hand, Ron Miller's "Days of Future Past" (page 76) recounts Collier's magazine's two-year campaign in the Fifties to develop the space program's potential. It's an insightful look backward at a magazine's ability to help influence the future. **OO**

July 1986 \$3.95

Volume 10 Number 7

ISSN 0891-9122

Printed in the United States of America

THE LUPPOT JON

John Deere, Jr. (aka "The Luppot Jon") is a 10-year-old boy who lives in the town of Luppot, New York. He is the son of John Deere, Jr. and Mary Deere, Jr. He is a member of the Luppot Junior High School and is a member of the Luppot Junior High School. He is a member of the Luppot Junior High School and is a member of the Luppot Junior High School.

EDITORIAL

Editor: John Deere, Jr. (aka "The Luppot Jon")
 Assistant Editor: John Deere, Jr. (aka "The Luppot Jon")
 Managing Editor: John Deere, Jr. (aka "The Luppot Jon")
 Production Editor: John Deere, Jr. (aka "The Luppot Jon")
 Circulation Manager: John Deere, Jr. (aka "The Luppot Jon")
 Advertising Manager: John Deere, Jr. (aka "The Luppot Jon")
 Business Manager: John Deere, Jr. (aka "The Luppot Jon")
 Treasurer: John Deere, Jr. (aka "The Luppot Jon")
 Secretary: John Deere, Jr. (aka "The Luppot Jon")
 Receptionist: John Deere, Jr. (aka "The Luppot Jon")
 Mail Room: John Deere, Jr. (aka "The Luppot Jon")
 Post Office: John Deere, Jr. (aka "The Luppot Jon")
 Distribution: John Deere, Jr. (aka "The Luppot Jon")
 Subscription: John Deere, Jr. (aka "The Luppot Jon")
 Single Copies: John Deere, Jr. (aka "The Luppot Jon")
 Back Issues: John Deere, Jr. (aka "The Luppot Jon")
 Reprints: John Deere, Jr. (aka "The Luppot Jon")
 Permissions: John Deere, Jr. (aka "The Luppot Jon")
 Copyright: John Deere, Jr. (aka "The Luppot Jon")
 All Rights Reserved: John Deere, Jr. (aka "The Luppot Jon")

John Deere, Jr. (aka "The Luppot Jon") is a 10-year-old boy who lives in the town of Luppot, New York. He is the son of John Deere, Jr. and Mary Deere, Jr. He is a member of the Luppot Junior High School and is a member of the Luppot Junior High School. He is a member of the Luppot Junior High School and is a member of the Luppot Junior High School.

ADVERTISING AND MARKETING

Advertising Manager: John Deere, Jr. (aka "The Luppot Jon")
 Sales Manager: John Deere, Jr. (aka "The Luppot Jon")
 Production Manager: John Deere, Jr. (aka "The Luppot Jon")
 Circulation Manager: John Deere, Jr. (aka "The Luppot Jon")
 Business Manager: John Deere, Jr. (aka "The Luppot Jon")
 Treasurer: John Deere, Jr. (aka "The Luppot Jon")
 Secretary: John Deere, Jr. (aka "The Luppot Jon")
 Receptionist: John Deere, Jr. (aka "The Luppot Jon")
 Mail Room: John Deere, Jr. (aka "The Luppot Jon")
 Post Office: John Deere, Jr. (aka "The Luppot Jon")
 Distribution: John Deere, Jr. (aka "The Luppot Jon")
 Subscription: John Deere, Jr. (aka "The Luppot Jon")
 Single Copies: John Deere, Jr. (aka "The Luppot Jon")
 Back Issues: John Deere, Jr. (aka "The Luppot Jon")
 Reprints: John Deere, Jr. (aka "The Luppot Jon")
 Permissions: John Deere, Jr. (aka "The Luppot Jon")
 Copyright: John Deere, Jr. (aka "The Luppot Jon")
 All Rights Reserved: John Deere, Jr. (aka "The Luppot Jon")

John Deere, Jr. (aka "The Luppot Jon") is a 10-year-old boy who lives in the town of Luppot, New York. He is the son of John Deere, Jr. and Mary Deere, Jr. He is a member of the Luppot Junior High School and is a member of the Luppot Junior High School. He is a member of the Luppot Junior High School and is a member of the Luppot Junior High School.

ADVERTISING

Advertising Manager: John Deere, Jr. (aka "The Luppot Jon")
 Sales Manager: John Deere, Jr. (aka "The Luppot Jon")
 Production Manager: John Deere, Jr. (aka "The Luppot Jon")
 Circulation Manager: John Deere, Jr. (aka "The Luppot Jon")
 Business Manager: John Deere, Jr. (aka "The Luppot Jon")
 Treasurer: John Deere, Jr. (aka "The Luppot Jon")
 Secretary: John Deere, Jr. (aka "The Luppot Jon")
 Receptionist: John Deere, Jr. (aka "The Luppot Jon")
 Mail Room: John Deere, Jr. (aka "The Luppot Jon")
 Post Office: John Deere, Jr. (aka "The Luppot Jon")
 Distribution: John Deere, Jr. (aka "The Luppot Jon")
 Subscription: John Deere, Jr. (aka "The Luppot Jon")
 Single Copies: John Deere, Jr. (aka "The Luppot Jon")
 Back Issues: John Deere, Jr. (aka "The Luppot Jon")
 Reprints: John Deere, Jr. (aka "The Luppot Jon")
 Permissions: John Deere, Jr. (aka "The Luppot Jon")
 Copyright: John Deere, Jr. (aka "The Luppot Jon")
 All Rights Reserved: John Deere, Jr. (aka "The Luppot Jon")

FOREIGN EDITIONS

John Deere, Jr. (aka "The Luppot Jon") is a 10-year-old boy who lives in the town of Luppot, New York. He is the son of John Deere, Jr. and Mary Deere, Jr. He is a member of the Luppot Junior High School and is a member of the Luppot Junior High School. He is a member of the Luppot Junior High School and is a member of the Luppot Junior High School.

LETTERS

COMMUNICATIONS

Out of the Mouths of Babies

"Cosmic Comets of the Sea" [July 1986] is an intriguing article on an important scientific discovery. When Louis Frank declared to reveal his findings, he knew he might be considered a "nut" by other scientists. But he put his respectability on the line to further science.

I may be only twelve years old, but I really enjoyed the heated debate and was impressed by the way Frank defended his arguments. I congratulate James Ennison on a splendid piece and Louie Frank for his courage and intelligence.

David Brainer
 Winnipeg, Man.

By the Book

I was surprised by Arthur C. Clarke's First Word [July 1986]. I have read most of his books, and I've come to think of him as a person who is not bound by conventional theory. Yet he stated that we know what other life forms will not look like. "If the terrestrial experiment started all over again in Time Zero, there might still be intelligence on this planet, but it wouldn't look like us." In the dance of the DNA spiral, the same partners would never meet again. I don't know why Clarke is setting limits on himself.

Richard Klassen
 NBC Studios
 Winnipeg, Man.

Comrades in Arms

I would like to clarify a misconception left by Jerome Clarke's article "Militant Debuters" [Antimatter, June 1986]. The Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP) does approve of and cooperate with many antiparanormal groups.

Although these groups are autonomous, CSICOP has encouraged their activities when their aims are similar to ours—to examine fairly and objectively the claims about the paranormal. CSICOP recognizes such organizations as A STOP REASON, and TUSKS and applauds their efforts. Clarke is incorrect in labeling them "militant debuters."

Barry L. Karr
 Affiliate Coordinator
 CSICOP
 Buffalo

Whale Watch

The explanations for why whales get stranded on land were not exhaustive ["Whale Suicides," Earth, July 1986]. Toxic waste, sewage, pollutants, and acid rain do affect our oceans. Has any scientist considered the obvious? These magnificent creatures are probably highly intelligent beings and "know" that life in an excessively polluted environment is a fate worse than death.

J. S. Buck
 Benit, Ala.

Stakes of Comfort

I read the article "The Terror of Relaxation" [Continuum, July 1986] with particular interest because I have supervised and taught relaxation techniques for more than 25 years. The results have been positive and sometimes nearly miraculous. Rarely have I had an indifferent or negative response.

I am appalled at the commercial exploitation of instant procedures used by individuals who don't know what they're doing. They read a book or purchase devices for measuring the body's response and then begin to guide other people into the uncharted regions of inner space. When a teacher administers relaxation methods properly, its effects are both beneficial and delightful.

Peggy Genova
 Tucson, AZ

Manne Land

As a marine biology student I appreciated your Mysteries of the Deep issue [July 1986]. The ocean is the next frontier to conquer and will provide needed resources in the future. It is important for the public to understand what marine biologists are accomplishing today. I especially enjoyed the interview with Robert Ballard. He is one of the pioneers in oceanography and should be given the recognition he deserves.

Chris Parris
 Southampton, NY

DIALOGUE

FORUM

We are quickly approaching the day when we will be able to extend our lives through artificial means. Physicians will replace our hearts, our tendons, even our blood vessels, with man-made components. While advances in artificial organ technology are being made every day, do the present risks and enormous costs warrant continued research? Will science ever improve on what nature has bestowed? Is the artificial heart a mere pseudo endevigance? We asked these questions of Dr. Robert Jarvik, inventor of the Jarvik 7 heart, and Dr. Pierre Galletti, who is creating an artificial pancreas.

The notion of replacing a nonfunctioning organ with a spare part borrowed from the animal kingdom (a transplant) or fabricated through human ingenuity (a prosthesis) has been a landmark of medical progress in the past few decades, and man-made organs have a definite place in our lives. Otherwise, why should more than 2 million Americans a year receive a cardiac pacemaker, hip replacement, vascular graft, mammary prosthesis, plastic lens implant, or any of the less celebrated devices that are so widely used we forget their "bionic" character?

I am not concerned about a widespread, misdirected use of the artificial heart. In the short time since the pioneering experiment on Barney Clark, surgeons have concluded that present-day technology is not sufficiently advanced to warrant

extensive use of a permanent prosthesis. They rely on the artificial heart as a temporary bridge to keep candidates for cardiac transplantation alive while waiting for a donor. Common sense, as much as ethical aims, has turned it into a useful tool for special circumstances.

My landlord in Providence is a ninety-three-year-old doctor whose random-to-age is a painful case of degenerative joint disease. A few years ago arthritis in both knees brought him to a complete standstill. The pain was so excruciating that he needed massive doses of analgesics, which in turn depressed his vital functions and compromised his independence so profoundly that he

needed to be committed to a nursing home. An orthopedic surgeon saw that repairing the knee joints could break the vicious cycle of decay and decline. With two artificial knees, Dr. J. is now back home—ambulatory, independent, and of clear mind. The bionic revolution in medicine should not be expected to promote longevity but to extend active life expectancy and to enhance independent living. If we accept this, much of the controversy surrounding the use of artificial organs evaporates.

The notion of organ replacement is shocking only to the extent that our culture has not yet assimilated it. As it becomes commonplace we will also appreciate its limitations. It makes sense to replace a nonfunctioning part in an otherwise working engine. The increasing longevity of mankind makes us appreciate that it is not so much life expectancy that counts but an active, independent life.

Artificial organs and transplants are not a recipe for immortality. They are useful inasmuch as they prevent premature death or an early loss of body functions. They will not make us live beyond the time allotted by our genetic background, but hopefully they will keep us functioning to the last moment.

Pierre Galletti, M.D.
Professor of Medical Science
Brown University
Providence

There is a valuable future in what many call bionics: We can sustain life, alleviate suffering, and replace at least the function of most organs.

The first pacemaker was the size of a portable TV and was wheeled around on a cart. Nuclear pacemakers, the size of a cigarette pack, were developed and were rapidly made obsolete by more practical technology. Lithium batteries and microcircuitry shrank them to the size of a stack of a few silver dollars. Modern pacemakers work reliably for a decade.

The story is the same for a score of other developments in bionics. Usually early setbacks with cumbersome devices are followed by remarkable success.

The term bionics often suggests implantable replacements for diseased organs. This field of medicine really deals with a range of technology applied to better our lives, not just to prolong life. Many artificial organs—such as the heart-lung machine and the artificial arm—are not even implants. Artificial skin can be a fancy term for certain wound dressings. And many artificial organs—the total hip prosthesis, implantable intraocular lenses—do little to effect longevity. But they greatly improve the lives of the people who use them.

I am president of a company called Symbion—a combination of symbiosis and bionics—a name we coined to suggest the beneficial coexistence between the body and technology. Our goal is to effectively interface the two. Medical technology can do things we never imagined a century ago, and it will do things we haven't yet imagined. But after years of work on the artificial heart and other medical devices, one thing has become apparent to me: The improvement of our health is as important a goal as is the prolongation of life.

Motivation and responsibility for taking care of ourselves can never be delegated to a doctor, a nurse, or a computer. Replacement organs may be much better than their diseased counterparts, but they usually lack the broader capability of the healthy original. The huge advance of medical technology is a sloppy excuse for poor individual preventive care. We need much more exercise. We should stop overeating and smoking.

I would take an artificial heart in an instant if it were my only way to live. But I never want one. I don't smoke, I exercise regularly, and I keep fit. Some of us will need bionic parts, and I believe it is well worth the energy and investment to continue to advance them. Technology won't save us later, however, if we let ourselves go now. So whenever you are out smoking, by the time you need a new heart, despite everything we now know, at least you won't have lung cancer.

Robert Jarvik, M.D.
Salt Lake City, UT

NUCLEAR REACTORS

SPACE

By Paul Bagne

In the Fifties—the days of Atoms for Peace—nuclear engineers dreamed of rocket ships propelled by ions, and spacecraft heated by plutonium. Today they dream of nuclear-power plants in space. Solar power will never do. To obtain the huge amounts of energy needed for star wars would require solar panels the size of football fields—too easy a target for enemy forces. And on missions to distant planets or for work on the dark side of the moon, there isn't enough sunlight. To date, the United States has spent \$1.4 billion on space reactors—but has launched only a tiny, 500-watt test model that ran for 43 days and still orbits the earth in a high "nuclear sail" orbit.

Nevertheless, the dream refuses to die. The Department of Energy (DOE) is presently developing and hoping to test by a reactor powerful enough to run Strategic Defense Initiative (SDI) platforms. And the National Commission on Space envisions orbital labs and human settlements "from the highlands of the moon to the plains of Mars"—many of them powered by atomic reactors.

The U.S. space program has more experience with another, quite different source of nuclear energy—the radioisotope thermoelectric generator (RTG). It's not a reactor, but a chunk of plutonium sealed in a container. As the plutonium decays, it produces enough heat to generate a few hundred watts of electricity to power SDI platforms. DOE plans to design a larger RTG that will contain considerably more plutonium. RTGs powered the Apollo lunar surface experiments and the Voyager missions, and will power the Galileo mission to Jupiter and the Ulysses mission to the sun.

Until the shuttle disaster these two craft were to be mounted on Centaur rockets and were scheduled for separate shuttle launches last May. Their RTGs would have contained about 45 pounds of plutonium. NASA had assessed the danger of a launch accident releasing this radioactive element, regarded by many scientists as the most toxic substance there is. "The risk should be small," wrote the agency "due to the high reliability

inherent in the design of the space shuttle.

After the Challenger explosion and launch failures of the Titan, Delta, and Ariane rockets, critics question whether it is safe to send nuclear payloads aloft. (NASA has dropped the onboard Centaur rocket from future shuttle flights.) To estimate the amount of danger that would ensue if a shuttle carrying an RTG exploded, DOE projected a worst-case scenario. If a small RTG were ruptured during a shuttle launch, 900 square miles around the launch site would be contaminated with plutonium, and 386 cases of cancer would result.

NASA says that the chance of the DOE scenario actually taking place is one in 100,000. If an RTG had been aboard the exploding Challenger, "it would have survived," says James Lombardo of the DOE special-applications division. "It would have picked it up at the bottom of the ocean."

But an RTG as big as a bus cannot deliver the power required for some SDI systems. So DOE intends to spend \$690 million to build a 300 kilowatt reactor

called the SP-100. NASA hopes to test fly it in 1993, perhaps as a nuclear-electric propulsion system for a space tug. Research is also under way on a futuristic reactor that would generate several million watts of electricity. It will take 10 or 20 years to develop.

Originally designed to fit into the cargo bay for launch on a Centaur rocket into a high, safe orbit, the SP-100 will be a compact reactor cooled by liquid metal.

"We have looked at all stages of the flight," says Jay Boudreau, a nuclear engineer at Los Alamos National Laboratory. "We have assured ourselves in the design that the reactor can hang together even through reentry of the shuttle in an abort, crashing into the ocean or into the ground. And even if it did somehow come apart, it is not really that hazardous."

The reason: Reactors will be launched in a "cold state"—not switched on until deployed in space. "If you do get an explosion during launch, you're talking about spreading around uranium, that's a minor concern," says Robert Pollard, a reactor engineer with the Union of Concerned Scientists. "But I worry about the thing coming back to Earth. Look at the difficulty the Russians had with the reactor that came screaming back."

In 1978 the Cosmos 1584 reactor fell from orbit and showered fission products over 100,000 square kilometers of northwestern Canada. Some recovered material emitted a lethal dose of 500 reentgens per hour. The accident caused a worldwide furor and cost millions to clean up. By comparison, the SP-100, after operating for seven years, would hold roughly 3,000 times the radioactivity of the tiny Russian reactor.

"Our designers assure us that if [the SP-100] will stay intact if it comes in," Boudreau says. The DOE also suggests that reactors be used only in a nuclear safe orbit, one with a 300-year decay time. "If there were any malfunction or indication of reentry," Boudreau continues, "we would shut it down. That amount of time allows the fission products to decay so they do not represent a significant health hazard to the world population." □



Are nuclear payloads in the shuttle's future?

BOOKS

THE ARTS

By Murray Cox

I first met horror writer Clive Barker on a cold day in late February. We ate at an elegant but oddly deserted restaurant on New York's Upper West Side; our table nestled close to a roaring fire. I felt as if I'd suddenly stepped into a medieval castle full of macabre, violent incidents—a place where the dead never really died. The elegance and the desolation, the warmth and the bitter cold, seemed appropriate for an interview with the hottest new horror-fiction writer of the decade. Barker has been called the "future of horror fiction," the new Stephen King—and that's a difficult role to fill, but a role he's ready to take on. He's a boyish thirty-three, with dark, penetrating brown eyes and a very easy manner. But when Barker talks about horror fiction, he's passionate, as pointedly vivid as the gruesome tales he tells.

He didn't eat very much. He would put down his fork, cock his head to one side and say, "I'm not interested in preferring that old truths have credence when they don't." Through much of the interview he seemed in flight, high above the terrain, ready to swoop down on me like a predatory bird of prey. And then he would sit on the end of his chair, staring intently into the tape recorder placed between us.

Barker's *Books of Blood*, volumes one, two, and three, are published by the Berkley Publishing Group.

Qwell: You believe that horror writing is a seriously undervalued but important literary genre. What is its importance?
Barker: Most people think that horror fiction is not serious art. And that's odd because there's always been a heavy emphasis on the horrific in painting, play-making, and literature. It requires much more scrutiny than it gets. I feel that horror literature is touching upon the big issues time and time again: death and the after death, sex after death, insanity, loneliness, greediness. Horror writers are addressing the deepest concerns of the human condition. Horror fiction is really about control—of various kinds—or about being out of control. Obviously death is the ultimate moment when we relinquish control

Qwell: Does it follow, then, that horror is such a popular phenomenon today because we feel less and less in control?
Barker: It seems to me that the structures that kept us from total panic have fallen away. Certainly in what we arrogantly call cultured communities, among sophisticated folk, simple notions like redemption through good deeds or the notion of heaven or the possibility of aspiring to a kind of moral perfection—all these kinds of issues have gone by the board. We don't believe that stuff any longer. Or if we do believe it, we believe it in an aesthetic way. It may be out there somewhere in our system, but we certainly don't have structures or rituals that make it possible to keep the darkness at bay. We don't have a route to redemption. So we have to find new routes. We have to look for other structures. I think good horror fiction offers alternative structures or, if not alternative structures, surely ways to reilluminate the old structures. Peter Straub's *Ghost Story*, for example, is actually a reinvention of an old structure of femme fatale/ghost/transformer. The

truth is sexual. It's about sexual anxiety, sexual nervousness, and lack of control.

Qwell: Many people have written horror stories without the gore. I assume that you have deliberately chosen to write graphic, gory stories.

Barker: Absolutely. I will never apologize for being gross. When people say "stop" to me, when people say "don't do that," I begin to suspect them. I think they're scared or repressed. When people turn their eyes away inevitably it's because something exists that's just too much for them. And if something is too much for them, it's important.

Qwell: You have said that most current horror fiction is old-fashioned. Is Stephen King old-fashioned?

Barker: King is not old-fashioned. He is contemporary because he describes a real world. I'd say that old-fashioned horror lacks immediacy. King is a very immediate writer. I am to be an immediate writer. We want our depictions to appear in the reader's mind with the clarity of a movie—that a part of our modernity. I want my images to be flashing—you know, *wham! wham! wham!—whereas* Poe and Lovecraft create a distance between the reader and the image. The experience is safer. You're detached.

Qwell: I'm not a horror aficionado. I read a few of your stories, and I had nightmares after reading each one of them.

Barker: I think I should apologize.

Qwell: No, actually I find it quite fascinating. One night I dreamed about undergoing eye surgery without anesthesia. The surgeon stood above the operating table, gloved and gloved, and said that he simply was going to make an incision above both my eyes to cut the connecting nerves to the eyeballs. I would then be able to see better.

Barker: Really wonderful. I love that! It's a beautiful metaphor. I mean, what are you dreaming there? Are you dreaming about the possibility of pain making you see better? I've always wanted to do a movie in which angels performed surgery on someone without anesthesia. There'd be a requiem playing—very calm, very sweet. The patient would be



Beware: Clive Barker intends to terrify you.

coming apart, but it would be okay. The angels would be saying it's okay. Your dream is really interesting. If you told the really things all day, you can't see. I mean, your dream is about seeing clearly. And I think horror is about seeing clearly. I like happy stories, and really your dream was about a revelation.

Orrin: Okay. You say you write happy stories, but your critics say your world is nihilistic and bleak. One critic has said, "His characters lead hopeless lives that are interesting only by random encounters with the appetizingly powerful evil that rules his cosmos."

Barker: A lot of my characters do live dull lives, lives in which a metaphysical dimension is entirely lacking. The supernatural events that interrupt their lives may kill them, but their lives are recontextualized because they see the possibility of the wonderful, the awful, the terrible. It's important to have an image of monsters. If you like, as creatures who have great ambiguity. They're not creatures who come in and just screw up. I think the most we can hope for in the world is that we come to see how complex our situation is. But a lot of horror fiction returns us to the old solutions instead of offering new ones.

Orrin: Why do you take sex so explicitly in your stories?

Barker: Oh! So much of this has to do with the Christian paradigm—a lot of Christian crap about the fact that the act of creation is sacred and that anything associated with it should be kept under a veil. Basically it's all about fear. It stinks.

Orrin: Does it stink you as odd—that both King and Straub came from religiously conservative, fundamentalist backgrounds? King has claimed he still believes.

Barker: I think he's moralistic, but the imagination is not moralistic. I often think of that line, "We are not hypocrites in

our sleep." We don't take shit when we dream, and when we're writing good horror fiction, we're dreaming. We don't have to tell lies. King describes the world of his readers, then subverts it. I love that. His sensibility is destructive to the status quo. He always turns a safe world upside down. King's also good with children's perceptions. Children have a much clearer perception of malice and of the way the "real" and the "unreal" overlap. Children have an instinctive knowledge that the world is much more complicated than their parents think it is. I do that for adults. The adults are flung into worlds either because they are confronted with monsters or because they're drawn by dreams into a world in which they are forced to concede that their reality won't bear much scrutiny. In a sense both King and I are saying that the world as we are taught it is a lie.

Orrin: Has William Burroughs influenced your subject matter?

Barker: Well, sexuality is close to the surface in Burroughs's writings and in my pieces. But Burroughs piles image upon image with no apparent concern for the narrative line. I'll tell you how I write stories. I come up with images. I draw pictures. I write pictures down. I say "Picture." And I wait. Eventually a story appears around the pictures. I have hundreds of pictures, images that are waiting for the birth of the narrative. You see what I mean? Burroughs doesn't take the narrative structure as far as I do. I love writing stories, and I love telling stories. I don't think Burroughs cares about the story; he's interested in the primacy of the image. For me the narrative is the rails on which the ghost train rides. You take the passenger along that track with a terrible inevitability. I love it when people say to me, "Take your stuff, but I can't stop reading it!" If they say, "I have to find

out what the hell happens, but on the way I'm going to be appalled," that's wonderful. I want to project images into people's minds, images they wouldn't otherwise accept. It's force-feeding.

Orrin: I was watching MTV the other day and thinking about this interview. The two "events" collided with each other. MTV's a live show featuring our shadow selves. The stories are often violent, explosive, and strange. A kaleidoscope of dream images—which is what I experienced when I read your stories.

Barker: The best videos plug us into ourselves. But so do good movies and good theater. That's what the artist is all about, isn't it? What is unique about MTV is that you can actually sit in front of it twenty-four hours a day. But I don't think these "pictures" are analyzed. I try to place my images in a structure. I hope that at the end of a story you understand why the image was there in the first place. The images that infect our unconscious are images that require contexting. The doppleganger appears in Jung; actually it appears in Freud, too. It's an incredibly common image with a long historical tradition. It represents a confrontation with another part of oneself. The doppleganger story means new things to each generation. The collective unconscious can be reimagined.

Orrin: Do you think that we, collectively, are closer to the images of the unconscious, the shadow self?

Barker: Our culture's shot through with images of great potency all the time. We're confronted with images in advertising, television, movies. They contain great power to convince and to manipulate. But we don't understand them. We are confronted with potent material, and we're dumb in the face of it. That's dangerous, much more dangerous than having no imagery at all. We're awake in an unconscious sea and drowning. We have to embrace the point where our lives touch the unreal or touch the unconscious. The conscious can encounter the unconscious through fiction.

Orrin: If your stuff is authentic, then you are constantly dealing with raw unconscious material. It's got to affect you in the process of writing.

Barker: It does. It does. And here the narrative is important. Narrative keeps me from drowning. It's like a rhyme scheme in a poem, the means by which I order experience. I write very tight plots, though I try not to make them seem too tight. But in fact, they're meticulously plotted. There are maybe fifty pages of narrative plotting for the book I'm doing at the moment, even before I write the first chapter. That doesn't rule out the arbitrary factor that comes along. But in order to weave through your own stuff you need a guideline. Otherwise I think you end up like Burroughs. You end up with a collection of incredible images like MTV, and it's processed in a way that I don't find



"It's important to have an image of monsters as creatures who have great ambiguity."

particularly wild or satisfying. You could call it a cut-up kind of process. It's not a process I understand. It implies that the unconscious can process its own material, which I don't believe. You know that Burroughs implies that if you make too much sense it isn't useful to you. We need a combination clone of Dostoyevski and Burroughs. The master is Fellini. He entices you with just enough narrative. You are led from one scene to another scenes filled with outrageous imagery plucked straight from the unconscious.

Omer: During Jung's three-year "confrontation" with the unconscious, which reached what I would call near psychotic proportions, he writes that he would stand in front of the mirror and say, "My name is Carl Jung. I live at blank, my wife's name is blank. I have blank children. He claims that this reality test, this narrative line, kept him sane.

Barker: It kept the darkness at bay. Yeah!

The artist is in a sacred position. I've been telling stories since I was knee-high to a duck. It's instinctive for me to create narrative structures. The world I live in becomes a story. Do you know what I mean?

The artist can see the broader context. One's life is part of a story that is already happening. When I see a loved one cry, I think, *How would I describe this?* How would I make a sentence to describe what is happening? That can be damaging because it distances you. I constantly tell myself that what I experience today will one day be in the past. I write all my fiction in the past tense.

Omer: Your work has been described as having mystical intensity.

Barker: It's sort of interesting because whenever I can, I will take a character into mystery. We live in a barren place. We live in a barren condition. One of the big questions of our age is where to find revelation. Where do we look for the angel

that will come out of ourselves, even, and say, "The world is greater than you are—greater than your perspective?" I write stories in so many different physical locations—cities, deserts, dirty cinemas, broken-down theaters—because revelation can happen anywhere. But don't run away. Don't get out your crucifix. It means you no harm. And even if it means you harm, it will be better than living the life you're living.

Omer: You think the violence in your stories is qualitatively different from the slick-em-up, shoot-em-up Rambo or slasher-movie type of violence?

Barker: Oh, sure. You can do just about anything to an audience as long as you put them in a place they've never been before and they comprehend what has happened to them. We're so locked in ourselves. We are victims of our angularity. I'm saying, "Look, you may not like this very much, but sure as hell you've never been here before." That is a major part of the lecture thrill, as far as I'm concerned.

Sartre said that the only thing we can never know is our own death, but I can show you lots of other things—behaviors, disembowalings, boiling oil. That's a bit cynical, I know. But sometimes I feel like someone who runs a ghost train. "Roll up! Roll up! You don't have to buy this stuff, but if you buy it there are no limits. I even put it on the jacket cover. I promise you nothing more than blood, sweat, and more blood."

Omer: That's not true.

Barker: Well, no, except that that's the baker's line. That's what happens outside the train ride. I don't want to say "I offer you blood and metaphysics."

Omer: You have a tendency to be very hard on metaphysics. Why?

Barker: I don't think I'm hard on metaphysics. Well, I am. Let's go at this again because this is important.

Metaphysics is a philosophy of being, right? Now I'm very hard on conventional metaphysics. If your daily consciousness at St. Mary's is metaphysics, then I won't be a part of that. But if metaphysics is actually seeing what your dreams mean, which it can be, or if metaphysics is looking at the shuffle going up and trying to work out what happened in those three seconds—one moment they're there and the next moment they're not. I surely believe in images of a dying god and of the mother impregnated by light. That is highly charged material. I love Catholic imagery. The image of Christ patting his cheek to reveal a heart floating in light with thorns around it—well, that's potent. A lot of my Catholic friends have calendars with Christ exposing the sacred heart. It's an extraordinary image.

Omer: But it's an image designed by tradition, by repetition, by interpretation.

Barker: I agree, but there are ways to sanitize that image. That's what we must try to do. I think.

Omer: You have been quoted as saying you would rather have monsters glowing in the dark than the silence of empty space.

Barker: Absolutely. Wouldn't any sensible person? Isn't nothingness the pit?

Omer: Well, I wonder. Don't you think that we are so afraid of that nothingness that we will do anything to avoid it?

Barker: Yes, I do. I very much do.

Omer: To talk about the "void"—well, the bullshit tends to pile up. Or it's an intellectual exercise. And surely to say that we seem less able to face silence than our grandmothers or grandfathers was a bit worn out.

Barker: I've tried to define nothingness. The villain of my book *The Desecration Game* brings the void with him. He brings absence, the fear of sexuality, the fear of testing. He is nothingness personified. The get Caryl is preceded into his mind at one point and has to confront this terrible absence, this terrible nothingness.

The only thing we can hope for is a kind of unity of mind under such circumstances. And love will do the job. Really, I believe love will do the job. And I don't mean sexual love. I mean the chemical attraction of one living creature for another living creature, someone to stroke in the dark. Maybe that nothingness stands for our deaths. Maybe it stands for the time when we will be absent. Or maybe it stands for a time when the entire business will be absent. When Big Bang number two occurs. There were two questions I asked as a kid: What's infinity? You think and think, but you can't get there because it's impossible to imagine infinity. The other question I asked was: What was it like before the world began? What was the nothingness out of which the world came?

I think they're the same question. And that terrifies me. It's the big one. But still after death I prefer hell to nothing, because in hell I have a chance of talking my way out of it. **GG**



I've tried to define nothingness. Maybe it stands for a time when Big Bang number two occurs.

SURROGATE BRAINS

ARTIFICIAL INTELLIGENCE

By Grant Fjermedal

I'm sure that Hans Moravec is at least as sane as I am, but he certainly brought to mind the classic mad scientist as we sat in his fifth-floor office at Carnegie-Mellon University on a dark and stormy night. It was nearly midnight, and he moiled for each of us a bowl of chocolate milk and Cheezos, with slices of banana piled on top.

Then, with banana-sticking knife in hand, Moravec, the senior research scientist at Carnegie-Mellon's Mobile Robot Laboratory, outlined for me how he could create a robotic immortality for Everyman: a deathless universe in which life would go on forever. By creating computer copies of our minds and transferring, or downloading, this program into robotic bodies, Moravec explained, humans could survive for centuries.

"You are in an operating room. A robot brain surgeon is in attendance. Your skull but not your brain is anesthetized. You are fully conscious. The surgeon opens your braincase and peers inside." This is how Moravec described the process in a paper he wrote called "Robots That Roar." The robotic surgeon's attention is directed at a small clump of about one hundred neurons somewhere near the surface. Using high-resolution 3-D nuclear-magnetic-resonance holography, phased-array radio encephalography and ultrasonic radar, the surgeon determines the three-dimensional structure and chemical makeup of that neural clump. It writes a program that models the behavior of the clump and starts it running on a small portion of the computer sitting next to you.

That computer sitting next to you in the operating room would in effect be your new brain. As each area of your brain was analyzed and simulated, the accuracy of the simulation would be tested as you pressed a button to shift between the area of the brain just copied and the simulation. When you couldn't tell the difference between the original and the copy, the surgeon would transfer the simulation of your brain into the new, computerized one and repeat the process

on the next area of your biological brain.

"Though you have not lost consciousness or even your train of thought, your mind—some would say soul—has been removed from the brain and transferred to a machine," Moravec said. "In a final step your old body is disconnected. The computer is installed in a shiny new one, in the style, color and material of your choice."

As we sat around Moravec's office I asked what would become of the original human body after the downloading. "You just don't bother waking it up again if the copying went successfully," he said. "It's so messy. Humans have got so many problems that you might just want to leave it relieved. You don't take your junker car out if you've got a new one."

Moravec's idea is the ultimate in life insurance. Once one copy of the brain's contents has been made, it will be easy to make multiple backup copies, and these could be stashed in hiding places around the world, allowing you to embark on any sort of adventure without having to

worry about aging or death. As decades pass into centuries you could travel the globe and then the solar system and beyond—always keeping an eye out for the latest in robotic bodies into which you could transfer your computer mind.

If living forever wasn't enough, you could live forever several times over by activating some of your backup copies and sending different versions of yourself out to see the world. "You could have parallel experiences and merge the memories later," Moravec explained.

In the weeks and months that followed my stay at Carnegie Mellon, I was intrigued by how many researchers seemed to believe downloading would come to pass. The only point of disagreement was when—certainly a big consideration to those of us still knocking around in mortal bodies. Although some of the researchers I spoke with at Carnegie Mellon, MIT and Stanford and in Japan thought that downloading was still generations away, there were others who believed achieving robotic immortality was imminent and seemed driven by private passions never to die.

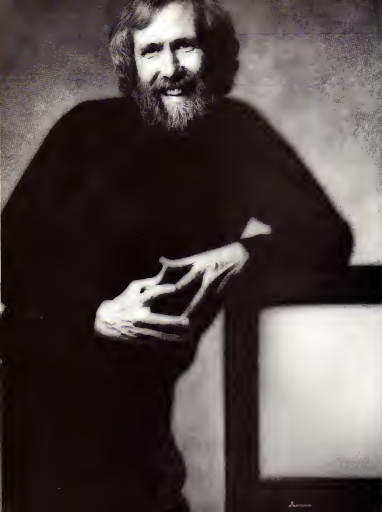
The significance of the door Moravec is trying to open is not lost on others. Clive Shivers, a Carnegie-Mellon graduate student who works closely with Moravec as well as with Allen Newell, one of the founding fathers of artificial intelligence, told me: "Moravec wants to design a creature, and my professor Newell wants to design a creature. We are all in a sense trying to play God."

At MIT I was surprised to find Moravec's concept of downloading given consideration by Marvin Minsky, Donner Professor of Science and another father of artificial intelligence. Minsky is trying to learn how the billions of brain cells work together to allow a person to think and remember. If he succeeds, it will be a big step toward figuring out how to join perhaps billions of computer circuits together to allow a computer to receive the entire contents of the human mind.

If a person is like a machine, once you get a wiring diagram of how he works



The new containers: brains without bodies



Jim Henson Gives Television A Hand.

Jim Henson has achieved extraordinary audience and critical approval from every medium he's had his hand in. Educational TV; *Sesame Street*. Network TV; *The Muppet Show*. Film; a trio of Muppet movies, *Dark Crystal*, and *Labyrinth*. His insightful imagination, expressed through an enduring cast of creatures, artfully exposes the very best in people and media alike.

"I spent a summer traveling through Europe meeting other puppeteers. That was when I first realized it was an art form... the sort of thing a grown man could do for a living."

"*Sesame Street* surprised everybody, the impact it had on the culture and all. It wasn't like you had to do anything dramatic to do a very good job."

"I think it's important that movies be about something, so that there is that substance to be discovered."

"Frank Oz, who does Miss Piggy, builds layers and levels of character. He knows her background, what kind of painful childhood she's had. Her humor comes from the pain."

"If our 'message' is anything, it's a positive approach to life. That life is basically good. People are basically good."

The vision of people like Jim Henson challenges the manufacturer to develop componentry capable of capturing their art in all its subtlety and nuance. Equipment like the Mitsubishi 2053 Monitor/Receiver with full-square Diamond Vision picture tube shown here.

For a detailed look at Mitsubishi audio/video equipment for the home, from projection to history's first 35-inch direct-view TV, send for our brochure—Mitsubishi Television: The Thinking Inside.



 **MITSUBISHI**

Mitsubishi Electric Sales America, Inc. 5757 Plaza Drive, Cypress, CA 90603-0097

MOUNTAIN MANIA

STARS

By Owen Davies

About two years ago a group of astronomers from Steward Observatory, part of the University of Arizona at Tucson, asked the U.S. Forest Service for permission to build an ultramodern observatory on a patch of government-owned land called Mount Graham. What began as a straightforward attempt to construct the preeminent observatory in the United States has exploded into a debate in which the needs of astronomy are pitted against a strange coalition of activists.

Mount Graham is a wooded peak located in the Pinaleno range of southeastern Arizona. After a lengthy survey of sites, Steward Observatory officials decided it was the best place for a new generation of astronomical instruments.

Astronomers make a strong case for the location. Mount Graham has the right combination of ingredients: soft, dry air at its peak, an elevation of 11,000 feet at which it is comfortable to work (lack of oxygen at higher altitudes makes it difficult to concentrate); and a logging road already in place, running partway up the mountain. "We now know how to build much more powerful instruments than any we have, and they are severely needed," explains Steward operations manager John Rafie. "And we have to find a new site for these major telescopes. There are not many left in existing observatories. Kitt Peak is about full, and Mauna Kea has only three or four sites that aren't committed. Other important observatories are troubled with light pollution. There's just nowhere left to go."

The dream is to build 13 astronomical instruments, including two radio astronomy dishes, across an area of five square miles. The largest telescope would be the National New Technology Telescope, a multiple-mirror telescope that would duplicate the seeing power of a mirror 15 meters across. Eventually Rafie says, there could be five more eight-meter size-range telescopes—all more powerful than any now in use.

Once completed, the entire observatory complex would spread out in a pattern forming a ragged Y. But a complication in

building the observatory in the area is the richness and divinity of the local ecology. Mount Graham has one of the densest bear populations anywhere in the country," explains Gerald W. Connors of the U.S. Forest Service. Connors also serves the Forest Service at Colorado National Forest and heads the team working on the environmental impact statement on Mount Graham. "It has a population of Apache trout, now on the endangered species list, and the Mount Graham red spruce squirrel, which is being considered for the list. There is an endangered plant species growing on suggested telescope sites," he says.

Rafie believes the environment would not be compromised by this addition. "Naturally we would prefer to use whatever sites are best for astronomical work," he says. "But if some of these are ruled out, there are more than enough alternatives. We can adapt quite a bit. We have eleven possible telescope sites, of which only five would be used."

Only 40 to 60 acres of the area's 3,500 acres would be occupied by construction

and roads for the observatory. Rafie says. The area around the observatory would be an unspoiled "buffer zone" between the sites and the forested area.

Tucson engineer Paul Pierce, head of the Coalition for the Preservation of Mount Graham, is skeptical. "To say the least, 'When you clear five acres here and ten acres there, you feel the impact throughout the region,'" he says. "You disrupt wildlife habitats and take away recreation areas far beyond where you actually build."

The proposed observatory has caused some surprisingly diverse groups to join forces. The Defenders of Wildlife, the Tucson Rod and Gun Club, and the Arizona Arms Association are all part of the coalition. Pierce himself admits it is an odd collection. "People who normally wouldn't give each other the time of day are working to stop this proposed development," he adds.

"If you strip away the scientific trappings from this proposal," maintains Paul Pierce, "you have a standard development versus conservation issue." University of Arizona officials disagree, saying the issues are more complex. The area has already been partly developed. Logging operations have cleared tracts from ten square miles on the south side of the mountain, and on the highest elevation of Mount Graham stands a microwave transmission tower operated by the Army.

The real issue may not be environmental. The Sierra Club supports neither side. Basically the activists object to the restrictions that would come with having an observatory on the mountain. For example, no campfire could be lit at night and the four wheeled vehicles that now travel up and down the logging road could not use their headlights.

What happens to the mountain will depend, in part, on the contents of an environmental-impact statement that was to be completed this fall. It will be followed by a few months of public hearings, and early next year the U.S. Forest Service will decide whether the Mount Graham observatory will fade into history as yet another unfulfilled dream of astronomers. **DO**



View of the stars clouded by controversy

MIND SCAN

BODY

By Stephen Robinett

The same technology that once used to hunt submarines from the air is shedding light on such neurological disorders as epilepsy, multiple sclerosis—and may someday reveal our most secret thoughts. Nerve tasks "talk" to one another in the brain through electrical signals that generate a weak magnetic field, about one billionth the strength of the earth's. Now surgeons and brain researchers can monitor magnetic patterns emerging from the human brain with a new computer-based technology called magnetoencephalography (MEG). MEG may affect not only neuroscience and medicine but also job-screening practices, the way equipment is designed and even social policy. This technology is relatively easy to use. The subject either lies down on a bed or sits in a chair. A complicated electrical device, known as a neuromagnetometer, is placed near the subject's head. It acts as an antenna and picks up the magnetic fields emerging from the brain.

To appreciate MEG's potential requires some perspective on other types of

brain-research hardware. First, you must distinguish brain function (what a group of brain cells does) from brain anatomy (where cells are located). Most medical imaging equipment—X rays, ultrasound, CAT scans—shows location, not function. For example, while an electroencephalograph (EEG) records information related to the way the brain is working, it tells almost nothing about where an event occurs in the brain.

Currently PET (positron emission tomography) scans can supply information on both location and function as well as details of the body's chemical interactions. PET does, however, carry some degree of risk. Radioactively tagged glucose is injected into or inhaled by the subject, and PET tracks its progress as it moves through the brain. The more active a particular brain location, the more glucose it consumes and the brighter its image in the final picture. But PET scans take pictures in slow motion, which are based on the roughly 20-minute half-life of the radioactive tag.

MEG equipment combines the benefits

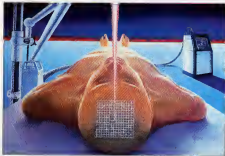
of all these technologies—and it is virtually risk free. It senses magnetic-field patterns produced by brain cells, locates the field's source, and takes a snapshot every millisecond. The key to MEG's value is mapping and linking. And the only reason to get a map is to find out where normal brain events occur," explains Jack Batty, a physiologist and brain researcher at UCLA's Human Neurophysiology Laboratory in Los Angeles.

Consider the simple task of answering your phone. If rings and the sound stimulates your eardrum, which sends impulses to your brain. Your brain pays attention, evaluates, decides on action, and initiates impulses to perform that action. Each of these activities produces a measurable brain event. MEG can monitor the entire process from stimulus to response. "Our ultimate goal," says Dr. Edward Flynn, a physicist using MEG equipment at Los Alamos National Laboratory in New Mexico, "is to produce a four-dimensional picture of the functioning brain." Or as Batty puts it, to understand "the physiology of thought."

Both the Air Force and the Navy think this technology may be helpful in predicting job performance. Greg Lewis, a Navy researcher in San Diego, used MEG to scan the brains of 60 Navy security people. Navy supervisors had previously rated these participants according to their job knowledge, performance and overall reliability. The idea was to compare the brain activity of the high achievers with that of the low achievers—to see whether there was a discernible difference between the two groups.

To test their hypothesis, researchers took MEG readings while participants watched a flashing light. Those people earmarked as high performers tended to be consistent in brain function and to have similar readings. Low performers showed little consistency from moment to moment. And the group showed more disparate responses. Lewis hopes to use these data to produce a companion baseline for future job candidates.

Dr. Glen Wilson, an Air Force psychologist who uses MEG, hopes his studies



Magnetoencephalography: a new piece of hardware helps doctors map events in the brain

MECHANICAL ZOO

EXPLORATIONS

By Erik Larson

By the end of the year the gorillas at the Milwaukee County Zoo will be able to watch the midday soaps, switch on a little Bach, and check out videotapes of fellow gorillas. By pressing a specially constructed device they will be able to select their own entertainment or simply shut the machine off and enjoy the silence.

The smart home-entertainment system is the brainchild of Hal Markowitz, who for 16 years has been designing similar contraptions to ward off a major affliction among zoo animals—boredom. Markowitz has designed such boredom fighters as a live cricket dispenser to bring out the pecking instincts of Asian river otters, a mechanical rabbit to tempt tigers, and coming soon, an exhibit that will enable polar bears to hunt for their meals.

Animals in captivity are essentially powerless, says Markowitz, a round, genial man with a Bull Terrier voice. When trying to give them back as much power as we call—power, for example, to feed themselves when they want to instead of when a keeper feels like it.

Markowitz, who is a biology professor at San Francisco State University, shies from the term boredom. An animal that looks bored by human standards may be perfectly content, he says. Lions in the wild, for example, spend a lot of time either asleep or at rest. He prefers to talk about the behaviors that result when captive animals lose the power to influence their own lives: to forage, hunt, roam or mate freely with members of their own species. Such animals tend to develop an array of abnormal, repetitive actions known to zoo curators as stereotypical behavior. Captive monkeys, for example, may salute—actually raise their paws to their foreheads—over and over like privates at a convention of generals. "We know," he says, "that a human being in captivity suffers most from a sense of powerlessness: the fact that nothing he does matters."

For animals food is central to the issue. It plays a big role in an animal's day in the wild and can play an equally large role in relieving the boredom of captivity. Zoots, for example, have discovered that

simple tricks can help—scattering snacks in hard-to-reach places or leading animals at intervals throughout the day. At the Bronx Zoo in New York an artificial tree periodically oozes honey for the bears. Another device there spits live mealworms into an exhibit of sugar gliders, members of the marsupial order, providing food and diversion at the same time.

Likewise, food figures heavily in Markowitz's devices. But he adds another element: work. He cites studies showing that animals will push levers for their food, even though the same food is available free in the cage, with no need for any effort. His devices also give the animals a chance to stut their stuff within the limits imposed by captivity.

Consider Milwaukee's planned polar bear exhibit. At most zoos, Markowitz says, visitors see the bears bask in ways never encountered in their natural habitats. In seventy percent of zoos in the world, what kids learn about polar bears is that they "bag," he says.

When the Milwaukee exhibit is completed these polar bears will be able to hunt. From time to time the bears will hear digital seal sounds; the polar bear lunch bell. They will be able to ignore the sounds or to investigate by pawing among the rocks in their enclosure. If a bear sticks his paw inside a particular pile of rocks, he will interrupt a light beam and in turn activate another device that will launch lunch (frozen fish, not live seals) into the exhibit's pool.

Markowitz's critics say devices like these can turn animals into Pavlovian automatons, compelled to respond to a given apparatus. They contend his machines are unnatural and can give exhibits a "circuit" flavor. Michael Hutchins, a behavioral ecologist now doing an internship at the Bronx Zoo, says Markowitz's machines may even produce behaviors just as abnormal as those created by sheer boredom.

But counters Markowitz, animals in the wild face millions of contingencies and deal with them by using jungle smarts and the physiological tools designed by nature. "I'm not saying, 'Put them in life-

Continued on page 52



Designs for captive living: Hal Markowitz gives zoo animals the chance to take charge



CONTINUUM

JUMPSUITS AND LONGEVITY

Lunch with Dirk Pearson and Sandy Shaw can be unsettling. At a conference on aging, I watch as the gallees in their stroganoff gradually fill and then disappear beneath grumpy hills of an MSG-basted flavor enhancer. A glance plate-side lands on a virtual army of tiny vials containing BHT, vitamin C, and other assorted dietary supplements—more evidence of the kind of tinkering that has launched the careers of these famous life-extension researchers. Their mission? To dance into no-man's-land, that age beyond the limit bravely staked out by Fanny Thomas, a San Gabriel, California, woman who died in April 1980, 113 years and 215 days after her birth. Pearson and Shaw, authors of the best-selling book *Life Extension*, are betting their lives on an array of preservatives, amino acids, vitamins, and prescription drugs that they expect will enable them to live on and on and on.

Sheathed in thick silver bracelets and zipped into snug leather jumpsuits that set off well-developed, if pale ("We rarely go outside"), pecs, Dirk and Sandy sport a style that seems at odds with their mass appeal. In the four years since their first cookbook for life extension hit the bookstores, more than 2 million copies have been stretched up. Both authors have been regulars on the talk-show and lecture circuit, expounding on the recipes for staying young they have concocted from scientific studies.

The silver age of both Pearson and Shaw is forty-two, but they look... about that old. Dirk's hair, though long and conspicuously abundant, is graying, and Sandy leans close during our interview to compensate for her poor hearing. Nonetheless, in the ten years since they began experimenting with various life-extension formulations, both researchers believe they have grown younger. In fact, they have generously submitted their bodies to countless clinical tests that indicate their "true, chronological age may actually fall far short of their forty-two years."

"We have the lipid panels of teenagers," boasts Pearson during a recent interview (lipid panels measure fat content). Pearson's long, pointed features and slightly hunched frame accentuate the height advantage he has over his diminutive research associate-wife, Sandy, who so often overlooked during interviews in the early days of the *Life Extension* success that she developed a ploy to attract attention—"to make her seem tougher and meaner," disabuses Dirk.

Pick a horsehoe!" demands the woman who says her ultimate aim in life is to bring her physiological age down to twenty-five years and maintain it "indefinitely." Out of one of the steel suitcases lining their hotel room, I withdraw a hefty arc of iron. And one second later, with nary a grunt to record the moment, the little lady has twisted that horsehoe into a shining pretzel. "That makes 'em all up," says Dirk. And Sandy hasn't done more than thirty minutes of exercise over the past seven years.

Come on. But that's the beauty of this boldest of life-extension programs. In this age of running, pumping, and fasting, Dirk and Sandy offer a painless guide to living longer. "We're gourmet and sedentary type A scientists," offers Dirk as something of an explanation of their penchant for daily toasting back a blend of potent chemicals. "What we're trying to do is protect ourselves from ourselves." The scientific community generally agrees that Dirk and Sandy's research demonstrates a remarkable lack of rigor. The couple has failed to conduct controlled studies, and the majority of Pearson and Shaw's predecessors in life-extension experiments of this nature have been laboratory animals. Even so, Dirk and Sandy have earned qualified praise for helping to popularize the growing belief among scientists that it is possible to intervene in, and even slow, the aging process. At least they're saying that things can be found to retard aging and there's something you can do," says Richard Cutler of the National Institute on Aging, in Baltimore.

Dirk and Sandy hope the proceeds from their current release, *The Life Extension Weight Loss Guide*, will fuel future research projects. And they have other plans that will take them outside their study center. The two researchers—who claim that ultimately the only causes of death will be suicide, murder, and accident—plan to take up drag racing for fun. And they have landed their first movie roles. Scheduled for release this past summer, the movie *Ratboy* features Dirk and Sandy playing themselves.

"What we like best in life is discovering new things," says Dirk. Adds Sandy, "Put in there that I'd like to get a bit part as a mad scientist someday." —SUSAN ELLIS

Susan Ellis is the editor of the newsletter *Longevity: A Practical Guide to the Art and Science of Staying Young*, published by Orion Publications International Ltd. in New York City.

CONTINUUM



Teachers view lectures by satellite. "Shoulders of the Giants" program will feature such instructors as former astronaut Alan Bean.

SCHOOL VIA SATELLITE

Astronaut Christa McAuliffe's dream was to teach a science class in orbit. Now earthbound science teachers will have a chance to enter the Space Age—on the ground—with a new training program developed by the Talbot Mountain Science Center in Avon, Connecticut.

The program will use a communications satellite 22,300 miles above the equator to broadcast lectures by experts in various fields and allow participants to talk back and forth across the nation and even the world.

"The center has been conducting a program for a number of years," explains Talbot technical consultant William Dunkerly, "in which students hear well-known presenters talk on their areas of expertise. But we feel that we can have a greater impact on American education by dealing with teachers, who go back to the classroom and work with anywhere

from thirty to one hundred thirty students." The satellite broadcasting, he says, "came about as a desire to reach teachers not only in Connecticut and the surrounding states but virtually anywhere." Teachers as far away as the Arctic Circle will have access to the satellite broadcasts, and, adds Dunkerly, the science center hopes to include American overseas schools in future programs.

Credited "Shoulders of the Giants," the course will enlist as instructors such luminaries as former astronaut Alan Bean and star-wars proponent Robert Jastrow. Beginning this fall teachers at institutions possessing satellite dishes will be able to view the lectures on a television screen, then ask questions using a standard telephone hookup. Planned lesson topics include breakthrough in molecular genetics and new methods of computer storage.

"One of the lead subjects," Dunkerly says, "is the 'boys

in space' experiments that were conducted on the shuttle—in which astronauts played with such items as a yo-yo and a Slinky to demonstrate the effects of zero gravity" (see *Games*, February 1985).

Says Dunkerly, "We don't know of any other course being offered on the open market that's taught interactively like this."

—Nancy Lucas

SEXLESS OYSTERS

It doesn't sound like much fun for the oysters, but a new sexless oyster developed by genetic-engineering techniques, may be a boon to seafood lovers who want to enjoy the bony bivalves all year round.

Floyd Bagley, vice president of Hilton Sea Food, a Seattle company that helped sponsor the project, explains that oysters normally lose their flavor during

People don't like the way they taste then."

Stan Allen, a research associate in the University of Washington's Fisheries Department, reasoned that to keep oysters plump and succulent all year, you'd have to keep them from reproducing. To that end, he and his colleagues treated freshly fertilized one-cell oyster eggs with cytochalasin, a chemical derived from a fungus. Oysters receive one set of chromosomes from a male and two sets from a female, and they normally kick off the extra set of female chromosomes," Allen explains. "But the chemical exposure caused the oyster egg to hold on to the extra set of chromosomes. The resulting creature was named a triploid, a nonreproducing mutant oyster.

The main problem with growing these sexless creatures for commercial sale says Allen, is their high mortality rate. "Only about ten to fifteen percent of the treated eggs live. But those are still pretty good odds when you consider that one female oyster can produce fifty thousand to one hundred thousand eggs. Plus, it's not an expensive process, even when a lot of them die. It only takes about twenty-five dollars worth of chemicals to treat five hundred million eggs. Nevertheless, Allen hopes to find methods that will create triploids without killing so many in the process. He's currently looking into how heat or hydrostatic pressure could be used to force oyster eggs to hold on to



Wiggle, please. An extra set of female chromosomes.

the hot summer months. "When it's warm they start to develop sperm and eggs and their texture turns all mushy runny and gooey

their extra chromosomes.

According to Bagley, the technology needed to genetically engineer triploids is well enough developed that year-round edible oysters should be on the market soon. In fact, the sexless creatures are already growing in some Hilton Sea Food oyster beds. "I'm convinced this is the biggest thing to happen to our industry in a long time," says Bagley.

—Sherry Baker

THE JAPANESE MINISTRY OF TELEPATHY

What will the Japanese think of next? Does a human telephone sound too far fetched? Japan's Ministry of Posts and Telecommunications doesn't think so. The government agency that oversees the phone and postal systems for the Japanese recently announced it is looking into human telepathy as a new communications medium.

The ministry's specially appointed eight-member committee, which includes Japan's foremost parapsychologist as well as bigwigs from Japan's aerospace and electronics industries, has already begun discussions on the potential uses not only for mental telepathy but for gravity waves, the as-yet-unproven gravity patterns thought to travel almost infinite distances. The committee will also be seeking uses for neutrinos—subatomic particles thought to have no mass, thus enabling them to pass right through the earth at the speed of light.

Theoretically, the gravity waves could be used to send incredibly long-distance communications. And because neutrinos are emitted by the reactors aboard nuclear submarines, a huge neutrino detector might conceivably be built to track underwater movements of submarines on the opposite side of the world.

The parapsychologist on the ministry's specially ap-

pointed committee, Soy Dotori of Japan's National Defense Academy, says, "Although scientifically we are not at the stage to actually

use telepathy or these other proposed methods, there is a good possibility that they could be used. So it is a good idea to begin thinking about them."

But Alun Anderson, Tokyo correspondent for the British science journal *Nature*, who has reported on the new committee's work, disagrees heartily.

"The ideas they are looking into are really far-fetched yet they decide to look for practical applications first, before the basic research is done," he says. "It's like announcing that you're going to investigate whether bird cards readers can predict the behavior of the Russian army!" —Eric Mathias

GALACTIC THREADS

Astronomers from the University of California at Los Angeles and at Columbia University in New York City have used radio telescopes to discover two strange new structures, origin unknown, near the center of the Milky Way. They are unlike any other objects in our galaxy and would seem to indicate the presence of a previously undetected phenomenon at the galactic center.

The scientists are astronomer professor Mark Morris at UCLA and Farhad Yusef-Zadeh, a doctoral candidate at Columbia. They report: • One structure consists of three thick disk-like lines, smooth radio transmissions each of which stretches more than 100 light-years in length. They curve across the northern center of the Milky Way. • The other structure has

been tentatively identified as a jet of extremely hot gas that streams out of the galactic center. If that can be confirmed, it offers further evidence of a black hole at the center of our galaxy.

Says Professor Morris, "These new structures add to the growing mosaic of curious forms of activity at the core of the Milky Way."

Morris believes that the strange threads are the result



Line at upper right comprises mysterious galactic threads

of "interaction of interstellar gas and the magnetic field." They were discovered during a random radio-telescope search. "Some signposts were missing, which led us to take a closer look," he explains. But right now there is no explanation that can identify the threads' composition or origin. While they may be unique in our galaxy, they do have counterparts in others. "In our own quiet galaxy, however," says Morris, "this phenomenon was unexpected."

—George Nobbe



Can bird cards predict the behavior of the Russian army?

ported committee, Soy Dotori of Japan's National Defense Academy, says, "Although scientifically we are not at the stage to actually

CONTINUUM

PLASTIC ENGINES

Car engines may soon go plastic.

Already almost all major automakers in the United States and abroad have bought plastic engines for experiments.

The six-cylinder, double-overhead-cam, turbocharged power plant weighs only 202 pounds, about 155 pounds less than the standard metal engine. The engine block, cylinder heads, piston skirts, connecting rods, valve spring retainers, tappets, timing gears, piston pins, intake valve stems, and scraper rings are all made of plastic.

With a lightweight engine a car can accelerate faster, handle better, move more smoothly, and produce about 100 decibels less noise. Inventor Motty Holzberg of Polimer Research, Inc., of Fair Lawn, New Jersey,

says, "You can also make the plastic engine in half the time—at about one third the cost—through new injection-molding manufacturing methods."

The Polimer Loka T-616 equipped with a four-cylinder version ran in several International Motor Sports Association Camel GT endurance races in 1984 and 1985, once finishing as high as third, never worse than sixth. The V-6 plastic engine is expected to debut in the 1987 Indianapolis 500.

Back in the Seventies Holzberg realized that thermoplastics—notably Teflon—an engineering resin made by Amoco Chemicals Company—could figure strongly in the design and manufacture of internal-combustion engines. Thermoplastic polymers are found in ball bearings, business machines turbine-engine parts, aerospace electronics connectors,



Habitual readers, it turns out, are far from sedentary.

and integrated circuit packaging equipment.

Polimer plans to turn out ten plastic engines this year for more racing tests, but Holzberg predicts the engine—or some variation thereof—will become commercially available within ten years.

"It really is the wave of the future," says Ford design engineer Robert Nefen. "By the year 2000 plastic engines will be commonplace."

—Robert Brady

"The very purpose of existence is to reconcile the glowing opinion we hold of ourselves with the appalling things that other people think about us."

—Quentin Crisp

ACTIVE BOOKWORMS

Bookworms, or habitual readers, are often portrayed as dull, inactive homebodies. Studies, though, show just the opposite, says John Deissauer, director of the University of Scranton's Center for Book Research, in Pennsylvania.

In surveys by Yankelovich Skelly & White and other firms, says Deissauer, one thing was clear: "Active readers were active in many other things, such as sports, TV watching, motorcycling and game playing."

"The significant thing is how many other activities readers engage in," explains Deissauer. "They're not the retiring wallflower types sitting at home with the shades drawn, reading."

In addition to other findings the center's studies revealed that habitual book readers like arcade video games, music, and computers more than those who don't read as much.

Deissauer, who heads the only book industry study center in the nation, says that, contrary to popular opinion, baby boomers read more than their parents do. "They have better educations and more books available," he says.—Alan Maurer

"Without bigots, ecocritics, cranks, and heretics, the world would not progress."

—Frank Baker Burgess

"Already at the origin of the species, man was equal to what he was destined to become."

—Jean Rostand



Scoring nearly 100 mph in 10 seconds, the new model V6 1.8-liter turbocharged engine is also an ecobelt saver. 34 CUNA



The platypus is even stranger than previously thought. Besides laying eggs, this weird mammal tracks its prey electrically.

ELECTRIC PLATYPUS

At first glance the duckbill platypus looks like a refugee from evolution's junk pile. Neither fish nor owl, the platypus is that most anomalous of animals: an air-breathing mammal that lives underwater and lays eggs. If that weren't enough, it now appears that the profile of the platypus features yet another startling eccentricity. The animal can actually use its ducklike bill to pick up signals from weak electric fields.

Biologist Henning Scheich of the Technical University in Darmstadt, West Germany had long suspected that the platypus—in common with sharks, rays, and some kinds of sturgeon—might have this electrical sense

"They fit the description," Scheich explains, "a night-active, water-bound animal with weak eyesight that eats live prey." When Scheich tested his notion by dropping penlight batteries into a pool where two platypuses were swimming, he found that the animals unthinkingly homed in on the batteries as if they were prey—preferred them, in fact, to the shrimp they were offered simultaneously.

Apparently the platypus's sensing mechanism consists of a series of tiny nerve-like receptors located in the animal's bill. As it swims about in search of food, it sweeps its bill back and forth, using it to pick up the tiny electrical signals that accompany nerve impulses in the bodies of its prey—an idiosyncratic

and uniquely platypusan form of biological radar.

—Bill Lawren

"Every revolution evaporates and leaves behind only the slime of a new bureaucracy."

—Franz Kafka

"It is a fact that man must control science and occasionally check the inevitable advance of technology."

—Thomas Huxley

MAGNETIC MONOPOLE

Found (maybe) the elusive particle that may tie the universe together. Ever since physicists started to formul-

ate the first GUTs—grand unification theories that attempt to find a common ground for the four basic forces in the universe—they have been searching relentlessly for a mysterious sub-

atomic particle called the magnetic monopole, the existence of which is necessary to make all these grand theories work.

Now physicist David Caplin of Imperial College in London has come up with what he calls a "candidate monopole event." In the fall of 1984 Caplin set up a detector especially designed to register the passage of a magnetic monopole: a free floating magnetic particle that, with its brethren, produces magnetic current just as electrons produce electric current. Such a particle would bridge the apparent gap between electrical and magnetic phenomena.

Because monopoles, if they exist at all, are expected to be extremely rare—"Maybe one would come by every ten thousand years," Caplin says—the physicist expected to find nothing at all. Then one day in August 1985 his detector registered an abrupt and dramatic jump in magnetic flux—almost exactly what theory predicted would have happened if a monopole had in fact passed through.

Even so, Caplin remains cautious about his claim. His detector, he explains, has only one channel, and to verify the monopole's existence its passage would have to be recorded simultaneously by a second channel. Huge multichannel detectors are now being set up at Stanford, Fermilab, and BM's Yorkton Heights center. If there are monopoles to find," Caplin says, "these should find them."

—Bill Lawren



The Imperial College detector did indeed find?



CONTINUUM

PAIN BLOCKER

A hormone-like substance that actually triggers the pain emanating from cuts, burns, arthritic joints, internal wounds, and other damaged body spots has now been identified. And new synthetic blockers—drugs tailored to block the action of the pain substance bradykinin—are currently being developed for human use.

Bradykinin is the most potent pain-producing substance known to man, neuropharmacologist Sola on Snyder of Johns Hopkins University in Baltimore says. "We're talking about a new generation of painkilling drugs acting at the initial site where the pain begins." Bradykinin normally travels in the bloodstream, attached to a so-called precursor molecule. But Snyder and his team of researchers found that when body tissue is injured, the bradykinin breaks from the precursor and attaches to nerve receptors at the site of the injury, triggering pain.

But the synthetic blockers created by biochemist John Stewart of the University of Colorado in Denver, can also attach to the nerve receptors, thereby stopping the bradykinin from doing so and thus preventing pain.

The blocker binds very tightly to the receptor but doesn't go on and on the most important step, which is to produce pain. "Stewart explains: 'It is like a key that won't turn but just sits in the lock so another key can't get in.' Right now Nova Pharmaceutical Corporation



The searing pain of burns is caused by bradykinin.

of Baltimore is in the early stages of refining Stewart's blockers. A prescription pain-prevention cream for cuts, burns, and arthritis Nova Vice president Hans Mueller says, could be on the market in four years.

—Eric Mahern

ADVANCED TELEPRESENCE

How do you fix a broken motor in the radioactive bowels of a nuclear-fuel-reprocessing plant? Dispose of hot nuclear waste or toxic chemicals? Repair a satellite in space?

From the Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee, comes a brand-new robotic creature that can do all these things. Called the Advanced Servomanipulator (ASM), it is basically a pair of dexterous mechanical arms—complete with shoulders, elbows, wrists, and grippers—linked electronically to a human operator in a distant control room. The operator experiences "feel" or force reflection, through electronic feed back while

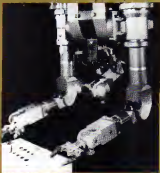
closed-circuit TV cameras and microphones function as the eyes and ears. The result is the latest in telepresence: an electronic slave that can venture into places too hazardous for man.

Since the late Forties there have been mechanical devices called master/slave manipulators to handle radioactive materials, but these, like all stationary industrial robots, are limited to a fixed position and can handle only specific, repetitive tasks. The ASM, in contrast, can move around over a large area at the bidding of its distant human masters. "It's very dexterous, very mobile," says Joseph N. Herndon of ORNL's Fuel Recycle Division. "And it is

designed modularly so that another manipulator can fix it if it breaks down on the job. This combination of traits makes the ASM unique in all the world," according to Herndon.

Only jobs like nuclear-fuel reprocessing (wherein usable material for the defense industry is extracted from spent nuclear fuel) and the disposal of nuclear waste are right up the ASM's alley, Herndon notes. And one day a cousin of the ASM will very likely be working for NASA, too. —Judith Hooper

"Science is the meeting place of two kinds of poetry: the poetry of thought and the poetry of action."
—George Agapostolis de Silva



The ASM at work. (Fuel cycle-related only)—complete, with shoulders, elbows, wrists, and grippers—linked to a human being.

ODD BODIES

For Dr. Ronald Bergman, exception is not simply the rule but a cause. After two decades of explaining to medical students why parts of their cadavers did not match anatomy texts, Bergman compiled the *Catalog of Human Variations*, a compendium of the 10,000 regis-



An extra finger says Dr. Bergman is contrarian.

terly occurring human anatomical variations.

One person in 6 million, for example, has *situs inversus*, in which the organs are turned around. More common are extra fingers and three bones in the thumb. And you can have four, six, or eight nipples or breasts.

Women with double vaginas might seek out men with an extra penis. Extra ribs occur rarely, whereas third kidneys are more common as are accessory lung lobes, spleens, and pancreases. Missing can be gallbladders, intestines, bones, and ligaments.

Textbooks omit such phenomena for space reasons, though physicians commonly encounter them in treatment. So with fellow

anatomists Dr. Sue Ann Thompson and Dr. Adel Ala-Bergman scoured 223 medical journals in four languages to compile all variations and their frequency. Doctors have sometimes failed to find certain structures, mistaken one for another and caused damage because they were uninformed or misinformed about natural variations.

Muscles, for instance, can be split in unusual ways or be absent altogether. Blood vessels can have dozens of exotic patterns, and nerves also wander.

Bergman maintains that there is a finite number of variables for any structure. With his second edition just out, he claims to have cataloged 95 percent of all possibilities. The book is 1,000 pages long.

—William Mueller

FALSE WITNESS

Judges and juries who depend on the testimony of police officers to arrive at a verdict are in for a sad surprise. A recent study by a British psychologist implies that cops' memories for facts elicited in interrogation are woefully bad.

Noel Clark of the University of Kent at Canterbury wrote up a fictitious interrogation by two police officers of a woman who claimed to have been raped. He showed the interrogation to 67 police officers. Then, only five minutes later, he asked them to imagine themselves in court, recalling the content of the interrogation for a judge.

The results varied accord-

ing to the technique used to recall the story. Those who did it script style ("He said then she said") remembered only 21.4 percent of the content accurately and introduced a large number of erroneous facts. Those who recalled the interrogation as a narrative ("This happened, then that happened") introduced fewer plausible inven-

tions but had a miserably low accuracy rating of 8.4 percent.

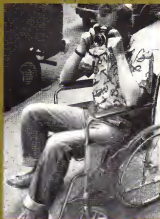
The only consolation in all this is that the cops did no worse than a group of students that Clark used as a control. In the meantime, Clark says, concerned constables are "streaming down to see me. They know it's a problem." —Bill Lawrence



Cops' courts depend on the accuracy of police testimony? A University of Kent experiment produced some frightening results.



CONTINUUM



• *There's no glass between them* When people in wheelchairs take pictures of others, the subjects seldom look at the photographer

PHOTOPSYCHOLOGY

Photographs provide a good picture of the people who take them as well as the subjects, says a University of Florida psychology professor.

"Photography is like holding up a multifaceted mirror that reveals things about you that you never realized," says Robert Ziller, who for nearly a decade has been conducting a worldwide study of what photography suggests about the photog-

rapher. Assisted by his students, Ziller found:

- When people in wheelchairs take pictures of others, the subjects seldom look at the photographer. "Our results were dramatic," Ziller says. "Everyone in the pictures looked away. That helps us understand both the images people in wheelchairs have of others and how others treat them."

- Both rich and poor Mexican boys, when asked to supply photos depicting who and what they were usually came

back with pictures of themselves taken by others. Mexican girls, however, rarely brought back photos of themselves. "South American males seem to have a lot more self-esteem than females do," Ziller notes.

- Shy college students take photos of school activities or buildings rather than people or themselves. Those not so shy take lots of pictures of others and ask others to photograph them. It's as if shy people don't like others to control their environment while a less shy person's time is usurped by others. Ziller speculates: "It's worth a deeper look."

- When college students at the University of Florida and in Poland were asked to shoot photographs of what he good life meant to them, Poles took pictures of churches, families, and schools. Americans shot personal belongings, themselves, and their friends having a good time. "It was a night-and-day difference," Ziller says. "Americans took much more personal, casual pictures."

Photographs are really an ideal nonverbal way of understanding others better," asserts Ziller, who is continuing his research. "They also help us see ourselves better. They're really like a dream, a frozen dream." —Alan Maurer

TRAINED SHARKS

Although sharks are usually perceived as dim-witted eating machines, trainers at the Naval Ocean Systems Center in San Diego have

taught nurse sharks to relieve traps, nuzzle targets, and perform other common dolphinlike tasks.

We wanted to see what we could get out of them, explains the center's Scott Johnson. Sharks have one advantage over dolphins: They don't have to come up for air. "We thought they might be helpful in finding things on the ocean bottom," says Johnson.

Starting with foot-long nurse sharks that grew to three feet long, the trainers used the same techniques that worked with dolphins: teaching them to nudge a trainer's leg and to respond to buzzers and other electric stimulation. They even fed the fish by hand. Nurse sharks don't have sharp biting teeth, Johnson says. "Their teeth crush. Of course, you don't stick your finger in their mouth."

He notes that those of us who have been around sharks weren't too surprised at what they could do. Most people think they're just swimming mouths. Actually they're brighter than many big, dumb fish and a lot of animals.

Johnson and his co-workers did discover that sharks tend to rebel against the training. "You could only do so much with them before they would get upset and bang at the gate to get back to their habitat. We'd just use them up."

And no, Johnson adds, there was never any plan to build a kamikaze shark. "If we could do that," he quips, "I'd move farther from the ocean." —Alan Maurer

In the twenty-first century
antibiotic substances will revitalize our skin,
our organs—and our genes

BY ANN GIUDICI FETTNER AND
PAMELA WEINTRAUB

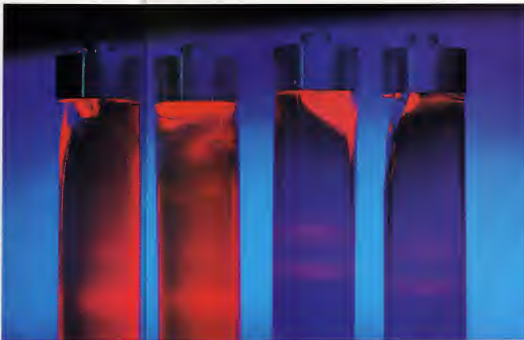
During Prohibition, Mama and her friends used to hike out into the still rural area surrounding Atlanta to buy bootleg whiskey from Pop Adams. In the Southern mode they would sit on the porch drinking "butterball" while Pop's daddy—who was one hundred one—tossed a shovel across his shoulder and ripped down through the pine woods to scatter some fuel cans of white lightning and outwit the Feds. Mama said the liquor was so raw it'd take the enamel off your teeth. But it must have been doing something right because the old man awakes by it. We have a little toddy now and then through the day, yessiree. Pop's daddy used a home-run cigarette dangling from his mouth. "Good corn leekers the secret to long life," wouldn't miss a day.

Pop himself had no patience for Mama's shudder as she gagged down the white corn squawgers and longed for something bottled in bend. That government whiskey? Why, isn't nothing but a little

water and a double handful of chemicals that'll kill ya sure n' half. Pop's professional bias notwithstanding, it's likely that some double handful of chemicals—produced internally or consumed in the course of everyday life—enabled the Adams men to survive in exceptional health and vigor to great old age.

The search for this double handful of chemicals—a magic potion to slow or defeat and postpone the ravages of age—is as old as man. The myth of Shangri-la, for example, comes from the Greek tale of the Hyperboreans, who—after living 1,000 years—simply plunged into the sea. The promise of gold went the Spaniards' only quest in the New World. They genuinely thought they would find the Fountain of Youth on the shores of Florida. Had the Spaniards recognized Aztec and Inca ritual smoke paintings as symbols of rebirth, though, it would probably have tipped them off. The Indians were looking, too.

But now, after millennia of



ELIXIRS OF YOUTH

PHOTOGRAPHS BY DAN MCCOY

frustration, youth alone may be at hand. What's more, the dozen or so substances on the horizon stem not from the commercial aspirations of a health-food chain or the twisted imaginings of a crank but from a new and profound understanding of how we age.

To scientists in the forefront of longevity research, aging is the tragic side effect of life. The hormones released during puberty and as a result of stress slowly erode the body's organs. The food we eat and the air we breathe generate highly reactive free radicals, which make subtle but deadly changes in DNA. And environmental hazards, from ordinary sunlight to industrial toxins, infiltrate the cells, helping to grind their engines to a halt. Some scientists have even found compelling evidence for an aging clock in the brain. As that clock winds down, they say, it alters the levels of hormones and other biological substances, slowly lowering the effectiveness of the heart, lungs, immune system, and just about everything else that keeps the body healthy and strong.

Increased comprehension of the problems, however, may soon yield what amounts to an aging cure. Within the next decade we might use hormones to bolster our immune systems, virulike vaccines to slow the death of cells, and urea acid to prevent the destruction of our genes. Such supplements could help us maintain our health and vigor throughout much of our current maximum life span of 115 years. What's more, in the twenty-first century these potions will be cleared by a new, more potent generation of "longevity pills." Enzyme drinks will endow us with the ability to repair each new nick in our armor of DNA, and synthetic neurohormones will literally reset the aging clock in our brains.

Instead of simply keeping us healthier longer, these new drugs will push the outside of the aging envelope, eventually increasing our life span by dozens of years. The first longevity drugs to reach the market could be the thyroxines, a family of hormones produced by the thyroid, the master gland of the immune system. "The immune system is the bubble that protects us from a dangerous, hostile environment," says biochemist Allen Goldstein, chairman of the biochemistry department at George Washington University. "And the immune systems of superhealthy people are unusually effective. The thyroxines play a key role for these people. Our goal is to learn how. Then we'll put the thyroxines into day-longevity pills to be taken once a day like vitamin supplements. The pill could add perhaps a dozen years to the maximum human life span of one hundred years. But even if it doesn't, it should help us live out in health the years to which we are genetically entitled."

Twenty-two years ago no one even knew what the thyroid gland was. Indeed, because the thyroid is the first gland in the body to atrophy—it weighs 200 to 250 grams at birth, begins to shrink at puberty

and has shriveled to a three-gram, gruelized clump of cells by the sixth decade of life—scientists always believed it had no function at all. But in 1961 researchers from the University of Minnesota removed the small, pink organ from a group of newborn mice. Much to their surprise the mice failed to grow and their diet of overwhelming infection. The suggestion that the thyroid gland was crucial to the immune system and quite apart from that, to the growth of the whole organism.

Enter Goldstein, a brilliant young post-doctoral student at Albert Einstein College of Medicine in New York. The year was 1964, and Goldstein was lucky enough to be working under the late biochemist Abraham White. When asked by White to conduct a needle-in-a-haystack search for a thyroid hormone, Goldstein agreed.

The thyroxine and its hormones, Goldstein eventually learned, control production of the white blood cells known as T cells, the brain and brawn of the immune system. He

Enzyme drinks will endow us with the ability to repair each new nick in our armor of DNA. And synthetic neurohormones will literally reset the aging clock in our brains.

found that the thyroxines work their magic by acting in the activation of three types of T cells: killer cells, which attack foreign organisms and cancer cells directly; helper cells, which aid in the production of antibodies and suppressor cells, which prevent the immune system from attacking one's own tissue. "It was obvious," Goldstein says, that "any imbalance in the numbers of various T cells could lead to poor health. The further implication that we could increase a person's immunological response by manipulating the amount of thyroxine in the blood."

Finally, in the early Seventies, Goldstein put his theories to the test with a five-year-old girl named Heather, who was suffering from a condition known as thymic hypoplasia. "Her body didn't make enough T cells," Goldstein explains. "She should have weighed early to seventy pounds, but she weighed only twenty-six pounds. She had all sorts of severe infections. In truth, her condition was terminal. But five days after we started her on thyroxine, her T cells were multiplying, her infections had decreased, and she was gaining weight."

Today, Heather is a healthy junior high

school cheerleader living a normal life. "I have a beautiful picture of Heather on my wall," Goldstein says. "And I think that what was true for Heather will be true for the great majority of the aged. Right now the shriveled thyroxine glands of the elderly produce only small amounts of T cells. Instead of suffering from the acute disease that Heather had, they go into gradual decline. But for them and for Heather, the solution will be the same. If we can give them enough thyroxine to keep the T cell level high, we should be able to enhance immunity throughout old age."

Rejuvenating the immune system with thyroxines would add perhaps a dozen years to life by fighting off cancer, arthritis, pneumonia, and many other diseases to which the aged are prey. But Goldstein's most recent work, suggesting that the thyroxines regulate an aging clock in the brain, should revolutionize the longevity field.

According to Goldstein, the idea that the thyroxine regulated more than the immune system came to him in the mid-Seventies as a result of a series of experiments done by endocrinologists like Sandra Michaels at the State University of New York at Binghamton.

Michaels found that removing the thyroid gland in female mice not only decreased resistance to infection—a sign of impaired immunity—but also distorted the ovaries and altered the vaginal opening. What's more, when Michaels gave the most thyroxine supplements, the conditions were corrected. Strangely as it seemed, the thyroxines—in addition to the normal array of sex hormones—were affecting sexual development, usually under the control of two glands at the base of the brain: the hypothalamus and the pituitary.

Goldstein decided to study the relationship between sexual development and the thyroxines too. Under normal circumstances, he knew, the hypothalamus secretes hormones that trigger a second plateau of substances in the pituitary—the sex hormones—that take us through puberty and ultimately make us mature.

Goldstein and Robert Reiter, now at Northwestern University Medical School, found that when they removed the hypothalamus and pituitary from mice and kept them in solution, the glands still released the full cascade of hormones—as long as thyroxine was added to the solution as well. Thyroxine, it seemed, could trigger the release of hormones in the brain.

In subsequent experiments, Goldstein learned that thyroxines were directly linked to other brain systems as well. They could stimulate the brain's production of adrenocorticotrophic hormone (ACTH), normally associated with light-and-dark reactions, beta endorphin, the "feel-good" chemical, and prolactin, a growth hormone. Stimulation of ACTH, for instance, caused the adrenal gland to pump out the hormones of stress. Even more interesting, he found, the stress hormones traveled full circle back to the thyroid gland. They crank the



TASTE WHAT YOU'VE BEEN MISSING

gland, turning production of thymosins—and thus release of stress hormones—down.

According to Goldstein, these elaborate feedback loops between the thymus and the brain are the key to aging itself. As we grow older, he says, "there are changes in brain chemistry. These changes alter hormone levels, causing deterioration throughout the body. And our studies place the thymosins at the center of this process. It's even possible that the whole range of brain hormones falls off from optimum levels as soon as the thymus begins to shrink before the onset of puberty. The suggestion is that it's the deterioration of the thymus that leads to deterioration of the brain—and ultimately of the body itself. By adding the thymosins back, much of that decay should be set in reverse."

Goldstein still recalls that when he first developed an interest in the field of aging, his mentor, Abraham Wiks, said, "Alan, whatever you do, don't pursue it until you're at least forty-five because it's sure to ruin your reputation. People will think you're a crackpot." Now forty-eight, with the discovery of the thymosins behind him and pictures of powerful political friends on his office wall, Goldstein can afford to dream. We know for sure that thymosins prime the levels of brain hormones involved in reproduction, growth, and development, he says. Thus we should be able to use them

to maintain a whole complement of characteristics associated with youth: fertility, razor-sharp cognitive skills, tactile memories, fast reflexes, potent wound healing abilities, and even that most intangible of traits, a youthful zest for life. Because these restorative hormones also bathe our skin muscles and bones, these body parts should retain their youthful structure and appearance as well.

"In five to ten years even healthy people will be taking the thymosins on a daily basis," Goldstein declares. "Those supplements should help to push the average person's vigorous years upward of eighty or ninety simply by boosting the immune system. Because we'll also increase the level of vital brain hormones, the impact will probably be greater still."

While Goldstein wants to reset the aging clock in the brain with thymosins, other substances may also prove to be potent antiaging agents. As it turns out, it might be possible to tap into the feedback loop of aging at any point along the way. And one of the most promising youth elixirs to emerge from the brain-thymus feedback loop has the prebaking name of dehydroepiandrosterone, or DHEA. One of the most common steroid substances secreted by the adrenal gland, DHEA has recently been shown to protect the thymus gland, increasing the number of T cells available to fight off infection and disease.

The last chapter of the DHEA story, though, started more than a decade ago, when Temple University cancer researcher Arthur Schwartz stumbled upon a study of 5,000 women on the British island of Guernsey. The study found that those women who eventually developed breast cancer had abnormally low levels of DHEA. It seemed to Schwartz that if low levels of DHEA were associated with the presence of cancer, high levels might keep cancer away.

Schwartz went on to add DHEA and powerful carcinogens to animal cells in culture. The carcinogens alone would have resulted in high rates of mutation and cell death. But with the addition of DHEA, the culture continued to grow in perfect health.

To try to understand these results, Schwartz went back to the literature for clues. And two things stood out. First of all, the amount of DHEA in the body was highest at age twenty-five or thirty. From that point on it decreased until, at age seventy, it was at about 5 percent of its peak.

Even more interesting, DHEA, where metabolism. Excess glucose, Schwartz explains, is normally stored in the body in the form of fat. But when DHEA was added, the fat pathway was blocked. The glucose instead traveled down the only other metabolic pathway available—the energy-yielding pathway, where it was converted to the body's ultimate form of fuel, ATP.

Significant weight loss resulted.

Studies had long shown that low-calorie diets prevented some forms of cancer. Now it seemed as if a mysterious cancer-preventive, DHEA, acted just like a low-calorie diet, promoting weight loss. Perhaps DHEA and low-calorie diets worked in much the same way.

If so, Schwartz knew there was a tantalizing 36-in with aging. Thus far, the only proven means of extending life had been fasting. Anecdotal evidence came from the Himalayan Yogis, known for their long lives and subsistence diets. And experimental evidence came from Cornell University nutritionist Clive McCay who in 1935 doubled the average life span of rats by limiting their food intake. Not only did McCay and other researchers eventually use the technique to stretch the average life span in a large number of mammalian species, the researchers also found they could increase what's known as maximum life span—the age reached by the oldest survivor of a population. The implication? Something basic to the very mechanism of aging had been changed.

Schwartz set out to see if that mechanism, whatever it was, could be affected by DHEA as well. And after eight months he achieved remarkable results. Untreated mice "were coming down with cancer right and left," while those injected with DHEA had no tumors at all. But the absence or presence of cancer was just the

beginning. The untreated mice seemed old. They couldn't move as quickly and their coats were coarse and gray. The DHEA mice ran around like pups—and their coats were sleek and black. Says Schwartz, "Without a doubt they were aging at a slower rate."

Today Schwartz is working with a safer, synthetic analogue of DHEA that he says is ten times more potent. He still hasn't received Food and Drug Administration approval to test the analogue on humans, but he expects to receive the go-ahead in a couple of years. And when he does, he hopes he might see some of the same life extension effects in people that calorie restriction has in the mice. If animal results can be carried over to humans—a distinct possibility—then the DHEA analogue might extend our life spans by as much as 50 percent. In other words, when treated with the supplement a sixty-year-old would resemble in every respect the forty-year-old of today. At age one hundred the treated individual would resemble a healthy person at sixty-five.

"The goal right now," Schwartz adds, "is to understand the mechanism by which DHEA seems to promote weight loss and longevity. Once we understand what's happening during calorie restriction, which seems to be the same thing that's happening when DHEA is consumed, we might develop a host of DHEA-like substances that can help us lengthen life—without re-

ducing a person's weight."

Many have taken Schwartz's goal to heart. This past summer, when longevity researchers attended the prestigious Gordon Conference in the tiny college town of Plymouth, New Hampshire, the big news was that the diet-restriction mechanism—and the body chemicals that drive it—were on the verge of being found.

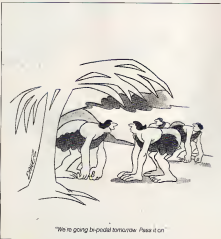
Gathered at the foothills of White Mountain, in the solemn lecture halls of the Plymouth State College, the world's top longevity researchers were unprepared for the weight of evidence that would mount. First German gerontologist Klaus Beyreuther reviewed the life cycle of a cell. Ever since Leonard Hayflick published his classic paper in 1961 it has been known that human cells are mortal. They divide some 60 times over a period of years. Then they suddenly stop. Beyreuther explained that the amount of time between each division cycle could be increased or decreased, depending on the nutrients present in the petri dish. The cells could divide at least 60 times in as little as a year, but if they were virtually starved, the 60 divisions would take three times as long. If diet-restricted mice stretched out their life spans because they had less food, perhaps diet-restricted cells did the same.

Also on the agenda was physiologist Edward Masoro of the University of Texas at San Antonio. When Masoro restricted the calorie intake of laboratory rats, he extended the spans by 50 percent.

Recently Masoro reported he had come to suspect that the increase in life span might be due not to a decrease in calories per se but rather to a decrease in a specific component of the diet. To test that notion he restricted elements of the everyday diet, one by one. But it was to no avail. He now believes that diet restriction itself seems to trigger the release of a neurotransmitter or hormone, and that, in turn, is what extends life. "I'm now preparing experiments with two guiding principles: What kind of hormonal change might cause life extension? And how can hormonal responses be modified by calorie restriction? Once we find the answers to these questions, we may be able to home in on the specific biochemical mechanism. Then, and this is a very real possibility, we'll be able to intervene in that mechanism, actually extending life."

The mechanism suggested by Masoro, it turns out, may have been found in what amounted to the most explosive life extension news in years. Molecular biologists James R. Smith of Baylor Medical College in Houston and Charles K. Lumpkin of the Veterans Administration Medical Center in Little Rock, Arkansas, and their colleagues said they were zeroing in on a senescence protein that inhibits DNA synthesis in skin cells, literally shutting down the cell.

As Lumpkin, a specialist on aging, tells it, he began to suspect the existence of such a protein when he learned that old cells, infected with certain viruses, seemed





*The face of the future,
high-tech tucks and laser lifts*

BODYSHOP

BY VIVA

William de Kooning, the great abstract expressionist interpreter of the female form, worked so long and obsessively on each painting, the story goes, that the only way his dealer could make him finish one was by yanking it off the easel. A lot of women who undergo cosmetic surgery

PHOTOGRAPH BY KIM STEELE

•Skin substitutes might be made by mixing artificial skin with cells stored in a tissue bank when the patient was young •



view their flesh-and-blood bodies the same way. The forty-six-year-old American I met in Rio while I was having some alterations myself was undergoing her fifteenth surgical procedure. One short year later she asked if I knew a good surgeon in the USA because she wanted her bottom redone for the third time and her eyes for the fourth.

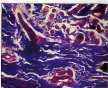
New to the De Kooning syndrome, I was just beginning to find more room for improvement on myself when I ran into Gore Vidal and Paul Newman, and Gore said: "You're looking good, but why'd you stop at the neck?" If I hadn't been nursing my daughter Gabby I told him, I would have lain down right there on the slab like every body else in Rio and had a total overhaul.

"My philosophy," Paul volunteered looking better than he ever did at thirty—is to do everything you can do to yourself until you can't do any more. Then check out."

After researching this article I have news for Paul. He may not have to slum that racer into a cement retaining wall when osteoporosis takes over. Thanks to a blurring of the lines separating biochemistry, physics, engineering, medicine, and surgery, eternal youth may be around the corner.

I began at the engineering school of MIT.

Previous page: laser-cycled cosmetic surgery by Sachs. This page (clockwise from lower left): electron micrograph of young skin; electron micrograph of old, degenerating skin; Yannas-Garke artificial skin; Sachs's tissue clay.



where Ioannis Yannas, the inventor of artificial skin, has just told me he's also regenerated the sciatic nerve of a rat by severing it, removing a two-thirds-inch piece, and fitting a polymer-filled tube into the gap. But the intense, darting-eyed scientist has also nearly shown me to the door of his clutter-filled rooms at the university because of the following exchange: "They don't know you in the news office."

"That's because I'm not a medical writer. I'm an actress, and when I write I usually write kind of quirky things."

"I am not quirky. My work is not quirky," he says, in the formal, accented English of the nonnative speaker.

But the public relations man who told me Yannas has "already been burned by the National Enquirer" convinces him that I'm on a nonquacky mission, so he consents to give me 20 minutes of his time.

"We've discovered it's possible," he says, "to take a fresh wound before it has had the chance to grow scar tissue and, by filling in the wound with artificial skin, to guide it in the direction of regrowing the tissue that was there. The artificial skin biodegrades as new cells grow into it."

"What about test-tube skin—cultured skin—the kind Nicholas O'Connor, the plastic surgeon right here in Boston, put on those two famous little brothers who were burned over eighty percent of their bodies? Why is artificial skin better?" I ask, referring to the skin cloning procedure developed by Howard Green of Harvard Medical School and implemented in the brothers' case by O'Connor and Dr. Gregory Gallico, another great plastic surgeon from Boston. They took two centimeters of skin from the boys' armpits and saved the brothers' lives by reproducing enough of it to cover their entire bodies.

"Everybody talks about those two boys," Yannas complains, "but there are more than one hundred and twenty patients walking around right now on whom we put our artificial skin."

The artificial skin, as it biodegrades, stimulates the regeneration of the dermis (the dermis lies under the epidermis). The artificial skin is actually an arrangement of collagen fibers, and it's that arrangement, Yannas says, that makes the difference between scar tissue and the new skin when it grows in. The Yannas-Garke skin (Dr.

CONTINUED ON PAGE 122



FICTION

THE END OF THE WHOLE MESS

BY STEPHEN KING

I want to tell you about the end of war, the degeneration of mankind, and the death of the messiah—an epic story deserving thousands of pages and a whole shelf of volumes. But you—if there are any of “you” later on to read this—will have to settle for the frozen dried version. The direct injection works very fast. I figure I’ve got somewhere

PAINTING BY RUDOLF HAUSNER

between forty-five minutes and two hours, depending on my blood type. I think it's A, which should give me a little more time, but I'll be gaddamned if I can remember for sure. If it turns out to be O, you could be in for a lot of blank pages: my hypothetical friend, I think, maybe I better assume the worst and go as fast as I can. I'm using the electric typewriter—Bobby's word processor is faster, but the gamm's cycle is too irregular to be trusted, even with the voltage regulator. I've only got one shot at this. I can't risk getting most of the way home and then seeing the whole thing go to data heaven because of an ohm drop.

My name is Howard Fomor! I was a freelance writer. My brother Robert Fomor was the messiah. I killed him by shooting him up with his own discovery four hours ago. He called it *The Calmative: A Real Big Mistake* might have been a better name, but what's done is done and can't be undone as the Irish have been saying for centuries, which proves what astrologers they are.

Shit, I can't afford these digressions. After Bobby died, I covered him with a quilt, sat at the window of this cabin just north of North Conway, New Hampshire for some three hours, looking out at the big nothing. Used to be you could see the orange glow of the high-intensity arc-discharge from town, but no more. Nowhere's just the White Mountains, looking like dark pieces of crepe paper cut out by a child, and the pointillist stars.

I turned on the radio, dialed through four bands, found one crazy guy, and shut it off. I sat there thinking of ways to tell this story. My mind kept sliding away toward all that nothing. Finally I realized I needed to get myself off the dime and shoot myself up. Shit, I never could work without a deadline. Well, I got one now.

Our parents had no reason to expect anything other than what they got: bright children. Dad was a history major who had become a full professor at Hofstra; at thirty-five years later he was one of six vice administrators of the National Archives in Washington, DC, and in line for the top spot. Good shit, too. Had a whole Chuck Berry collection, my dad. He died by day and reeked by night. Mom graduated cum laude from Drew Business Administration. Got a Phi Beta Kappa key she sometimes wore on this funky lodestone hand. She became a successful CPA in DC; met my dad, married him, and took in her shingle when she became pregnant with yours truly. I came along in 1969. By 84 she was doing taxes for some of my dad's associates as a "hobby." By the time Bobby was born in 1987, she was handling trusts, investment portfolios, and estate planning for a dozen powerful men. I could name them, but who gives a fuck? They're either dead or chivvying dots by now.

I think she probably made more out of her "hobby" each year than my dad made at his job, but that never mattered—they were happy with what they were to train-

selves and to each other. I saw them squabble lots of times, but I never saw them fight. When I was growing up, the only difference I saw between my mom and my playmates' moms was that their moms used to read or iron or sew or talk on the phone while the soaps played on the tube, and my mom used to run a pocket calculator and write down numbers on big green sheets of paper while the soaps played.

I was no disappointment to a couple of people with Mensie cards in their wallets. I maintained A and B averages through my public-school career (the idea that either I or my brother might go to a private school was never even discussed so far as I know). I also wrote well early with no effort at all. I gave my first magazine piece when I was twenty—it was on how the Continental Army wintered at Valley Forge. I sold it to an inline magazine for four hundred fifty dollars. My dad, whom I loved and do love deeply, asked me if he could buy that check from me. He gave me his own personal

● I went
running after him. Visions
of his body
tumbling off that stupid
saddle and
impaling itself on a tree
stood out with
hideous clarity in my mind. ●

check and had the check from the inline magazine framed and hung over his desk. Sweet guy. Of course he and my mother both died raving and pissing in their pants—like most of the human race—late last year, but I never stopped loving either of them.

I was the sort of child they had every reason to expect, a good boy who grew up in an atmosphere of love and confidence, a bright boy who found a considerable talent and put it to work.

Bobby was different. Bobby wasn't just bright; he was a bona fide genius.

I polly trained two years earlier than Bob; that was the only thing in which I ever beat him. But I never let jealous of him; that would have been like a fairly good high-school pitcher feeling jealous of Carlinus Hunter or Ron Gaudy. After a certain point the competitiveness that causes feelings of jealousy simply ceases to exist. I've been there, and I can tell you. You just stand back and shield your eyes from the flash burns Bobby read at two and began writing at three. His printing was the straggling, struggling galvanic constructions of a six-year-old, startling enough in itself, but if

transcribed so that the logging motor control no longer became an evaluative factor, you would have thought you were reading the work of a bright, if extremely naive, junior high school student. Sometimes his syntax was garbled and his modifiers misplaced, but he had such flaws—which plague most writers all their lives—pretty well under control by age five.

He developed headaches. My parents were afraid he had some sort of physical problem—a brain tumor, perhaps—and took him to a doctor who examined him carefully, listened to him even more carefully, and then told my parents there was nothing wrong with Bobby except stress. He was in a state of extreme frustration because his hand would not work as well as his brain. "You got a kid trying to pass a mental kidney stone," the doctor said. "I could prescribe something for his headaches, but I think the drug he really needs is a typewriter." So Mom and Dad gave Bobby an IBM. A year later they gave him a Commodore 64 with a WordStar program for Christmas, and Bobby's headaches stopped, although he really believed for the next two or three years that it was Santa Claus who put that word cruncher under the tree.

Now that I think of it, that was maybe the only other place where I beat Bobby. I Santa-trained earlier, too.

I could go on, and will have to, at least a little, but I'll have to go fast. The deadline. Ah, the deadline. I once read a very funny piece called "The Essential Gnome with the Mind that went like this: 'A war?' laughed Scarlett. 'Oh fiddle-dee-dee!' Boom! Charleston was taken! Ashley died! Atlanta burned! Rhett walked in, and then walked out! Fiddle-dee-dee," said Scarlett, through her tears. I will think about it tomorrow, for tomorrow is another day. I laughed heartily over that when I read it, now that I'm faced with doing it, it doesn't seem quite so funny. But here goes.

"A child with an IQ immeasurable by any existing test?" smiled Linda Fomor to her devoted husband, Richard. "Fiddle-dee-dee!" We'll provide an atmosphere where his intellect—not to mention that of his something-less-than-micronic older brother—can grow. And we'll raise them as the normal, all-American boys they by gosh and! Boom! The Fomor brothers grew up! Howard went to Rutgers, graduated cum laude, and settled down to a freelance-writing career! Made a comfortable living! Stepped out with a lot of women and went to bed with more than a few of them! Managed to avoid social diseases both sexual and pharmacological! Bought a Curtis-Matthe TV and a Moulton stereo system! Wrote home at least once a week! Published two novels that did pretty well! "Fiddle-dee-dee!" said Howard. "This is the life for me!" And so it was, at least until the day Bobby showed up with his two glass boxes, a bed's nest in one and a waste nest in the other. Bobby wearing a Mumford Phys. Ed T-shirt inside out in the best



DAYS OF FUTURE PAST



*It was a great plan:
space station by '63, a man on the moon in '64*
BY RON MILLER



The vast bulk of the space shuttle (facing page) sits on the launchpad at tiny Johnston Island in the equatorial Pacific Ocean. It is a monster rocket—as high as a 24-story building, more than 130 feet taller than the Statue of Liberty. The 85-foot-diameter blue houses 51 massive engines, which will lift the 7,000-ton rocket from the earth.

As the dawn countdown reaches zero and 5,000 tons of volatile nitric acid and hydrazine ignite, the shuttle heaves skyward on a mile-long column of flame. The first and second stages separate, parachuting back into the ocean for eventual recovery and reuse, and the glider-winged, manned third stage soars into Earth orbit, 1,075 miles above the planet.

Here is how astronauts begin unloading the 30 tons of cargo they have ferried into space:



building materials for the giant wheel-shaped structure looming close by (next, page 76). When completed, in 1993, the 250-foot-diameter space station (pages 76 and 77) will house 80 technicians, scientists, and astronauts. Then the crew begins the next phase of their mission: a manned landing on Earth's moon in 1994.

This is how our space program could have evolved if, in 1962, the editors and consultants of a magazine called Collier's had had their way. One of four top-circulation magazines that flourished in the Forties and the Fifties, Collier's was famous



TEST ORBIT USING RHESUS MONKEYS (BELOW LEFT) AND LAB TESTS WITH MEN (BOTTOM) PAVED WAY FOR MANNED SPACEFLIGHT. ESCAPE PODS (LEFT AND BELOW) WERE PART OF THE SHUTTLE.



for its fiction, its exposé of government corruption, and its scoop on the latest scientific developments. Eventually the editors decided to investigate the feasibility of space travel in the (then) near future.

In 1951 managing editor Gordon Manning decided Collier's should hold a symposium on the subject. He gathered a team of experts who would dedicate themselves to exploring the possibility of space travel.

The team Manning assembled included Wernher von Braun, then technical director of

the Army Ordnance Guided Missile Command; Fred Whipple, chairman of astronomy at Harvard University; Joseph Kacelnik, professor of physics at UCLA; Heinz Haber of the U.S. Air Force Department of Space Medicine; and the symposium's general adviser, Willy Ley, an authority on space travel and rocketry.

To translate the ideas of Von Braun and Ley into the pictures shown here, the team chose artist Chesley Bonestell, whose work had often appeared in Collier's. Fred Freeman, an-





other Collier's veteran, and technical illustrator Roll Klapp.

During the two-year course of the magazine series a full-scale space program was outlined. In the opinion of the Collier's symposium the United States could have an artificial satellite in orbit by 1953 and a 50-man expedition to the moon by 1954, all supported by a fleet of giant shuttle rockets and a manned space station. And all at a cost of only \$4 billion!

Their last step would be the launch of a "baby satellite," an unmanned artificial moon car-

rying three rhesus monkeys. The 30-foot cone—200 miles above Earth—would orbit for 60 days. Eventually it would reenter the atmosphere, incinerating like a meteor. (The monkeys would be, thoughtfully, first given a dose of lethal gas.)

The preliminaries for manned spaceflight would follow: extensive physical and psychological testing; the development of a space suit, special tools, escape pods—every necessary detail. The authors also specified that women would be included from the beginning.

Once the manned orbital flights were successful the construction of the space station would follow. The completion of the station was slated for 1958. It not only provided a platform for observation of the earth but was the base of operations for the construction of the fleet of spacecraft that would eventually make the trip to the moon.

The space-station design has become a classic: a twin-spoked wheel 250 feet in diameter and a giant inner-tube-shaped rim 30 feet wide, divided into three concentric floors (see the large drawing on pages 76 and 77). The wheels



rotation used centrifugal force to generate gravity. The rim was divided into numerous departments, including meteorology, communications, astronomy and medical research. The station was also equipped with a number of space labs for microgravity maneuvering.

While the magazine's letter columns were filled mostly with enthusiastic comments, the Collier's reviewer prompted mixed reactions from others. Time magazine's editors, for example, admonished that an "oversold public" happily mixing fact and fiction apparently believed that spaceflight is just around the corner.

But the public was right. Collier's surely can take some credit for the enthusiastic support the event received when the United States launched its first satellite four years later. ☐



EARLY ROCKET (RIGHT); ITS NOSE CONE, A BABY SATELLITE (ABOVE RIGHT); AND EARTH TRACKING STATION (ABOVE), SPACE-STATION TRAINING (TOP) AND FLIGHT TO ORBIT (FACING PAGE)

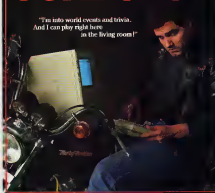


COMPUTOUGH



"Anyone who wants to win MegaWars has to dominate entire planetary systems. And me."

COMPUFUN



"I'm into world events and trivia. And I can play right here in the living room!"

BODY

BY KATHLEEN RICHMOND

of the brain's capacity for work will help to determine a particular person's "boggle point," when a normal brain stops processing information because it's overloaded. The information could also be instrumental when custom designing an air traffic controller's console or an aircraft cockpit. The tool would be made to fit the user rather than requiring the user to fit an improperly designed tool.

Medicine ultimately may be the biggest beneficiary of current MEG research. Parkinson's disease, chronic pain, manic depression, and schizophrenia could be diagnosed more precisely and thus treated more effectively. But epilepsy is the ailment for which MEG research may have the most immediate application.

Doctors nearly always use EEGs to draw maps of epileptic activity: the brain emits electromagnetic emissions that indicate seizures. EEGs record the brain's electrical signals. Unfortunately, the skull distorts those signals. In a few instances doctors have had to drill holes in patients' skulls—sometimes as many as 100 holes—to place electrodes close to the brain, and this is a very risky business.

MEG on the other hand, uses passive sensors outside the skull and can reliably detect and localize the same epileptic spikes magnetically—with no distortion. Indeed, Dr. Giovanni Rizzo of Rome's Institute of Neurosurgery recently used MEG in three cases to pinpoint epileptic tissue prior to surgery.

People may move from comas more quickly if stimulated, but finding what stimulus works best with a particular person—light, sound, touch—presents a problem. With a good brain map and MEG, doctors could quickly determine which stimuli "switch" the brain and then go on to select appropriate treatment. During the 1973 Arab-Israeli war, Dr. Yehuda Ben-Yehoy, director of New York University's Head Trauma Unit, noticed that soldiers who could not communicate because of head trauma recovered more quickly if exposed to sensory stimulation—flashing lights or noise. At Los Alamos, Ed Flynn is preparing to extend Ben-Yehoy's work to comatose patients. Flynn will soon scan children born in comas, hoping to establish ways of differentiating active and comatose areas in the brain.

Only hard-hearted Malthusians quibble with improving medical care, but MEG promises other technological improvements: some raising ethical questions. Flynn's Los Alamos group is using MEG to study how ampie sounds like "do, do, do" and go are processed mechanically in the ear. They hope to apply this knowledge in the area of artificial intelligence. Though the CIA won't discuss its MEG research, MEG offers potential for a more sophisticated generation of lie detectors. **OO**

EXPLORATIONS

CONTINUED FROM PAGE 48

threatening situations, but put them in situations where they can use those natural abilities," he adds.

Wild gibbons, for example, spend 70 percent of their time foraging for food. "That's the beauty of their behavior—the fact that they run between trees, pick the best fruit, find another tree, go on like that," he says. Yet in captivity, with their large canines and ape-like nails, they typically are fed by having food thrown on the floor through a slot so they can't get the keeper.

In one of his first Portland projects, Markowitz devised an apparatus that enabled the zoo's gibbons to obtain food by swinging between two elevated stations. Now animals learned the technique from the animals involved in the original experiment, and for the few gibbons who chose not to participate, food was provided in the usual way. "It's not as if any of this stuff is forced on them," Markowitz says. "They choose if themselves."

Predators pose a ticklish problem. They, too, get bored. One way to pique their interest would be to give them the chance to kill another animal. Zeos understands they are squeamish about this idea.

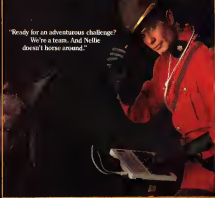
Insects are about the only live food zeos will serve. Markowitz, in fact, once built three cricket dispensers for an exhibit of Asian river otters at the now defunct Marine World Africa USA in California. Visitors pressed buttons to determine which dispenser would yield the next cricket. No body shed any tears for the insects, although keepers did stage a mock protest called the Save the Crickets Movement and, in turn, petitioned an employee party.

Real blood and guns, however, do not go over big with first graders on field trips. So Markowitz has built exhibits to trick captive predators into showing off their predatory skills without shedding blood. For a start, Haver has designed tanks, mechanical prey to attract the zoo's tigers. By scratching a fake tree with a built-in sensor, the tigers could take a rabbit and a fake squirrel to go out of two artificial mounds in the exhibit. (Tigers in the wild often scratch trees as a prelude to hunting.) If the tiger caught its prey—that is, swatted it or pounced on it—another device would deliver refrigerated meat to the exhibit. The tigers get exercise and amusement; zoo visitors get a chance to see tigers at work.

But there's less the paradox of the better-zoo movement: Zeos seek ever more naturalistic environments, yet no zoo, Markowitz contends, really wants to let a wild "Nobility" wants nature in the zoo because nobody wants to see Bambi die, he says. "Nobody wants to see the way animals really make their living."

Markowitz believes that his machines can restore at least some of lost skills and powers. "We have an obligation," he says, "because we have taken these things away from them." **OO**

COMPUCRAZY



"Ready for an adventurous challenge? We're a team. And Nellie doesn't horse around."

COMPU SERVE GAMES



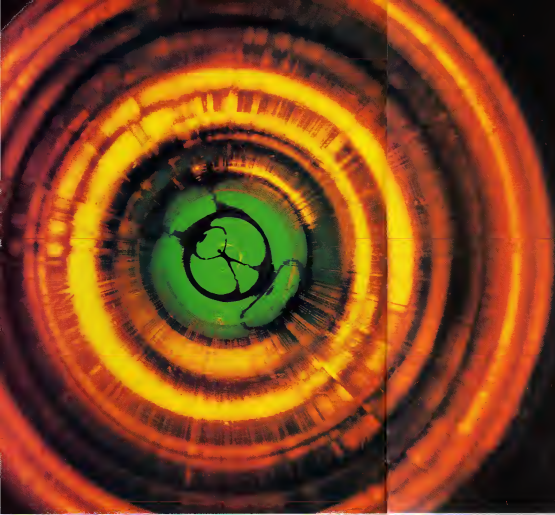
You never know who you'll be up against when you go online with CompuServe.

To buy your CompuServe Subscription Kit, see your nearest computer dealer. Suggested retail price \$59.95.

To request our free brochure or order direct, call or write: **800-848-8199** (in Ohio, call 614-457-0800)

CompuServe

3000 Anderson Grove Road, Columbus, OH 43207



Seekers of eternal
life, they are science's

DEATH AVENGERS

BY KATHARINE LOWRY

By the time I'd tramped up four flights of stairs to John Smith-Sonneborn's lab, burdened with the weight of various textbooks and journals thrust on me by the dozen life extension advocates I'd already interviewed, I was on the last leg of my journey and on my last leg, period. Gasping for breath and bristled in sweat, I could hear my knees making what sounded like a death rattle.

How much I'd just oversteered the country, yHaggled through several time zones, rained at the crack of dawn, blazed burned the midnight oil, bowed the L.A. freeways' kamikazes, waded through rooms of atrocious scientific data, and now climbed stairs as steep as Mount Everest, just to catch up with—and keep up with—these

PHOTOGRAPH BY
ERIC MEOLA

indefatigable crusaders for life extension.

You just aren't used to the seventeen-thousand-foot altitude here in Llanfair. Smith-Somebeneb said as she mopped my forehead with her lab coat and watched me swallow a Coca Cola whole.

Likewise the week before California physicist Richard Hochstetler tested my physiological age with his highly acclaimed and accurate H-Scan machine. "You actually look young for your age," he kindly offered, along with a Kleenex when the H-Scan's cold computer printout pronounced this his twenty years senior.

All in all it was a humbling, harrowing odyssey but well worth the effort. The two charismatic leaders profiled here are truly inspirational revolutionaries, reminders that altitude and action can change the course of history and alter our view of reality. By normal standards, these enthusiastic advocates of life extension might seem opinionated, hard-headed, egocentric, and single-minded, but who can deny that there is at least a beautiful obsession? Among the most articulate, altruistic activists in the field, they confront the late date most of us deny refusing to succumb without a fight. Meanwhile, those of us who remain as resigned to death as we are to taxes—and five years beyond our chronological age—can only sit back and wish them the very best of luck.

DON YARBOROUGH

Standing on the Clear Springs Cade, a century-old barn turned saloon near New Braunfels, Texas, big, barrel-chested Don Yarbrough seems the kind of larger-than-life Texas character all the myths are made of. So is his gun-slinger attitude toward death: "Death is just like a bounty hunter or a hired gun out to get you, you can stand there quaking in your boots or hiding under the covers until he finds you, or you can try to do something ahead of time to save yourself."

Yarbrough began his career as a lawyer with a nine-man Houston firm, then went on to amass self-made millions with shrewdly purchased real estate in Houston and along the Austin-San Antonio corridor before the big boom fizzled out. With yet another family to raise (he's on his third wife and sixth child), this backsliding Espada coplan is understandably loath to give up all this prime acreage for an eight- to four-foot burial plot.

Though he keeps abreast of every development in the field of aging and has funded life extension research to a high six-figure tune, some prices are too high to pay even for the gift of life.

"I'm bad about exercise. In fact, I'm fat," he declares, patting the beer belly underneath his tennis shirt, which doesn't even qualify him as paunchy by Texas standards. "I play a little tennis, do some walking, and a lot of talking," he cracks. "I don't smoke but do like to eat and drink in moderation, and I just hate to die," he adds unnecessarily, watching down his friend

shrimp special with three white wines.

Yarbrough, who's always been a science buff, first got interested in aging research more than a quarter century ago. "I'd been reading science journals for years, and the more I read, the more I started to notice that we were on the verge of a scientific revolution in the aging field," he says. "Every year it seemed as if the control of aging were getting to be more and more feasible."

When he launches into a long recitation of why he firmly believes that physical salvation is at hand, he both sounds and looks like evangelist Billy Graham, except that Yarbrough's steel-gray crew cut could never be "moussed" into a pompadour. With a probing speed that leaves a listener breathless, Yarbrough noddies from subject to subject: on the government's obligation to save the lives of its people, on the NIA's (National Institute of Aging) need to spend more on the mechanics of aging, on the promise of protein

● *Most people don't confront death until they have to, but it's hard to understand how a rational person who does confront it wouldn't want to do something about it.*

engineering, on the heartening advances in sophisticated laboratory tools, on the plethora of biotech companies now scrambling to beat down death's door on and on and on.

Finally taking one deep breath and one big gulp, Yarbrough concludes his ten-minute sermon by forwarding a guess that a way to cure genetic disease may come as soon as Christmas. Just how long would he like to give himself? Well, I enjoy life an awful lot, and it stays as good as it is, I would love to go on another fifty or one hundred years at least.

Asked if he personally fears death, Yarbrough pauses thoughtfully and then answers in the second person: "Well, I think as you get older you get less and less afraid of it. . . . Like everybody else you've just been programmed to accept that that's what's gonna happen, so the program just takes over and makes you more almost matter-of-fact about it."

Not that he'd go willingly. "If some doctor said I had just a year to live, I'd spend most of my time doing everything I could to kick it before it kicked me. That just fits my personality," he says.

DAVID BROWN

As a twenty-nine-year-old consultant with NASA, David Brown saw his career prospects soar when the Eagle landed smoothly, courtesy of the landing gear he'd designed for NASA's first lunar module. But his former space engineer turned real estate magnate turned financier turned energy-management executive is also a passionate life extension philanthropist. "Remember when they said it was utterly impossible to land a man on the moon?" he asks. "Now they say it's impossible to substantially prolong life. Well, we managed that giant step for mankind, and we can manage the one, too."

Still in the habit of thinking for himself, Brown vehemently rejects the prevailing myth that the prospect of death is what gives life meaning. "I disagree," he says quietly, sipping iced tea and ordering mushroom soup and blackened redfish. "Unless you're a very religious person, I think it's exactly the opposite. Death is what makes life not have very much meaning."

The son of a poor railway postal clerk, Brown is still recovering from his father's sudden death from a pulmonary embolism several months ago. "Both my parents were very devout Christians," Brown says, mentioning the trip to the Holy Land he sent them on. "But I'm afraid I'm more of an agnostic. I hope God is out there, but I suspect he isn't. But even without God's help we have it within our power to save ourselves," he declares. "What's stopping us, aside from a trivial death of funding, is the almost universal tendency to deny death's existence. Most people don't confront death until they have to, but frankly it's hard for me to understand how a rational person who does confront it wouldn't want to do something about it."

Claiming he's far from an ideal executive—prone to giving sketchy instructions and losing his patience—he delegates much of his energy-management company's business to others and spends an exorbitant amount of his own time and money advancing the cause of life extension. Brown is an original member of the Alliance for Aging and the founder of the Foundation for the Enhancement and Extension of Life (FEEL), a nonprofit organization designed to fund research projects and engender more public interest in the control of aging. The money Brown spends on this venture is strictly his own, he's careful to say, not his stockholders'.

Using the modest, not the royal, "we" throughout our talk, Brown specifies his foundation's projects to date. "We've put about half our money into research, especially seed money for various experimental things. For instance, we gave money to help develop accurate physiological biomarkers, since it's impossible to study aging if you can't measure it." At the same time, he adds, the foundation funded a controversial project with University of California at Berkeley research scientists Paul Seppel and Paolo Timmer in the field of cryonics, or

body freezing. "You know the Robert Frost poem about ending in fire or ice?" he asks. "Well, give me ice, since it won't be long before we'll be able to achieve true hibernation, ready to be thawed when whatever killed us can be cured."

Despite receiving the standard tax write-off for nonprofit charities, FEEL is fiscally a losing proposition for Brown but one that might reap priceless long-term benefits—in his lifetime. "Like most of my fellow life extensionists, I'm insatiably curious—and selfish," he says. "I have a very enjoyable life, one in which I can basically go where I want, do what I want, and buy what I want. But there's simply no way with a normal life span, to do or experience all that I'd like. Besides, I really enjoy being productive—and reproductive, too," he adds, pausing to boast about his three grown children. "There must be some kind of a God," he says with a twinkle, "because love and sex are actually good for your health."

As for wanting to live longer: "I want as many years of healthy life as possible. I think the ideal situation would be if everyone could live as long as they wanted to," he adds altruistically. "A thousand years sounds good to me."

PAUL GLENN

For the past 30 years business tycoon Paul Glenn has been the Santa Claus of life extension, donating well over \$2 million of his own money to aging research. During a lengthy conversation from his home in Scottsdale, Arizona, Glenn is gradually expansive, delivering a lucid assessment of how things stand in the field and where he stands, pausing several times to volunteer a dozen different names and phone numbers that might prove helpful. Despite the rains of factual data Glenn rattled off with computer-printout speed, his feelings are exposed just as fully and expressed with heart-felt candor.

"Being an only child, life had always been very pleasant. I was treated like a crown prince, essentially, and was exposed to a very rosy view of the world. So in my late teens, when I watched my grandfather die of cancer, it was shocking to see the tougher side of reality and confront the presence of death. I resolved then that since nothing was more valuable than healthy human life, trying to help extend human life was the most valuable thing I could do in this world. However, he drolly interjects, "because my dad had brainwashed me into first making money in the business world. I did. But the aging thing stayed on my mind."

In 1985, already a self-made millionaire, Glenn became friends with an early champion for the rights of the aged, Florence Mahoney, best known for ramrodding the NIA through Congress over Richard Nixon's vehement objections. She impressed on the young idealist the critical importance of establishing an organization to serve as a viable, effective power base. Taking her advice, he formed the Glenn

Foundation for Medical Research. "I also got involved with Denham Harman, who developed the free-radical theory of aging twenty-six years ago; we supported his work and also Johann Bjorksten's close-link theory of aging and we scattered money around in various directions for a lot of years," he sighs. "Without what you'd really call a breakthrough, I'd say most investigators would concede that we still don't know much about the aging process."

"But," he continues, "we do know a lot more than we did when I got started, and now we have the tools and the techniques to make cells give up their secrets, and—more importantly—we have better researchers with better ideas than ever before. So while it may sound contradictory to say that I'm far more pessimistic than anybody else, I'm also still an optimist."

He's more a clear-eyed than a cock-eyed optimist, though. Reminded that several well-respected scenarios, including Roy Walford and Joan Smith-Sornborom, now predict the likelihood of major breakthroughs in the next five to ten years, Glenn impatiently snaps, "Yes, they do believe that. But on the other hand, I've been hearing statements like that for a long, long time—an understandable attitude for a man who has been hearing for 30 years that his check is in the mail and has yet to receive a single dividend."

It seems logical to me to expect that a combination of life-style, exercise, and

chemical intervention that might increase our DNA-repair capability might help," he sums up. "But frankly, fifty-five looks pretty old to me right now. It's about the seventh inning of the ball game for me."

In the meantime he does what he can to save himself. "I avoid sugar, I've never smoked. I've never even gotten married," he says, laughing, though he has come close several times. Though described by friends as tall, thin, robust, and perpetually smiling, with a zip-a-dee-doo dash cheerfulness, Glenn has a nasty-sounding cough this day, as he details his health regimen: a Protein-low-calorie, low-protein, high-carbohydrate diet, a lot of vitamins, and supplements like selenium, choline, and several other compounds—though taken in much smaller amounts than by the fearless likes of Duke Pearson and Sandy Shew. "We simply don't know the long-term effects of those megadoses, and I don't have the courage to be a guinea pig," he says. Like Yerebrough and Brown, Glenn finds it hard to mix hard exercise with the easy life. "I do play a lot of golf and carry my own bag and almost jog," he says, "but I probably get more exercise just going nineteen hours a day like I do."

He sadly agrees that his life is more purposeful than pleasurable. "I spend three quarters of my time making money and one quarter of my time deciding how to give it away," he says. "Still, making money is fun, and so is participating in the creative pro-

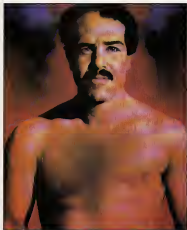
CONTINUED ON PAGE 70



*The way we age is undergoing
a profound transformation. Today's middle-aged
man is the next century's youth.*

LIFELINES

BY SUSAN ELLIS



You're probably wondering why the man above looks so strange. He is forty years old, but the two halves of his body live in different centuries. The right side of his body (left side of picture) represents the forty-year-old male of 1995: skin sagging, hairline receding, muscles softening. But his

better half (left side of body, right side of picture) is what the forty-year-old man of the twenty-first century will look, and feel, like—if longevity research is allowed to develop its potential.

Why must we grow old and die? What triggers the settling of bones, the shifting of flesh, the

PAINTING BY KUNIO HAGIO



reshaping of contours? The answers are still being worked out by an energetic core of scientific researchers. And from that work a new patient may emerge: one in which the life span of the human being verges on immortality. It doesn't occur to the average young man that the aging process has already begun. But by age twenty-five, he has already shrunk slightly so that by forty-five he will have lost an eighth of an inch in height. He has also grown hairier, but not where it counts. On the top of his head an overload of the male hormone testosterone is short-circuiting hair growth. His skull is thickening, enlarging the head's circumference about one quarter inch every ten years. His shoulders are narrowing, and muscle mass is yielding to fat—an difference to muscle cells that fail to regenerate and repair themselves. His vocal cords have stiffened, pitching his speaking voice higher. And because the brain takes slightly more time to process information,

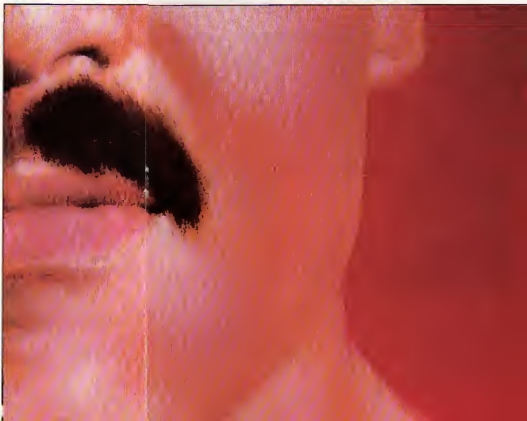
TODAY'S FORTY-YEAR-OLD (THIS PAGE, CLOCKWISE FROM LEFT): THE EYE'S LENS HARDENS, HINDERING CLOSE VIEWING; HAIRS SHRINK; TASTE BUDS DECLINE IN NUMBER; CONNECTIVE TISSUE REPLACES BODY'S MUSCLE FIBER, CAUSING THE MUSCLES TO STIFFEN; SKIN THINS AND SPREADS, LOSING ELASTICITY AND BAGGING IN MIDSECTION.



**TWENTY-FIRST-CENTURY
MAN: HIGH-TECH
FITNESS TESTS WILL HELP
OPTIMIZE EXERCISE
REGIMENS, CONDITIONING
MUSCLES FOR
LONGEVITY (ABOVE AND
TOP RIGHT);
DRUGS WILL PROTECT
VISION (MIDDLE
LEFT); HORMONE-BASED
FORMULAS WILL
SLOW HAIR LOSS (TOP
LEFT); COMPOUNDS
WILL REJUVENATE AND
PRESERVE
THE SKIN (RIGHT).**

his reflexes have slowed.

Will we ever be able to delay these changes and prolong our youth? Science has already provided some answers. Aging, it appears, stems from no single cause but from many. Researchers are investigating the genes, the endocrine system, and the chemistry of our cells for the secret of youth. While some scientists hunt for the genes that may control how quickly we age, others seek to fine-tune the body's self-repair mechanisms that maintain good health. Already in clinics there are steroids that curb obesity and diabetes, and a group of hormones that bolster the immune system. There are drugs to help prevent the chemical damage that precedes cataracts, and others that enhance memory by intensifying neurochemical activity. In some laboratory cell transplants may reverse neural disorders. Someday we may live our entire lives as youths, protected from the gradual alterations of age. ☐



SOME OF US MAY LIVE FOREVER

LONGEVITY

THE NEW MONTHLY NEWSLETTER FROM OMNI MAGAZINE

SUBSCRIBE TO LONGEVITY TODAY AND RECEIVE THE ULTIMATE GUIDE TO HEALTH, WELL-BEING, AND A LONGER, MORE VIGOROUS LIFE!

At no point in man's history have there been so many dramatic advances in the science of life extension and in the number of years we can stay healthy, active, and young. Even more exciting is the revelation that it's never too late or too early to begin! With this in mind, we would like to invite you into a bold new world in which people do, in fact, live longer, more vibrant lives—the world of LONGEVITY. Not just another fitness magazine, LONGEVITY is the extraordinary new monthly newsletter bringing you the latest breakthroughs and up-to-the-minute information on the art and science of staying young.



IMPROVE WITH AGE

More and more we're finding that the overwhelming majority of personal issues related to health and longevity are within our control. LONGEVITY will draw together the latest findings on how we can retard the aging process and prolong youth.

- Why do we age?
- How can we help our bodies stay young?
- Are there ways to rejuvenate the human brain?

The quality of your life is yours to determine—and LONGEVITY will show you how.

CONSUMER WATCH

There is a great deal of confusion about the products now crowding the health-care market. LONGEVITY will cut through all the clutter and offer clear, concise reports on how they stack up.

- How do anti-aging creams compare against each other?
- Which hair-growth formulas really work?
- Are there memory drugs available that can enhance intelligence?

LONGEVITY's "Consumer Watch" column is a report evaluating the newest products on today's market, how they work, if they work.

WHAT TO EAT

The question of what diet best promotes health and longevity has long been imbued with controversy. In order to help you choose the best diet, LONGEVITY will help you understand the basic principles.

- How many of the old nutritional tenets are viable today?
- Do vitamins C and E help extend life?
- Can polyunsaturated oils hurt more than help?

LONGEVITY will bring you the most encouraging advances available today on achieving longevity through dietary manipulation.



THE IMMORTALISTS

In the pages of LONGEVITY you'll meet the practitioners of the new life-extension techniques.

"Information is already available to enable one to live more than 120 years."

—Ray Walford, gerontologist
UCIA Medical Center

"People now under thirty (and perhaps those substantially older) can look forward—at least tentatively—to medicine's overtaking their aging process and delivering them safely to an era of cell repair, vigor, and indefinite life span."

—Eric Drexler, author
Engines of Creation

LONGEVITY will examine the personal regimens of today's visionaries and determine how useful they may be for others.



INTO ETERNITY

Eliminating death does not seem likely. But a number of visionaries have given us pause to reflect.

- Can memory and identity be transplanted from one lifetime to the next?
- Is there a way to repair the body on a molecular level to keep it running indefinitely?
- Can genetic engineering redesign our bodies to live forever?

Each month, our "Life Lines to the Future" column will help bring you closer to the frontiers of life extension.

THE FIRST ISSUE IS FREE!

As a charter subscriber to LONGEVITY, you are entitled to receive, absolutely free and with no obligation, the next issue of LONGEVITY. If you are not completely satisfied, simply write "cancel" on your bill and return it. You get to keep the first issue—free—and owe us nothing.

If you choose to subscribe (and we think you will), you pay just \$29—a savings of 40% off the regular price of \$45—for a total of 12 monthly issues. If at any time you become dissatisfied with LONGEVITY, simply let us know, and you'll receive a full refund for all unmailed issues.

LONGEVITY

P.O. BOX 11301 DES MOINES, IA 50347-1301

- ☐ Send me Longevity today and bill me later.
☐ I know I'm going to want Longevity, so I have enclosed \$29 for 12 issues!

Name

Address

City State Zip

CREDIT CARD HOLDERS CALL TOLL-FREE:

1-800-341-7378

IN IOWA CALL: 1-800-333-6662

- ☐ Check enclosed ☐ Money Order enclosed
☐ Visa ☐ MasterCard
MasterCard InterBank #

Acct. # Exp. date

Canada and elsewhere: add \$4.00 per subscription. Please allow 6 to 8 weeks for delivery. H036



"WE ARE ON THE BRINK OF NOTHING LESS THAN A PROFOUND REDEFINITION OF HUMAN LIFE."

—SEN. ALAN CRANSTON,
ON THE
SCIENTIFIC INQUIRY
INTO
WHY WE AGE

LONGEVITY will visit the front of aging research and bring back the kind of information that could change the lives of all who read it.

LIVE YOUNGER

Reports featured in upcoming issues will include: Cell repair machines that could make perfect health forever • How a woman's brain ages differently from a man's • The modern doctor's physical • Make yourself younger from the inside out • The optimal weight for longevity • Building a better brain • The cities that give you a longevity edge • A drug that cures obesity and diabetes • The next one-a-day vitamin • Add decades to lifespan through diet • A chemical antidote to stress • The way to rejuvenate aged skin • The scientists winning the war against memory loss • Clues to why we age • Drugs that help you lose weight safely • Slow your rate of aging in three weeks' time • How to be young in the year 2010 • Preventing the onset of glaucoma and cataracts • Exercising for longevity • A new technology that promises to reverse the effects of brain damage • Hormones that boost the immune system • Looks, brains and longevity • Why women outlive men • Tuning up the body's self-repair mechanisms

BREAKTHROUGH REPORTS

Relocating genes for a longer life • Bringing dead tissue back to life • Life extension profiles on Senator Alan Cranston, gerontologist Roy Walford, Life Extension founder Saul Kent, Life Extension authors Dirk Pearson and Sandy Shaw, and others • Consumer reports on memory drugs, life extension formulas, vitamins, hair-growth formulas, antiaging skin creams, calcium

products, fitness programs, health spas • The value of cell extract injections • Spas that claim to make you younger • Finding out your "true" age • Natural longevity aids • Mind over longevity • Aging myths • Curing insomnia • The power of dreams • Machines that cleanse blood clogged with fat • How a woman ages • Conceiving a child at 60 • Cell transplants that could build a whole new brain • Reversing the effects of stroke • Drugs that make you smarter • New and improved antioxidants • Life preservers • Natural enemies • Aging index • Lifestyles of the 100+ set • Food for life • Why we die • Resetting the biological clock • Preventing bone loss • Antiaging drugs • How to avoid cutting life short • Energizing the body's youth factors • The world's longest-lived people • Fetal extract with life-prolonging potential • Protecting cells against damage • The value of "life extension" formulas • Finding the genes that control how long we live • Ageless lifestyles • Lifelines to the future • Old age in the next century

LIFE PRESERVERS

The first creams to repair aged skin • Biomarkers of aging • People who expect to live forever • Tackling the secret of youth • A survival kit for the 21st century • Whether funding for aging research • Achieving optimal health • Personality and longevity • The height advantage • Growing younger • How a man ages • Transplanting memory from one lifetime to the next • An oil that helps prevent age-related disorders • In search of the "death hormone" • Gorgeous at 80 • The lowdown on megadosing • Antiaging nutrients that work • Longevity indicators • Improve with age • Thinking young

LONGEVITY

THE NEW MONTHLY NEWSLETTER FROM OMNI MAGAZINE

"FULL OF EXCITING, CHALLENGINGLY PROVOCATIVE FINDINGS."
FORBES



"SO RICH IN SCOPE AND VISION THAT BOTH MEN AND WOMEN WILL LEARN ABOUT THEMSELVES... A MAJOR WORK."
BUSINESS WEEK'S GUIDE TO CAREERS



"A SUPERB BOOK OF IMAGINATION AND INFORMATION..."
LOS ANGELES TIMES



WOMAN OF TOMORROW AVAILABLE IN PAPERBACK TODAY!



SEEN NATIONALLY ON
MERV GRIFFIN,
SALLY JESSY RAPHAEL,
AND GOOD MORNING
AMERICA!

WOMAN OF TOMORROW
BY KATHY KEETON
AVAILABLE THIS OCTOBER
PUBLISHED BY
ST. MARTIN'S PRESS
\$4.95



FICTION

This con artist can turn a fast buck, but with the right shell he can make a fortune and live high on the hog

PIG THIEVES ON PTOLEMY

A TALE OF THE TRICENTENNIAL

BY LEO DAUGHERTY

I was the year of the Tricentennial 2076. I was up on Ptolemy working the traveling bubblegum-carnival circuit with a penitentiary three-card-monte game that brought in steady money without putting much of a hurt on folks.

I'd been a preacher back on Earth in one of the biggest and most powerful of the evangelical TV variations. I thought I was up-and-coming in the firm, so I was damned surprised to be assigned way the hell out to Ptolemy to do this straight-out missionary shot for the pioneers. But it was my call, and I accepted it with a fighting sensation of a cheerful heart. I was ready to drop Earth like a hot potato anyway, just like everybody else you met down there at the time who could get his hands on a Geiger counter. We are as the saying goes, taking Mean Chance here. So I was really about as amazed as anybody else when I up and ran off to follow the circus just ten days after I stepped down

PAINTING BY AUDREY FLACK

from the Goodbird onto that hot, hard, orange ground of Ptolemy. But I had to go. All I took was one good look at the master program they'd put together for the prisoners up there—particularly the needed behavioral subroutines controlling subject attitudes toward sex, death, money and the work ethic. A very big fog was in, and I just figured I couldn't be a part of it and still live with myself. So since I couldn't get off Ptolemy, all I could do was head out like any old Huckleberry Finn.

But I found out fast that I was not the only runaway but fly on this blazing little Sun-kist ball. I quickly ran into the small cadre of painted ladies and smiling-cloggs, small-time con artists that had sprung up like a cheap bouquet of paper wildflowers on the edges of the Company's nearly limitless bureaucracy. All of these folks had been something else, sometime, but they had found out fast in the Ptolemaic outback that they would have to metamorphose their former arts and skills into things that could turn them a fast buck. Me, I metamorphosed a Transitanian minstrel into a little three-card-monty routine. At the first pang of hunger, I saw the transformatory light and I decided to live in and by it. The Company tolerated the ladies as a biological necessity and it tolerated us con artists as that time-honored, necessary distraction that has always been called entertainment. But the Company stood still for the existence of both groups on the sole condition that I got its far-tied share from the hookers and from us. So, yeah, I was allowed to live—and to live outside the hideous Company prison—only because I offered the workdome a small opportunity to let off a little diversionary steam via a spot of indulgence in some floating three-card Alas... after two finger callusing years, the trouble inevitably got to be what the trouble always gets to be: I couldn't make enough money to live. Three-card is like the old shell game in that you really need a partner to shell it for you. Somebody to talk the rubes in and keep them in. And somebody good enough at adding to play the capper's role on occasion—to pretend to be a mark who is betting you at your own game. So I began to plan on getting me one.

It was important to get one quick because I wanted to make a killing off the Transitanian. It was the American way, and everybody else had their hands in the patriotic pie up to their eagle-and-flag-tattooed forearms on all five of the colonized planets and moons, buying low during the first half of 2070 and hoping we'll sell high during the actual week of the Fourth.

So I made it my plan to look for a malleable apprentice, largesse what on my monthlong vacation with Black Johnny Walker and Doubledeck Lonely Hearts. I needed a blue-eyed, tow-headed miscreant possessed of a natural buccic shink to play the confidence-inspiring young American citizen in these little one-act outages I was forever writing in my head. The ideal shink would, in fact, be a

cryptoauma slave case—or, as the slang had it, a Frank—who would meet those surface aesthetic criteria, who would work for less than a kid off the street, who would worship the panson he or she worked for, and who could be taught to do a job about as well as anybody else (Frank is diminutive for the naive people remember as belonging to the poor creature invented by Mary Shelley and played by Boris Karloff in the movies.) Not too many folks knew it then or know it now, but back on Earth in the last part of the century they had the international project in cryogenic medicine called Freeze Till Fix. They were using people killed in accidents, car crashes mostly as cryogenic-research subjects and they simply fast-freeze these bits of highway unhappiness until the time when they could mend them in a manner sufficient to make that depressing old blue first line turn into some of your merry little hop-skip-and-jump vital signs. So when the big cryogenic breakthrough came in the Thir-

teenth century, it was Slepik Fetchit. And those Franks—bought to serve as slave labor for eternity—were Ptolemy-bound.

What Argentina did not tell the Company—and, in fact, may not have known, since some of those Franks were scraped off Earth's iceways as early as the 1960s—was that the majority of them had, in fact, been previously programmed to be skill-specific slaves of various kinds (usually done with the subjects' consent in return for a guaranteed minimum wage plus benefits—disgusting after 1997 but not below) and that sometimes that ancient circuitry had not been even half-assedly yanked out by the people who awakened these marginal citizens years after from their deep icy beds into the new servitudinal warmth of Frankdom. So—when I set myself up to interview potential slaves in my vanile-scented hotel room on the last day of my vacation, one of my main concerns, obviously, was to not stir any previous enslavement programs that might still be in there. For example, you wouldn't want a slave for your three-card-monty shink who'd been previously programmed to garrote any inquisitive person who asked. What's going on here?

After interviewing five or six seriously fucked-up Franks during all of one typically steamy Monday on Ptolemy, I got discouraged and began to despair of finding anybody who'd be really first rate—who'd provide smooth, suave, intelligent seeming service as a shink, all the while being dominated to hell and gone by a good old slave mentality neurochip that would render him happy only in the total service of a perfect master such as myself. I stood up, stretched and strolled out into the white fluorescent hall. And I hunkered down and sort of somnambulistically began dealing some three-card on the hall carpet. Sure, I was on vacation, but I'd been doing this game nonstop for two years, and I didn't know how to quit. I even did it in my sleep.

I soon had me a perfect embryonic audience of two or three fat, drugged-out Company execs there in the hall, sitting around on the thick, periwinkle blue carpet, and they started losing a little money to me. But there was this one dopey-looking guy who was on to it and he kept winning off me every precious piece of change the suckers lost. I had to cut my losses, so I claimed I had a phone call to make. I quit dealing and put the cards in my vest pocket (never at the ready). And I did all the other my subtle necessary for folding up my metaphorical tent and strolling gracefully away—mostly small-talk stunts of grin, nod and hairumph to provide the twin illusions of continuity and closure so crucial to the happiness of man in groups.

But the dopey-looking guy stayed. He was wearing blue-tinted mirror glasses and a pink silk scarf, and he was ting his nails with a real metal file. About a small one. Dangerous sign, that. He smiled an abnormally twisted smile—a sardonic, knowing smile too—as he handed me back all the money he'd won. "I know how you do it,"

Comac
was sitting in a huge walnut
rocking chair,
in his lap was a squealing,
half-grown hog
with the smooth, translucent
pinkness of the
erstwhile piglet still upon him.

ties they brought about half of these people back faster than you could say "bioethical questions of terrifying magnitude."

But—without the accompanying renaissance in bionics and the sudden appearance of the infamous parking lot businesses on the black market, we would not have seen Franks in the vast numbers that we did. It happened, however, that the support industries were there. And so Franks by the hundreds of thousands were seen there too, mostly stumbling around with glazed-out expressions on their faces.

Naturally, as you might expect, the first thought on lots of peoples minds was: Let's jam neurochips into these archaic bastards' skulls and erasive them and make lots of easy cash off of them. There were strict laws against that kind of entrepreneurship in America, but not in some of the other countries that had Franks on ice, and thus it came to pass that there was this ugly little chapter—exposed. I have noticed, from most official histories of Ptolemy—in which the Company bought three hundred Franks from Argentina with untraceable dollars and implanted them with the infamous program the big guns re-

he said: "Used to deal a little three-card mazzé," he said. "I'm here for the interview, he also said. I am Calgula Coniac."

We went back into my room. I poured a drink for this fucked-up Frank—I'd know one of those Frank smiles anywhere—and a drink for me. "Calgula, how'd you do?"

"Shot." He sort of chuckled and blushed embarrassedly. "Shot with a genuine twenty gauge shotgun, in point of fact."

"Who shot you?"

"Hog farmer."

"Why?"

"Caught me pig stealin'! Pretended little pinkie'din's you ever laid your eyes on."

"Why were you stealing his pig?"

"Coniac is a Pal Mail, inhaled deeply, and let the blue smoke pour out of him along with a deep sigh. "Born again pig thief programmed to steal pigs for a stock-raising outfit out of Groenwilde, Texas, and—"

"This was a voluntary programming?"

"Oh, yeah, voluntary, hell, yeah," he said with a slight grimace. He spoke extremely slowly. I could just barely see that his eyes were shut behind his sparkling blue lenses. I mean, my folks were gone and I had to have a skill of some kind to survive, and they had these specific programs back then—parts of that wild old underground implant master they called Fagin; you may've heard of it—which freed you to do lightly felonious thievery of an ultraspecific sort for an exacting central taskmaster." He grinned. "My sort was stealing pigs."

Now there had always been a thriving hog business on Ptolemy. This was because the Company surveys showed that the workers wanted pork chops, pork roasts, ham sandwiches, and BLTs. And that finding never varied from day one.

So that meant pigs. But the Company kept its porcses in sufficiently short supply to keep the prices jacked up, so pig stealing was a profitable, small-time, under-world enterprise. Calgula Coniac had been shipped up to Ptolemy as part of a five-Frank deal after he and the four others had been brought back in Buenos Aires from a long, cold sleep. As a Frank known to come with a powerful slave implant, and an equally powerful Fagin pig-thief program, Calgula was snapped up by a notorious hog ring boss, name of Harry Hopkins, who was eventually caught and hung at a Company picnic for running his Fagin ring. The late Mr. Hopkins' Franks were then, of course, appropriated by the Company and mostly reprogrammed as office menials.

It was a good story. I always loved a good story.

"I was the best pig thief in this venue," Calgula said. "And I was goddamned proud of it. He looked out the window at the transparent, gray bubble-dome of the circus, with the wind-beaten pennants flapping madly atop (in eight bright pastel hues. "I could lift a shoat out of a pen, from under a porch, up from the trough, day or night, even under a full moon, anywhere or

anyhow, and nobody wouldn't have a single, solitary squeal. It's all in the way you grab hold of 'em and carry 'em afterward."

I let a King Edward cigar took another long hit of Johnny Walker and smiled my most laconic and dangerous smile. In as casual a fashion as I could muster, I asked Calgula Coniac the big one: "That old pig-pillage program still in there?"

"Now. They erased that bastard four years ago when they made me pink-collar and put me over in Files."

"Why're you leaving the Company?"

"Just being as hell here in Files, really. They told me they'd put me on someplace else, but I decided to strike out on my own. You never get anywhere workin' for wages in the free-enterprise system."

I looked at him as piercingly as I could. "You want to work for me though?" I said. "And you won't even be getting wages, exactly. You'll be a damned slave. Again!" I knew there was nothing he could do about his slave mentality, but I liked him enough to want to warn him.

Calgula Coniac downed his drink and looked back out the window, clenching the ice cubes with teeth made from God knows what. "Workin' for a man ain't like workin' for a bureaucracy," he said. "So it would be a start for me, mister."

I left a real salt tear made each eye. He was right in what he said. I had to agree with his sentiments—and admire the man who had uttered them.

And so it came to pass that I moved, in that precise time and place, to invent a very little money in exchange for what I hoped would be a shoat of slave labor.

At no point in my life prior to the preceding month or so would I have ever taken on a Frank. I would have thought it immoral and degrading and just categorically evil. But now I knew more about the American Dream being celebrated by the Bicentennial. I had learned the eternal economic truth that profit is uncompensated labor. And that eternal truth I figured must mean that uncompensated labor—somebody else's—is the very heart of the American Dream, the real meaning of 1776 and 2076. So on this day I gleefully, and in high good conscience, took on a Frank, Calgula Coniac. On the stormy night following that same day, I went down to the embubblised circus tents and started running a little three-card in my regular licensed area. In his thespian debut Coniac was to play the time-honored role of the capper, the make-believe mark, in this polka-pine string. I had given him a roll of small counterfeit bills to bet with, and I had kept another small roll of counterfoils in my vest pocket from which I'd pay him his supposed winnings. (I didn't mistrust Coniac; it's just that I can't manipulate the cards to lose when I see real money bet. My fingers go on strike.)

I set up my trusty folding table and began to show the rubes how easy it was for them to guess which face-down card was the jack of hearts. These hardworking pastoral folk quickly gathered in a thick semi-



circle and began to nudge and tease each other into betting—just what I like to see.

Well, it was night then and there that Comac ought to have ditchhopped up and called the turn on the jack for a few lives and tens, just to get these assembled day-shift software workers started. But no Comac it was weird. I'd seen him two or three times while doing my warm-up spell, looking about aimlessly and looking at the side-show pictures with half a pound of popcorn in his mouth and a cold beer in his hand, but he'd never come within a hundred feet of my operation.

The crowd was moderately enthusiastic, but as I hope to have made clear trying to make money off three-card without a skill on your payroll is like fishing without bait. So I closed down the game with only forty-two IPOs on the black side of the ledger—enough for a carton of cigarettes and a week's worth of chili-burgers—when I'd hoped to make at least four hundred.

I sauntered on home around 11:30 or so, poised myself a worried nightcap and turned in I lay awake for two minutes or so while images of Comac drifted through my mind—images of a dumb Frank with a wad of counterfeit money in his pocket, drifting around in the ersatz sidewalk amongst the peroxide cometeers and dolphin perlers, and interactive holographic strip shows of what was possibly his first real circus. I vowed to give him a stern fatherly lecture first thing in the morning.

I was dreaming about Marilyn Monroe and Groucho Marx when I jerked straight up in bed at the sound of somebody's loud sneezing and sneaking in ungaily fashion. It sounded like the colic to me, probably the green-apple colic I'd been through all that in my time. I thought, *All* was the loudmouthed little bastard out. But two hours later he or she was still going strong. Infuriated, I called the dock.

In my quietest, most reasonable, most upper-class voice, I complained. They said they'd send somebody up. The screaming continued. Fifteen minutes later there came a knock at the door. I got up, threw on my robe and opened it. In a picture perfect, little adolescent black suit, the night manager stood before me with his eyes rolled up to the heavens. He said nothing but made a palms-up gesture as he shrugged his shoulders and sort of semi-sighed.

"Look, buddy," I said to him before he'd said a word to me. "I don't care what the damned baby's parents said. I want you to get back over there and tell 'em to cram a grapefruit in its mouth! Is that clear?"

"Sir," said the night manager with a practiced, long-suffering air, "that is no child. It is the squealing of the pink pig that your friend Mr. Comac brought home to his room a couple of hours ago. And if you are uncle or brother or second cousin to it, I would much appreciate your shutting up its mouth, sir, yourself, if you please." His eyes had become narrow slits of flame. He had pulled the curtain on his patience act.

I mumbled embarrassed apologies while

throwing on my clothes. In a minute I was in Comac's room. He was sitting in a huge walnut rocking chair and in his lap was a squeaking, half-grown Hampshire hog with the smooth, translucent pinkness of the erstwhile piglet still upon him. Comac was attempting to feed him from a baby bottle—and to all appearances, succeeding.

"Jesus, Comac," I was dumfstruck, but only just for a second there. Then I started in on him. He had not kept his word. He had caused me to waste time and lose money. He had kept me awake. He had embarrassed me with the night manager. But worst of all, he had backed, going back into piggy pulling after intentionally lying to me about having had his porcine-specific Fagin program installed. I said a lot of things. I was outraged. Morally outraged.

The poor fucking Frank looked up at me with the eyes of a found dog that's done wrong and knows it. "Please don't be too hard on me," he said in a choked voice. "And please give me another chance. It's

◀ *Standing
before him in the dim light,
I must have
looked like a farmer with a
- wheelbarrow, with
a pig on it that was tied down
with somebody's
lime-hued decorator sheets* ▶

true that the program was only partly erased, and it's true that the pig passion is still there on certain nights, particularly for the fat pink ones. I couldn't help but hear Pig stealing a call I was ever any good at. It was my goddamned identity. And I will be that way until I am gone into and deprogrammed and then truly reprogrammed. That's why I'm working for you—to get the money to make the dream of getting myself AppleCored a reality." (AppleCores was the only true global deprogrammer in those days; it went into you at the center of things and just sort of reamed it all out.)

Again tears came into my eyes at the sentences coming from Comac's mouth. Who could not forgive him? Who could not give him another chance? Who could not act in furtherance of his nearly impossible dream?

"He was hungry, that's all," said Comac. "He'd go back to sleep now." And indeed. The little porker's eyes were shut, and he was launched on an ocean of sleep in the protecting arms of the pigpsychical Frank.

Within five minutes, back in my own bed I was launched on those same calm waters. I always get up early, no matter where I

am, and read the morning paper before having a big breakfast followed by five or six cups of coffee to accompany my ritual attack on the triple-crustic crossword puzzle. And the first thing I saw in the next morning's *Prolemy Proday* was a double-column, boldfaced ad right at the bottom center of the front page. I said:

FIFTY THOUSAND IPOs REWARD

I will pay fifty thousand IPOs, no questions asked, for the return of Count Zero Interrupt, the famous "Educated Pig from Paris," which strayed or was stolen from the side-show tents of the Ringling Brothers and Fleamur & Fleazy Circus last night. This animal is unique and irreplaceable. And I make special note of the fact that even though he is the most valuable animal in the known world, he is far too familiar to be fenced on any of the planets or moons.

—Walter R. Brocks, Business Manager

I folded the paper flat, put it into my pocket, threw down my napkin and sprinted to Comac's room. He was up and dressed in a stylish dark blue suit. He was feeding Count Zero Interrupt the rest of the milk and some Orzo cookies.

"Well, well, good morning, all!" I said upon entering, in my heartiest and most amiable fashion. "So we are up, I see. And Piggy is having his breakfast." Comac looked at his shoes. I went over and held the Count's bottle for him, and I asked, "What are you, ah, intentions toward Piggy?" Answer me that, Comac."

The Frank's answer was quick and decisive. He'd been thinking on it. "I'm going to crate him up and shuttle-express him to my brother Claudius over on Marine Bay. He'll be good company for my brother while I'm earning the money to enable us to live together as we did as little boys in the twentieth century on Earth."

"He's a mighty fine pig, Comac," I said, scratching him on his tummy.

"You called him a lot of names last night."

"He looks a lot better to me this morning," I said. "You know, I was raised on a farm, and I'm actually very fond of pigs." I smiled down at the Count and continued scratching as the Count snickered back. "Tell you what I'm going to do, I said. "I'm going to give you fifty IPOs for him."

I reckon I wouldn't want to sell this shoat, or," Comac said quickly, "if it was any other one, I might."

"Why not this one?" I asked, trying to remain calm. I was suddenly terrified that he might be onto the Count's true value.

Comac lit his first Pall Mall of the morning and gazed at the pig's interested, up-turned face. "Because snatching him was the greatest achievement of my life—*that's why!*" His quiet voice trembled. "The truth is, there ain't a single other man that could have done it. If there's over a miracle that allows me to have a freese and little children, I'll sit there beside it and tell 'em how their daddy pulled off a prime pig in front of a whole crowd full of people. And maybe my grandchildren, too. And they'll

MISSILE ANTENAS
FOR SALE

Slightly
used
ANTI-
PERSPIRANT
STICK.
Best offer.
Exc. cond.
Owner
Switched to
OLD SPICE.



**24 hour OLD SPICE SOLID
keeps guys so dry, they just
might switch, mid-stick.**

© 1994 Shalimar Inc.

be proud of me! Comac turned and looked out his window onto the circus below. His glance alone implying the Liffluputan status he attributed to the big-top workers and audiences so far beneath him. His voice became tender, more silvery.

"There was two tents, see, one of 'em copping onto the other. I snuck in, and this plump, pink beauty was on a high platform, tied with a little red chain. There were lots of people around, and the fluorescent lights were bright enough to blind you. The trick was to catch almost all of 'em with their eyes lookin' away from the pig and most importantly to appear to be an official patronage. I just reached up, unhooked his chain, and hustled him the hell out of there! And I crawled out from under the canvas again without him squeakin' as much as a mouse. I put him under my coat, and I must have passed five hundred people before I got out where the streets were dark enough to relax even a milester. I reckon I wouldn't sell him. I'd want my brother to have him so there'd be a witness. You can understand that, can't you?"

This time I successfully fought back any sign of a tear—admittedly with a good amount of effort. Comac, I'm going to give it to you straight, I said. "That pig can't possibly live long enough to use as an entrée in this fucking Inside Haze of your distant sonality. Your grandchildren will simply have to take your word for it. If you were

your own grandchild, would you take your word for a story like that? Huh? I'll give you a hundred IPDs.

Comac looked at me in astonishment. "Comac, this pig can't be worth anything like that to you, mister," he said. "What do you want him for?" He scratched his head in puzzlement.

If a man were to view me cynically," I said, looking out the window that Comac himself had vacated, he wouldn't think that I am possessed of an artistic temperament. But I am. I'm a collector, a connoisseur, Comac—and believe it or not, particularly of pure-blooded pigs. Over on Green Bell, I've got a hog ranch that contains almost every extant specimen—from a Malaysian Norford to a purple-and-black Tasmanian Sea-Snaps. This is a blooded pig and a fine one. That's why I'd love to have it." The perspiration had broken out on my forehead, and my mouth was as dry as a hanging judge's wit.

Comac thought on it. "I'd really like to accommodate you," he said, "but I think I've got the artistic temperament, too. I may or may not be a connoisseur or collector, but I don't see why I ain't art when you can steal a pig better than anybody else on live fucking planets. Shows are a kind of inspiration and genius with me, and especially this one. I don't think I'd take a thousand IPDs for that animal. He stubbed out his cigarette in the hotel ashtray, gazed at

me, and shrugged helplessly.

Listen to me, Comac. I said, wiping off my brow with the soft macon hotel towel from the Peewee's bathroom. It's not so much a business matter with me as it truly is art, honest to God—the highest art of basic philanthropical altruism. Being the connoisseur of pigs that I am, I wouldn't feel that I'd done my duty to the WORLD unless I added that Hampshire to my collection and saw to it that his genes were passed on. In the spirit of the ethic of pigs as peaceful and beneficent benefactors of man, I offer you two thousand IPDs.

"Mister," said this fellow pork aesthete, "I ain't the money. It's the sentiment with me. And yes, damn it, the sentimentality!" He shook his head and stared at the floor. "Five thousand!" I croaked.

Make it fifteen thousand! Comac said with a choked-back sob, "and I guess I can put this particular dream behind me in service to the other one! The main one!"

For fifteen thousand IPDs you could have bought a small, private interplanetary shuttle in those days—and a loaded one at that, not some stripped-down piece of crap. But it was still a good deal for me, so I took it. Done! I said.

I gave Comac my American Express card and he called them to verify my credit. (I barely did have it, but they merely said a smooth "Certainly, sir. To Comac's query. It was a stroke sum, my life savings.") He

CONTINUED ON PAGE 155

127



Your great-grandchildren may live twice as long as you do, says this eminent longevity researcher. You don't have to rebuild the body or redesign the brain. The secret is just to retune a few key genes.

INTERVIEW

RICHARD CUTLER

Stringy gray hair, long on one side, covers the expanse of his scalp. His face is lined. His hands tough-leather. His kids, almost grown, just wear him thin. They mostly need money, he says, of the two all-expensive universities. "The days when I could play with them, nurture them, teach them are gone." Richard Cutler, age fifty, is prey to the inexorable passage of time. But like a cancer researcher who charts the course of his own malignancy, Cutler, pioneer in the field of human longevity, is cursed with the knowledge of truth: His diminishing strength, the unrelenting onslaught of oxygen, hormones, and nutrients. His loss of zest, molecules of hemoglobin pulsing ever outward from deregulated neurons in his brain. "I can see the process of aging," Cutler says. "I can see it all coming on."

Cutler accepts the certainty of his own short life and ultimate death. But, declares this preeminent advocate of scientific life

extension, there's not one shred of evidence for any bottleneck on the evolution of human longevity. How can we keep building new and wonderful machines while we've stayed the same for a hundred thousand years? Our first priority must be to control man's aging process, and from that all other things will flow.

Cutler's dream of longevity flowed from the lonely Colorado town that was his childhood home. Born a Mormon among Mormons, he was brought up to think of life as a testing ground for the reward of heaven beyond. "The Devil was always here tempting you," he explains. "For that reason your brief bat will not so stick around too long." Cutler had his doubts, of course. But as a boy whom parents and teachers had pigeonholed as intellectually slow, he didn't feel equipped to protest.

Cutler, still a teenager, was catapulted out of the oppressive domain of his past by an unbelievable, explosive series of

PHOTOGRAPH BY MIKE MITCHELL

events. One minute he was a backwoods boy on his way to vocational school, the next, the brilliant, quirky Cutler found himself head of a corporation funded by one group of millionaires while yet another millionaire sent him through school. "It was really wild," Cutler reflects. "Almost like coming out of a cave."

Cutler eventually found his way to graduate school in biophysics at the University of Houston and to prestigious posts at the Brookhaven National Laboratory on Long Island and the University of Texas at Dallas. All the while, he pursued the question that had gnawed at him ever since his youth: Why do we have to age and die, and what could be done?

Approaching the problem with his broad and eclectic intelligence, Cutler scrutinized anthropology, evolution, comparative physiology, molecular biology, and more. And in the interstices of the disciplines, buried in data from thousands of reports, he saw the pattern. No more than six tenths of a percent of all human genes could possibly be involved in the evolution of longevity. Aging—the field that seemed to require a complete understanding of every organ, system, and cell type in the human body—might be reduced to common denominators. And those denominators might be comprehended, harnessed, and even changed. Human longevity might be extended not just by 20 years, Cutler decided, but by 200 years or more.

Cutler's radical theories have thrust him into the biomedical spotlight, bringing both songs of praise and scathing attack. Although his theories derive from tight, deductive reasoning, they're just too unconventional for many mainstream scientists. Many of his colleagues in gerontology, already troubled by the economic burden of the infirm aged, are philosophically opposed to his work. He has been accused of plagiarism. And his two most loyal benefactors have recently been forced to limit their support. To make up for the loss, his medical technician wife, Edith, works in his lab gratis from ten in the morning to four in the afternoon. (Then she goes to her job as a paid lab technician from 4:30 to midnight.) "I sometimes feel bad that my wife still has to come in and help me," Cutler declares. "Her presence reminds me that I'm struggling. She's there to save the day. Without her I simply couldn't go on."

Despite his troubles Richard Cutler has prevailed. He has secured a tenured position at Baltimore's prestigious Gerontology Research Center, part of the National Institute on Aging. And though his support has been limited, he has conceived perhaps the most sweeping theory of human longevity to date. His elegant ideas, rooted in the ancient axioms of evolution and the driving logic of DNA, may one day yield up the reward of prolonged life. They may also point the way toward vast increases in intelligence and creativity, ultimately aiding the future evolution of man. Richard Cutler was interviewed in his office and over lunch

at Baltimore's quaint European Cafe by Omniv senior editor Pamela Weintraub.

Omniv: What initially lured you into life extension research?

Cutler: Disappointment with religion. The first thing I learned was how lucky I was—a white male in the right church in the USA. All I had to do was work hard, follow the rules, and heavenly immortality would be my reward. I was uneasy about that point of view from the start, but I went along.

In high school my family moved to Anaheim, California. I wasn't considered too bright. After I took an aptitude test, my guidance counselor suggested I forget college and go to vocational school for welding. As a senior I found my way to the machine shop and constructed a helicopter of unusual design, with engines in the top of the blades. I flew it in my backyard and created quite a ruckus. There was a lot of noise and wind, and with fire streaming out of the top, people thought there was

◆ *Some of our greatest scientists and musicians were exceptionally neater than people don't realize that being like a child is what made them great.* ◆

an explosion. Police and newspapers arrived, and a reporter wrote a long story about me in the Sunday edition of the Santa Ana Bulletin. He took me under his wing, and I ended up at a two-year college—the Electronic Engineering Institute in Englewood, California. I met some people there belonging to The Los Angeles Philosophical Society and began to think about things—psychokinesis, levitation, UFOs. I was just nineteen years old, and after my Mormon upbringing this was like coming out of a cave. I began to question the notion of immortality and realized in the face of aging and death, just about every religion offered hope of salvation in a world beyond. It just seemed like a cop-out. I even went to UCLA and asked some professors what we could do to increase our life span, and they said, "Nothing at all. The aging process is too complex." That's when I decided increasing longevity was something I'd like to attempt.

Omniv: What was your plan?
Cutler: About that time the accountant at the electronics institute saw the article in the Santa Ana Bulletin. He put together a group of four millionaires and convinced

each to invest about a quarter of a million dollars in what we called the Cutler Helicopter Corporation. The idea was that I would design a light, cheap craft affordable to the masses. I had several machinists and welders in a building in Pasadena helping to make the helicopters. Once I made my millions, I planned to set up my own laboratory and do aging research. The whole thing was crazy. My parents thought it was totally wild, and in fact I was lucky to escape with my life. The last time we tested our engine at the Van Nuys Airport, it blew completely apart. First it tore up the tarmac, then it flew off altogether, wiping out several large airplanes. I had constructed a tower from which I conducted the experiment—that collapsed, too. I was left dangling by my arms. We were insured by Lloyd's of London, thank heavens.

Omniv: Were your backers upset?

Cutler: No, they were delighted. The experiment proved that the engine was really powerful. The work went on until eventually I was contacted by another millionaire who had also read the article in the Santa Ana Bulletin. This man had made his fortune in hydraulic valves, and had recently lost his son in the Korean War, so he set up a foundation in his honor. After questioning me for about half an hour, he told me he'd help me through college. I walked out with a five-thousand-dollar check. Though I never saw him again, he sent me several thousand dollars a year for five years, until my undergraduate education—I majored in physics—was complete.

Omniv: How did you switch from physics and helicopters to longevity?

Cutler: The helicopter company folded, and I began scouring the country for a place to pursue my true interest, longevity. Finally I found a program in biophysics at the University of Houston. It was a totally new field with two main goals: to reveal the impact of physical phenomena such as light or X-rays on organisms and cells, and to explain complex living systems through basic forces or laws, much as physicists try to explain the universe. Biologists told me that aging was too incredibly complex to ever understand. You'd best have to understand every system in the body—heart, lung, skin, brain—and then alter each one. I wanted to find some underlying principle that might control aging no matter where the animal, organ, or cell. The time was ripe—Watson and Crick had just discovered the underlying mechanism for heredity in the structure of DNA. So I took off for Houston in my little hot rod car. For the first time in my life I was heading far from home.

Omniv: What did you do then?

Cutler: I found a way to make all the cells in a single bacterial culture divide at once so that they passed through all the stages of life literally in synchrony. This study made it possible to map the bacterial genome. But none of it would have happened if I hadn't been taking organic chemistry at night with this girl named Edith. I'd pretty been out with girls. Always helicopters, you

know. But now I was kind of lonely, and this girl looked nice, so I asked her out to see *West Side Story*. As it turned out, she was also real good in chemistry. She turned out to be a medical technologist and a superb bacteria counter. She could just look at cells and tell me what they were like! I'm half blind, so I could hardly see the cells, but with her expertise, she just executed the bacteria culture concept I'd come up with and it worked. We got married three months after that first date, and she's been helping me ever since.

On the basis of that work and many letters, I finally got a fellowship with Howard Curtis of Brookhaven National Laboratory. Curtis was the only American studying aging from a molecular perspective. He gave me my own lab and assistant—I was in heaven. I decided to devote myself to determining how complex the biology of aging really was. If it was too complex to unravel within the context of twentieth-century science, I would leave the field. But if I could find some indication that understanding—and perhaps slowing—the aging process was possible with current knowledge, I would devote my life to the quest.

Omni: How did you proceed?

Cutler: Curtis showed that as animals age, their chromosomes acquire alterations. So he postulated that with increasing age DNA accumulates mutations that destroy the basic information used to run a cell. That leads to aging. Being right there, I picked

up something about his work that most everybody missed. He experimented on three species: the beagle, with a life span of about twenty years; the guinea pig, with a life span of eight years; and the mouse with a life span of three years. He found that the rate of chromosomal aberration correlated well with the aging rate. Longer-lived species acquired mutations at a slower rate. This longevity appeared to be regulated by factors within the cells. Because the cells making up dog, guinea pig and mouse are extraordinarily similar, this suggested that the cellular differences contributing to longevity must be simple despite the complexity of the aging process itself.

Omni: Did you see any other evidence for the theory that relatively simple factors were contributing to longevity?

Cutler: What struck me most was that the increase in longevity across species seemed to be accompanied by increases in intelligence: humans, for instance, have a particularly long life span. In the wake of that observation, I came across George Sacher's work. A radiation biologist at Argonne National Laboratory, Sacher had dedicated much of his life to understanding the biology of longevity. He realized that the larger the brain-to-body-size ratio, the slower a species will age. Sacher even came up with a formula relating maximum life span potential [MLSP]—the maximum number of years that an individual of any

given species could possibly live—to brain size and body weight. Just knowing the brain and body sizes of any mammal would enable you to plug into the formula and crank out the MLSP.

Omni: Did he explain the phenomenon?

Cutler: Because shorter and longer-lived species had essentially the same cell biology, Sacher decided longevity-control mechanisms had to reside in the brain. Bigger brains, with their superior processing, could better maintain the body. He even tried to find a longevity-controlling center in the brain but never did.

Omni: Where did you fit in?

Cutler: I reinterpreted his results. Even though different species had essentially the same biology, I nonetheless thought that basic biology, not brain size, had the primary role. The correlation between brain size and longevity, I said, was there by virtue of evolution. If larger-brained mammals have longer life spans, it's because a longer life span confers an evolutionary advantage to those with scorable brains. Life span and brain size coevolved.

Omni: If the brain doesn't control longevity, what does?

Cutler: I found part of the answer in studies on speciation—the mechanism by which different species form. One of the first things scientists studying speciation did was compare perukes that had all presumably evolved from a single ancestor about sixty-five million years ago. They found extraordinary similarities from one group to the next. When researchers compared humans, with an MLSP of one hundred years to chimpanzees, with an MLSP of fifty years, they found that ninety-nine percent of the genes were same. Chimp and human livers worked the same. Food and energy metabolism was similar. Studying the two species, from the skeleton to the muscles to the cells, there are no new structures. So what the heck was the difference? Structures and functions are just differentiated to different degrees. From species to species some genes are expressed more strongly than others. And that difference in expression is all you need to create new species. Evolutionary biologists went on to estimate that the one percent genetic difference between human and chimp resided in regulatory genes—genes that act like switches to turn other genes on and off. My concept was that slowing the aging process might be accomplished by altering these few genes.

Omni: Armed with evidence that altering life span might not be that complex, you plunged into the longevity field.

Cutler: Yes, and I still burn with excitement when I think of how it all came together for me. I'd gotten a job at the University of Texas at Dallas. Edith and I already had three kids—one right after another. I had a little Datsun 240 Z, and one day I plied my kids in the back and took off into the desert for Anahim. Every so often I'd stop and write down notes, until I had road maps covered with scribbles. One thing made



TROUBLE IN THE FOOD CHAIN

Leo Cutler



SOULS ON ICE CRYO SCIENCE

BY PAUL BAGNE
AND NANCY LUCAS

Mike Darwin keeps the frozen heads out back in the workshop. He climbs a ladder to the top of a concrete vault, unlocks a door revealing the lid to a porthole, and lifts the cover slowly. He holds a trouble light above the opening, waits for a cloud of vapor swirling around him to clear, then peers inside. The liquid nitrogen—*at a temperature of -196°C—looks like crystal clear water.* On the bottom of a stainless-steel tank inside the vault are five aluminum iceo bottles, each containing one human head wrapped in a polyester-blend pillowcase.

After a long silence Darwin says: "I got the same kind of feeling when I look into a hospital room at someone I love. With years of research and work ahead of me I try not to get emotional, yet I never lose the feeling that these people are on their way to reanimation."

Darwin envisions some future doctor injecting medical fluids the size of molecules into one of the heads as it thaws. These "nanomachines" were first envisioned by engineer Eric Drexler of MIT's Space Systems Lab. They would work like tiny robots, propelling with enamel spines and perforating microscopic bombpots. With the head

reverted to its original condition, a new body would be cloned from a single cell. Until One day, the patient awakes, sits up, and asks for his morning paper and coffee.

Darwin is president of the ALCON Life Extension Foundation in Fullerton, California. He is a cryonicist, someone who believes a body can be frozen and revived. Although not trained to freeze tissue—his prior technical experience entailed operating a dialysis machine—he hopes to preserve his clients until the day when doctors can cure their ills.

His particular approach, which he calls *neuropreservation*, is new, but the idea of cryopreservation is not. The idea of cryonics can be traced back to 1964, when Robert Ettinger—a physics professor at Highland Park Community College and now head of the Immortalist Society, a cryonics group in Oak Park, Michigan—published a slim book, *The Prospect of Immortality*. In it Ettinger presented the "scientific probability" that people who had died and were frozen could one day be revived. It spawned cryonic societies in Europe, Australia, and the United States. Today their leaders claim that a few hundred people are prepared for the big chill. Over the years the basic doctrine of cryonics has remained the same: The dead are temporary incarcinate.

To the small number of people willing to pay up to \$100,000 to freeze their bodies (\$30,000 for just the head), cryonists are the link to immortality. But to most cryobiologists—scientists who study life at low temperatures—cryonists are targets of criticism and derision. Some allege the whole field is fraudulent; others view cryonists as sincere but misguided in their claims. Most simply say that the scientific underpinnings for the idea aren't strong enough for it to be taken seriously. Arthur Rowan, head of the cryobiology laboratory at the

PRINTING BY
MICHEL HENRICOT

I don't think that even the most die-hard critic of cryonics among us would claim that suspended animation will never be possible.

New York Blood Center and former president of the Society for Cryobiology says, "Many of our members take a dim view of some of the people in cryonics coming to our meetings and encroaching on our good image in an attempt to legitimize their activities. To us they represent a fringe element."

Rowe challenges the cryonists' notion that those already frozen will one day be thawed to live again. "I think all the people who have been frozen so far have had such irreparable damage [from the freezing process] that there is no scientific evidence that it would ever be possible to reanimate them." Still, the dream of cheating death is a seductive one, and cryobiologists in their own deliberate, quiet way have been inching slowly toward the time when preserving the whole person may be possible.

Not too long ago a group of cryobiologists crammed to gether in a small conference room at the Hilton Hotel in Augusta, Georgia, for their annual meeting. Particularly popular was one session on organ preservation moderated by a soft-spoken, personable biologist named Gregory Fahy. Near the end of the session he asked another researcher to provide some "commentary." The house lights darkened, and the screen lit up with what looked like a standard projection graph. It plotted the success cryobiologists have had preserving human tissue over the years: sperm and red blood cells in the Fifties, embryos in the Sixties, and comets in the Eighties. "At



Top: A technician removes a batch of deep-frozen skin cells to prepare a tissue culture.

the present rate we will have to wait until the year 2040 before we are preserving kidneys and hearts," he announced. And beyond that—to the year 2060—for bodies. "The audience laughed."

Fahy said later that the slide was meant to be an insiders' joke but one that contained a kernel of truth. "I don't think that even the most die-hard critic of cryonics among us would claim that suspended animation will never be possible," he says. In fact, the head of his laboratory—an outspoken critic of cryonics—once stated that achieving suspended animation was the ultimate goal of cryobiology.

It's obvious that as we succeed in preserving more and more complicated sys-

tems, we will keep working our way up and up until the final thing we'd be able to do is preserve human beings," Fahy adds. "What would be hotly debated of course is whether we think it's desirable."

The art and science of freezing body parts are still in their infancy, though they have progressed tremendously over the past two decades. Tissue banks now routinely freeze blood cells, arteries, heart valves, skin, bones, sperm, and even embryos. Typically the tissue is first immersed in a solution, which often contains glycerol and other agents that protect it from damage sustained during the freezing process. The tissue is then cooled at a controlled rate to the temperature of liquid nitrogen, where molecular activity—and hence biological activity—halts. With its aging clock stopped, the tissue can stay viable for millennia.

Freezing these tissue samples is primarily the realm of cryobiologists who have a dream of their own: that one day a surgeon could phone a tissue bank and order up a frozen heart, liver or kidney or a finger or arm for one of his patients. With this resource and new anticipation techniques, he could perform transplants at will.

Tissue that has been successfully frozen can be kept, if not forever, for decades. Arthur Rowe knows of tissue-culture cells still viable 22 years after being deep-frozen. He himself has used blood that spent 15 years on ice.

"If you don't see any changes in sixteen years, I wouldn't expect to see any changes in double or triple that time," he says. "Apparently it's good indefinitely."

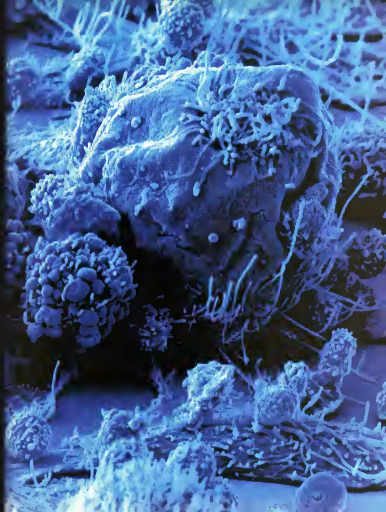
CONTINUED ON PAGE 101

*Ever vigilant, the body's
immune cells are the main players in a daily
drama of life and death*

BY LEAH WALLACH



PHOTOGRAPHS BY LENNART NILSSON



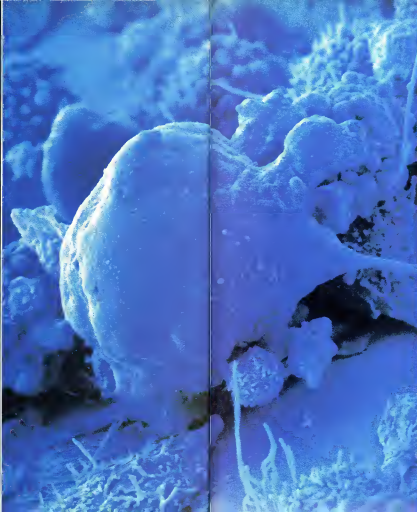


PAGE 122: BODY'S
ROUND IMMUNE
CELLS MOVE IN ON
A CANCER CELL.

PAGE 123: A TUMOR
CELL FALLS
PREY TO AN IMMUNE
ATTACK. ABOVE:
CANCEROUS LUNG'S
OUTSIDE FLECKED
WITH MALIGNANT,
YELLOW TISSUE.

PAGE 125, BOTTOM:
A HAZY LUNG
CELL IS ATTACKED BY
SHINY CELLS.

PAGE 126, TOP: A
CANCER CELL
IS SURROUNDED BY
IMMUNE CELLS.
AT RIGHT, ANOTHER
IS DISABLED.



Captured within these
startling microphoto-
graphs are vignettes of
its mounting fight against
a deadly enemy: lung
cancer. Every second of
your life millions of
specialized cells are
swarming through your
body, constantly on
prowl for abnormal cells
and such microscopic
inemies as viruses.

The ball-shaped struc-
tures shown are T
cells—specialized white
blood cells. They are
born in the bone marrow
and carried by the blood
to the thymus—a nut-
sized gland under the
breastbone. Then they
mature into various
types of T cells.

These lung-tissue
coloscopes are the work
of Dr. Lennart Nilsson,
who documented the
struggle of one cancer
patient's immune system
to hold the malignant
invaders at bay. DO

to revert to youth. If those old cells were damaged in numerous ways, he asked himself, how could a single virus restore them to vitality? It just couldn't. "I began to think," Lumpkin says, "that the virus simply repressed a protein that shut down the cell."

Then, in the early Seventies, Lumpkin discovered a paper by pathologists Tom Norwood and George Martin of the University of Washington in Seattle. The Seattle scientists took young and old cells and fused them to produce a cell hybrid—a single cell body with two nuclei in the center. (The cell nucleus contains the genetic material, the DNA.) In that single cell, neither the old nucleus nor the young nucleus was able to synthesize DNA. In other words, the fused cell took on the characteristics of the old cell. The implication: The old nucleus produced a protein that shut down its own replicative machinery and then traveled through the cell body to quell the young nucleus as well.

Lumpkin was so impressed by the work that he went to Seattle to study with Martin. And it wasn't long before he used Martin's findings to help develop a potent theory of his own. Working with molecular biologist Jim Smith, Lumpkin proposed the existence of one or more cell proteins that turned DNA synthesis off.

Last year the two tested their notion in the lab. In essence they extracted genetic material from old cells, divided that material into segments, and injected each segment into a different young cell. Time after time, a specific bit of material from the old cell made the young cell age as well.

The present goal is to isolate and clone this genetic material—apparently the gene that codes for the senescence protein. Once the gene is found, Lumpkin says, we can find ways to turn it off. One suggestion might be a vaccine that instructs the body to produce antibodies against the protein. Another solution would be to override the protein with another natural substance—one that turns the cells on.

That may soon be possible, thanks to biochemist Vincent Cristofalo of the University of Pennsylvania and the Wistar Institute in Philadelphia. Cristofalo and his group have found proteins in the mammalian brain that speed senescent cells. There's a definite relationship," Cristofalo says, "between the balance of cell proteins and the rate at which organisms age."

As we get older, he explains, the proteins that prevent DNA synthesis become increasingly common in a larger proportion of our cells. As a result cells become less able to respond. Muscles, for instance, contract more slowly. And the cell receptors, which normally act as portals for everything from energy molecules to growth hormones, don't always recognize the substances they were designed to process and absorb. Without growth hor-

mones, for example, wounds won't heal. And without sufficient energy the body can't function at all.

There's a strong correlation, Lumpkin says, between the life span of cells and the life span of the organism. "On the most basic level," he says, "the eighty-year old would be able to heal his wounds as easily as if he were fifteen. Theoretically speaking, if we were to suppress the protein that inhibits DNA synthesis, our cells should be rendered immortal."

If all the body's organs—including the kidney and the liver—age in analogous ways, he adds, we might be able to surpass the current limit of one hundred and fifteen years in a sexually mature but youthful state (our bodies light and our minds alert). "Once we understand the cellular pathways," Lumpkin says, "we might even be able to live three or four hundred years and keep on going from there."

Listening to the findings, gerontologist Richard Cutler of Baltimore's Gerontology

●The untreated mice seemed old. Their coats were coarse and gray. The DHEA mice ran around like pups. Their coats were sleek and black. They were aging at a slower rate. ●

Research Center suggested that the on/off proteins found by Smith, Lumpkin, and Cristofalo were the very substances responsible for extending the lives of lab mice placed on restricted diets. Muling it over while in a canoe on Plymouth's placid Lake Squam, Cutler was reminded of a well-understood phenomenon known as heat shock response. "When heat becomes particularly intense, neurotransmitters in the brain stimulate a set of genes to produce a protective protein," he explains. "The protein literally cools the animal down, eliminating undue stress."

Dietary restriction might work the same way. When the food supply is low, he notes, adult animals can't sustain a fetus or care for their young. In the face of this threat a hormone like the one suggested by Mazer probably switches on a special gene. The gene, in turn, probably generates the senescence protein found by Lumpkin and Smith. Under normal circumstances that protein would be produced only by very old cells, to trigger death. But in times of famine they might be switched on temporarily, delaying development—and the years of reproductive wabity—until such

time as nutrients would again abound. When food becomes plentiful, the protein found by Cristofalo comes into play. "Once we isolate the neurotransmitter or the proteins," says Cutler, "we might use them to enjoy the same antiaging benefits of diet restriction we see in the mouse."

A serum that inhibits the senescence protein might drastically increase the longevity of our cells, conferring infinitely more staying power on our organs and the body as a whole. But according to Cutler, the technique will add decades to life only if supplemented by a third sort of poison—one that prevents genetic damage caused by metabolism, environmental toxins, and the sun.

In the forefront of that research is the short, stiletto-thin Bruce Ames. A biochemist at the University of California at Berkeley, Ames is the controversial researcher who first declared that small amounts of man-made chemicals cause cancer by creating mutations in our genes.

In 1984, just as people were embracing the notion that cancer is caused by the toxins of our industrialized world, Ames came out with an even more radical sentiment: True, man-made chemicals are carcinogenic, he said. But most cancer-causing mutations come from the very food that we eat and the air that we breathe. Living is like being irradiated, he explained. Many fruits and vegetables produce natural pesticides that are as mutagenic as man-made ones. And the oxygen molecules we breathe tend to turn into highly reactive free radicals—particles that scavenge the body, voraciously consuming bits of DNA and damaging the cells.

As far as Ames was concerned, these same forces were responsible for aging. The genetic damage they caused was fairly constant throughout life, he theorized. Although DNA was always repairing itself, eventually the mutations would mount, resulting in aging and death.

He found support for his ideas in evolution itself. Indeed, as we evolved from our early primate ancestors to Homo sapiens, over a period of millions of years, our life span basically doubled while our metabolic rate was cut in half. "Perhaps we lived twice as long," Ames suggests, "because we were producing free radicals and other natural toxins at half the rate."

Ames was also aware of new research showing we could protect ourselves against the oxygen scavengers, at least to a degree, with another sort of natural substance—the antioxidants. This group—including vitamin E, selenium, beta-carotene (which provides carrots with their orange color), and superoxide dismutase—literally neutralized the free radicals before they had a chance to destroy DNA. "A major factor in the evolution of increasing life span," Ames adds, "might well be an increase in the presence of these protective mechanisms against free radicals."

Fascinated by this theory, Ames even discovered another, unlikely antioxidant—

ure acid, long considered nothing but a waste product." I realized that at the beginning of primate evolution, we lost the enzyme that breaks down ure acid. What's more, the kidneys pump ninety-five percent of all ure acid back into our blood," he says. Thus unlike mice and rats, we have high levels of ure acid circulating throughout our bodies.

If antioxidants like ure acid and superoxide dismutase propelled the evolution of human longevity, then it only makes sense that raising their levels would extend life span even further. The problem with taking such supplements in pill form, however, is that increasing one antioxidant reduces the levels of all other antioxidants—unless the total antioxidant load is especially low.

If that load is low, DNA damage might pile up more rapidly than normal, and life span would be short. But if we could somehow detect that damage early in life, we would be able to worsen antioxidant protection. DNA damage would be limited, and the potential for a normal life span would be restored.

Already Richard Cutler (see Interview beginning on page 100) is developing a longevity kit to do just that. First, he screens patients for high levels of thymidine glycol, a by-product of damaged DNA. "If someone excretes excessive amounts of thymidine glycol in the urine," Cutler says, "its probable that free-radical damage is high—and that the antioxidant level is low. We'll keep adding different antioxidant supplements and retesting the urine for thymidine glycol. When the right combination of supplements has been found, thymidine glycol should be reduced to normal. Then we'll know that the aging is as slow as possible and that antioxidant protection is prime."

Cutler, who takes supplements of beta carotene and vitamin E himself, says that his current technique may help those who now age abnormally quickly. But for the rest of us, other tactics may be suitable. What we've got to do is understand how evolution increased our antioxidant level, then use the same technique ourselves.

One of evolution's tricks may have been convincing the cells that extreme genetic damage had occurred. He explains: "When you exercise, you burn more oxygen, produce more free radicals, and also generate more antioxidant protection. If you could trick the cells into thinking that exercise or its equivalent was taking place when it wasn't, then you might increase the antioxidant levels while free-radical damage stayed the same."

Cutler is currently working on two ways to trick the cells so that excess antioxidant production occurs. In one experiment he's simply injecting mice with thymidine dimers, chemical by-products of damaged DNA. In another he's injecting them with cyclic GMP, a messenger chemical produced whenever free-radical damage has occurred. So far, he says, the cyclic GMP and the dimers seem to be miming the

alarm. Treated mice are more resistant to radiation. The extra protection, he adds, can be easily explained if we assume that excess antioxidants are produced.

If that turns out to be the case, Cutler says, then such supplements as thymidine dimers or cyclic GMP might eventually increase our protection against free radicals, expanding our maximum life span as much as a decade or two. But in the distant future there will be a far more powerful way of fighting off DNA damage—increasing the amount of enzyme available to (1) orally repair our genes. Working on this technique is cell biologist and paramecia expert Joan Smith-Sonneborn of the University of Wyoming at Laramie. Someday Smith-Sonneborn believes, "we'll be able to identify and clone the genes that make the different repair enzymes and transfer them into our cells."

Right now Smith-Sonneborn is attempting just that: with her paramecia. She's chopping the paramecia's genome into

**●Theoretically,
once we suppress the protein
that inhibits DNA
synthesis, our cells should be
rendered immortal.
If we understood the cellular
pathways, we might be
able to live 300 or 400 years. ●**

sections and matching each section with a known repair gene from yeast. When she gets a match, she'll know that the paramecia's repair gene has been found. Then she'll transfer cloned versions of the gene into the paramecia cells. "If the repair genes do what we think they should," she says, "the life span of the paramecia will increase." We might then use the same technique to create a gene-repair formula for consumption by man.

Yet another formula might pry open our genes. Smith-Sonneborn believes DNA, she explains, is tightly coiled. If we could relax the coils, the genes would open up and we'd get in more repair enzyme.

One of the most important benefits Smith-Sonneborn predicts would be a boost for our immune system. Recent experiments lead her to suggest that some DNA-repair enzymes and the antibody-building enzymes may be one and the same. And, she adds, it's possible that an increase in these enzymes will offer a considerable advantage, too.

"Skin is wrinkled by ultraviolet rays from the sun," she explains. "What those rays do is damage DNA. But repair enzymes

might fix the damage as fast as it occurs."

Finally, Smith-Sonneborn's experiments indicate that stimulating DNA repair can boost the life span of single-celled paramecia by 50 percent. "One thing's for sure. When we tap into the mechanism of DNA repair, we're tapping into a great many of the things that make us age," she says. "If we can increase repair, we'll help ameliorate any pathology associated with damage to our genes. Our immune systems should produce more antibodies, and we should be less prone to cancer and infectious diseases. We'll reach old age later, and we might be able to greatly exceed the maximum human life span of one hundred and fifteen years."

Many experts of course doubt that we'll be able to achieve drastic expansion of human life any time soon. Dr. Edward Schneider, deputy director of the National Institute on Aging, says, "I don't foresee a magic bullet, an amazing pill that you could take to reduce youth. But I do predict that our increased knowledge about the aging of different organs will enable us to prevent various body functions from deteriorating. We might be able to restore immune function, for instance, and even prevent short-term memory loss. In the next decade or so, we might see average life span increase from seventy-five to about eighty-five years for men and ninety years for women. Perhaps in the next few years someone will eventually live to be as old as one hundred and thirty. Barring some unforeseen breakthrough, though, I don't think we'll see people living to one hundred fifty in the near future."

But a lot of longevity researchers say Schneider may be erring on the side of caution. There's no obvious bottleneck on the extension of life span, Cutler declares. "Today it seems probable that aging is caused by hormones and other molecules that alter the activity of genes. We should eventually be able to manipulate these hormones and molecules directly or through control sites in the brain. The result would be a slowing of the aging rate of virtually every organ and cell."

The impact would be profound. Once we fine-tune our engines, we'll spend more time in the flush and energy of youth. Natural problems will make us more vigorous. Enzyme supplements will restore smoothness to our skin and rigor to our bones. Hormone additives will add light to our immune system, giving us powerful resistance to cancer, arthritis, lupus, and the array of infectious diseases. Virulike vaccines will literally alter our genes, suppressing the chemicals that once made us ill and made us old.

After we extract the secret fuel of old Pop Adams and his hundred-year-old daddy, we'll fulfil the dreams of Ponce de Leon. In the twenty-first century the Fountain of Youth will be here. In one sense, Ponce de Leon was born 500 years before his time. But in another, the answers have always resided within him and us all. **DO**

• It's only a
matter of time before someone
suggests that the

crash was caused by the UFO •

ANTI-MATTER

Films of UFOs in flight are rare. Rarer still are those films that survive technical scrutiny, apparently providing evidence of some unknown object in the sky.

That's why the 20-second film made by British building surveyor Peter Day has achieved such celebrity status in the world of UFOs. It was January 11, 1973, at 9:10 a.m. on the outskirts of the village of Geddington, when Day spotted an orange ball of light. He just happened to have a super 8 camera along in his car and filmed the pulsating object as it passed over some rooftops about a quarter of a mile away (simulated version above, at right).

It didn't take long for the film to come to the attention of the British UFO Research Association (BUFORA). The segment the group announced was both genuine and puzzling. "A later examination by UFO photography specialist Peter Warrington, in conjunction with the Kodak-UK Laboratories at Farnell Hempstead, backed up the BUFORA conclusion: 'There has been no trickery,'" Warrington declared. And Peter Suthers, technical-information consultant for Kodak-UK, agreed. "Whatever the film shows," he said, "it is a real object in the sky."

Just recently, though, BUFORA asked a team headed by ufologist Ken Phillips to investigate the film again. The new finding: The object in the film was a U.S. Air Force F-111 jet, presumably ablaze. The jet had taken off from nearby Upper Heyford Air Force Base, developed a malfunction, and circled the area for 40 minutes to use up fuel. Before the pilot could make an emergency landing, though, the crew para-



UFO UPDATE

chuted in safety and the plane crashed in a field. The time and date of the crash, 9:46 a.m. January 11, 1973.

"The chances are against two highly unusual but unrelated phenomena occurring in the same area at around the same time," the team declared in an official written statement.

The inevitable conclusion is that there was only one unusual phenomenon, namely the troubled F-111, and it was this which was observed and filmed by the witness. Adds team coordinator Phillips: "The conclusion seems hard to refuse."

Warrington doesn't necessarily agree:

"I accept that these investigators have a respectable case," he says. "But we studied the film under considerable magnification, and at no point was an aircraft detected."

Day, who says he has filmed many an aircraft, is even less pleased with the BUFORA report. "I would be quite happy if someone could tell me what I filmed that day," he says, "but I don't believe I filmed an aircraft." A dozen other people, including a schoolteacher and several schoolchildren, also saw the UFO. They were closer to the object than "was" and their descriptions tally with what is on the film.

The controversy over the Day film will continue to rage, and it is only a matter of time before someone suggests that the F-111 crash was caused by the UFO. But to serious UFO investigators the concern is that yet another prime case has been thrown into doubt. The hunt is still on for a piece of film that delivers rational solution. After nearly 40 years its failure to serve offers little solace to those who champion the existence of UFOs. —JENNY RANDLES

MIRACULOUS HEALINGS*

Healing through prayer is a promise held out by many world religions. Now a collection of such wonders has been amassed by physician Rex Gardner of Sunderland District Hospital in Great Britain.

The most notable of Gardner's seven reported cases concerns a pensioner from Weymouth, England who suffered from a large, ulcerated varicose vein in her leg. When she decided to ask her church to pray



for her, a general practitioner warned that even if the leg were miraculously healed, the scar would require skin grafting. Nonetheless, Gardner says, the ulcer healed the day after the prayer meeting, and grafting was not required.

This story is so bizarre, says Gardner, that it would not have been included had it not been one of the doctors who examined the patient's leg at the next monthly prayer meeting and had all the



people who had been present not been available for interrogation.

Another case concerns a little boy who was slowly succumbing to an infection in his lungs. Long-term antibiotic treatment failed to work, and the boy's condition grew progressively worse. His doctors at the Royal Victoria Infirmary at Newcastle upon Tyne gave up all hope, but his mother took him to a prayer service. To his doctors' amazement, he recovered

almost immediately.

Skeptics are quick to point out that spontaneous remissions occur all the time, so cases such as these can hardly be called miraculous. According to physiologist Gordon Stein of Santa Monica, California, "Gardner has chosen his cases poorly if he wishes to document miraculous cures. The body's immune system could conceivably cure any of the conditions he presented. A better list would have been a

case of a regenerated amputated limb, eye, or ear, which the immune system cannot recognize.

Dr. Gardner disagrees. He's not sure, he says, that his cases represent "proof" of religious miracles. But he adds, "the adjective miraculous is permissible as a convenient shorthand for an often-wait almost instant while healing that occurs after prayer to God."

—D. Scott Rugg

Once upon a time there was magic."

—Arthur M. Young



Mouse-rug makers

They lack the elegance of Oriental rugs and the plushness of wool-to-wool carpeting. They're too small, measuring just a couple of inches across, to be of much use except in a dollhouse. But a lot of people in the Minneapolis suburb of Richfield just don't care—because for five years hundreds of them have been signing up at the Wood Lake Nature Center to learn how to make rugs out



of mouse skins.

Recently 73 people, from elementary school kids to senior citizens, paid a dollar each to take the latest mouse-rug course offered at the city-sponsored nature center. Ann Sigford, center manager, thinks the popularity of the program stems from curiosity.

"People wonder what it's like to actually skin an animal," she says. "And some are attracted to this because it's, frankly, a little offbeat."

Would-be mouse-rug makers aren't forced to catch their own raw material for the course. They are provided with frozen mice bought at local pet stores. "People are always amazed that there are actually places where you can buy a bag full of frozen dead mice," Sigford notes. But you can't just lie on a dying mouse, "hicken."

In fact, the original idea of making rugs out of mice came after Wood Lake Nature Center personnel took a long, hard look in their freezer. "We had a lot of dead mice

in there," Sigford says, explaining that rodents are fed to snakes on display at the center. "So we figured that if we taught something like taxidermy, we'd have an additional use for these same carcasses."

The purpose of the mouse-rug course, Sigford points out, is threefold. First, participants learn about skinning. Next, the anatomy of the skinned body is explained.

Then, says Sigford, we talk about how things die and how life goes on from one living thing to another. We illustrate this by watching two bull snakes eat the little skinned mice.

At the end of the class, mouse-rug enthusiasts flatten out the freshly removed mouse skins and pin them on corrugated cardboard squares. What do they do with these creations? "Kids keep them in their rooms," Sigford says. "And I know of a few people who have received mouse rugs as gifts." —Sherry Baker

DESIGNER TOMBSTONES

If you want designer years and dine on raw fish at sushi bars, then we suggest you consider another fave: designer tombstones.

Monument designer Eugene Rosenbloom of St. Louis has already designed a guitarist's tombstone in the shape of a six-foot tall guitar; a jazz pianist's tombstone with a bass relief of the deceased seated at a piano; and a trucker's tombstone that has a dump truck jutting from its face. Somewhat more bizarre is a tombstone (not designed by Rosenbloom) that is carved with a re-creation of the deceased's fatal motorcycle crash-up.

Tombstones are just like clothing and houses. They run in cycles. "Rosenbloom says, "Today many people are trying to personalize their expressions of respect, affection, and regard for their loved one who is gone by creating a monument that really illustrates what his interests and accomplishments were here on Earth."

The price of a designer tombstone, if done in stylish three-dimensional bas-relief, Rosenbloom says, is typically double that of the average \$1,200 monument.

—Eric Mahard

"Scientifically speaking, the only thing different about life and death is that death lacks a 3D image."

Terry Southern

"Too far west is west."

—English proverb

JOB JEOPARDY

Early W. Bryant is a fighter no doubt about it. When he thought the Air Force was covering up UFO crashes, he went to court demanding it hand over the bodies of UFO crews. Later he advised the Army and Air Force news papers for whistle-blowers to crack the story.

Now it seems that taking on the military could cost Bryant his job. For the past 26 years Bryant has worked as a writer and editor for the Pentagon. He's mostly senior associate editor for ARNEWS, a news service for the Army. But since he ran his acts, he says, his bosses have been trying to drive him out.

One ad in particular started the trouble. It charged that Army medics had performed secret autopsies on the crew of a crashed saucer 30 years earlier. Then I asked witnesses to come forward and set in a lawsuit that would make the records public. Outraged and reluctant to give the advertisement what he called "undeserved credibility," Captain James Pezard banned it from publication in the Peterson Air Force Base newspaper. Bryant protested the decision and even plans to take the Air Force to court.

But that is not the end of it. Until this happened I was acting chief of my section wherever the military chief was out. Bryant says, "I assigned projects, reviewed stories, even wrote my own editorials. Now I just write what they give me. I even have a report to a sergeant at 1000."



I've died." Adding insult to injury he says, "his supervisors have given him an unsatisfactory job rating."

It's an old technique, he concludes. "You find excuses to make someone look bad. You put pressure on him until he really does screw up. And then you fire him. The only reason they've attacked my competence is to teach me a lesson."

I'm worried about my career," says the least. Bryant says, "But if they think this has mellowed me, they're dead wrong. The issue now has gone beyond UFOs. It's whether you can work for the government and still have the right to criticize it."

Bryant has filed a formal grievance with the Army chief for public affairs, trying to get his unsatisfactory

rating reversed. Army officials decline to comment while the action is pending.

Owen Davies

UFO HOTLINE

Want the latest news on contact with ETs, inside stories on UFO sightings, and scientific verification of alien visits to Earth?

Call (213) 576-UFOS. You'll be hooked into the UFO Contact Hotline. And for the price of a phone call you'll hear a different three minute recorded report each day. The branch of Los Angeles businessman Paul Shepherd, thirty-one and musician Rusty Weaver, twenty-seven, the UFO Contact Hotline is the first of its message line of its kind in the United States.

Narrated in broadcast style by Weaver and KABC radio announcer Bill Jenkins, the daily reports feature eyewitness accounts, sightings, contacts, and abductions. One series, for instance, featured "verbatim" conversations between James Farmer Edward Billy Weaver and his friend Senjase who allegedly hail from a planet in the Pleiades star cluster. Another report featured a recording of the actual voice of an extraterrestrial lying over South Africa two years ago.

Quality information concerning factual UFO cases has never before been available in this easy-access way, says Shepherd, the line's executive director. "Each month we cover six to seven phenomenal cases which we investigate ourselves, along with other reports from all over the world."

For an additional fee of \$1.25, he adds, the UFO Contact Hotline will send callers transcripts of the daily messages, copies of full investigative reports (complete with photos), and even a monthly newsletter.

Governments have tried to keep the UFO phenomena out of the limelight, says Weaver, the hotline's producer. "What we're trying to do is affect the average person, to take the fear out of aliens coming to the planet. Extraterrestrials are here and they've been here, and this information can't be swept under the carpet forever. Besides," he says, "even if you don't believe in UFOs, this number is fun to call." A J.S. Ray

John Burke collaborated with Yarnas, as it's called, is made of collagen that comes from cowhide and of glycosaminoglycans (small sugar molecules that are linked together). These are taken from the cartilage of cows or sharks.

How is your skin different from Frederick Silver's skin at Rutgers?

He was one of my students.

"Oh. Then I might as well not bother seeing him."

It's up to you. I don't know how his skin differs from our skin. We're working with the worst cases—cases in which the skin has been lost down to the muscle and we can instruct that muscle to grow new skin.

The MIT man said you might one day be able to grow new breast tissue—after a mastectomy, for example. I say while so-called thinking of Gene Vidal's why did you stop at the neck? comment.

I cannot speculate on that. Yarnas says stiffly. The future lies in looking at wounds as bioreactors, which, if properly instructed and controlled, will not give you a scar but a higher-grade product—regenerated tissue.

A higher-grade product than the one you had before? I ask, ever hopeful of a better complexion and bigger tits, with no risk of the breast-mastectomy scar capsules that plastic surgeons call cocoons.

No. A higher-grade product than scar.

Why couldn't O'Connor and Gallico have used your skin? It would have been so much faster and easier.

I do not know. It may not have been available.

Across the Charles River in a basement office of the great labyrinth that is Boston Brigham and Women's Hospital, Nicholas O'Connor is gulping down a pastrami sandwich and some coleslaw, his head strategically angled over the wastebasket he has moved between his chair and his desk. A lanky, genial, good-looking Irishman with a shock of prematurely whitish hair, O'Connor says he couldn't use the Yarnas-Burke skin on the burned babies because MIT wasn't making it then. Now it's available on a controlled FDA trial basis at nine centers around the country. "But you can't just get it," says O'Connor. "Yet he concludes that even though it always grows to epidermal thickness, cultured skin—an extremely thin, transparent layer looking like Jell-O that hasn't quite jelled—might be more durable in the long run over a layer of the Yarnas-Burke artificial skin.

Too bad they couldn't have worked twenty-four hours a day at the lab to make some for you."

O'Connor shrugs, passes it off: doesn't want to get into a discussion of scientific, commercial, clinical cooperation. The man thing in the future, says O'Connor, will be an acceptable skin substitute for burn patients, trauma victims, people with

radiation damage or wrinkled skin. This future skin will exactly mimic real skin, with as many appendages of skin as possible. It will probably be accomplished by moving artificial skin with the patient's own epidermal cells, which will come from a bank of cells stored away when the patient was young. Whatever goes wrong later—from accident to disease to old age—can then be corrected, removed or regenerated.

The solutions for wrinkled skin at the present time—dermabrasion or peeling—are less than perfect. And although peeling is more effective than dermabrasion, it replaces the skin of a lot of color. Better to scrape off the wrinkled epidermis and resurface the face with skin cloned from the futuristic frozen-cell bank.

Thinking about a friend who went to a "back street peeling parlor" in Miami and couldn't close her eyes for three years, my Dr. Keeney complex restrains.

I have these lines above my lip? I say.

What would you do if it were your face?

●We're working with the worst cases—cases in which the skin has been lost down to the muscle and we can, in fact, instruct that muscle to grow new skin.●

Dermabrasion or peeling?

Neither. O'Connor answers.

How do you think my nose came out? I had it shortened and the bump shaved in Rio.

Let's see the problem. I turn, giving him my bad side.

It's a nice, straight nose. He did a nice job. But turn toward me. I turn again. "See in this light you can notice little squiggles on the bridge. That's why you should always powder your nose."

Laughing at the advice I've been given by one of the country's top plastic surgeons, I phone Yarnas and tell him I forgot to take a look at his artificial skin. "You can't expect me to respond immediately to a sudden request like that," he complains. "I have a seminar in ten minutes."

Oh, never mind. I'll look at the Rutgers skin when I get back. It's closer anyway.

Do not take their skin for our skin," Yarnas warns. "Have not seen it. I do not know how it compares."

Set amid a lonely, sun-blinded landscape reminiscent of architectural renderings, Rutgers University's modernistic Robert Wood Johnson Medical School

looks bleak. But on the seventh floor in a tiny, windowless cubicle, Frederick Silver is anything but that. Speaking with the kind of accent that calls an idea an "idea," he grins a rubbery grin, pushes his horn-rimmed glasses down onto a face that looks about twenty-two, whips a little, clear plastic bag out of his pocket and tells me I can touch the skin—but only through the plastic. "I'll let everybody touch it, I won't have any more lies," he explains.

Floating in what appears to be a saline solution is a white, porous pad that looks like several woven layers of plastic gauze. I squeeze through the plastic, and the skin bounces back. He takes out another bag. "A collagen fiber," he says, which will eventually be used for an artificial tendon. "I can barely locate it. Finally I spot a thin whiter hair floating in the solution."

Though he was co-inventor of the MIT skin, Silver complains that it has certain disadvantages. He questions the necessity of the glycosaminoglycans because they're water soluble and the minute any one touches biological fluids, they're washed out of the artificial skin. Why have them there? he asks me. "It just confuses the issue. And you have to get them from shark cartilage and how available is shark cartilage?" I remind him that Yarnas says you can get them from anything—cow cartilage, for example.

"You can," he agrees, "but go down to the butcher and say, 'How about some cow cartilage?' and he'll say, 'Sure. Here are the bones.' You cut it off." The main ingredient, collagen, on the other hand, is easy to get, thanks to slaughterhouses. And the leather industry strips the collagen layer from the rest of the hide anyway and would rather sell it than throw it out. "And you don't have to do a lot with it once you get it. The second problem with the MIT skin is that they've cross-linked it with glutaraldehyde, an agent that can be cytotoxic."

The whole point of the artificial dermis, says Silver, is to replace the skin and "contour out" the wound. When you have a wound, your cells move in and lay down something called granulation tissue, which is followed by scar tissue. The presence of the collagen matrix (or artificial skin) apparently tricks your own cells into skipping the granulation process, and when fibroblast cells (responsible for connective tissue) are inserted into the matrix, you don't have to wait the three to seven days it would normally take for them to move into the wound and begin making new tissue.

To explain contouring out he shows me photographs of a deep skin ulcer that has been filled in and is shrinking as a result of applying the artificial skin. One cell needs a graft over that, he says; otherwise one is still open to infection and loss of water and heat. In other words, it's essential to keep the inside in and the outside out.

The liberated man sees that the skin may just as well be regarded as what joins us to our environment as what separates us from it, "said the late hippie Buddhist

convert Alan Watts. I listen in amazement to Silver's explanation of the piezoelectricity of bone and collagen—wherein mechanical energy or stress becomes electrical energy—and to his theory that perhaps "the organized collagen fibers within the scaffolding of the matrix are enveloping an electrical surface pattern on which the new cells are ovulating."

I imagine the plastic surgery patient of the future, lying on an operating table out in a field, her own electromagnetic currents hooked up to the earth's, not only her skin but also her bone, muscle, cartilage, and other tissue joined even further with the environment. I think of the Hindu belief that one is taking in *prana* or "life force" with every breath and that it can be released. Is *prana* composed, then, of electromagnetic currents? When Shiva in the Bhagavad Gita says, "This body, O son of Kuruk, is the field," does he mean the electromagnetic field? Is the agricultural field separate from the electromagnetic field, or are they one and the same?

O'Connor tells me that future surgery will be like an episode from *Star Trek*. They get under a machine, a light came on, a laser zapped out, and they got up and walked away healed. I imagine chins and noses rearranged, breasts augmented and thighs thinned without knives, needles, anesthesia, or implants. And I realize Dick Tracy was right when he said, "He who controls magnetism controls the world." Nevertheless, Silver has insisted I go to Memorial Sloan-Kettering Cancer Center to see Magdalena Eisinger, who knows more than anybody else in the country about the black magic of growing cells.

When I follow his recommendation Eisinger laughs that Fred Silver's trying to brainwash you with electromagnetism, but I'm going to brainwash you with the growth factor, instead. "The obdurate, blue-eyed blond who is head of the senescence biology laboratory at Sloan-Kettering left Prague for Vienna in 1968 for a weeks vacation with her husband, two daughters and two surrogates. Because of the Russian invasion of Czechoslovakia, they got on a plane for New York instead of returning home. The first thing she asks me is, 'What is Yarnas like?'"

"Stern."

She counters, "You have to give him credit for being the first and for sticking to it for so many years before he got results."

Eisinger and her staff are working with melanocytes, the pigment-making cells responsible for tanning, brown spots, freckles, and the deadly skin cancer melanoma. They've isolated the cells' growth factor. Shun-ichiro Ogata, a young Japanese researcher is purifying it now in a maze of glass jars, machines, and tubes he designed himself. We all stand back to admire the aesthetics of the arrangement. Once Eisinger and colleagues purify the growth factor, they can figure out how to reproduce the pigment-producing cells and to stop the cells' growth. Then they'll

be able to make a cream to get rid of brown spots, or a substance that will let you tan without sunbathing. This research, they hope, will lead to a melanoma cure.

While explaining all this, Eisinger is absently running a hand back and forth over a spot on her forearm. "I've heard that some scientists use themselves as guinea pigs," I say, awedly examining her arm for signs of dissection. "Could it be that you're doing the same thing?"

"No, no, no! Don't you dare suggest a thing like that. It isn't true," she insists, clapping her hands together on her lap.

"Here, I tell her. 'Look at my arm. I've got a really dark brown spot right there.'"

"Oh, she sighs. 'If only you were a pig! That one would be particularly useful for experimentation.'"

"Just shush me with the stuff anyway," I beg, after which I give her a blow-by-blow account of some of my recent surgical experiences in fllo, to convince her of my bravery when it comes to beauty.

● I imagine the plastic surgery patient, her electromagnetic currents hooked up to the earth's—not only skin but muscle, cartilage, and other tissue joined to her environment. ●

"Don't tell me how old you are," she orders. "Let me guess. If I didn't know you had all that work done, I'd say thirty-five."

"Forty-seven," I answer.

"Then you should never let anybody you've had surgery. You look so good. Why spoil it?"

"You use yourself as a guinea pig in medicine," I explain. "I use myself as a guinea pig in journalism."

Laughing but denying any self-experimentation, she takes me down the corridor. It's past five, but everybody's still working with the thousands of plastic jars and bottles containing red liquid (red to show pH changes) and various combinations of skin cells—with and without fibroblasts, cancerous and noncancerous, pigmented and nonpigmented. Some are growing on Fred Silver's collagen matrices, and some are growing on the bottle base plastic walls.

"Oh, Sara," Eisinger says to the young Israeli working on immunology (the skin is the most allergic organ; a transplant from one person to another lasts only a few days), "do you have that wonderful flask of cells, the pigment-producing cells? Give

her a basic course in cell biology."

"It's not so good," Sara says. "It was typhoidized yesterday. Typhen suspends the cells and separates them."

Then show her some fibroblasts. Olga, she says to another blond, blue-eyed Czech. "In one case we put fibroblasts into the collagen matrix without epidermal cells and the epidermal cells grew in anyway." I look through the microscope and see beautiful Persian arrangements of normal fibroblasts, arrangements that are crying to be painted. Then I see—to quote Olga—"pencil-shaped viciae," spindle-shaped, cancerous fibroblasts, shaped that way to penetrate more easily. They look like a decorator's house and disturb me the way an overdose of TV sound, or Times Square after dark, does—an assault on the space between my eyes. Gazing at some pigment cells they've managed to isolate, I say, "Oh, yes, the greenish yellow spots."

"No brown. 'Greenish yellow' I insist. 'She must be color-blind,'" Sara says. "No, she's an artist!" Eisinger says.

"Here, look at this beautiful green," I say. "It's at about two o'clock."

Magdalena looks through the microscope. "That's not the color of the cell," she says, disgusted. "That's a light refraction."

Then Magdalena shows me a photograph of a young black boy afflicted with a rare disease that causes the skin to peel off. Skin grafts didn't take well, so they cultured his skin. But skin grown in a test tube lacks pigment, so the boy's face is a mottled white and black, a dramatic illustration of the importance of Eisinger's work. No matter the colors, however, the later photo shows a dramatic improvement over the raw, bleeding tissue that covered the entire middle section in the "before" photo. Feeling incredibly blessed to have normal skin, I leave after promising to come back to witness an operation on one of the experimental pigs housed on the third floor. "Don't forget," Eisinger reminds me at the elevator, "to give Yarnas credit."

Magdalena Eisinger did the pioneering work. She was the first one to grow epithelial cells. Yarnas says when I check with him about the damn glycosaminoglycans, explaining that Silver claims they disappear upon contact with bodily fluids.

"That's his opinion."

"What about the cytotoxicity of glutaraldehyde?" I ask, interrupting his response to scream "Stop it!" at my daughter Gabby, who is babbling in my ear.

"If Gabby is bohemian you," he begins again, "and you get another little girl to play with her."

"I've got another little girl."

"Ten, then. She'll be busy in the next room—fed up—and she won't be jabbering at you. That's what happens to the glutaraldehyde. It ties up the collagen fibers, bonds with them. And having done that, it's spent itself and loses its toxicity. Any free glutaraldehyde that might remain is washed out for twenty-four hours, and the water is tested with a special glutaraldehyde de-

lecting agent. This is very important. Other scientists should not.

The competition among scientists is tight, eager to express solidarity with anyone who uses my beloved child as a scientific metaphor.

"Competition is not all destructive," Yan-nas responds. "The one hundred twenty-two people treated with artificial skin who are well and, to some extent, the result of competition."

In Manhattan's world of cosmetic surgery—an even more competitive field than pure science—I see the charming, perpetually smiling Dr. Robert Cucin in his marble-lined town house. After a discussion of various types of face-lifts and reconstructive surgery, he gets down to business, playing with his computer imaging machine, poking dots into profiles to slim them down, adding and subtracting theoretical bone, cartilage and tissue. Finally satisfied that my own frozen-on-the-screen image is as good as he can get it, he says, "Well, what would you like to have done?"

"Can you do anything about my bulging forehead?"

No.

"Can you make my lip turn up?"

"Unfortunately not."

"Well, then, what needs doing?"

"How about some implants on your cheekbones?"

Having heard of all my life how well I was going to age because of my high cheekbones, I panic. "My God! Am my cheekbones disintegrating already? He swears around and takes a look at my actual flesh-and-blood face.

"Well," he concedes, "maybe not. How about this area?" Bury with a stylus, he takes a look in my left eyelid, which unbeknownst to him had been tucked by two Ptarmigan the famous plastic surgeon from Brazil, 12 months earlier. He raises the eyebrow. There's virtually no difference, however, between the two eyes, since the image he's playing with is already characterized by the startled-dog look of my almost too-wide-open eyes, thanks to my altered lids. Sensing something amiss, he gets up, walks over to me, and takes a closer look. "Have you ever in your life had surgery on your eyelids?" he asks.

When I admit the truth, he explains that (I'm so far-shinned there's been no scarring, so it was impossible to tell). Making a mental note to thank Ptarmigan for a scowl-free face, I tell Cucin that since I had my nose bump removed, I've acquired a new one, probably from Gaby bouncing on my bed a few months after my surgery and slamming her hard little skull right into the newly sutured bridge. He erases my face and gets me to sit for a profile.

I look like a hideous crone. "My God, I never realized how ugly my chin is," I complain. "Forget the nose; it's the chin that wants attention. After he whittles away at the chin, I decide now that the chin looks good, the nose looks bad. He says if I really

want to get rid of the bump, he'll have to break the bone, as Ptarmigan should have done. Then we both decide the bridge is too wide. He punches some black dots into the video profile to thin the bridge, shortens the tip, changes the nostril, and adds some white dots to fill out the upper lip, all at my suggestion. I look like one of my younger sisters now, the one who married my last fiancé, the sister I quote Ptarmigan, born with a ten-thousand-dollar nose.

This is not a surgical tale. Doctor, it's a Freudian one. I tell him on my way out the door, clutching a Polaroid of the altered profile. Back home my fifteen-year-old daughter, Alexandra, studies it and says, "Mom, you don't look like Aunt Marybeth here, you look like a fed!"

"Nonsense!" says the young, equally charming Michael Evan Sachs in his posh Manhattan office after a pretty and very pregnant black receptionist wearing a jumpsuit shows me in. "I can raise that bump down in ten minutes right here in my

●Once Eisinger purifies pigment-growth factor, she may develop a cream that gets rid of brown spots, or a substance that allows you to tan without sunbathing.●

office. (Ifnesses sculpting rhinoplasty, he calls it.) I never heard anything cruder than breaking the bone! "I think of Silver's wish for the future, that clinicians and researchers would communicate and share information and results more closely.

"Are you squeamish?" Sachs asks. I relate that upon graduating from college, where I majored in fine art, I took a job with a scientist at Harvard Medical School. When he showed me how to slit open a rat's vein and insert a plastic tube, I fainted.

"Can you sit through a video of my fat evaporation technique?"

"I can try," I answer.

In realistic color a Chien Anleeb-type image flicks on a knife approaching an eyeball. But instead of the eye, the skin underneath is slit open to reveal a yellow pad of fat embedded in a triangle of raw, bloody tissue. A needle is inserted into the pad, the suctioned fat suddenly sizzles away and evaporates, and I don't even feel heat.

"Why is that better than cutting?"

"By cutting you either nick some of the tissue or you don't get it all the fat. This way you get it all and no bleeding."

"Can you do it to thighs?"

"I don't see why not, though you'd need a much stronger current. But the trouble with doing it to thighs or sucking it out of thighs is that you have all that skin left over and something has to be done with it. I only do head and neck work."

Since I survived the eye-fat evaporation, I decide to watch a tissue-augmentation video, using Sachs's other invention, tissue clay. First I'm shown the collagen, a white, Play-Doh-like substance being mixed in a bowl with the patient's own blood. (Reminds me of my mother during World War II kneading a red wax into white sand to make yellow margarine.) The resulting dark red material is put into a syringe and inserted under the skin into the patient's nose, where the skin has been lifted off the bone. The way the lifted nose is manipulated as the tissue clay is sculpted makes the patient look like a corpse dragged out of the hops on Quincy.

"How long does it last?"

"So far we've had a maximum sixteen percent resorption in six years. Beyond that, it's too soon to tell. But actual bone and other materials resorb even more."

"What about the sliced coral Kenneth Salyer uses in Houston?" I ask. "The new bone grows into the coral holes, and the coral biodegrades."

"Anything hard will do that," Sachs says. "Whether growing new bone cells or new skin, the structure of the inserted material is the key. The reason Zyderm collagen implants don't last beyond 18 months when used in filling facial lines is that each artificial molecule is hollow. When new cells form on the collagen molecule's smooth, spherical surface, they eventually degrade it and tumble into the empty space whose volume is greater than that of the now-degraded surface. Hence there aren't enough new cells to fill up the wrinkles."

Fred Silver showed me his solution, a jar filled with collagen beads that looked like lavender caviar. ("That's just so you can see them," he says about the color.) The beads are shaped like sponge or coral so that new cells begin to proliferate from deep within the center of each molecule and spread outward. Once the artificial beads have biodegraded, you have a lifted-in surface. Silver unfortunately rejected my quack pig offer to test the beads. Because he's not a physician, he explains, he can't inject it.

"Micro is the key here!" says San Francisco's Dr. Samuel Slegman of the American Society for Dermatologic Surgery about experimental micropigmentation, a technique that suction fat from one part of the body and injects it into another. It is widely used in France and Switzerland but is not considered a standard procedure in the United States. "By injecting less than three cubic centimeters of teeny-tiny fat globules through a nineteen gauge needle and not injuring them in the process and by spreading them out enough in an area that has fat anyway you get them to grow, giving you something that's feasible," he

explains: "This is still in the let-me-try stage. It's not in the I'm-ready-to-give-you-the-right-formula stage. Microinjection is autologift: the patient is his or her own donor, so there won't be any allergies. It's simple to harvest and simple to do—an office procedure. It's too early to tell how long it lasts, but the word on this one is: Follow closely. Crow's feet are too fine, for them, use collagen; springy. You and I are the same age. I've got a thin face and I've looked in the mirror and said, 'Well, when is it gonna be time?'"

"You know the hollow between the top of the cheekbone and the eyeball?" I ask, encouraged to really get into the De Kooning syndrome.

"I know exactly what you're taking about, and I do it there. Zylplast and maybe a little Microinjection. Zylplast goes under the skin to build it up at about the same level that silicone is put in. It's sort of a gel. I've done many of the studies for the Collagen Corporation, and I've used Zylplast for three years now. Whereas collagen may disintegrate between six and eighteen months, Zylplast may disintegrate between twelve and twenty months. Microinjection is for tiny little puff-ups. For the laugh lines, the hollows of the cheeks, and some of the forehead furrows—no creases but deep furrows. I'm also looking into a sonic fat dissolver so I can go under the skin with a needle and sculpt," says Stegman.

No cuts, no stitches, no scars—just a blast of sound, right?

"Right."

"Anything new with the breasts? Can you move the fat up a few feet? Say, from the thighs to the tits?"

"No. Everything's gotta be in the bag."

(Wrong. A Beverly Hills plastic surgeon, Mel Beccol, has been moving nonfat fat up into breasts in amounts of 130 cubic centimeters for the past 21 months, too soon to tell if there will be resorption.)

In a reassuringly old-fashioned office in New York, Bernard Simon, seventy-four, consulting surgeon, professor emeritus of plastic surgery at Mount Sinai, and the last surviving plastic surgeon of those who worked on that "Hiroshima machine," greets me with: "Anybody who touches your face should be drummed out of the profession, prevented from communication with anybody, put in a cell, the door slammed shut and never opened again. You're absolutely stunning, for God's sake!" When I tell him about computer imaging and fat evaporation, he says: "You've been keeping some pretty saucy company."

"It's as if Picasso or Michelangelo would have had to use a computer," he says. "You know the story about Giotto and the pope don't you? The pope's representatives came up to Giotto like a search committee for a university to see whether he was a good enough artist to do some things for the Vatican. And Giotto took a piece of paper and, with a flourish, drew a circle and said, 'They'll understand it.' His skill was such that he didn't need a compass. The

ability to translate hand, eye, and heart. Well, is very exciting—it's a unity."

Simon puts two books in my lap: *Long-Term Results in Plastic and Reconstructive Surgery*, edited by Robert M. Godwyn, and *The Principles and Art of Plastic Surgery* by Sir Harold Gillies and Ralph Milard, Jr. Milard's one of the most important people in the field of cleft-lip surgery. Simon explains, and also, according to my friend from the back-street peering parlor in Miami, one of the experts on face peeing.

I open this latter volume at random and read: "In face-lifting, avoid the young woman who has little to gain." Yet there is a state in a woman's facial pique [drooping] when it is better to lift or re-lift than wait until too late. A beautiful woman is worth preserving, and should be kept youthful while she is still young enough to enjoy it."

I close the book after glimpsing some pictures of a couple of World War II vets whose faces, from the upper lip down, are abstract masses of bloody tissue. Now I do

● **Microinjection**
is for tiny little puff-ups,
for laugh lines,
and some forehead furrows.
I'm also looking
into a sonic fat dissolver to
go under the skin
with a needle and sculpt. ●

feel faint. Taking a deep breath, I say: "Well, Doctor, just last year I had my eyes, neck, nose, and face done in Rio."

"You did?" he exclaims, shocked.

"I suppose I didn't really need it."

"I was going to say: You have the kind of face and figure that when you're eighty you're going to look like Katherine Hepburn. When a beautiful woman, an already attractive woman like yourself, has surgery, in her countenance she looks at the surgeon and says, 'Oh, Doctor, aren't you wonderful, you're a genius, and these dumb SOB's believe it.' They don't realize they're just doing what they've been trained to do. Just as any abdominal surgeon of any competence takes out your appendix, your gallbladder, your..."

But Doctor, what can I do about my breasts? Between my two children, I'm embarrassed to admit, I've been nursing for a total of six years."

"Why are you apologizing?"

"My father said I was going to turn Gaby into a lesbian."

"Oh, baby! Don't let your daddy con you. Anyway, I have literature to prove that every single woman who's had breast-augmen-

tation surgery did it only to please herself. Not a husband or lover gave a fig what her breasts looked like!" (Later Simon, recalling a bit, says that he was referring to a Johns Hopkins study of 60 women who had undergone breast-enlargement surgery. None had done so to please a man.)

"How about face-lifts?" I ask. "Why do you sometimes do them over again after eighteen months?"

"If you read my article in Bob Godwyn's book, you'll understand that in face-lifts the skin stretches, and I point out why."

Really, the collagen fibers—which do not have elastic properties and are oriented in a scraggly, random fashion—straighten into parallel structures after a face-lift. Meanwhile, the skin's elastic network, which is incapable of regeneration, stretches and, with age, becomes like a worn-out girdle.

Horrified at the thought of my straightened-out collagen and the worn-out girdle that was once my elastic network, I rush home and track Ptanguy by phone in St. Tropez, where he's "staring out to sea at a boat that doesn't seem to move." After a brief foray into philosophy ("The passage between maturity and old age can be eased by the right direction between soul and body"), he tells me that the "right direction" of the pull between the tragus (the bump on the cartilage where the front of the ear joins the cheek) and the Densen tubercle (the bump on the back of the ear opposite the tragus) is one of three things responsible for the long-lasting effects that characterize his face—its and the nondisruption of collagen fibers. ("Impossible," says Owen.) Pull without overstretching the skin, Ptanguy continues. The other two are a proper amount of undermining, or separation of the skin from the muscle, which includes liposuction of the fat under the chin (with an instrument that separates skin from muscle whether oriented you suction fat) and treatment of the SMAS platysma. (SMAS stands for the superficial muscular aponeurotic system, which envelops the deeper platysma. The platysma, according to Gray's *Anatomy* is a broad, thin plane of muscular fibers that extends from the face to the clavicle and produces wrinkling of the skin's surface, depression of the jaw, and a drawing down of the mouth, "being one of the chief agents in the expression of melancholy.")

"Do you cut through the SMAS platysma?"

"You resection it. No one cuts through it anymore. I was always against cutting through because it distorts the expression," says Ptanguy.

Maybe Ptanguy gets a distortion when he cuts through it, but we don't," claims Dr. Val Lambrose, an associate of Bruce Connell, the Santa Ana, California, surgeon who brought Thod Skood's SMAS platysma technique from Scandinavia to this country. Lambrose also says that the literature on traditional breast implants above the pectoral muscle claims 30 to 40 percent scarring, but with his technique of implant-

ing underneath the muscle, only 10 percent of his patients fall victim to the "oo conut syndrome." Furthermore, after Cornell realized that "when people look at you, they concentrate on the triangle between your eyebrows and your upper lip," he refined the brow lift: a procedure that had fallen into disrepair. Cornell cuts through the muscle at the hairline, thus avoiding cutting away any hair or lengthening the brow.

I ponder the proposition. I thought nobody did that anymore because it prevents one from lifting one's eyebrows.

"Some doctors might not get that result, but we don't," says Lumbroso, who also reveals that with the "deep, strong pull" he and Cornell gave to the severed SMAS platysma, their results "can only be described as miraculous."

Looking for something even more miraculous, I phone Sachs and ask for a more detailed futuristic plastic surgery scenario than the one O'Connor gave me—the CAT scan with the laser beam.

"Okay," Sachs says. "Let's say we're gonna do a nose job and a face-lift and we're not gonna use a laser, we're gonna use an electromagnetic ray."

"Why not a breast augmentation and an ass and thigh reduction at the same time? Why not lay her right down on that table the way Porgy does and do it all in one fell swoop?" I suggest.

"Why not?" Okay. First her doctor gives her site-specific pills a couple days ahead. One to the bone, muscle, cartilage and skin. She'll go into a CAT-scan-type room and lie down, but instead of a CAT scan she'll have a nuclear magnetic resonance unit. Instead of X rays, it uses the intrinsic radiation that's given off by her own cells to take a photograph.

As the developing fluid so to speak?

"Right. We'll have a hologram image and we'll have a computer. We'll call up her nose on the computer. With a pen I'll draw the changes I want to make, and the computer will analyze that picture—the bone, cartilage, subcutaneous tissues—and we'll see what needs to be reduced and in what way. Then we'll make a new hologram. The machine she's in will emit a certain electromagnetic radiation—just like TV waves. To reduce the bone in that area, an energy beam will inoper the molecules from the chemical that's already in there from the pill she's taken. Same way with the skin. This little machine will spray a sort of invisible paint on the skin. The paint will react with the chemical that's already lodging there, and the electromagnetic ray will turn on the chemical reaction, remove some molecules, tighten the skin."

(According to Silver, with whom I immediately double-check, this might be possible: a small amount of molecules, invisible to the naked eye, were removed. The replacements growing in would have a tighter alignment because the normal healing response is to lay down fibers under tension; a wrinkle in fabric is removed

under tension.)

To augment the breasts? Sachs continues: "We'll call them up on the screen, redesign them, and the electromagnetic ray will cause the molecules in the lactating tissue and the muscles to increase the skin to stretch."

When I talk to Silver later, he points out that an electromagnetic ray is a laser and what it does is emit a high-intensity light that has an electric and magnetic field. The ray causes evaporation of the atoms by pulling the electrons away from it. But the patient would have to be immobile because movement can change the coordinates, so a surgeon would have to contour the surgery table and attach the patient's body to it with vacuum cups. And it should move, he later would shrill off.

"Will we be sorry we played God?" I ask O'Connor when he talks about research he's working on DNA that can be inserted into cells and can give them better ability to repair themselves.

Oh, yeah, he says, but we've been sorry we played God all along. With every major advance there are prices to pay. The magnificent theories of Einstein, for instance, led to atomic bombs.

What about it? I ask Esinger. Will we have a board of laymen and scientists to make future decisions—the way we should have had before the nuclear arms race and power plants got out of hand?

We have that already in Japan, says her assistant. Ogata, more reactions than you do here.

But it would make sense they worry about it more in Japan, I say. They've been the ones to suffer most from the magnificent theories of Einstein.

Ogata nods and smiles. He wants to continue what Esinger calls "a philosophical discussion," but time is short. So he gets back to the thousands of plastic bottles containing red fluid and various skin cells, clanking on simultaneously in at least two of the three fields. Bernard Simon calls the keys to the plastic surgery of the future: technical know-how, immunology and regeneration. Even today, however, with these keys for form-perfected movies, TV beaches, restaurants and health clubs are fast becoming populated by armies of the surgically altered. I watch them parade by and think of the Queen of Miami Beach, an eighty-year-old who managed—with exercise diet and plastic surgery—to appear no older than thirty-two. She and her thirty-year-old lover spent their time with her children. One day her body was found with a note reading: "I couldn't stand it anymore. I looked thirty-five but inside I felt like eighty, and I just couldn't keep up. My insides didn't match my outsides. Sorry!"

Once we get to the point where our insides match our outsides, we're really in trouble. Then maybe we can indulge our Dr. Koobing complexes indefinitely to the point where the big dealer upstairs never has to come down and take our bodies off the easel. **DO**

MESS

CONTINUED FROM PAGE 74

mid-scientist tradition, on the verge of destroying human intellect and just as happy as a clam at high tide.

Guys like my brother Bobby only come along once every two or three generations. I think—guys like Newton, Einstein, Da Vinci, maybe Edison. They all seem to have one thing in common. They are like huge compasses that swing aimlessly for a long time, searching for some true north and then homing in on it with fearful force. Before that happens, such guys are apt to get up to suffer wind shiv, and Bobby was no exception. When he was eight and I was fifteen, he came to me and said he had invented an airplane. By then I knew Bobby too well to just say "Bullshit" and kick him out of my room. I went out to the garage where there was this weird plywood contraption sitting on his American Flyer red wagon. It looked a little like a lighter plane, but the wings were naked forward instead of back. He had mounted the saddle from his rocking horse on the middle of it with bolts. There was a lever on the side. There was no motor. He said it was a glider. He wanted me to push him down Campari Hill, which was the steepest grade in DC's Grant Park—there was a cement path down the middle of it for old folks. That, Bobby said, would be his runway.

"Bobby, I said, 'you got this puppy's wings on backward.'"

No, he said. This is the way they're supposed to be. I saw something on *Wild Kingdom* about hawks. They fly down on their prey and then reverse their wings coming up. They're double-pointed, see? You get better lift this way.

Then why isn't the Air Force building them this way? I asked, blissfully unaware that both America and the Soviet Union had plans for such forward-wing lighter planes on their drawing boards.

Bobby just shrugged. We went over to Campari Hill and he climbed into the rocking horse saddle and gripped the lever. "Push me hard," he said. His eyes were dancing with that crazed light I knew so well—Christ, his eyes used to light up that way in his cradle sometimes. But I swear to God, I never would have pushed him down this cement path as hard as I did if I thought the thing would actually work.

But I didn't know and I gave him one hell of a shove. He went freewheeling down the hill, whooping like a cowboy just off a trail drive and headed into town for a few cold beers. An old lady had to jump out of his way and he just massed an old guy in a walker. Halfway down he pulled the handle and I watched, wide-eyed and gaped, as his splintery plywood plane separated from the wagon. At first it only hovered inches above it, and for a second it looked like it was going to settle back. Then there was a gust of wind, and Bobby's

quantum physics and advanced-algebra classes at Georgetown University. One day he blanked out every radio and TV on our street—and the surrounding four blocks—with his own voice. He had found an old portable TV in the attic and turned it into a wide-band radio broadcasting station. One old black-and-white Zenith, twelve feet of hi-fi flex, a coat hanger mounted on the roof peak of our house, and presto! For about two hours all four blocks of Georgetown could receive his WGBB—which happened to be my brother, reading some of my short stories, telling moron jokes, and explaining that the high sulfur content in baked beans was the reason our dad lapsed so much in church every Sunday morning. But he gets most of an off-putting quiet. Bobby told his audience of roughly three thousand, "or sometimes he holds the real bangers until it's time for the hymns."

My dad, who was less than happy about all this, ended up paying a seventy-five-dollar fine and taking it out of Bobby's allowance for the next year. Life with Bobby, oh, yeah—and look here, I'm crying, is it honest sentiment, I wonder, or the cried? The former, I think—Christ, knows how much I loved him—but I think I better try to hurry up a little just the same.

Bobby had graduated high school, for all practical purposes, by the age of ten. But he never got a B.A. or B.S., let alone any advanced degrees. It was that big, powerful compass in his head, swinging around and around, looking for some true north to point at. He went through a physics period and a shorter period when he was nifty for chemistry—but in the end, Bobby was too impatient with mathematics for either of those fields to hold him. He could do it, but it—and ultimately all so-called hard science—bored him. By the time he was fifteen, it was archaeology—he combed the rocky White Mountain foothills in the area around our summer place in North Conway, building a history of the Indians who had lived there.

But that passed, too. He began to read history and anthropology. When he was sixteen my folks gave their reluctant approval when Bobby requested that he be allowed to accompany a party of New England anthropologists on an expedition into South America. He came back five months later with the first real tan of his life; he was also an inch taller, fifteen pounds lighter and much quieter. He was still cheerful enough, or could be, but his little-boy exuberance—sometimes infectious, sometimes wearisome, but always there—was gone. He had grown up. And for the first time I remember him talking about the news—how bad it was. I mean, that was 2003, the year a PLQ splinter group called Sons of the Jihad set off a squirt bomb in London, polluting sixty percent of it for the next seventy years and making the rest of it extremely unhealthy for people who ever planned to have children (or to live past the age of fifty without developing some sort of cancer, for that matter). The year after,

HEAR

the incredible sound of one of the world's most sophisticated VCRs—the new Canon VR-HF720. It has multi-channel TV sound for stereo and bilingual broadcasts and a 96dB dynamic range for breathtaking hi-fi stereo performance. For more information and the Canon Video dealer nearest you, call 1-800-343-4300, extension 233.

Canon
Accu-Vision™
The engineers that took broadcast quality



Canon U.S.A., Inc., One Canon Plaza, Lake Success, NY 11042 • ©1997 Canon U.S.A., Inc.



DRINK FOR TASTE, NOT TRENDS. DOS EQUIS
Ask for the smooth, amber taste of Dos Equis. It's not a dark, but has more flavor than pale beers. A taste that towers above the trends.

XX

IMPORTED BY MONSIEUR IMPORTS, EVANSTON, ILL.

we tried to blockade the Philippines after the Cedeno administration accepted a 'small group' of Red Chinese advisers (fifteen thousand of them according to our spy satellites) and only backed down when it became clear that a) the Chinese weren't kidding about emptying the holes if we didn't pull back and b) the American people weren't all that crazy about committing mass suicide over the Philippine islands. That was the same year some other group of crazy motherfuckers—Albanians, I think—tried to as-spy the AIDS virus over West Berlin.

This sort of stuff depressed everybody, but it depressed the shit out of Bobby.

Why are people so goddamn mean? he asked me one day. We were in North Conway, it was late August, and most of our stuff was already in boxes and suitcases; the place had that sad, deserted look it got just before we all went our separate ways. For me it meant back to The Rut, for Bobby it meant Waco, Texas, of all places. He had spent the summer reading sociology and geology texts—how's that for a crazy salad?—and said he wanted to run a couple of experiments down there. He said it in a casual way, but I saw my mother looking at him with a peculiar, thoughtful scrutiny in the last couple of weeks we were all together. Neither Dad nor I suspected, but I think my mom knew that Bobby's compass needle had finally stopped swinging and started pointing.

Why? I asked. "I'm supposed to answer that?"

"Someone better. Pretty soon, too. Because that's the way people are built." That's bullshit. I don't believe it. Even that double-X-chromosome stuff turned out to be bullshit in the end.

"Because of economic pressures." Also bullshit. The only people who really want to fight are relatively well-off. And the people they want to fight are also relatively well-off. Poor folks are too busy looking for something to eat.

"Original sin," I said.
"Well," he said, "maybe that's it. I won't say it isn't. But what's the instrument?"
"I'm not following you," I said.
"It's the water," Bobby said moodily.
"Say what?"
"The water. Something in the water."
He looked at me.
"Or something that isn't."

The next day Bobby went off to Waco. I don't see him again until he showed up at my apartment wearing the inside-out Munsie shirt and carrying the two glass boxes. That was three years later.

"Hi, Howie," he said, sleeping in and giving me a seal on the back as if it had been three days instead of three years.

"Bobby?" I yelled, and threw both arms around him in a bear hug. Hard angles bit into my chest, and I heard an angry hum.

"I'm glad to see you, too," Bobby said, but you better go easy. You're upsetting the natives."

I stepped back in a hurry. Bobby set down the big paper bag he was carrying and unslung his shoulder bag. Then he carefully brought the glass boxes out of the bag. There was a beehive in one, a wasps' nest in the other. The bees were already settling down and going back to whatever business bees have, but the wasps were clearly unhappy about the whole thing.

"Okay, Bobby," I said. I looked at him and grinned. I couldn't seem to stop grinning. What are you up to this time?"

He unzipped the tote bag and brought out a mayonnaise jar that was half filled with a clear liquid.

"See this?" he said.

"Yeah. Looks like water."
"It is, with two important differences: it came from an artisan well in La Plata, a little town forty miles east of Waco, and before I turned it into this concentrated form there was two gallons of it. I've got a regular little distillery running down there. Howie." He was grinning, and now the grin

●That was 2003,
the year a PLO splinter
group called Sons
of the Jihad had set off a
squirf bomb
in London, polluting sixty
percent of it
for the next seventy years. ●

broadened. "Water's all it is, but it's the goddamnedest popekull the human race has ever seen—just the same."

"I don't have the slightest idea what you're talking about."

"I know you don't. But you will. You know what, Howie?"

"What?"

"If the idiotic human race can just manage to hold itself together for another six months, it'll hold itself together for all time."

He held up the mayonnaise jar, and one magnified Bobby eye stared at me through it with huge solemnity. This is the big one, he said. The cure for the worst disease to which Homo sapiens is prone.

Cancer?

Nope. Bobby said, "War. Where's your bathroom?" My back teeth are floating.

When he came back he had not only turned the Mumford T-shirt right side out, he had combed his hair—nor had his method of doing this changed. I saw Bobby just held his head under the faucet for a while, then raked his fingers through his long, coarsely blond shag. He looked at the two glass boxes and pronounced the bees and wasps back to normal. Not

that a wasps' nest ever approaches anything closely resembling normal. Howie. Wasps are societal insects like bees and ants. But unlike bees, which are almost sane and ants, which have occasional school-leavers, wasps are lunatics. He smiled. "Like people." He took the top off the glass box containing the beehive.

Tell you what, Bobby. I said, I was smiling, but the smile felt much too wide. Put the top back on and just tell me about it—what do you say? Save the Mr. Wizard demonstration for later. I mean, my landlord's a real pussyfoot, but the superintendent's this big bulldozer who smokes Odele Pease cigars and has thirty pounds on me. She—

"You'll like this," Bobby said, as if I hadn't spoken at all—a habit as familiar to me as the Ten Fingers Method of Hair Grooming. He was never impolite but often totally absorbed. And could I stop him? Aw, shit, no. It was too good to have him back. I mean, I think I know even then that something was going to go totally wrong, but when I was with Bobby for more than two minutes, he just hypnotized me. He was Lucy holding the football and promising me the time for sure, and I was Charlie Brown, rushing down the field to kick it. In fact, you've probably seen it done before—they show pictures of it in magazines from time to time or in TV wildlife documentaries. It's nothing very special, but people have got a sort of prejudices about bees.

And the weird thing was, he was right—I had seen it before.

He stuck his hand into the box between the hive and the glass. In less than fifteen seconds his hand had acquired a living, black and yellow glow.

It brought back an instant of total recall, sitting in front of the TV, wearing footy pajamas and clutching my Peaseington bear, maybe half an hour before bedtime (and surely years before Bobby was born), watching with mingled horror, disgust, and fascination as some bookkeeper allowed bees to cover his entire face. They had formed a sort of executioner's hood at last, and then he had brushed them into a grotesque, living beard.

Bobby winced suddenly, sharply, then grinned.

"One of em stung me," he said. "They're still a little upset from the trip. I hooked a ride with the local insurance lady from La Plata to Waco—she's got an old Paper Cub—and few People's from there."

"I think you ought to get your hand out of there," I said. I kept waiting for some of them to fly out—I could imagine chasing them around with a rolled-up magazine for hours after he bopped out, bringing them down one by one, like escapees from some old prison house. But none of them had, at least so far.

"Relax, Howie. You ever see a bee sting a flower? Or even hear of it?"

"You don't look like a flower."

He laughed. "Shit, you think bees know what a flower looks like? Uh-uh! No way man! They don't know what a flower looks



For people with
a head full of facts,
Casio offers a
place to store them.



Nobody's perfect. The more you have on your mind, the more likely it is that something will slip.

That's why Casio perfected the Databank watch. Not only can it tell the time and date, it can remember phone numbers, birthdays, anniversaries, cash machine numbers

—up to fifty things. And your own private password makes sure it answers only to you.

Not only is a Casio

Databank watch the next best thing to a photographic memory, it has a countdown alarm and four other alarms that serve as daily reminders.

In addition, some of our databanks can recall your next week's schedule, as well as help you add, subtract, multiply and divide with an eight digit calculator that has a memory of its own.

What's more, if you have a lot on your mind that you can't afford to forget, you can easily afford a Casio Databank watch to store it in.

No matter how good your memory, there's probably room for improvement. Why take a chance that something will slip? With a Databank watch on your wrist, Casio's got your facts stored only an arm's length away.

CASIO
Where miracles never cease

like any more than you or I know what a cloud sounds like. They know I'm sweet because I excitee suicide diem in my sweat... along with at least thirty seven other diemins."

He paused thoughtfully. "Although I must confess I was careful to uh... sweeten my self up a little tonight. Ask a box of chocolate-covered cherries on the plane—"

"Oh, Bobby, Jesus!"

"—and had a couple of Malibu Cokes in the taxi coming here."

He reached in with his other hand and carefully began to brush the bees off. I saw him wince once more just before he got the last of them off and eased my mind considerably by replacing the lid on the glass box. I saw a red swelling on each of his hands, one in the cup of the left palm, another high up on the right, near what the palmists call the Beaclets of Fortune. He'd been stung, but I saw well enough what he'd set out to show me. What looked like at least four hundred bees had investigated him. Only two had stung.

He took a pair of tweezers out of his pants pocket and went over to my desk. He moved the pile of manuscripts and lit the tiny lamp on the place where the pages had been—fiddling with it until it formed a tiny red spotlight on the wood.

"When anything good, Bow-Wow? he asked casually and I felt the heat on the back of my neck. When was the last time he'd called me Bow-Wow? When he was four? Six? He was working carefully on his left hand with the tweezers. I saw him extract a tiny something that looked a little like a noose hair and place it in my ashtray. "Place on art forgery for Vanity Fair Bobby what in hell are you up to this time?"

"You want to pull the other one for me?" he asked, offering me the tweezers, his right hand, and an apologetic smile. I keep thinking if I'm so goddamn smart, I ought to be omniscient, but my left hand has still got an IQ of about six."

Same old Bobby.

I sat down beside him, took the tweezers and pulled the bee stinger out of the red swelling near what in his case should have been called the Beaclets of Doom and while I did it he told me about the difference between bees and wasps, the difference between the water in La Plata and the water in New York, and how goddamn everything was going to be all right with his water and a little help from me.

And oh, shit. I ended up running at the football while my laughing, widely intelligent brother held it one last time.

"Bees don't sting unless they have to because it kills them." Bobby said matter-of-factly. "You remember that time in North Conway when you said we kept killing each other because of original sin?"

Yes. Had shit.

Well, if there is such a thing, if there is a God who could simultaneously love us enough to serve us His own Son on a cross, and send us all on a rocket sled to hell just because one stupid bitch bit a bad apple,

then the curse was just this. He made us like wasps instead of bees. Shit. How are you doing?"

"Hold still and I'll get it out. If you want to make a lot of big gestures, I'll wait."

"Okay," he said, and after that he held relatively still while I extracted the stinger. "Bees are nature's kamikaze pilots. Bow-Wow. Look in that glass box; you'll see the one who stung me lying dead at the bottom. Their stingers are barbed, like fishhooks. They slide in easy. When they pull out, they disembowel themselves."

"Gross," I said, dropping the second stinger in the ashtray.

"It makes them particular though."

I bit.

"Wasps, on the other hand, have smooth stingers. They can bore you all they like. They use up the poison by the third or fourth shot, but they can go right on making holes if they like it, and usually they do. Especially wall wasps. The kind I've got over here. You gotta sedate 'em. Stuff called

in that period he read my piece on art forgery, although it was already twenty pages long.

"Okay," he said, putting the pages down. "That's pretty good, man. You ought to read up on how Jay Gould furnished the parlor car of his private train with lake Manets—shit, that's a no—but it's good. Watch."

Before I really knew what he was up to—I was musing on how much Gould might have paid for the lake Manets—he had removed the cover of the glass box containing the wasps' nest.

Jesus. Bobby quit! I yelled.

"Same old wimp!" Bobby laughed and pulled the nest, which was dull gray and about the size of a bowling ball, out of the box. He held it in his hands. Wasps flew out and in on his arms, his cheeks, his forehead. One landed on my forearm. I slapped it, and it fell dead to the carpet. I was scared—I mean, really scared.

"Don't tell 'em," Bobby said. "You might as well be machine-gunning babies. They're harmless," for Christ's sake. That's the point! He tossed the nest from hand to hand like an overgrown softball. He lobbed it in the air. I watched, horrified, as wasps cruised the living room of my apartment like lighter planes.

Bobby lowered the nest carefully back into the box and sat down on my couch. He pulled the place next to him, and I went over, nearly hypnotized. They were everywhere, on the rug, the ceiling, the drapes. Half a dozen of them were crawling across the screen of my Curtis-Mattheis.

Before I could do down, he brushed away a couple that were on the sofa cushion where my ass was aimed. They flew away quickly. They were all flying easily, crawling, moving fast. There was nothing drooped about their behavior. But as Bobby talked, they gradually found their way back to their spit-paper home, crawled over it, and eventually disappeared inside again through the hole in the top.

I wasn't the first one to get interested in Waco. He said, "It just happens to be the biggest town in the funny little nonviolent section of what is, per capita, the most violent state in the Union. Texans love to shoot each other. Hows—I mean, it's like a state hobby. Half the male population goes around armed. Saturday night in the Fort Worth bars is like a shooting gallery where you get to plunk away at drunks instead of clay ducks. There are more NRA card carriers than there are Methodists. Not that Texas is the only place where people shoot each other or carve each other up with straight razors or stick their kids in the oven if they cry too long, you understand, but they sure do like their firearms."

"Except in Waco," I said.

"Oh, they like 'em there, too," he said. "It's just that they use 'em on each other a hell of a lot less often."

Jesus. I just looked up at the clock and saw the time. It feels like about fifteen minutes, but it's been almost an hour already.

*• Bobby
sat down the big paper bag
he was carrying
and unsling his shoulder bag.
He carefully brought
out the glass boxes. There
was a wasps' nest
in one, a beehive in the other •*

Nixon. It must pain 'em a hell of a hang-over because they wake up madder than ever. He looked at me somberly and for the first time I saw the dark brown wheels of weemness under his eyes and realized my kid brother was dead, almost tired to death, maybe.

That's why people go on fighting. Bow-Wow. On and on and on. We got smooth stingers. Now watch this."

He got up, went over to his tote bag, rummaged in it, and came up with an eyedropper. He opened the mayhemase jar, put the dropper in, and drop up a tiny bubble of his distilled Texas water.

When he took it over to the glass box with the wasps' nest made, I saw the top on this one was different—there was a tiny plastic side piece set into the top. With the wasps, he was taking no chances.

He squeezed the black bulb. Two drops of water fell onto the nest, making a momentary dark spot that disappeared almost at once. "Gave it about three minutes," he said.

What—?

"No questions," he said. "You'll see. Three minutes."

That happens to me sometimes when I'm running at white hot speed, but I can't allow myself to be seduced into these opies. I feel as well as ever—no noticeable drying of the membranes in the throat, no groping for words, and so I glance back over what I've done, I see I note the normal typos and strikeouts. But I can't let myself. I've got to hurry up. "Fiddlededeeen, said Scofield, and all of that."

The nonviolent atmosphere of the Waco area had been noticed and investigated before, mostly by sociologists. Bobby said that when you look through statistical data on Waco and similar areas into a computer—population density, mean age, mean economic level, mean educational level, and dozens of other numbers—you got back a whopper of an anomaly. Scholarly papers are rarely popular, but even so, several of the better than fifty Bobby read on the subject suggested ironically that maybe it was "something in the water."

"I decided that maybe it was time to take the pie seriously," Bobby said. After all, there's something in the water of a lot of places that prevents both decay. It's called fluoride."

He went to Waco accompanied by a trio of research assistants—two of these were sociology grad students, the other a full professor of geology who was on sabbatical. Within six months Bobby and the sociology guys had constructed a computer program that Bobby called the world's only stereographic picture of a calquaque. He had a slightly rumpled printout in his tote. He gave it to me. I was looking at a series of forty concentric rings with a diameter of six miles each. Waco was in the eighth, ninth, and tenth rings.

"Now look at this," he said, and put a transparent overlay on the printout. More rings, but in each one there was a number. For the eighth ring: 471. Thirty-ninth: 420. Thirty-eighth: 418. And so on. In a couple of places the numbers went up instead of down, but only in a couple (and only by a little).

"What are they?"

"Each number represents the incidence of violent crime in that particular circle," Bobby said. "Murder, rape, assault, and battery—even acts of vandalism. The computer assigns a number by a formula that takes the population density into account. He tapped the twenty-seventh circle, which held the number 204, with his finger. "There's less than nine hundred people in this whole area, for instance. The number indicates three or four cases of spouse abuse, a couple of barroom brawls, an act of animal cruelty—some senile farmer got pissed at a pig and hit him with a shovel—and one involuntary manslaughter."

At the center of Bobby's calquaque was the town of La Plata. "To call it a sleepy little town seems more than fair. The numerical value assigned to La Plata was zero."

"So here it is," Bobby said, leaning forward and rubbing his long hands together nervously. "Here's this weird little sagebrush Garden of Eden. Here's a commu-

nity of fifteen thousand, twenty-four percent of which are people of mixed blood commonly called Indians. There's a moss-on-tortery, a couple of little motor courts, a couple of scrub farms. That's it for work. For play there's four bars, a couple of dance halls where you can hear any kind of music you want as long as it sounds like George Jones, two drive-ins, and a bowling alley." He paused and added, "There's also a still. I didn't know anybody made whiskey that good outside of Tennessee."

In short (and it is now too late to be anything else), La Plata should have been a fertile breeding ground for the sort of casual violence you can read about in the police blotter section of the local newspaper. Should have been, but wasn't. There had been only one murder in La Plata during the five years previous to my brother's arrival, two cases of assault, no rapes, no reported incidents of child abuse. There had been a number of armed robberies, but they had all been committed by trans-

He stuck
his hand in the box between
the hive and the
glass. In seconds his hand
had acquired a
living black and yellow glove.
Suddenly he
winced sharply, then grinned.

sients—as the murder and one of the assaults had been. The local sheriff was a fat old Republican part with a pretty far Rodney Dangerfield imitation and what Bobby believed to be the preliminary symptoms of Alzheimer's disease. He only deputy was his nephew. Bobby told me that he bore an uncanny resemblance to Barney Fife on the old Andy Griffith show.

"Put those two guys in a Pennsylvania town similar to La Plata in every way but the geographical," Bobby said, "and they would have been out on their asses fifteen years ago. But in La Plata they're gonna go on until they die—which they probably do in their sleep."

"What did you do?" I asked.

"Well, for the first week or so after we got our statistical shit together, we just sort of sat around and stared at each other," Bobby said. "I mean, we were prepared for something, but nothing like this. I mean, Waco doesn't prepare you for La Plata."

He tapped the readout and the overlay and I saw what he meant. The numbers in the last seven or eight circles dropped off radically: 83, 81, 70, 63, 40, 21, 5, 0.

It was the classic Holmes situation of

the dog that didn't bark." Bobby shivered restlessly and cracked his knuckles.

"Jesus, I hate it when you do that!" I said. He smiled. "Sorry, Bow-Wow. Anyway, we started geological tests, then microscopic analysis of the water. I didn't expect a hell of a lot, everyone in the area has got a well and they get their water tested to make sure they're not drinking borax or something. If there had been something really apparent, it would have turned up a long time ago. So we went on to submicroscopy and that was when we started to turn up some goddam weird stuff."

"What kind of weird stuff?"

"Breaks in chains of atoms, subdynamic electrical fluctuations, and some sort of unidentified proton. Water isn't really H₂O, you know—not when you add in the sulfides, iron. God knows what else happens to be in the aquifer of a given region. But La Plata water—youd have to give it a string of letters like the ones after a professor emeritus's name." His eyes gleamed. "But the proton was the most interesting thing. Bow-Wow. So far as we know, it's only found in one other place: the human brain."

Oh-oh. It just arrived, between one swallow and the next, the throat dryness. Not much as yet, but enough for me to break away and get a glass of ice water. I've got maybe forty minutes left. And oh, Jesus, there's so much I want to tell! About the wasps! nests they found with wasps that wouldn't sting, about the fender bender Bobby and one of his assistants saw where the two drivers—both male, both drunk, and both about twenty-four (sociological bull moose, in other words)—got out, shook hands, and exchanged driver's licenses and insurance information amicably. Well,

one of them had insurance information; the other had no insurance at all. And of course the guy without the insurance had clearly been at fault and had sustained about five hundred dollars' less damage. But here's this other guy, clapping him on the back and saying they can work it out.

Bobby talked for hours—more hours than I have. But the upshot and the result were both the same: the stuff in the mayonnaise jar.

"We've got our own still in La Plata now," he said. "This is the stuff we're brewing. Howie, peach! while lightning. The aquifer under that area of Texas is deep but amazingly large; it's like this incredible Lake Victoria driven into the porous sediment that overlies the Moho. The water is potent, but we've been able to make the stuff I ascribed on the wasps even more potent. We've got damn near six thousand gallons now in these big steel tanks. By the end of the year we'll have fourteen thousand. By next June we'll have thirty thousand. (But it's not enough. We need more. We need it faster."

...and then we need to transport it."

"Transport it where?" I asked him. "Bornos to start with."

I thought either I had lost my mind or misheard him. I really did.

"Look, Bow-Wow sorry, Howie. He was scurrying through his tote bag again. He brought out a number of aerial photographs and handed them over to me. 'You see? You see how fucking perfect it is? It is as if God suddenly busted through with something like And now we bring you a special bulletin! This is your last chance, assholes! And now we return you to Wheel of Fortune. Or something like that.'"

"I don't get you," I said. "And I have no idea what I'm looking at." Of course I did; it was an island—not Borneo itself but an island lying to the west of Borneo identified as Gulandó—with a mountain in the middle and a lot of muddy little villages lying on its lower slopes. What I meant was that I didn't know what I was looking for.

"The mountain has the same name as the island," he said. "Gulandó in the local petos it means grace, or fate, or destiny, or take your pick. But Duke Rogers says it's really the biggest time bomb on Earth, and it's wired to go off by October of next year. Probably earlier."

The crazy thing is this: The story's only crazy if you try to tell it in a speed up which is what I'm trying to do now. Bobby wanted me to help him raise somewhere between six hundred thousand and a million and a half dollars to do the following first: to synthesize fifty to seventy thousand gallons of what he called the high-test second; to airlift all of this water to Borneo which had landing facilities (you could land a hang glider on Gulandó, but that was about all); third, to ship it over to Gulandó, fourth, to truck it up the slope of the volcano, which had been dormant (save for a few puffs in 1838) since 1804, and then to drop it down the muddy tube of the volcano's caldera. Duke Rogers was actually John Paul Rogers, the geology professor. He claimed that Gulandó was going to do more than just erupt; he claimed that it was going to explode as Krakatoa had done in the nineteenth century, creating a bang that would make the Hiroshima bomb look like a stick of dynamite and the atom bomb that depopulated three quarters of London like a kid's firecracker. The debris from the Krakatoa blowup, Bobby told me, had literally encircled the globe; the observed results had formed an important part of the Sagan group's nuclear winter theory. For three months afterward sunsets and sunrises half a world away had been grotesquely colorful as a result of the ash whirling around in both the jet stream and the Van Allen belts, which in turn miles below the Van Allen belt. There had been global changes in climate that lasted five years, and nipa palms, which previously had only grown in eastern Africa and Micronesia, suddenly showed up in both South and North America.

"The North American nipa all died before the turn of the century," Bobby said, "but they're alive and well below the equator. Krakatoa seeded them there. How—? The way I want to send La Plata water all

over the earth, I want people to go out in La Plata water when it rains—and it's going to rain a lot after Gulandó goes bang. I want them to drink the La Plata water that falls in their reservoirs. I want them to wash their hair in it, bathe in it, soak their contact lenses in it. I want whomever to douche in it."

"Bobby?" I said, knowing he was not your crazy.

He gave me a crooked, tired grin. It wasn't until then that I saw how tired my brother was, how badly he needed a place to sleep, to vacation from himself a while.

"I ain't crazy," he said. "You want to see crazy? Turn on CNN B—." Howie. You'll see crazy. In living color."

But I didn't need to turn on Cable News to know what Bobby was talking about. The Indians and the Pakistanis were posed on the brink. The Russians and the Chinese dingo Half of Africa was starving; the other half was on fire. There had been border skirmishes along the entire Mex-Mex border in the last few years, since Mexico went

♦It just arrived, between one swallow and the next the throat dryness. Not much as yet but enough for me to break away and get a glass of ice water. I've got maybe forty minutes.♦

Communist, and people had started calling the Tijuana crossing point in California Little Berlin because of the wall. The saber rattling had become a din. On the last day of the old year the Scientists for Nuclear Responsibility had set their black clock to fifteen seconds before midnight.

"Bobby, let's suppose it could be done and everything went according to schedule. You don't have the slightest idea what the long-term effects might be."

He started to say something, and I waved it away.

"Don't even suggest that you do, because you don't! You've had time to find the calqueque of yours and ridate the cause. I'll give you that. But do you remember thalidomide? Or that nifty little acne stopper that caused cancer and heart attacks in thirty-year-olds? Or the AIDS vaccine in 1984?"

"Bobby?" "It stopped the disease, but it turned all the test subjects into epileptics."

"Bobby?" "Then there was—"
"Bobby?" I stopped and looked at him.

"The world," Bobby said, and then stopped. His throat worked. I saw he was struggling with tears. "The world needs heroic measures, man. I don't know about long-term effects, and there's no time to study them because there's no long-term prospect. Maybe we can cure the whole mess. Or maybe—"

He shrugged, tried to smile and looked at me with shining eyes from which two single tears slowly tracked.

Or maybe we're giving heroin to a patient with terminal cancer. Either way, it's on end to the whole mess. He spread out his hands, palms up, so I could see the stings. Hello me, Bow-How. Please help me.

So I helped him. So we fucked up. I don't give a shit.

We killed all the plants, but at least we saved the greenhouse. Something will grow there again someday. I hope.

Are you reading this?

My gears are starting to get a little sticky. For the first time in years I'm having to think about what I'm doing. Should have turned more at the start!

Well, of course we did it, distilled the water, flew it in, transported it to Gulandó, built a cog railway up the side of the volcano, and dropped over twelve thousand five-gallon containers of La Plata water—the brain-buster version—into the murky moly depths of the volcano's caldera. We did all of this in just eight months. It didn't cost as much as a hundred thousand dollars or a million and a half; it cost over four million, still less than a quarter of one percent of what America spent on defense that year. You want to know how we raised it? I'd tell you if I had more time, but my head's falling apart so never mind. I raised most of it myself; it all matters to you. Some by hook and some by crook. Tell you the truth, I didn't know I could do it myself until I did. But we did it, and somehow the world held together and that volcano—whatever its name was. I can't remember and there it is—time to go back over the manuscript—it blue just when it was spot white.

Okay. A little better. Dorian, Bobby had it. Heart's beating like crazy but I can think again. The volcano—Gulandó, by God—blue just when Duke Rogers said it would. Everything when ships and for a while everyone's attention turned away from whatever and toward the skies. And brrr-dee-dee-dee said Scarlet!

It happened pretty fast like sex and checks and special reflex and everybody got healthy again. I mean, well. Jesus please let me finish this.

I mean that everybody stood down. Everybody started to get a little pure perspective on the situation. The world started to get like the wasps in Bobby's nest; the one he showed me where they didn't sink too much. There was three yozt like an Indian summer. People getting together like in that old Youngbloods song that went on in

everybody get together like now as in Shop-Rite where mom took me when I wuz in the baby seat and wt

More Debltin Bag blast Feel like my heart is coming out thru my ears But if I concentrate every bit of my force my—

It was like an Indian summer Three years Bobby went on with his research La Place Sociological background etc You remember the local sheriff? Fat old Republican with a good Henry Youngblood mustache? How Bobby said he had the preliminary symptoms of Rodney's disease? concentrate asshole

Wasn't just hell, turned out like there was a lot of that going around in that part of Texas. Ah, Hellwax disease is what I mean. For three yezs me and Bobby went there. Created a new program. New graf of cirkles. I saw what was happen and came back here. Bobby and his to assistants stayed on. One that hee! Bobby said when he showed up here.

Wait one more blast

All right Last time Heart beating so fast I can hardly breathe The new graf of the last graph really only whammed you when it was laid over the calmquake graf. The calmquake graf showed acts of violence going down as you approached La Place in the middle. the Alzheimer's graf graph showed incidence of premature sexuality going up as you approached La Place. People there were going very silly very young but bubbly wasn't there long enough to see it or even how dogs got silly very young all he remembered something later if I had time to tell you. We didn't take any water but boiled three years and wt big long skeletons in the tan, so no war and when everybobby started to get seely we din and I came back here because he my brother I cant remember what his name Bobby

Bobby made me sick what he had dun only when he came here longt crying I said Bobby I lov you Bobby sed I'm sorry Blowow time sorry I died it the world the hole world full of foids and dumbbels and I sed better foids and bells than a big black under in apaz and he cryed and I cryed Bobby I lov you and he sed wil you give me some welder and I sed yez and he sed wd you ride it down and I sed yez an I think I did but ta if I cant remember I see wude but I don't no what they mean bi I used to no

I have a Bobby he nyme a brother and I think I am dun rindng and I have a books to put his info thats Bobby ad full of quyet ar to last a milyun yez so gudoo im gon to slop gudoo bobby I love you it wuz nt yr but I love you forgi ye love ye smed (for the world)

Bow Wow Fornooy oo

AVENGERS

CONTINUED FROM PAGE 38

esses of medical research. I'm never gonna win the Nobel prize, but if one of my scientists does, I'll certainly get a vicious thrill out of it and feel that I've made some sort of contribution."

Meanwhile, he's deeply frustrated that so many of his wealthy peers, all of whom would like to live longer, are setting instead for secondhand immortality—leaving monuments to themselves in the form of hospital wings and college funds and libraries engraved with the same name they'll have on their tombstone. "I tell them, Just give one percent of your money to research, just wicker it and maybe well strike the magic wishing well. But they tend to be fatalistic about it. They somehow feel there's a 'they' out there that's doing their best to solve the problem—whatever they are—and they refuse to understand that they are that 'they' that it's we who are the 'they'," he says, delivering one last impassioned plea to reason.

JOAN SMITH-SONNEBORN

Her father died of a heart attack when she was three, her much-adored mother, 17 years later. The resulting pain and guilt caused Joan Smith-Sonneborn to devote herself against going into medicine, instead, she decided to learn things doctors didn't yet know about preventing the age-related diseases that orphaned her.

Now fifty, Smith-Sonneborn has done work with one-called paramedics that's a giant positive step in that direction. In 1971 she heard about research showing that paramedics—unlike most life forms—seemed virtually immune to X-ray damage. She decided to find out why. Postulating that some form of repair was involved, she began a series of experiments in which she induced DNA damage in paramedic cells with ultraviolet radiation, then photoactivated them to help erase that damage. This form of first aid she discovered did much more than that. Not only did the cells recover, they lived substantially longer than the never-damaged cells in her control group. Nature, she thought, was such an efficient housekeeper that the excess repair enzymes induced by the treatment cleaned up past as well as current damage in effect reversing the aging process by some mysterious, delicate balance of DNA damage and repair.

The implications for human cells were inescapable. If some way could be found to induce such overly conscientious repair in human DNA, it might be possible not only to prevent the onset of age-related diseases, such as the cancer that killed her mother, but also possibly even to reverse that damage.

Now a professor of zoology and physiology at the University of Wyoming in Laramie, Smith-Sonneborn, far from resting on those remarkable laurels, is using them as

a stepping-stone to understanding how DNA repair works. From this she hopes that we can someday intervene genetically in the human aging process.

Proving that real women do pump their own gas, Smith-Sonneborn fills up her Jeep at a self-service and heads for her favorite retreat in Medicine Bow National Forest, 20 miles outside Laramie. Wilderness ("earth-born spirit") on a sacred place of the Cheyenne, is still an evocative case of impossibly balanced boulders and pine trees dispensing a fragrance as heady as incense. It's impossible in such a place not to believe in something, and Smith-Sonneborn does. "I'm not a practicing Catholic," she says, "but I do believe in God, a caring, all-perceiving God. There might even be a heaven and hell in the classical sense, not that I really want to leave my future up to Saint Peter. Besides, my life-force is so instinctively wrong that no other state of being really appeals to me. I guess the component that drives me the most is a wonder for the universe and a curiosity for life. I can't imagine anything more satisfying than feeding that curiosity."

Going to work each day is never a grind for her, though she admits two things would make her life happier. One is having her two sons with her (they'll now away at college); the other she gains in getting "a million dollars" to fund her work. "The interest alone could keep my lab work going for ever," she sighs.

Nondefensive and candid as only a well-loved daughter can be, Smith-Sonneborn cheerfully admits that another driving force is her personal aversion to and terror of growing old and dying, her fear of losing her looks, her strength, her intellectual acuity, her self. But even more intense than that, she says, is the conviction instilled by her mother and the Irish Catholic Church, that one should use one's God-given gifts to make a contribution. To give something back in return. "I really want to help humanity," she says simply.

BILL REGELESON

Oncologist and researcher Bill Regelson, author of a two-volume text called *Intervention in the Aging Process* and currently a professor of medicine at the Medical College of Virginia, tends to believe in some kind of afterlife because, as he puts it, "I've seen occasional patients dying of cancer, having incredible dialogue with people on the other side."

Not that Regelson, who also admits to an innate excess of curiosity, is in any hurry to check out this hunch firsthand.

"I'm sixty years old. I'm not afraid to die," he protests, "but I don't want to be a worm either. If I'm gonna die, I want to fall apart like the one-hoss shay. I want to fall apart making mad love to somebody in full command and control of all my faculties."

Regelson, brought up in the Jewish faith, is also quite orthodox in terms of his devotion to his family. My mother is eighty—a great lady—but she's suffering from ar-

thritis and vertigo. I'm at an age where I'm losing my aunts and uncles and seeing my colleagues suffering, and it's damn frustrating because I think control of aging is feasible, probably in the next few years, if only the proper resources are given to it. I think I know how to do it. We've discovered the death hormone. We know how to control it, but we need a couple hundred thousand to get going on this. I can't wait thirty more years for some graduate student to solve the problem!" he declares. His impassioned words tumbled out of an audience's breakfast paces, even at this normally laid-back midnight hour.

Nor does he expect the NIA or the medical establishment to come to the rescue. "They tend to see aging as a random collection of degenerative diseases instead of a distinct syndrome that allows those diseases to come in. If you delay aging you delay the disease," declares Regelson, a man given to unqualified opinions who, he admits, gets in trouble for being a lateral thinker and for bridging disciplines. "If you get out of your field, explains this man of medicine turned man of science, "people get mad at you, but this is the kind of thing I do and do very well," he concludes, showing little modesty aside.

It was Don Yarbrough, whom Regelson calls a kindred spirit, who first got Regelson interested in doing something about the death of aging research. In 1979 Re-

gelson got together with Yarbrough, Glenn, California senator Alan Cranston and Don Perry (a former Cranston aide) and formed FIBER (Fund for Integrative Biomedical Research), which "I headed up to stimulate research on the biology of aging by raising necessary seed money to fund various studies, organizing workshops and conferences, acting catalytically to stimulate the field and identify areas that require forward movement."

Like many good ideas, he sighs, "we folded due to lack of funds. Also, Senator Cranston was the strong voice we needed, and when he got sidetracked running for President he kind of lost interest," he adds.

Right now everyone's caught up with this overblown vitamin supplementation fadism, believing that taking this pill or that pill will make a difference—but there's simply no data to support that," he says. (Regelson does, however, take vitamin E, selenium, magnesium, pyridoxine and Q-10.) "Then you've got hucksters like Pearson and Shaw," he continues, "who are pushing things like arginine and BHT which might be harmful."

Regelson is convinced the difference will ultimately come through painstaking laboratory work. Currently, he's most intrigued with free-radical repair. Harbo aspires: the longest-lived mammal, not only has a higher scavenging system (repairing free-radical damage) than other creatures, but

also sports the highest levels of vitamin E and beta carotene, the free-radical scavengers probably responsible for these higher repair rates. Now you can call this Regelson's theory because this is a mixture of concepts," he says. But I'm convinced that if we can get our bodies to absorb and use more vitamin E instead of peeing out the excess as we now do, we can repair our cells even more effectively. And so I'm supporting research to see if manipulating levels of calcium can affect the maximum concentration of antioxidants (including E) inside a cell and alter the pattern of senescence.

Regelson intends to get the money he needs by becoming a multimillionaire himself. Like Glenn and Brown, he's currently involved in potentially lucrative research and development ventures. "We've now got our own company called VIGOR (Virginia Institute of Graduate Organized Research)," he says. "Our first product is phospholipase A2, a chemical inhibitor that might help alleviate inflammatory diseases like arthritis. We're also working on a hearing aid, about to be tested and a hair-growth factor. What I intend to do is use my creativity and that of the people I work with to get new products into the marketplace that will bring in the money I need. We've got good ideas and a good organization, so I'm gonna succeed with that and the rest will follow." □

Here's to
more,
more,
more,
more
gin taste.

GILBEY'S
DISTILLED LONDON DRY
GIN

Distilled London Dry Gin. Gilbey's Special Dry Gin. V.O.G. Dry Gin. Also available in other varieties. © 1992

PIG THIEVES

CONTINUED FROM PAGE 107

flashed the card across the talk hole, and the deal was struck. Comic had enough money to start a new life. I had Count Zero interrupt, redouble for a last thirty-two-thousand \$70 profit. It would be a classic, textbook instance of buying low and selling high. It was an outright steal.

"I'll just convey him into my own room," I said, "and lock him up till after breakfast."

I took the Count by the hand leg and he let out a squeal like the crouching antique steam calliope beneath the fingers of the Phantom of the Opera or someone like him.

"Let me take him for you," said Comic. He picked up the beast under his right arm holding his shirt gently in his left palm and packed him into my room like a sleeping baby. It was poetry in motion.

Inside thirty minutes I had washed the pig onto a borrowed hotel cart with two shredded sheets, had rushed him down to the ground floor, and had raced with him squealing hee-hee through the scarlet-trimmed passages leading to Kipler City's circus sector. I found the main administrative tent and was told by the usual obnoxious little prick that Walter R. Brooks was inside, doing his morning meditation. I knew he would want to be interrupted, so I said it was urgent. This news was carried inside and I heard a rather suave voice muffledly reply, "Certainly, certainly. Suddenly, I was standing before him. I must have looked like a farmer with a wheelbarrow. A wheelbarrow with a pig on it that was tied down with lime-hued decorator sheets.

"Are you Walter R. Brooks?" I asked. "I swear it to you that I am," he replied. "Well, I've got it for you, sir."

"Specify, specify. Are you the enriched garbier for the Asato python or the alfalfa for the Sacred White Buffalo?"

"Neither," I said. "Sir, I have got Count Zero interrupt."

"Is this kidnapping? How much do you want?" He looked at me as if I were vermin. "Are you armed?" he asked. "No? Well, that's something, Johnson, get in here!"

A nervous little man displaying five or six cross-purpose facial tics on Johnson. I presumed. The darkness was closing around me, but I said the next of the sentences I'd rehearsed on the run. "I found Count Zero interrupt looking up the synthetic huffies in my buffie bed this morning, and I've ah, come for the reward."

Walter R. Brooks sprang up grabbed Johnson with one hand and me with the other, and ran with us in tow. Literally dragging us behind him in the dust as he raced across the midway and into one of the side-show tents. There before us was an elephantine jet-black pig with a bejeweled lavender ribbon around his neck, lying on some hay and eating carrot after carrot that a pleasant, grained man in faded overalls was feeding him.

"Thank God!" belowed Walter R. Brooks

(Thank God? echoed Johnson). The Count is safely at court and receiving."

I pulped out the newspaper and showed it to them. It was my sole remaining gesture. But I knew that all was lost. After a certain age you always know.

"I already saw that, Mr. Brooks," said Johnson. "I knew it was some sort of joke or other piece of minor unpleasantness, so I didn't tell you about it earlier. I didn't want to spoil your meditation session, sir. I mean, this sniveling, genuflecting little hatchet man had Frank written all over him."

"Thank you, Johnson," murmured Walter R. Brooks with a voice that sounded trained in the art of sounding apologetic.

Both men turned to me in unison, giving the illusion of spinning on their heels like menacing tapachorean troupeurs. And they were suddenly howling at me in that mock way that people do in ballets. Their coats even billowed a bit in what seemed a stage breeze. "So quickly and I won't call the police," said Walter R. Brooks. "You ob-

●Comic
looked out his window onto
the circus below,
his glance alone implying the
Liliputian status
he attributed to the big-top
workers, and his
voice became tenser, siverly●

viously do not have the Count. And while it looks as if you may have been conned by somebody yourself lately, you are obviously running some feeble, outmoded con on us at the same time. Get out!"

I turned and started for the door, breathing a bit easier at walking one more line in my life out of something that could have been the screaming Bad. The police weren't there. I hadn't been stomped. I was not going to the Company's prison. My sudden financial ruin seemed secondary in importance—banally. But then Walter R. Brooks spoke behind me. "I believe, sir, that you may be forgetting something."

It would seem incredible that anyone could forget a half-grown, pink Hampshire hog tashed with green sheet springs to what was essentially a three-wheeled room-service cart. No?

The Threentennial had come and gone. Seven years later I was working the downtown streets of New Laredo over on Green Ball with the ancient pig partner I called Shocking Pink. At first I trained him to clap and shri—arrrr—that basically only require of a collier's efficient intelligence to do your

basic Glover Hers routine. At a signal from me the pig would tap his hoof in front of the facedown card covering the jack of hearts in three-card monte. He would always be right. The assembled crowd would laugh and applaud and I'd quickly shout, "By God, folks, if a piece of the mineral park can follow the jack of hearts and nail him, then I must perforce believe that any of you can effortlessly do the same." Ho hum and you bet. (Later I had him neurochipped and hardened by some guys who owed me a favor. Got him to where he could deal the fucking monte, in fact, but that's another story.)

It was a hot, bright day when Caligula Comic glided up beside me silently in a silver Chrysler. Andrew's minichopper. I could feel his smile upon the pig and me, although he said not a word. He had not aged, of course. In fact, corrective facial cosmologists made him look even younger than on the two days I'd known him on Polarny. He was wearing a weightless white suit and holding three long-stemmed red roses in one hand and a Pall Mall in the other. He was at home in the world.

Hello, master, he said from the rear seat, where he sat alone. I recognized the chaletur as the bootlicking Johnson formerly in the service of Walter R. Brooks.

Hello Caligula, I said. Hello, as they say in literature, that all passion was spent. Saying hello was a civility I could spare.

Three minutes of silence followed, punctuated by soft hog grunts.

"See the thing, I had to be to you about my programming."

"Why?" (Did I really care enough to ask?)

"Because my true programming was profit desamulation programming, not pig-specific Fagin." He looked at me steadily. He could possibly have won my confidence. Possibly. "I was programmed to do what I did to you, master." He lowered his eyes. "I'm sorry."

Jesus. It was instantaneously clear. How could I have been so stupid and so long in seeing the truth? This Frank had been laser reamed from pulsatory to petalife with the nefarious Buy High & Sell Low program, the infamous cynical parody of sound business practice that had nearly toppled that whole house of cards called the Company up on Polarny four years before my arrival. But how had he survived? They thought they'd caught all the Franks with those total con nervous-system programs. They'd all been publicly hanged and burned, too.

I got away because I am deeply believable. Caligula Comic said. I can make a grown man cry no matter how powerful his own anticon programming. And this believability is in me. It is not programming. It is in me, mister, in here! He hit his chest hard with both hands as he said it. He blue eyes out through me. His face tushed in passion.

I felt the onset of tears begin to form in my left eye, and I brushed it away with the back of my hand. ●●

THE PURE NORWEGIAN RINGNES EXPORT BEER

Ringnes Export is brewed for three long months, not a mere three weeks, using the purest ingredients and cool, clear mountain water. This gives Ringnes Export a unique, sparkling taste you will enjoy again and again!

Ringnes

We never act against nature



INTELLIGENCE

CONTINUED FROM PAGE 38

you can make copies," Minsky told me.

Although Minsky doesn't think he'll live long enough to download (he's fifty-seven now), he would consider it. "I think it would be a great thing to do," he said. "I've spent a long time learning things, and I'd like to see it all go away."

Minsky also said he would have no qualms about waving good-bye to his human body and taking up residence within a robot. "Why not avoid getting sick and things like that?" he asked. "It's hard to see anything against it. I think people will get fed up with bodies after a while. Then you'll have another population problem: You'll have all the people of the past, as well as the new ones."

Another believer is Danny Hillis, one of Minsky's Ph.D. students and the founding scientist of Thinking Machines, a Cambridge-based company that is trying to create the kind of computer that might someday receive the contents of a brain. During my research several computer scientists would point to Hillis's connection machine as an example of a new order of

computer architecture, one that's comparable to the human brain. (Hillis's connection machine doesn't have one large central processing unit as other computers do, but a network of 64,000 small units—roughly analogous in concept if not in size, to the brain's network of 40 billion neuronal processing units.)

"I've added up the things I want to do in my life, and it's about fifteen hundred years' worth of stuff," Hillis now twenty-eight, told me one day as we stood out on the sixth-floor sun deck of the Thinking Machines building. "I enjoy having a body as much as anyone else does, but if it's a choice between downloading into a computer—even one that's stuck in a room somewhere—and still being able to think versus just dying, I would certainly take that opportunity to think."

Gerard J. Sussman, a thirty-six-year-old MIT professor and a computer hacker of historic proportions, expressed similar sentiments. "Everyone would like to be immortal. I don't think the time is quite right, but it's close. I'm afraid unfortunately that I'm in the last generation to die."

"Do you really think that were that close?" I asked.

"Yes," he answered, which reminded me of something Moravec had written not too long ago. "We are on a threshold of a change in the universe comparable to the transition from nonlife to life."

NEW PRODUCTS

Those little yellow notepads with the pre-printed, peel-off glue made life a lot easier for office workers. Now several companies are offering software that brings the same convenience to computer users. Personal Corporation's Smart Notes and Micro Logic's Tomado Notes are two of the best electronic notebooks. Both programs are "RAM-resident." They hide in your computer's memory while you use another program, waiting for you to hit the "hot" key that calls them to life. When you do, a small blank page pops onto the screen, letting you jot down a stray idea. What makes these programs more than just size word processors is a "glue" that binds your note to the file you were working on, just where you were working—without changing the file itself. The next time you edit that manuscript, spreadsheet, or database with the notepad program in memory the note will pop up where you recorded it. So if, say, you aren't sure you'll remember how you got the number you're putting into a spreadsheet, the notepad program can be used to remind you. Both programs work with the IBM PC and compatibles. (Smart Notes is available for \$79.95 from Personal Corporation, 2352 Main Street, Concord, MA 01742; Tomado Notes is available from Micro Logic Corporation, Box 174, Hackensack, NJ 07602.) **JDD**

Copyright © 1989 by Grant Fjorvecler. To be published in November by Macmillan Publishing Company. Excerpted with permission from *The Tomorrow Makers: A Brave New World of Living Brain Machines* by Grant Fjorvecler.

SOULS

CONTINUED FROM PAGE 138

Cryobiologists have had some success freezing other body parts. Scientists have frozen and thawed the skulls of Langerhans, the parts of the pancreas that produce insulin. Again, when surgeons learn to control hostile immune reactions, they hope to use these frozen parts as surgical cures for diabetes.

But freezing more complex body parts is difficult. So far no whole adult organ—animal or human—has been frozen and successfully revived for clinical use. As ice crystals form, cells dehydrate and shrink. When the water expands as ice crystals, it pops open vessels and tears up cell structures. When thawed, the organ is so badly damaged it is useless. To complicate the problem, not all freezing methods work for all tissues, and even within the same organ different cells may require different rates of freezing and thawing, as well as different solutions to survive.

For the present, most researchers are trying to extend the brief shelf life of organs harvested from donors. Getting the organs isn't easy; getting them in time is even more difficult. "Of the livers and hearts that are available for donation," Fahy says, "nearly percent are thrown into the wastebasket. You've got to get the organ to the recipient within six hours. And that is generally impossible."

Cryobiologists have had some success preserving kidneys. By perfusing them or flushing the blood vessels with stabilizing fluids, and then cooling them to 32°F, they buy the transplant teams more time. Kidneys can now be kept for as long as 72 hours, and as a result the number of kidney transplants has jumped from an average of 500 per year to more than 5,000.

Biochemist James Southard of the surgery department at the University of Wisconsin Hospital in Madison wants to do the same for livers. He has developed a new perfusion fluid and a technique he hopes to have ready by late 1987. The method extends the shelf life of a liver from six hours to 24. He wants to refine the technique to buy even more time for other organs. "If we had more time," he says, "we could set up networks for efficient liver and heart harvesting, and every patient who needed a heart or a liver could get one."

Gaegory Fahy's hope is to extend the shelf life indefinitely. "Twenty-four hours is a start," he says, "but if you could preserve the liver and other organs in nitrogen when an organ donor dies and you don't have a recipient for his organs, you could just take them out and send them to the organ bank. Most cryobiologists think the breakthrough in preserving organs will come from Fahy's work. Considered a rising star in his field, he has been working at the transplant laboratory at the American Red Cross in Bethesda, Maryland, in his experiments with segments of animal livers.



The best sound you can hear next to Carnegie Hall.

Toshiba's new CD player makes concert quality sound portable. Yet, hooked up to your stereo system it's a top of the line home CD player. Offering 16 program random memory, 3 beam laser pick up, even a wireless remote. Toshiba's XR 90 is the complete, portable CD player. Outside of a concert hall nothing sounds better.

With 16 random memory

3 beam laser pick up

wireless remote

complete, portable CD player

Outside of a concert hall nothing sounds better

Toshiba America, Inc. 111 Townsend Drive, Secaucus, NJ 07094

ACCEPT NO IMITATIONS!
Don't be misled by low-quality copies of our patented equipment.

TO BE YOUR BEST... GET THE BEST!

When you're looking for exercise equipment...



Call for a FREE BROCHURE — Ask about our NEW VIDEO!

"To get a quality workout, you need quality equipment. My Fitness Master L775 is an essential part of my training."

Steve Selat, holder of 15 world fitness records.

Look for the QUALITY...

- quiet smooth performance
- full range of height and resistance settings
- floor mounted chrome-plated steel frame, cushioned footplate
- engineered for superior long-term use

Look for the SERVICE...

- prompt shipment to your home or office
- no assembly required
- thirty-day home trial, two year warranty
- toll free assistance with your exercise questions

Look for the NAME...

fitness master

TOLL FREE: 1-800-326-8995

In Minnesota: 1-612-474-8992
In Canada: 1-800-461-4872

Made in U.S.A. by

FITNESS MASTER, INC. 1260 Park Road, Dept. DM, St. Joseph, Missouri 64506

Buy Hasbro's G.I. Joe® from a toy store you'll feel like saluting.



When you shop with us, we'll give you good service, good prices, a good selection, and a convenient location in shopping malls across the country. So when you're looking for G.I. Joe, come to the toy store that will treat you so nice you'll want to salute them.

KAY BEE
TOY STORES

Buy Hasbro Transformers® from a toy store that transforms shopping into fun.



When you shop with us, we'll give you good service, good prices, a good selection, and a convenient location in shopping malls across the country. When you're looking for Hasbro Transformers, come to the toy store that transforms shopping into fun.

KAY BEE
TOY STORES

neys, he has gotten the issue to solidify without ice crystals forming.

Fahy has spent years in the laboratory taking pieces of rabbit kidneys, immersing them in various cryoprotectants, freezing and thawing them at different rates, and then studying the damage under a microscope. Recently he's found an alternative to freezing. By infusing high levels of protective agents into the organ slices, he gets them to vitrify—to cool and solidify—into a glassy state without forming ice crystals. It is a little like the way Jell-O changes from a liquid to a solid in the refrigerator.

When will he do the same with human kidneys? It's impossible to say. It might be in two years. It might be never. I just hope the day of cryopreserved organs will not remain a dream forever.

An easier candidate for the long-term organ bank might be the heart, according to both Fahy and David Pegg, a longtime researcher with the cryobiology group at Cambridge University. Pegg mentions an experiment in which the hearts of rats were frozen and after thawing, managed to beat weakly for a short while. So a cryobank filled with body parts is not exactly the stuff of science fiction, he concludes. It could happen one day.

Already cryobiologists are pushing for clearinghouses of frozen tissues. Arthur Rowe says that over the next five years, tissue banks will move toward centralized distribution of all the commonly preserved items—like blood components, skin, and corneas. The society's journal carries an ad recruiting a cryobiologist to help set up a generic tissue bank in Atlanta.

For the present, Rowe and other old-guard cryobiologists see little point in even attempting to freeze more complex parts like the head. Not only is the technology lacking, says Rowe, so is the incentive.

"Brain transplants would have to evolve before it'd be worthwhile," he says. As for freezing the body, he points out scientists have already done the equivalent by freezing an embryo. Here is a potential human being, suspended in time for decades before being brought to life.

Cryonists, however, remain hopeful that full-grown bodies can be frozen. They point to natural examples of suspended animation. Creatures like some Alaskan beetles and Antarctic mites survive temperatures as low as -80°C thanks to built-in supplies of glycerol, a type of antifreeze. And recent findings indicate that certain amphibians like spring peepers and gray tree frogs routinely spend the winter in a state closer to death than hibernation. Their body temperatures drop to -6°C, and their hearts stop beating, but with the warmth of the spring sun they revive and go hopping off. Biologists have discovered that more than a third of the frogs' bodies actually freeze solid and—in spite of this—avoid damage from ice crystals.

"When the frogs go down [freeze], so do their kidneys, livers and lungs. And if organs can freeze solid in frogs, the same

should be true in humans," says physiologist Paul Segall, a research associate at the University of California at Berkeley. For the past several years he and colleague Harold "Frosty" Wartz, a biophysicist, have been trying to find the secret of suspended animation.

In a series of experiments with golden hamsters done over the last few years, scientists anesthetized the animals and then packed them in ice to lower their temperatures. At 12°C Segall put the hamsters on a respirator as the animals' temperatures continued to drop toward 0°C, which is where ice begins to form. Gradually he says, he replaced the hamsters' blood with cryoprotectant fluid. They were kept in this state for several hours and revived after their blood was transferred back.

They don't look great, but they are conscious and moving," says Wartz. "What we did to these hamsters is very similar to what we did to that dog six months ago." Wartz points to the mutt lying around at his feet. He is named Miles, after the character Woody Allen portrays in *Sleeper*, his film about a frozen human who awakens in the next century. Miles appears healthy and in good spirits. Segall and Wartz are working with a veterinarian at the University of California at Davis. They hope to chill a pig male to the ice point and try to revive it.

The most exciting possibility of his work, Segall says, is not raising the dead but its applications in surgery and space medicine. Lowering a body temperature to the ice point offers the hope of bloodless surgery. As an example of things to come, doctors at Johns Hopkins Hospital in Maryland cooled a patient to 19°C and bypassed blood around the heart. The patient was "down" for some 40 minutes with the heart stopped. This provided the surgeon with a bloodless field to work in, protected the patient from bleeding to death, and made it possible for the surgeon to remove a tumor snarling one of the heart's major blood vessels.

These hypothermia techniques could provide short-term suspended animation for extraterrestrial medical emergencies, suggests Segall. Suppose flight surgeons make a little black mole on the left arm of an astronaut sent on a mission beyond the asteroid belt. "On the way home the physician onboard examines it and says, 'That's melanoma, and if you don't get him back home quickly, you can kiss him goodbye.' 'What you could do [to stop the cancerous growth] is bring him down to minus ten Centigrade and leave him there for five months," like the frogs.

Segall claims that mammalian cryobiologists have "emotional problems" with his work because it only encourages cryonics. What may disturb conservative biologists most is what's engraved on his Magic Alert bracelet. It instructs anyone finding him dead to call—collect—a cryonics company, Trans-Time Inc. The call will be answered in a cinderblock warehouse in Oakland, California. It's next door

to the Prince of Peace Baptist Church and across the street from Bud's Auto Wrecking. Segall is both a customer and an officer of Trans-Time.

Inside the building four tanks stand on end. They resemble eight-foot-tall thermos bottles and contain a total of six patients. "They were put in head last," says Trans-Time president Art Quare, "broadcasting a subject most cryonists shun," if for any reason a capsule starts leaking liquid nitrogen, the last thing to go is the head. "It is something to worry about. Of an estimated 45 cadavers frozen over the last seventeen years, at least 30 have melted."

In the middle of the warehouse stands a huge ten-patient tank, reserved for the day when enough of Trans-Time's clients start dying. Whole bodies will be placed in sleeping bags, packed in Styrofoam-lined metal boxes, and lowered into the tanks. When I die I want to go in there," says Segall, gesturing toward the tanks.

He admits that if the six customers already in tanks were thawed today, there would be a lot of damage. But he also believes that the genetic material of their bodies is intact. I can't tell you those guys are going to get up and walk around someday, but we're going to throw them with the knowledge of the late twenty-first century. Mike Darwin has had a glimpse of what twenty-first-century cryonists will see. He pulls out what looks like a family photo album. Inside are pictures of two headless bodies. The patients' trust funds could not support the costs of whole-body storage, so he removed the heads and kept them frozen. He then performed autopsies on the bodies to check for damage.

The snapshots of one male and one female body are a ghastly off-white, but they look pretty fresh considering they've been dead six years. Darwin points out photos showing damage done to various body parts by freezing. There's a lung almost split in half. "He turns to the next page. Here's a better view of the heart. There's the aorta fractured."

He closes the album. "Given this, you might say these guys are lunatics to be freezing someone, but these fractures hardly disturb me. We know we'd have to go in and make repairs inside the cells. Compared with that task, he argues, it will be easy to fix broken organs in the future. So he continues his work.

A "dissection team" stands at the ready night and day to travel to dying ALCOR members to prepare them for freezing. Their most recent case occurred in the winter of 1985. Darwin and colleague Jerry Lee learned that a member named Mary was only days away from "examination. They flew at once to Madison, Wisconsin, where they stayed at Mary's hospital bed side for three days and nights.

Quite sensibly she elected to have medication and full support withdrawn," recalls Darwin. But to his surprise she got better. "She pined about it and apologized for not dying on schedule.

GIANT HEAVY DUTY INFLATABLE BOATS

2 MAN \$38 3 MAN \$50 4 MAN \$65

Get Free
Details Tonight For The Next 30 Days

As part of our advertising sale, Don't Boat will send any of the above inflatable boats anyone who writes and requests to this list before the next 30 days. Each Don't Boat (225-PWC) is constructed of tough high density foam (resistant to stones, sunlight, salt, & oil), electrically welded cross-hatched seams, nylon safety line guaranteed to absorb twice duty impact loads. 3-seater or 4-seater for extra safety (2 air chambers) in 4-man, self-bailing safety valves, bow lifting & towing handle and are recommended for marine, sport and fresh water use. Also, seating, fishing or a family fun boat. Each boat will be accompanied with a LIFE LINE guarantee that if you don't love it 100% it will be replaced free. Add \$7 handling fee asking for each boat requested. Don't Boat lets anyone ship. If your order is received within the next ten days you will receive FREE a contained head/neck underinflator, bilge pump, pump for each boat required. Should you wish to return your boat you only do so for a refund. Any boat purchased after 30 days will be returned. LIMIT three (3) boats per address. No exceptions. Send appropriate sum together with your name and address to: Don't Boat, 1910-C, Dupont Ave. S.W., 20401 N. Place Blvd., Los Angeles, CA 90066. Or for fastest service mail any part of the country call 1-800-624-9868. We'll Boat You! 1986-C. Boat inflatable call collect 213-756-9868, before midnight seven days a week. Have strict card policy.



"FASCINATING" —REVIEWER

Yoga was developed millennium ago as a practical, scientific means for realizing the highest potentials of human consciousness. Autobiography of a Yogi, the fascinating life story of Paramahansa Yogananda, explains the universal principles underlying the yoga science and shows their relevance in our nuclear age. A deeply probing book that offers unique insights to understanding both the universe and ourselves, Autobiography of a Yogi is widely regarded as a classic in its field and has been used as a text in over 130 colleges and universities.

"A new account!" —NEW YORK TIMES
Paper, 654 pages, 52 photos \$4.50

Self-Realization Fellowship
1020 San Rafael Ave., Dept A-1
Los Angeles, California 90065

Please send me AUTOBIOGRAPHY OF A YOGI
(boxed in \$4.50 postpaid (CA add sales tax))

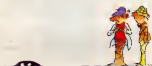
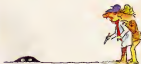
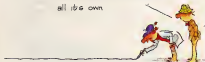
NAME _____
STREET _____
CITY _____
STATE _____

The Artist

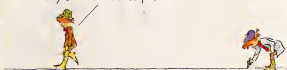
© ART CUMINGS

Your work has a character
all its own.

How do you
manage it?



Why doesn't that surprise me?



At 2:48 in the morning, Mary deamated. Within minutes, Darwin and Laila rushed her to a nearby mortuary, where they began perfusion and cooling. They washed out her blood and replaced it with fluids they'd used in recent dog experiments. Then they packed her in ice for shipment to California.

Back at his office in Fullerton, Darwin told ALCOF members who'd come to help with Mary's suspension that deamiation had been difficult. "I was with her at the end, holding her hand and comforting her," he says. After perfusing her brain with cryoprotectants, they sawed off her head.

They cooled it slowly. On Valentine Day, it was placed in the aluminum neuro-container. Over the next 12 days, Mary was chilled to -196°C as her head was gradually lowered into the liquid nitrogen.

There's a poem we like to quote," says cryobiologist Greg Fahy.

"I really think that I could freeze

My mother-in-law with the greatest of ease.

The only thought that gives me pause
is what will happen when she thaws.

Anybody frozen with the current technology is going to have a tremendous amount of injury done to him," he warns.

The cryonicists recognize that. The big difference between cryonicists and cryobiologists is the estimates of future repair capabilities. Cryonicists tend to be optimistic: In reality we don't know how it will turn out. "We don't know enough to evaluate the prospects for revival."

One very basic problem with the cryonicists is that "they are starting with people already dead," says Arthur Rowe. Preserving living humans at some twilight level between life and death may be more feasible, says Fahy. As a hypothetical example, he mentions Arthur C. Clarke's 2007, in which thermoyagers are chilled—and later lazily warmed by a psychotic computer. Hal, he admits the scene in which they are killed makes him uneasy "because one is so helpless in that state."

Fahy points out that the astronauts are not frozen solid—like the patients at TransTime, where body metabolism is arrested—but rather are in a state of hypothermic hibernation in which metabolic rates are slowed. "It is an intermediate type of process that we'd have some hope of achieving by 2007 or 2010—if people were working on it now," he says.

No one is, yet. For the most part, cryonicists and cryobiologists still go their separate ways. Today members of the Society for Cryobiology must sign a statement that "the act of freezing a dead body and storing it indefinitely on the chance that some future generation may restore it to life is an act of faith, not science."

Still, some of the very biologists who signed this statement have so much faith in the future of their science they've opted to have their bodies frozen in liquid nitrogen when they die. **GG**



At Lynchburg, Oregon, a cookout is enjoyed by a group of people.

AT A COOKOUT in Lynchburg, Tennessee you'll most surely sip some Lynchburg Lemonade.

It's a country concoction that takes its name from the Tennessee town where our whiskey is made. You pour one part Jack Daniel's over ice with a like amount of Triple Sec and Sweet and Sour Mix. Then, you add four parts 7-Up® and get sippin'. Our citizens have enjoyed this creation for innumerable summers here in Lynchburg. And, we believe, you'll find it equally refreshing no matter where you happen to live.



CHARCOAL MELLOWED FOR SMOOTHNESS

STAR^{DO}TECH

ACCESSING THE FUTURE

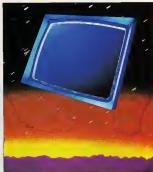
We are on the verge of a new millennium. We will need new tools for this new age. Orion is therefore launching Star Tech as a means of presenting tools for the year 2000. But this new column will contain more than just products and hardware. We will introduce you to "tech tools," new workshops, seminars, courses, software, excursions, books, innovative technologies, even new techniques for mind expansion. Often tools on the cutting edge are not so readily available, so in each story we have included an access guide for readers who want a head start on the future. Tell us what you think.

VCR'S THAT CAN READ

Videocassette recorders (VCRs) still have one major consumer problem: It is cumbersome to program them to record off the air.

Ironically, the technology that could move the VCR programming process light-years ahead is as near as the supermarket checkout counter. Right now many stores use optical scanning devices to read bar codes on products from canned peas to magazines. This same technology can be applied to TV listings.

Tests conducted in Europe, for example, are using VCRs equipped with light pens and optical decoders to read TV-show information contained in bar codes. In Blaupunkt's VPS—Video Programming System—for instance, as the light pen



scans a bar code printed alongside conventional TV text listings, the channel and start-and-stop time information is sent automatically to the VCR's tuner/timer. Here in America, however, VCR marketers have shown little interest in light-pen programming. A major reason is their reluctance to stir up broadcasters by introducing a feature that would make it easier to record programs off the air.

In Europe the challenge has been to persuade newspaper and magazine publishers to include bar codes in their TV listings. Current efforts under way in optical character recognition technology, however, may soon eliminate the need for the bar codes. The light pen would simply scan words

and numbers printed to an industry-established standard—Marjorie Costello.

Access: Not yet available on the market, prototypes are currently being tested by Blaupunkt, in Hildesheim, West Germany.

MAGIC MIRROR

For anyone who hates trying on clothes and for salespeople who hate picking up clothes after them, there is now a machine that obviates the need for both.

Called the Magic Mirror, it allows shoppers to see how clothes and accessories would look without actually trying them on.

Here's how it works: A customer chooses gar-

ments from a photo display of outfits, then steps into a darkened booth the size of a dressing room. As he stands in front of a full-length mirror reflecting only his head, a salesperson feeds information on his measurements and clothes size into the machine. Computer projections of the photographs reflect a two-dimensional torso wearing one of the outfits, onto the mirror, below the shopper's head.

It's a bit like standing behind the cutouts of he-men at the county fair and, similarly, you get only a frontal view with the mirror. Each reflection can be changed almost instantly, allowing as many as 80 outfits to be "tried on" in less than ten minutes. Accuracy of fit is 90 to 95 percent.

It's the twenty-first-century way of clothes shopping, boasts Bruno Lanning, president of Fashion Systems Corporation of New York City, the American distributor of Magic Mirror. Invented last year by Frenchman Jean Claude Boudrier, The mirror debuted in the United States late last year at L. S. Ayres, a chain of 25 department stores in the Midwest. Sales soared. One line of sportswear Leslie Fay jumped 887 percent in one month, according to store publicist Bob Wilson.

—Giselle Lowry
Access: Magic Mirror is scheduled to appear this fall in major department stores and specialty shops around the country. Distributed by Fashion Systems Corporation, New York, NY. Phone: (212) 750-0101.

STAR[∞]TECH

ACCESSING THE FUTURE

LOW-BUDGET SNOOPING

Want to ferret out a company's deepest secrets? All you need are an old TV, a good antenna, with an amplifier and \$15 worth of spare electronic parts.

According to Dutch computer security expert Wim van Eck, a computer terminal acts like a radio, broadcasting whatever appears on the screen. Eavesdropping on a video display is possible at a distance of several hundred meters, he says. "All you need is a normal



and-white TV, a directional antenna, and an antenna amplifier."

Just park a van across the street from your target, aim your antenna into the right office, and whatever you want to know should eventually appear on your TV. The only problem: Your TV won't be in step with the terminal, and the picture will crawl around your screen like a coded cable program. But a "black box," that feeds the proper synchronizing signals into your TV, can relieve the problem. That's where the junk transistors come in.

The extension can be designed and built by any electronic hobbyist within a few days," Van Eck says.

Donn Parker, a computer security specialist with SRI International, agrees that it's possible. "I've just spent most of the morning worrying about that problem," he comments. "I don't think it's



as important yet as Van Eck believes. It's not quite as easy as he implies. But this is going to get much more troublesome as more people learn how it's done. Any security broker would give his right arm to lay hands on a major company's quarterly reports. And government economic indicators are extremely sensitive.

Now let's see: What is the address of the Federal Reserve Board? Does Paul Volcker keep a terminal in his office?—Dwan Davies

Access: All ports available off the shelf.

CALL TRACER

By the end of the century, telephone users plagued by almost any kind of nuisance call will have quick recourse—a pre-set number that traces even the lightest breather.

provide the evidence," Foster says. The code number could cause both the called and the calling numbers to be automatically transferred to a central office or to a police station. "As we looked at the technology," Foster explains, "we realized we had the capability to do this," although he admits it may take a number of years to refine the system.

One of the wrinkles that must still be ironed out is the method of billing for this service, which should go a long way toward cutting down on obscene threatening or just plain annoying calls. Presumably says Foster, pre-registered customers could arrange to pay either on a monthly fee basis or by the individual trace (no more than \$5 to \$10 each), depending on the number of nuisance calls received.

—George Nobbe

Access: Through AT&T probably by the late 1990s.

SUBLIMINAL SOFTWARE

The self-help business has used subliminal stimulation for years in audiocassettes, videotapes, and even wallpaper. Now you can use your computer.

With a software package called *Subliminal Suggestions and Self-Hypnosis for Your Computer*, compliments of the New Life Institute in Santa Cruz, California, computer users can punch in any self-help message desired and have it flash tirelessly and all but invisibly across the top of the

terminal while they work.

The subliminal message—one that bypasses the conscious mind—will flash at intervals of one thirtieth of a second, allowing you to receive nearly 30,000 favorable flashes in an eight-hour day. Any one-line message can be programmed in (though you need an IBM PC or compatible machine), whether you want to lose weight, quit smoking, improve your memory or stop biting your nails.

Jodi Amkrut, president of New Life, which is primarily in the self-help cassette business, calls his \$75 subliminal "effortless self-im-

WIRELESS WIZARDRY

Tired of wires? We need them to hook up our TV sets, VCRs and stereos, but they are a nuisance. The next trend in the electronics revolution? Wireless hookups.

Electronics entrepreneur John Nady is in the vanguard of this movement having invented a wireless guitar and microphones for performers. Nady called the wizard of wireless, used radiofrequency (RF) signals to link up equipment. But the Federal Communications Commission limits the use of RF in the home because of



provement. It's a puttin' ethic that you have to suffer to improve. You don't. Let the computer do the work.

While studies indicate that subliminal stimulation works, Amkrut admits there is a dark side to it. It is possible, he says, for an unscrupulous employer to program an employee's terminal with self-serving messages [Mr. Smith, you are perfectly satisfied with your present salary].—Gregg Levy

Access: Software available from New Life Institute, Box 2580, Santa Cruz, CA 95063-2390.



possible interference with conventional radio and TV transmissions.

Last year, however, the FCC did relax some of its rules on RF use. This change made it possible for Nady's company to introduce its first wireless stereo speaker system. If more rules are relaxed, we may soon embrace a truly wireless future.—Magore Castello

Access: Wireless speakers are available from Nady Systems, 1145 Forty-fifth Street, Oakland, CA 94608.

VOICE-INTERACTIVE TEDDY BEAR

Little girl, I love you.
Teddy bear, I love you, too.
Girl: Do you want to play?
Teddy: Yes, let's have fun.
This is a dialogue between a child and Sing-Sing, an 18-inch-high, voice-inter-

active toy panda designed by the Audio Corporation of Saddle Brook, New Jersey.

Beneath its fur, the ursine interlocutor boasts two computer chips that convert analog speech sounds to a digital format, store the format, and activate the stored format upon recognizing a word. After purchase, the bear can be programmed to identify its young owner's voice and respond to five set questions.

"Because voice recognition is speaker-dependent," if the child's mother should address Sing-Sing, she might be met with a baffled "Sorry" or "Please respond." Presumably this trait would be popular with many a five-year-old.—Judith Hooper

Access: At present, Sing-Sing is sold (\$79.95) only by catalog from the INTV Corporation, 21535 Hawthorne Boulevard, Suite 223, Torrance, CA 90503.

RACING WITH THE MOON



We've all heard about the first man on the moon: the first words spoken on the moon, the first step and so on. But who remembers the first car on the moon? Known as the Lunar Roving Vehicle (LRV), or simply Rover, the "car" was a 485-pound, battery-powered two-seater cart with four-wheel drive, a sported joystick controls, two the original horseless carriages. Astronauts Jack Irwin and David Scott took Rover for its first spin as part of the 1971 Apollo 16 mission.

The vehicle was no Ferrari: it had a top speed of 11 miles an hour (a lunar record that still stands). It also had a tendency to fishtail at high speeds—around 10 miles an hour. Designed for the rugged lunar landscape, it could cross obstacles more than two feet wide and climb slopes of 25°. The four tires, made of steel mesh, had a life expectancy of 112 miles. Thanks to Rover, two teams of astronauts were able to explore miles of moonscape and collect invaluable samples that they brought back to Earth.

We are asking Omni readers to think about what the next wheeled vehicle on the moon should be. Unlike the Rover, it would be built strictly for fun to compete in the Omni 2000, a course that would take the lunar racers to each



Dream up the vehicle that will win the Omni 2000 Moon Rally, and win yourself a trip that is right out of this world
BY DOUGLAS COLLIGAN



of the six sites where astronauts landed as part of the Apollo program. Mapped on the photo at left, the route covers around 2,600 miles as the rocket flies. A tough course: it cuts through both the flat lowlands and the rugged highlands of the moon.

The race begins and ends at Tranquility Base, the site of the first moon landing. Racers cross Armstrong Flats on the Sea of Tranquility, round "Buzzi's Bend," and traverse the Sea of Serenity, then they drive along the Apennine Mountains, across the Ocean of Storms, heading southward along "Irwin's Alley" and finally northward to the checkered flag.

Omni is asking its readers to design a second moon buggy, a recreational vehicle that could compete in this contest in 2086.

Here are some facts you should know about lunar driving conditions:

- There is no atmosphere to speak of on the moon. It's practically a vacuum. Therefore, standard internal-combustion engines will not work. That leaves electric motors, solar power, nuclear power, rocket power, even rubber-band power—anything that doesn't require oxygen.
- The gravity on the moon is one-sixth that of Earth, so vehicles need less

CONTINUED ON PAGE 184

INTERVIEW

CONTINUED FROM PAGE 1M

genes, then another, and I knew I was onto something. Aging rate, I reasoned, varied from species to species, but the process of aging was the same. No matter what the species, once aging set in, everything—eyes, ears, reflexes, muscles—seemed to go more or less at once. Every tissue of the body, in essence, was run by the same aging clock. Comparative physiology suggested some common master gene of regulation, altered slightly among species, to increase longevity we didn't need to invent new body processes or genes. It had to be a small number of control genes turning the volume, the quantity of certain longevity biochemicals, up or down. We might

already possess the basic genetic makeup for a life span of four hundred years. I couldn't wait to test these ideas.

Qms: How could you prove that notion?

Cutler: One way was through a technique commonly used in evolutionary biology. To learn how many genes determine a characteristic, you ask how long it took the characteristic to evolve. If, for instance, a hundred thousand genes are involved in human longevity, a longer life span would take longer to evolve than if two hundred genes were involved. That's just the way evolution works. I needed to learn human longevity had actually evolved.

Qms: You'd have to measure the life span of extinct species—and they're already extinct!

Cutler: George Sechen had the key when he showed that you could calculate MLSP

by comparing brain size to body weight. Well, I checked out his formula for a whole range of species, from recently evolved primates to the opossum, which has been around in its present form for millions of years. This doggone formula seemed to work across the board. I didn't see why it shouldn't work for completely extinct species as well. So I went back to the literature, digging up the anthropologists' measurements of fossils. They had calculated the brain size and body weight of primate species as they'd evolved over millions of years. I discovered that longevity generally increased during primate evolution, but at different rates, depending upon the lineage, be it squirrel monkey, ape, or baboon. But for hominid lineages, the rate kept going up faster and faster the closer you got to modern man. The line on my graph went almost straight up. For the last few million years longevity could only change at that pace if it involved no more than six tenths of a percent of the entire genome, roughly six hundred genes.

Qms: Then longevity is evolving still?

Cutler: Not at all. Evolution of longevity like the evolution of brain size, has come to a total halt. I found that Neanderthal man, for instance, had longer MLSPs than Homo sapiens. Researchers also found the remains of hominids with superbrains and, according to my calculations, superior life spans. They probably looked like men from Mars, but the trait didn't prevail.

I calculated that hominid longevity increased an astounding fourteen years over the last hundred thousand years. But about fifty thousand years ago the rate at which longevity increased fell to zero because of the specific way we evolved. Our ancestors lived in small, traveling communities generally led by a single chimp with superior traits. Because he passed on more of his genes than anyone else, these were the ones that took. If another individual with yet more potent traits, arrived on the scene he would take over, and his genes would propel evolution further still. With the advent of civilization, these traveling bands disintegrated, because everyone had a more or less equal chance to reproduce, selection for superior traits, including increased longevity, stopped.

Another factor that probably played a role is a process known as neoteny. Neoteny means the retention into adulthood of early developmental features. Individuals take on increasingly childlike features—greater brain-to-body ratio, larger eyes, sparser hair. The larger brain necessitates a longer period for learning, so neotenic species spend more time in childhood; development is essentially stretched out so that every phase of the life cycle expands. As generations passed, individuals simply became increasingly neotenic until eventually we had modern man. A normal adult Homo sapiens has the same brain-to-body ratio as a baby chimp. He takes twice as long as the chimp to reach adolescence, spends twice as much time in



"The most beautiful thing we can experience is the mysterious. It is the source of all true art and science."—Albert Einstein

EINSTEIN

By Kenneth Seay
Now available for \$23.50.

An original, first edition 11" x 14" lithograph produced on archival cotton rag paper with graphite gray ink. Each lithograph signed by the artist.

Order by phone, 24 hours a day, 7 days a week

1-800-824-7888 ask for Operator 113

Add \$1.50 for postage and handling

Your satisfaction is guaranteed.

Sea Graphics

Box 1, Box 40

Lowell, OK 73051

the prime of adulthood, and takes twice as long to die.

After a while, though, our physiology forced the process of neoteny to a halt. We simply reached the point where it was impossible to give birth to more neotenic, larger-brained children without warping the females' pelvis, totally destroying her gait, and impeding her ability to walk. With increasing neoteny impossible, the evolution of longevity stopped.

Orren: What a sweeping theory. What was the response?

Cutler: It thrust me into the blackest period of my career. It was 1975, and the Proceedings of the National Academy of Sciences sent my paper to George Sacher for review. He claimed I'd stolen all the ideas from him and rejected it. I found that incredible because I'd been communicating with him all along. We even co-organized a meeting three months prior to this in which I'd presented a paper on the same data. And his only comment at the time had been "fascinating." The academy decided to publish my paper anyway but asked me to acknowledge that Sacher had arrived at similar data independently. But Sacher was bitter and acrimonious and even formed his own clique of supporters. Before he died, in 1982, he wrote one last chapter claiming everything I ever did as his own. The matter has not been resolved, and people still say, "Cutler stole the data because he had had trouble getting grants." Or, "He did it because he was too ambitious." Being accused of that was terribly upsetting. It humiliated me. It diminishes everything I've done. But I try to follow my wife's advice. Just keep going. Just continue. People will see where the ideas are coming from.

I had political problems everywhere, but I was finally put in touch with Don Yorborough, a philanthropist who was interested in aging research. He and his hands ended up supporting me. Don eventually introduced me to another philanthropist named Paul Glenn, who helped me pay the salary of a lab technician. This money was what scientists call soft, but at least I was generating enough of it to keep myself and my research going. A year after the Sacher furore, I left Dallas for what I thought would be a better opportunity—my current, tenured job at the Gerontology Research Center, part of the National Institute on Aging.

Orren: So things improved?

Cutler: Not at all. I'd been here for just a few months when the man who hired me left. As new men on the block with these far-out ideas, I received little support. But Yorborough and Glenn supplied money for technicians. And my wife is still here supplying her expert services.

Orren: Despite difficulties, you kept on?

Cutler: Yes, and my first goal was to figure out what actually causes aging. There were two points of view. The more popular notion was that we had aging genes that programmed the production of a death hormone—because aging and death

benefited evolution by killing off the old to make room for the new. Proponents of this idea suggested a Disney-like explanation for the death of animals in the wild: As rabbits grew old, crippled, and weak, wolves kill them off. But that's not the way it is at all. There aren't enough emboweled rabbits for the wolves. Instead, wolves kill healthy rabbits in a mostly random kind of way. Most rabbits are killed by natural predators while very young. No wild animal lives long enough to get old. The problem in nature has never been that animals live too long—it's quite the opposite—to stay alive to a distant reproductive age. So there's never been any pressure to evolve a hormone promoting aging and death.

Orren: You reject the dogma that aging is genetically programmed into all individuals for the good of the species?

Cutler: That's right. So let's consider the other alternative: Aging is the by-product of normal metabolic and biochemical processes necessary for survival. Look at the hormones we produce at puberty. When scientists castrated Pacific coast salmon, they found that the fish never producing sex hormones or reaching sexual maturity lived about twice as long. You must become sexually mature to survive, but there's a price to pay. Other examples are the highly reactive peroxides, free radicals you produce in metabolizing oxygen. You have to breathe in order to function, but you pay a price—free radicals that damage DNA. In nature, where most creatures are killed by predators and other hazards, the harmful aspects of these processes never come into play because animals simply don't live long enough. But for humans, living in the civilized world, these by-products cause aging. Because our basic biochemistry is virtually identical to that of the chimp, we must have better ways of coping with the same toxic by-products, agents of DNA damage, aging, and death.

Orren: How does DNA damage per se result in aging?

Cutler: Through a process called dysdifferentiation, which is essentially development in reverse. We all start from a single fertilized egg that develops by dividing and differentiating so that many different types of cells emerge. We have blood, brain muscle cells, and so on. Free radicals produced in one cell can alter the proper differentiated state of the cell. For instance, brain cells have been found to produce hemoglobin, a protein previously produced only by blood cells. As the brain cells continue to produce hemoglobin, the brain becomes just a bit less efficient. And other parts of the body undergo this process as well: kidney cells may begin to function as fat like liver cells, for instance, and stomach cells begin to produce proteins previously specific to the intestines. After a while you can't run the four-minute mile. Small and subtle departures from the optimum state occur over time, and very little change is required to account for the aging process.

The Mysteries of Mind



THE TWO WORLDS WE LIVE IN

Man is not just an isolated entity on Earth. He is also of a greater world—the Cosmos. The forces that create galaxies and island universes also flow through man's being. The human body and its vital phenomenon—Life—are of the same spectrum of energy of which all creation consists. The universe is just because you are one of its myriad forms of existence. Stripping away the mystery of these Cosmic forces within you increases the personal reality of the Self. There is no adventure greater than the exploration of Self.

This Free Book

The Rosicrucians, a worldwide cultural organization, have shown thousands of men and women how to rationally explore their inner world of Self. A vast province exists just beyond your conscious mind. It is a link with your potential creativity and attainment. Not magic, not fantasy, but a revelation of the fullness of your being. Write today for a free copy of the *Mystery of Life*. It tells how you can learn and use more of what you are.

The Rosicrucians are:

- Not a religion
- Non-political
- Non-profit

USE THIS COUPON



FIVE-11 FIGHTER/BOSSER

An outstanding watch value, on land, at sea, and underwater . . .

Navigator™ Watch

Now, with new ratcheted safety bezel, and still only **\$499.95***



Wear this watch to work, to play, to swim, and dive. The Navigator™ Watch is powered by a sophisticated, ultra-accurate, pressure quartz movement that is powered by a tiny mercury cell. It should last at least 36 months before you need a replacement. The Navigator™ has both luminous analog dial and LCD display. It gives you dual time capability. The LCD display shows time continuously — in 12- or 24-hour mode. Push the button and you display day and date. There is a subtle yet sensitive alarm and a switchable hourly time signal. The stopwatch/chronograph reads to 1/1000 sec and has "interrupt" and "stop" modes. A light switch illuminates the display.

The Navigator™ Watch is totally encased in black metal, including the linked, stainless-steel band. It is water-proof to 330 ft. The new, exclusive ratcheted safety bezel protects you from slipping underwater longer than you had planned. The crystal is "mineral glass" — it will never scratch.

We import these outstanding watches directly in large quantities and are able to offer them for just \$499.95. Nations all catalog houses offer the identical watch for \$529.95 or more, and that's without the exclusive safety bezel. But here is an even better deal. Buy two for \$899.90, and we'll send you a third one absolutely FREE, with our compliments. Take advantage of this outstanding offer while it is available.

*Note: For quantity orders (500+) with new computer logo on the dial, call Mr. Conrad at (415) 923-4370 or write him at the address below.

haverhills

since 1967

121 Townsend Street, San Francisco, CA 94107

*Many new watches are being "kicked off" in the last month of the year. The Navigator™ is no exception. From all our in-stock watches, there is only one left now. Buy now!

FOR FASTEST SERVICE, CALL
TOLL FREE (800) 433-9003
20 hours a day, 7 days a week.

Please give order #80048977. If you prefer, send check or card authorization and expiration date. We need daytime phone for all orders and timing bank for charge orders. We cannot ship without this information. UPS insurance: \$3.95 for one Navigator™ Watch. \$4.95 for three. Add sales tax for CA delivery. You have 30-day return and one-year warranty.

Buy the Atari Video Game Systems where good service is not a game.



EINST

By Kenneth... and great selection, all as close as a Key-Bee Joy Stick. When your systems and cartridges remember the original, first edition 11" x 14" lithographic paper with graphite gray ink. Each...

Order by phone, 24 hours a day

1-800-824-7888 ask for...

Add \$1.50 for postage and handling

Your satisfaction is guaranteed

BEE STORES

Item 1000 B000 1000 B000 B000 B000

ise. My theory is that free radicals, along with other active chemicals, make the dye-differentiation occur. Thus the mechanism that keep a cell in its proper state of differentiation might be the very one that determines the longevity of an animal.

If free radicals cause aging, then some species live longer because they have better ways of fighting them off. So you'd expect longer-lived species to have higher levels of antioxidants, substances that neutralize free radicals. Finding higher levels of protective antioxidants in the tissue of longer-lived species would be the acid test of this idea. That's what I set out to do.

Cutler: What antioxidant did you look at?
Cutler: I chose superoxide dismutase (SOD), whose only known role is to protect against free radicals. It's present in all creatures from bacteria to man, and it's required for survival. We tested humans, chimpanzees, gorillas, rhesus monkeys, and a few short-lived species, including guinea pigs and mice. We found a beautiful linear correlation. Longer-lived species had more SOD to protect against a given quantity of free radicals than did shorter-lived species. When I repeated the experiment for other antioxidants, including vitamin E, beta-carotene, and uric acid, the correlation held firm. What's so nice is that these findings fit into the control-gene theory. Just turn up the production of antioxidants, which all species have, and longevity increases.

Orr: Could I slow my aging by consuming some antioxidants?

Cutler: Not if you're already at the optimum level for your species. In that case raising the level of one antioxidant will probably lower the level of all others. That makes good biological sense—if life span is important to the evolutionary success of an animal, it won't be manipulated in a trivial way. It's going to have a set point of regulation, just like body temperature. And like body temperature, it will stay constant under a wide range of conditions. So the human MLSP is at most one hundred and ten years, no matter what the caloric intake, life style, and nutrients consumed.

Orr: But if there's an optimum set point for humanity at large, certainly whole groups of people fall below.

Cutler: Indeed they do. If antioxidants play a role in life span, perhaps some individuals live longer than others because they just happen to have higher set points. Antioxidant protection might vary within our species, just like eye color or height.

The first step of all my research will be a technique for diagnosis. People with abnormally low levels of antioxidants might age abnormally fast, with my technique they'll be diagnosed, and supplements will boost their antioxidants until the optimum level is reached.

We're developing a battery of assays to determine how much antioxidant protection you've actually got. For example, we analyze urine samples for thymidine glycol, a byproduct of DNA damage. When-

OMNI TIME CAPSULES



Now the magazine of the future can be kept for the future. Store your issues of OMNI in a new Custom Bound Library Case made of black simulated leather. It's built to last and it will keep 12 issues in mint condition indefinitely. The spine is embossed with a gold OMNI logo, and in each case there is a gold transfer for recording the date.

Send your check or money order (\$6.95 each, \$ for \$24.95, \$ for \$38.95) postpaid. USA orders only. Foreign orders (add \$2.50 for postage and handling per case).

to OMNI MAGAZINE
JESSE JONES INDUSTRIES
499 East Erie Avenue
Philadelphia, PA 19134

To expedite your order, call 215 CALL TOLL FREE, 1-800-972-5555 and Charge to AM VISA, MC, or DC. PA RESIDENTS ADD 6% SALES TAX.



Keep ranching for the stars with COUNTDOWN

The most important
countdown has begun
— the future of the
space program is

being determined now. Keep abreast of the
striking developments in space with
COUNTDOWN — only magazine.

Countdown, focusing on the Space Shuttle of
today and the Space Station of tomorrow, covers
downward Shuttle flights, as routine. Countdown
also reports on all international developments,
such as European and Soviet space projects. Keep
an eye on the 21st Century with Countdown.
Money back offer: you pay only \$4.95 for 12 issues.
If you don't like it, we'll refund \$4.95. No time
pressure is put on you. If not satisfied with your first
issue, send return to:

COUNTDOWN

Man Group Publications, Inc.
P.O. Box 278
Athens, Ohio 45701

Include either my subscription to COUNTDOWN, One
year, 12 monthly issues, for only \$11.95 (12 issues
\$12.00) or my subscription to only \$22.50 (12
issues \$22.50).

1 year
3 years

Payment enclosed
Please bill me
(\$12.00 extra per year)

NAME _____

ADDRESS _____

CITY _____ State _____ Zip _____

ever a piece of DNA is damaged, thymidine glycol is removed. Because the molecule is stable, it's never degraded but simply finds its way into the urine. Knowing how much thymidine glycol you're passing I can calculate your total body DNA damage load.

Over: The more thymidine glycol I excrete the more DNA damage I have?

Cutler: Yes. The solution is to prevent as much of that damage as possible. And that's what our assays will do. Future analysis shows you have high rates of DNA damage. I'll take blood tests. I might find for instance that you have trouble absorbing vitamin E. The solution might be as simple as doubling your consumption of that vitamin. You come back in two weeks and if I lack of vitamin E was the major problem then signs of excessive DNA damage in your urine sample should be gone. People could come to us early in their life before signs of aging appear and we might be able to readjust their system for a longer more normal life span.

Omni: Can we increase our MLSP beyond one hundred and ten years?

Cutler: The next step is trying to increase the net levels of antioxidant protection in our cells to challenge the set point to a higher level. Evolution itself continually increased the primate set point for longevity by increasing the production of protective substances. We have to understand the evolutionary process and push it still further.

Many different strategies have evolved to decrease the possible aging effects of free radicals. One might try, for example, to trick cells into thinking they were under more oxidative stress than they really were. When you exercise you burn more oxygen produce more free radicals, and also generate more antioxidant production. If you could trick the cells into thinking exercise was taking place when it wasn't then you might increase production of more antioxidant while free radical levels stayed the same. The question is: What is the mechanism by which the body recognizes that it's under oxidative stress? A particularly exciting possibility is the existence of a central coordinating factor. If it exists, one could identify and manipulate it without complex genetic engineering.

Over: Have you narrowed in on this so called factor? Have you ever tried to trick the cells yourself?

Cutler: We embarked upon such a program years ago. We started from a simple fact: Damaged DNA, one result of oxidative stress, produces molecules known as thymidine dimers. When the DNA is repaired the dimers are removed and you can detect their presence in the blood. The more dimers you find the more DNA damage has occurred. We injected these dimers into mice, hoping their presence would cause the cells to think the damage was extreme and to respond with excess production of antioxidants and other protective substances. We had two groups of mice: one injected with dimers, the other

with a placebo. Then we irradiated both groups of mice with X rays for twenty days. X rays, of course, produce stress, damage DNA. After a couple of weeks all the control mice were dead, but most of the thymidine-dimer mice were still alive. The thymidine-dimer mice ended up living about twice as long. This strategy seems to have worked, but we can't say for sure until more studies are done.

Over: If this work pans out, could people perhaps inject themselves with thymidine dimers, trick their cells, and live longer?

Cutler: It's not likely. A better idea is to actually understand the mechanism, the central controlling factor. One possible factor triggering the genes that produce antioxidants is a messenger chemical known as cyclic GMP. When I injected cyclic GMP into mice, it protected them against radiation. Such experiments suggest that we might be able to artificially enhance our levels of protection without having to overhaul the body as a whole. We could well see pharmaceutical agents that intervene at the normal set points, actually expanding the MLSP.

Over: How many years do you think we might gain through such therapy?

Cutler: It's hard to say though the increase would probably not be radical because this technique imitates just part of the evolutionary process. To double or triple human longevity would probably have to rely on neoteny itself. By slowing all stages of development and delaying production of sex hormones, we'd retain more of our fetal and early-childhood features into adult life. Neoteny as a mechanism for increasing longevity doesn't demand the development of new morphological forms, only the adjustment of the overall rate of the genetic program. Neoteny is an example of how a few regulatory genes can effect vast changes in overall morphology.

A neotenic version of Homo sapiens, with an MLSP of perhaps two hundred years, would be slightly taller and heavier than ourselves. But the head and the brain would be twice as large. The individual might reach sexual maturity at thirty and that thirty-year-old would be proportioned just like an eight-year-old Homo sapiens. But the most fascinating characteristic of this Homo futurus might be the retention into adulthood of childlike behavioral characteristics. Homo sapiens already retains into later life some of the infantile traits of animals—curiosity, playfulness, the ability to learn. The new species will retain even more behavioral traits from the human childhood, such as the ability to learn spoken and mathematical languages and the intense urge to explore. Some of our greatest scientists and musicians, from Einstein to Mozart, appear to have been exceptionally neotenic. People always say "He may be a great scientist, but he's like a child." They don't realize that perhaps being like a child is what made him great.

Omni: You've set your defiant sights on the creation of this superneotenic race?

Handle Pressing Matters In Minutes. With The Sunbeam Steam Valet Garment Steamer.



Introducing The Perfect Travel Companion

On-the-road wrinkles are one less worry when you travel with the new Steam Valet from Sunbeam. This compact convenience heats up in less than 45 seconds. Penetrating, wrinkle-removing steam from our Shot of Steam button makes even stubborn wrinkles fall out easily. The Steam Valet from Sunbeam. The quickest way to handle pressing matters.



Sunbeam
Makes It Easy.

An Allway International Company
Sunbeam, Shot of Steam, Steam Valet
©1986 Sunbeam Appliance Company

Quter: My long-term goal is to contribute toward humanity's future evolution, this would probably occur along the same nocturnal path we have already evolved. That would include not only relaxation of M.L.S.P. but all the other characteristics that went along with it: expanding the brain, slowing development, and enhancing nocturnal behavioral characteristics. The goal is to coordinate a safe and balanced evolution in which all these characteristics emerge at once.

Quter: First you'd search for the regulatory genes responsible for primate evolution, and upon finding the right ones you'd regulate them to increase longevity?

Cutler: That's right. The first step is identifying those regulatory genes. Scientists currently mapping the entire human genome hope to complete that project within ten years. We'd compare the genes across the entire range of species. Those genes differing between primates species are maybe the ones propelling longevity. Perhaps creation of the new human species requires only a few changes in the regulatory genes.

Quter: If it's so simple, why don't we see these mutant humans now?

Cutler: One reason we haven't seen mutation in the direction of modernity is that problem of the birth canal. With its larger head *Homo* futures wouldn't survive its journey through the pelvis. And if futures were born in a less mature state than the apes and baby if could never survive outside the womb.

Quter: How can such problems be solved?

Cutler: By sustaining them artificially outside the womb.

Quter: That would make the species so dependent on technology.

Cutler: You could say the same about sustaining a colony in space. What happens if the computer or the energy source shuts down? Whether we evolve into the species of *Homo* futures or not, female pregnancy is likely to soon become a thing of the past. All babies would be conceived and raised outside the womb. By eliminating nine months of pregnancy a woman would gain many advantages: even increasing her life span. Throughout history females always had shorter life spans than males because they spent much of their life pregnant, constantly stressed. They also produced pregnancy hormones that appear to accelerate the aging process. The female ultimately evolved a better cardiovascular system, stronger resistance to stress, and probably more protective antioxidants as well. With fewer children, the modern female not only lives longer than her historical counterpart but also longer than the male. The reason is that she's coasting on reserve capacity. Eliminating pregnancy altogether should boost female life span even further.

Quter: How will society cope with individuals who live two hundred or more years?

Cutler: Let's go back to primitive societies, which were societies of youth. Few individ-

ults survived much beyond thirty with people dying of infectious disease and all the various, random natural hazards. The death of an individual depended not on how old he was but rather whether or not he happened to get caught. Civilization eliminated many of these hazards, substantially reducing the random component of survival. Suddenly people had a more uniform life span, limited by aging itself.

The presence of aged people in our society today is an artifact of civilization. Senior citizens and the problems of caring for them are not natural to our species. Many people claim that increasing life span, including a longer period of decline, would only make the problems more extreme. But my studies show just the opposite to be true. Conferring even five or ten years of extra, healthy life on, say, a scientist or engineer would be an economic boon to society. Even more important, while random hazard has been drastically reduced, it still exists. People die via plane and car crashes every day. If people had the biological potential to live for six hundred years, according to insurance company statistics, there's almost a one hundred percent chance of meeting an accidental death. So with random hazards remaining as they are today no one would worry about the problems of aging. We'd have returned to a society of youth. The closer society gets to that six-hundred-year life span, the less old age will have.

Q: Why is six hundred years the optimum human life span?

A: Cutler: There isn't a shred of evidence for any real bottleneck on the evolution of longevity. But there's a practical limit: A six-hundred-year-old would have to wait ninety years to become sexually mature.

Q: I'd wait thousands of years if I meant I could live forever.

A: Cutler: But those longer-lived versions of man would probably be intelligent enough to come up with novel approaches to life extension. After we'd tripled or quadrupled our life span by enhancing mechanisms used during the natural increase of longevity, new means for increasing life span would evolve. In that instance you're talking about life spans of thousands of years. I can imagine the removal of all internal organs, from the liver to the spleen, because they generate toxic by-products. There'd be no need for a digestive system, only a mechanical heart to pump fluid through a body. You'd eat a pre-digested medium full of all the critical nutrients and vitamins. Ultimately because biological tissue can last just so long, you might eliminate the biological components for virtually everything but your brain. The brain itself would be enhanced by antioxidants and periodic transplants of new, healthy cells. But with life span extending beyond six hundred years, you'd start to see increasing anxiety over the possibility of accidental death. People would start trying to avoid accidents at any cost. You'd drop that sports car. Give up travel by

plane. In fact, you might just hole up at home. You could build redundancy into your systems, even isolate your brain in the equivalent of an iron vault and have it communicate with your body electronically. If the body were destroyed, well, that could always be cloned or reproduced.

Q: What about you? On the cutting edge of life extension research, you have various options for increasing your own longevity. At fifty, do you ever consider injecting yourself with thymidine dimers, cyclic GMP or anything else?

A: Cutler: Not yet. I'm afraid of it. These substances could turn out to be dangerous. My father will be eighty this December and is concerned about his aging, but I can't help him. I myself simply take vitamin E and beta-carotene capsules after every meal, hoping to reduce the possible mutagenic effects of food. I try to avoid particularly strenuous exercise. Though I know that the cardiovascular system can benefit from such exercise, I'm afraid that the gain may be more than offset by the extra oxygen metabolism and increased free-radical production. Right now there just isn't much we can do to extend life beyond the current 80-90.

Q: Doesn't bother you that you yourself might miss out on the increased life span you're helping to create and might die of natural causes at seventy or eighty?

A: Cutler: Sure I feel real bad about it. I make a person who studies cancer and suddenly discovers he has cancer himself. He can do a self-diagnosis, make charts of it, watch it grow. That's what I've been doing in watching myself develop all the changes of age. But I also feel good because I'm contributing toward the ultimate extension of human life span. That's my replacement for immortality. Also, let's say you could live two hundred years. Then you'd feel bad because a six-hundred-year life span was just around the corner. Those with a six-hundred-year life span would feel bad knowing that just a few generations later, they could have lived forever. That might be the worst feeling of all.

The important thing is that people in general are becoming increasingly dissatisfied with short life spans. Most politicians and scientists are still resistant to the idea of life extension. But historically, most radical scientific movements started this way. You have a few investigators who are considered weird. They undertake a lot of hardships to produce some key experiments, triggering the interest of the general scientific community to go at it in a more careful way. Despite politics, I believe that humans will want to increase their natural life span. We already have the hypotheses as to how this might be done. Around the year 2000 some researcher may finally use genetic engineering to double the life span of a mouse. That will be the breakthrough. People will stop and say, "This isn't quackery. This is real." Thousands of scientists might ultimately get involved. And that's when the bulk of the work will be done. **DD**



SCOTCH OF RARE CHARACTER

Here is the solution to last month's J & B puzzle

1	1	1		2	1	3
	1	1	1	9	0	4
2	1	8	4		5	3
	4	8		1	0	
4	3		3	7	4	4
4	3	9	5	6		2
6	6	7		4	3	5

ANSWERS ACROSS

- 54 + 50 + 8 - 1 = 111
- 2110 - 10 = 210
- 1984 × 6 = 11904
- 24 × (90 + 8) = 2384
- 63 - 30 = 33
- 42 + 6 = 48
- 61 - 51 = 10
- 66 × 80 - 5 = 43
- 16 × 2 × 9 × 13 = 3744
- 666 × 66 = 43996
- 29 × 23 = 667
- 1927 - 1492 = 435

ANSWERS DOWN

- 76 + 30 + 6 = 112
- 12 × 10 × 9 = 1080
- 16 + 2 + 8 + 3 = 29
- 1811 × 8 = 14488
- 7 × 7 × 7 = 343
- 2156 - 254 = 1902
- 1024 × 14 = 14336
- 42 × (11 + 11 + 10 + 10) = 1704
- (25 × 60 - 4 = 1496
- (14 × 51 - 2 = 715
- 11 × 25 = 275
- 68 + 49 = 117

GAMES

By Scot Morris

Who is the highest-paid writer of all time? The Guinness people once said it was Ernest Hemingway, who in 1960 received \$30,000 from Sports Illustrated for a 2,000-word article on bullfighting—a rate of \$15 per word. Aislinn Bellant, who writes epigrams and sells them on postcards, in 1981 got \$5,000 for 12 words in a TV ad. "I may not be totally perfect, but parts of me are excellent," which works out to \$416.66 per word. Coincidentally, the ad was for Sports Illustrated. Bellant recently told us that he thinks he should get the title as highest paid writer, but in its latest edition Guinness cites a woman in Minneapolis who in 1968 won \$500 a month for life in a "25 words or less" contest for Plymouth cars. By 1984, they say, her earnings had passed \$8,000 per word.

But since, as Guinness admits, no known anthology includes Mrs. Schneider's deathless prose—and apparently even Plymouth never used her slogan—we would agree with Bellant that she isn't a published writer.

Well, we have another candidate for the award: Devin Borgmann, who once was paid \$10,000 for a single word.

STARK RAVING LOGOMANIAC

In 1965 Borgmann published *Language on Vacation*, a book that set the standards for a field he called logology: the systematic study of wordplay or recreational linguistics, or the science of words. In it Borgmann pointed with delight at such treasures as:

- Subbookkeeper: The only word in the English language that contains four successive pairs of letters.
- Internally: A word in which the odd and the even letters spell other words: *lensy* and *renal*.
- Typewriter: The longest English word you can type in the top-letter row of a typewriter. The longest middle-row word is *bigfists*. **QUESTION 1:** What are *stereotactin* and *Johnny-jump up*?
- The English eye and the French one: are synonyms, yet they have no letters in common and together comprise all six possible vowels.

• Shift each letter of *steeds* forward one place in the alphabet and you get another word: *sufter*. A three letter shift turns *cold* into *rog*.

• Quotient contains five straight vowels. That's still not as many as *Potatoesodoo*, a British noddie born in 1773.

QUESTION 2a: How was this unusual horse's name pronounced?

QUESTION 2b: Borgmann also posed this question: Of all finite numbers ever named, from 1 to 1, contain which number comes first alphabetically?

QUESTION 3a: What do the answers to these two questions have in common with this issue of *Omn*?

As a result of *Language on Vacation*, Scientific American called Borgmann "the country's leading authority on wordplay." Time described him more simply as a "a stark raving logomaniac."

The book caught the attention of Standard Oil of New Jersey executives, who were searching for a new company name. They brought in Borgmann, Mario Pei, and other authorities on language. The final choice was *EXXON*, a Borgmann word that he guaranteed "means absolutely nothing."

"I had a page of conditions to meet," Borgmann said. "The name could be no more than six letters; it had to have the overtones of a big company as well as scientific and chemical overtones. And since the company had operations worldwide, the name couldn't be rusty in Swedish or any other language."

Borgmann's fee for delivering *EXXON* was \$10,000, a rate of \$2,000 per letter. That, we think, makes him the unqualified highest-paid writer of all time, and we petition the Guinness people to make the appropriate corrections.

LOGOLOGY'S LOSS

Borgmann died last December 7 at his home in Dayton, Washington. He was fifty-eight years old. We have tried to find out what we could about this man, but as a publicity reclusive he makes J. O. Salsinger look like Larry Falwell.

Joseph Madachy, editor of the *Journal of Recreational Mathematics*, asked us



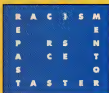
Squaring the circle: a classic word square

Borgmann's agent for *Language on Vacation* but never actually met him. Neither did Martin Gardner, who was responsible for getting Borgmann the job as founding editor of *Word Ways*, a quarterly journal of recreational linguistics in 1968. Nor did Howard Bergerson, who took over as editor for a year (1969) and remained a close friend of Borgmann to the end (by telephone and letter only). And neither did A. Ross Eckler, who has edited *Word Ways* since 1970.

"When he was in the mood," Eckler tells me, "Omn could turn out well written articles at the rate of three or four a week. As a consequence, even though he is dead, I have enough material to generate two more memorial issues, in February 1987 and February 1988. (Subscriptions: \$14 a year from Word Ways, Spring Valley Road, Morristown, NJ 07960.)

Borgmann delighted in taking a subject and writing about it so thoroughly that there was simply nothing more to say about it. In a recent article on palindromes he started with the shortest and worked up. Each letter of the alphabet is a palindrome, he said, but four are also words in their own right—A, I, O and X (O is the poetic exclamation, and X means to mark with an X). "The last of these words makes me a little uncomfortable," Borgmann wrote, "because it is spelled without a vowel."

• Five letters: An interesting example at this length is *SCHS* (hailing shouts used by hurlers). Like its shorter compen-



Question 10: Fill in the missing letters in these second-order word squares

- on, AQON, it is a four-way palindrome (that is, it also works forward and backward when turned upside down).
- Seven: *Reviver*, top spot race car
- Eight: Apollo RA, a borough near Pittsburgh, and Snellen's test for visual acuity
- Nine: Rap Pepper. That's Representative Claude Pepper of course, who has been a Florida congressman since 1963
- Eleven: Detartrated (separated from or free of, tartaric acid). This Borgmann said: it's simply "the finest palindrome the English language has to offer."

CROSSWORDS AND COMPUTERS

Borgmann lamented two influences on logicpuzzles: First was the crossword puzzle invented in 1913, which diminished interest in "more intellectual word recreations" such as palindromes, anagrams, and word squares. Second was the computer

which he said was ruining logicpuzzles by taking the creativity out of it.

As an example, consider presidential anagrams. (Borgmann himself made the pages of *Newsweek* just before the 1964 election with a pair of anagrams of Lyndon Baines Johnson: One could be used if he won: No nunny. He's on job, Jack. the other if he lost: He nod on, jobless nunny.) Recently a computer was programmed to find anagrams of Ronald Wilson Reagan. The best it found was No darlings, no ERA law Borgmann was delighted to point out that the computer missed insane Anglo warlord's a human-generated Reaganagram.

Another computer was programmed to find transposals. These are letter rearrangements, such as medicaldecimals, hemorrhoidswasaford, or Aristobalan's rotations. For the letters aegivrt it found five settings, garviter, garviter, grivates, and ingrates. Borgmann, who was willing to accept such things as names of people who might exist, had previously written an article with sixty-five transposals of the same eight letters from angriest to fergies.

TRY THIS BORGMANN QUIZ

As our final tribute to the founder of logicpuzzles, we offer this quiz:

- QUESTION 3.** Banger is another acceptable name for that seaport in Morocco. It has something in common with the words job, polish, and rice. What is it?
4. Borgmann once anagrammized his full name in two ways: complimentary and derogatory; to depend on how history would judge him—grand mind, mortal fibre, and damn mad boring infer! What was Dinitn Borgmann's middle name?
5. What is the only English word that ends in the letters ml?
6. With one exception the name of each letter of the alphabet rhymes with some English word or words. Thus W rhymes with bewile you! What is the exception?
7. What do the words ideality and aeryps have in common?
8. Clevead contains two pronouns, he and we. What six-letter word, a noun, contains five different pronouns, each

showing up as a solid word in its spelling?

9. Sixty one is the English spelling of a number with no repeated letters. It has eight. What number is spelled with the maximum number of letters without a repeat? What is the largest number that is spelled without repeated letters?

10. The word square was the prototype of the crossword puzzle. An example of "squaring the circle" is on page 182.

There are six different words here. In a double word square there are 12—the verticals and horizontals are different in the RACISM and SCRAPE puzzles at left: can you fill in the missing letters?

11. Kangaroo Words. You can take a word like indolent and cross out some letters to reduce it to idle, a word that means the same thing. Similarly you can transform roots to is, and transgression to an.

The starting word contains a synonym, the letters of which are in the proper order. Such words are known as kangaroo words, since they're analogous to the animals that carry their young in a pouch. (Ironically, though Borgmann hated computers, this is a perfect game for word-processing computers because it requires you to strike out letters without rearranging what's left.) What's in the pouches of the 15 kangaroo words below?

- | | |
|----------------|-----------------|
| 1. Resurized | 9. Columvus |
| 2. Exhalation | 10. Chocobate |
| 3. Numerated | 11. Encourage |
| 4. Celacomb | 12. Destruction |
| 5. Satedied | 13. Merculene |
| 6. Deliberate | 14. Instructor |
| 7. Miscolation | 15. Regulate |
| 8. Mylet | |
12. Corrosted Cardinals. It's easy to hide the number 12 in English words: London and zero are easy, lobster and fishing are even better because they change the pronunciation. Try to conceal the other ten cardinal numbers the best way you can. Then compare your list with Borgmann's. Easiest are one, two, eight, and nine. For the others, the best yet found are obscure words and far-out, hyphenated cognates. For example, Borgmann's best hidden-two offerings were prus robbing and maze roming.

Answers appear on page 184. **DO**

THE MOON

CONTINUED FROM PAGE 171

power to travel across the moonscape. A lighter vehicle is also tricky to control. The car will have to be fairly stable. Race over a hill too quickly, and both driver and vehicle may take off without notice.

• The landscape itself is like a desert, the weather, brutal. Temperatures can run as high as 230°F at high noon on the moon's equator and plummet to -250°F at night.

We are primarily interested in seeing what kind of imaginative and ingenious designs Omni readers can dream up. What do you see as the ultimate recreational vehicle for the moon?

The grand prize for the most ingenious and feasible vehicle will be one ticket on Project Space Voyage, a low Earth orbit tour of our planet, scheduled for launch in 1992. The tour includes a four-day briefing at a resort, an 8- to 12-hour trip, and then two days debriefing at a resort. Space gear will be provided. This trip is offered by Society Expeditions, which will be solely responsible for determining winner's eligibility to participate in the space voyage. If the grand prize winner does not meet health/eligibility requirements for the trip or declines the trip or if the trip is canceled or delayed, an alternate prize of a two-week "Lost Islands of the Pacific" South Pacific cruise will be offered for 1987 or 1988 (does not include transportation to and from point of embarkation). If for any reason the alternate prize is unavailable or cannot be taken by the winner, Omni may award \$500 as a consolation prize in lieu thereof.

The second prize is a trip for one to the United States Space Academy (airfare included), the space camp for adults at the Alabama Space and Rocket Center in Huntsville. During their three-day stay, visitors will hear lectures and see movies on spaceflight and get a sample of astronaut training that includes simulated weightlessness, flight-testing a real astronaut's jet pack and participation in a simulated shuttle flight to the moon. Third prize is a telescope from Hally Optical.

To enter the contest, print your name and address on a plain piece of paper and include proof of purchase the word STARTECH, cut out from atop page 167 in 200 words or less (printed or typed only) describe your vehicle. No drawings, please. No models. You must include in your description the following characteristics of the moon buggy: size, weight, number of occupants it could carry, means of propulsion, top speed, performance capabilities (can it cross crevasses? how large? how steep a slope can it climb?), material of which it is made. You can assume there will be mining and manufacturing facilities on the moon. We know our satellite is rich in aluminum, iron, titanium, silicon, and oxygen. Any or all of these could be used to construct a vehicle.

Send your entry to Moon Buggy Con-

test, Box 9113, Allison, MA 02134. Entries must be received by December 31, 1986. We are not responsible for lost, late, or misdirected mail.

Entries will be judged by a special panel and winners will be determined based on the following criteria: creativity (25 percent), originality (25 percent), suitability for lunar terrain and environment (40 percent), feasibility (10 percent).

Contest is open only to residents of the United States, except employees (and their families) of Omni Publications International, Ltd. its subsidiaries or affiliates, the judges, Society Expeditions, Inc., their respective advertising and promotions agencies, and Precision Marketing, Inc. All federal, state, and local laws and regulations apply. Void where prohibited.

Winners will be notified by mail and will be required to sign an affidavit of eligibility and release within 15 days of date of notification. If not returned within 15 days an alternate winner may be selected. Winners agree to the use of their names and likenesses for publicity purposes without additional compensation. Prizes are not transferable, assignable, or redeemable for cash. No substitution for prizes other than as stated. No duplicate major prize winners. Taxes and transportation to grand prize site are winner's responsibility.

For names of winners send a stamped self-addressed envelope to: Omni Moon Buggy Winner, 1985 Broadway New York, NY 10023-5965 by June 30, 1987.

All entries received will be reviewed and the finalists submitted to our panel of judges, who will vote on the winning concept. Our panel includes:

- Colonel James Irwin, USAF (Ret.), Apollo 15 mission commander
- Gerasim K. O'Neill, professor of physics at Princeton University and originator of the idea of orbiting space colonies
- Isaac Asimov, noted author of science fact and fiction
- James M. Saxon, the NASA engineer who headed the team that designed Rover
- Richard Petty, seven-time winner of the Daytona 500
- Mario Andretti, Indianapolis 500 champ
- Leonard Nimoy, better known as Mr. Spock of Star Trek
- Tom Brokaw, anchorman of NBC Nightly News and former candidate for NASA's Journalist in Space program
- Billy Dee Williams, actor who portrayed Lando Calrissian in The Empire Strikes Back and a graduate of the National Academy of Design
- Edsel Ford, son of Henry Ford II and adon of the Ford family
- Shirley Muldowney, the first woman to become a national hot-rod champion
- Chuck Yeager, Mr. Right Stuff himself
- Neil McAleer, author of The Omni Space Almanac
- T. C. Swartz, director of Project Space Voyage and founder of Society Expeditions, Society Expeditions Travel Company and American Space Corporation

GAMES

ANSWERS TO GAMES (PAGE 162)

1. Aftercatzats is the longest word that you can type using only the left hand. Johnny-jump-up (a variety of pansy) is the longest right-hand word.

2a. Potatoes — "Pot-pot-eight-oh's." 2b. The first alphabetical word is eight. 2c. This issue marks Omni's eighth anniversary.

3. All the words change their pronunciation when lowered or capitalized.

4. Altered

5. Dreamt

6. H

7. Both are examples of the most syllables with fewest letters. The rarer word cyclope gets five syllables out of seven letters.

8. (Cashed)—at, she, he, her and hers

9a. Five hundred 9b. Five thousand

10



11. 1. June 2. Elston 3. Luf 4. Bomb 5. Sated 6. Debate 7. Ren 8. Me 9. Live 10. Cocoon

11. Uge 12. Run 13. Mule 14. Tair 15. Rule 12. One. It's easy as in money or dried.

Two. Delfwood and network work. Three. Bagram Island and North Reef Island in the Bay of Bengal and named for steel-reeling and path reentering. Four. How about half-cous and Bellauna? Five. Most difficult.

The best offered are the contrived half-ven and Sulf-verencing. Six. We can't do better than quasi xenophobia. Can you?

Seven. Above-venting, house-venting, flight. Easy with English and English. Nine. Its in unwinable and Apemines (mountains on the moon) DO.

CREDITS

Page 61, David Wolf of Kentucky: page 12, David Michael Kennedy, Fred Proctor, Kasey Hagen, 1984-1985. Page 20, Jim Tatum, 1984-1985. Page 21, Don Henderson, page 22, G. Hagen, page 23, G. Hagen, page 24, G. Hagen, page 25, G. Hagen, page 26, G. Hagen, page 27, G. Hagen, page 28, G. Hagen, page 29, G. Hagen, page 30, G. Hagen, page 31, G. Hagen, page 32, G. Hagen, page 33, G. Hagen, page 34, G. Hagen, page 35, G. Hagen, page 36, G. Hagen, page 37, G. Hagen, page 38, G. Hagen, page 39, G. Hagen, page 40, G. Hagen, page 41, G. Hagen, page 42, G. Hagen, page 43, G. Hagen, page 44, G. Hagen, page 45, G. Hagen, page 46, G. Hagen, page 47, G. Hagen, page 48, G. Hagen, page 49, G. Hagen, page 50, G. Hagen, page 51, G. Hagen, page 52, G. Hagen, page 53, G. Hagen, page 54, G. Hagen, page 55, G. Hagen, page 56, G. Hagen, page 57, G. Hagen, page 58, G. Hagen, page 59, G. Hagen, page 60, G. Hagen, page 61, G. Hagen, page 62, G. Hagen, page 63, G. Hagen, page 64, G. Hagen, page 65, G. Hagen, page 66, G. Hagen, page 67, G. Hagen, page 68, G. Hagen, page 69, G. Hagen, page 70, G. Hagen, page 71, G. Hagen, page 72, G. Hagen, page 73, G. Hagen, page 74, G. Hagen, page 75, G. Hagen, page 76, G. Hagen, page 77, G. Hagen, page 78, G. Hagen, page 79, G. Hagen, page 80, G. Hagen, page 81, G. Hagen, page 82, G. Hagen, page 83, G. Hagen, page 84, G. Hagen, page 85, G. Hagen, page 86, G. Hagen, page 87, G. Hagen, page 88, G. Hagen, page 89, G. Hagen, page 90, G. Hagen, page 91, G. Hagen, page 92, G. Hagen, page 93, G. Hagen, page 94, G. Hagen, page 95, G. Hagen, page 96, G. Hagen, page 97, G. Hagen, page 98, G. Hagen, page 99, G. Hagen, page 100, G. Hagen, page 101, G. Hagen, page 102, G. Hagen, page 103, G. Hagen, page 104, G. Hagen, page 105, G. Hagen, page 106, G. Hagen, page 107, G. Hagen, page 108, G. Hagen, page 109, G. Hagen, page 110, G. Hagen, page 111, G. Hagen, page 112, G. Hagen, page 113, G. Hagen, page 114, G. Hagen, page 115, G. Hagen, page 116, G. Hagen, page 117, G. Hagen, page 118, G. Hagen, page 119, G. Hagen, page 120, G. Hagen, page 121, G. Hagen, page 122, G. Hagen, page 123, G. Hagen, page 124, G. Hagen, page 125, G. Hagen, page 126, G. Hagen, page 127, G. Hagen, page 128, G. Hagen, page 129, G. Hagen, page 130, G. Hagen, page 131, G. Hagen, page 132, G. Hagen, page 133, G. Hagen, page 134, G. Hagen, page 135, G. Hagen, page 136, G. Hagen, page 137, G. Hagen, page 138, G. Hagen, page 139, G. Hagen, page 140, G. Hagen, page 141, G. Hagen, page 142, G. Hagen, page 143, G. Hagen, page 144, G. Hagen, page 145, G. Hagen, page 146, G. Hagen, page 147, G. Hagen, page 148, G. Hagen, page 149, G. Hagen, page 150, G. Hagen, page 151, G. Hagen, page 152, G. Hagen, page 153, G. Hagen, page 154, G. Hagen, page 155, G. Hagen, page 156, G. Hagen, page 157, G. Hagen, page 158, G. Hagen, page 159, G. Hagen, page 160, G. Hagen, page 161, G. Hagen, page 162, G. Hagen, page 163, G. Hagen, page 164, G. Hagen, page 165, G. Hagen, page 166, G. Hagen, page 167, G. Hagen, page 168, G. Hagen, page 169, G. Hagen, page 170, G. Hagen, page 171, G. Hagen, page 172, G. Hagen, page 173, G. Hagen, page 174, G. Hagen, page 175, G. Hagen, page 176, G. Hagen, page 177, G. Hagen, page 178, G. Hagen, page 179, G. Hagen, page 180, G. Hagen, page 181, G. Hagen, page 182, G. Hagen, page 183, G. Hagen, page 184, G. Hagen, page 185, G. Hagen, page 186, G. Hagen, page 187, G. Hagen, page 188, G. Hagen, page 189, G. Hagen, page 190, G. Hagen, page 191, G. Hagen, page 192, G. Hagen, page 193, G. Hagen, page 194, G. Hagen, page 195, G. Hagen, page 196, G. Hagen, page 197, G. Hagen, page 198, G. Hagen, page 199, G. Hagen, page 200, G. Hagen, page 201, G. Hagen, page 202, G. Hagen, page 203, G. Hagen, page 204, G. Hagen, page 205, G. Hagen, page 206, G. Hagen, page 207, G. Hagen, page 208, G. Hagen, page 209, G. Hagen, page 210, G. Hagen, page 211, G. Hagen, page 212, G. Hagen, page 213, G. Hagen, page 214, G. Hagen, page 215, G. Hagen, page 216, G. Hagen, page 217, G. Hagen, page 218, G. Hagen, page 219, G. Hagen, page 220, G. Hagen, page 221, G. Hagen, page 222, G. Hagen, page 223, G. Hagen, page 224, G. Hagen, page 225, G. Hagen, page 226, G. Hagen, page 227, G. Hagen, page 228, G. Hagen, page 229, G. Hagen, page 230, G. Hagen, page 231, G. Hagen, page 232, G. Hagen, page 233, G. Hagen, page 234, G. Hagen, page 235, G. Hagen, page 236, G. Hagen, page 237, G. Hagen, page 238, G. Hagen, page 239, G. Hagen, page 240, G. Hagen, page 241, G. Hagen, page 242, G. Hagen, page 243, G. Hagen, page 244, G. Hagen, page 245, G. Hagen, page 246, G. Hagen, page 247, G. Hagen, page 248, G. Hagen, page 249, G. Hagen, page 250, G. Hagen, page 251, G. Hagen, page 252, G. Hagen, page 253, G. Hagen, page 254, G. Hagen, page 255, G. Hagen, page 256, G. Hagen, page 257, G. Hagen, page 258, G. Hagen, page 259, G. Hagen, page 260, G. Hagen, page 261, G. Hagen, page 262, G. Hagen, page 263, G. Hagen, page 264, G. Hagen, page 265, G. Hagen, page 266, G. Hagen, page 267, G. Hagen, page 268, G. Hagen, page 269, G. Hagen, page 270, G. Hagen, page 271, G. Hagen, page 272, G. Hagen, page 273, G. Hagen, page 274, G. Hagen, page 275, G. Hagen, page 276, G. Hagen, page 277, G. Hagen, page 278, G. Hagen, page 279, G. Hagen, page 280, G. Hagen, page 281, G. Hagen, page 282, G. Hagen, page 283, G. Hagen, page 284, G. Hagen, page 285, G. Hagen, page 286, G. Hagen, page 287, G. Hagen, page 288, G. Hagen, page 289, G. Hagen, page 290, G. Hagen, page 291, G. Hagen, page 292, G. Hagen, page 293, G. Hagen, page 294, G. Hagen, page 295, G. Hagen, page 296, G. Hagen, page 297, G. Hagen, page 298, G. Hagen, page 299, G. Hagen, page 300, G. Hagen, page 301, G. Hagen, page 302, G. Hagen, page 303, G. Hagen, page 304, G. Hagen, page 305, G. Hagen, page 306, G. Hagen, page 307, G. Hagen, page 308, G. Hagen, page 309, G. Hagen, page 310, G. Hagen, page 311, G. Hagen, page 312, G. Hagen, page 313, G. Hagen, page 314, G. Hagen, page 315, G. Hagen, page 316, G. Hagen, page 317, G. Hagen, page 318, G. Hagen, page 319, G. Hagen, page 320, G. Hagen, page 321, G. Hagen, page 322, G. Hagen, page 323, G. Hagen, page 324, G. Hagen, page 325, G. Hagen, page 326, G. Hagen, page 327, G. Hagen, page 328, G. Hagen, page 329, G. Hagen, page 330, G. Hagen, page 331, G. Hagen, page 332, G. Hagen, page 333, G. Hagen, page 334, G. Hagen, page 335, G. Hagen, page 336, G. Hagen, page 337, G. Hagen, page 338, G. Hagen, page 339, G. Hagen, page 340, G. Hagen, page 341, G. Hagen, page 342, G. Hagen, page 343, G. Hagen, page 344, G. Hagen, page 345, G. Hagen, page 346, G. Hagen, page 347, G. Hagen, page 348, G. Hagen, page 349, G. Hagen, page 350, G. Hagen, page 351, G. Hagen, page 352, G. Hagen, page 353, G. Hagen, page 354, G. Hagen, page 355, G. Hagen, page 356, G. Hagen, page 357, G. Hagen, page 358, G. Hagen, page 359, G. Hagen, page 360, G. Hagen, page 361, G. Hagen, page 362, G. Hagen, page 363, G. Hagen, page 364, G. Hagen, page 365, G. Hagen, page 366, G. Hagen, page 367, G. Hagen, page 368, G. Hagen, page 369, G. Hagen, page 370, G. Hagen, page 371, G. Hagen, page 372, G. Hagen, page 373, G. Hagen, page 374, G. Hagen, page 375, G. Hagen, page 376, G. Hagen, page 377, G. Hagen, page 378, G. Hagen, page 379, G. Hagen, page 380, G. Hagen, page 381, G. Hagen, page 382, G. Hagen, page 383, G. Hagen, page 384, G. Hagen, page 385, G. Hagen, page 386, G. Hagen, page 387, G. Hagen, page 388, G. Hagen, page 389, G. Hagen, page 390, G. Hagen, page 391, G. Hagen, page 392, G. Hagen, page 393, G. Hagen, page 394, G. Hagen, page 395, G. Hagen, page 396, G. Hagen, page 397, G. Hagen, page 398, G. Hagen, page 399, G. Hagen, page 400, G. Hagen, page 401, G. Hagen, page 402, G. Hagen, page 403, G. Hagen, page 404, G. Hagen, page 405, G. Hagen, page 406, G. Hagen, page 407, G. Hagen, page 408, G. Hagen, page 409, G. Hagen, page 410, G. Hagen, page 411, G. Hagen, page 412, G. Hagen, page 413, G. Hagen, page 414, G. Hagen, page 415, G. Hagen, page 416, G. Hagen, page 417, G. Hagen, page 418, G. Hagen, page 419, G. Hagen, page 420, G. Hagen, page 421, G. Hagen, page 422, G. Hagen, page 423, G. Hagen, page 424, G. Hagen, page 425, G. Hagen, page 426, G. Hagen, page 427, G. Hagen, page 428, G. Hagen, page 429, G. Hagen, page 430, G. Hagen, page 431, G. Hagen, page 432, G. Hagen, page 433, G. Hagen, page 434, G. Hagen, page 435, G. Hagen, page 436, G. Hagen, page 437, G. Hagen, page 438, G. Hagen, page 439, G. Hagen, page 440, G. Hagen, page 441, G. Hagen, page 442, G. Hagen, page 443, G. Hagen, page 444, G. Hagen, page 445, G. Hagen, page 446, G. Hagen, page 447, G. Hagen, page 448, G. Hagen, page 449, G. Hagen, page 450, G. Hagen, page 451, G. Hagen, page 452, G. Hagen, page 453, G. Hagen, page 454, G. Hagen, page 455, G. Hagen, page 456, G. Hagen, page 457, G. Hagen, page 458, G. Hagen, page 459, G. Hagen, page 460, G. Hagen, page 461, G. Hagen, page 462, G. Hagen, page 463, G. Hagen, page 464, G. Hagen, page 465, G. Hagen, page 466, G. Hagen, page 467, G. Hagen, page 468, G. Hagen, page 469, G. Hagen, page 470, G. Hagen, page 471, G. Hagen, page 472, G. Hagen, page 473, G. Hagen, page 474, G. Hagen, page 475, G. Hagen, page 476, G. Hagen, page 477, G. Hagen, page 478, G. Hagen, page 479, G. Hagen, page 480, G. Hagen, page 481, G. Hagen, page 482, G. Hagen, page 483, G. Hagen, page 484, G. Hagen, page 485, G. Hagen, page 486, G. Hagen, page 487, G. Hagen, page 488, G. Hagen, page 489, G. Hagen, page 490, G. Hagen, page 491, G. Hagen, page 492, G. Hagen, page 493, G. Hagen, page 494, G. Hagen, page 495, G. Hagen, page 496, G. Hagen, page 497, G. Hagen, page 498, G. Hagen, page 499, G. Hagen, page 500, G. Hagen, page 501, G. Hagen, page 502, G. Hagen, page 503, G. Hagen, page 504, G. Hagen, page 505, G. Hagen, page 506, G. Hagen, page 507, G. Hagen, page 508, G. Hagen, page 509, G. Hagen, page 510, G. Hagen, page 511, G. Hagen, page 512, G. Hagen, page 513, G. Hagen, page 514, G. Hagen, page 515, G. Hagen, page 516, G. Hagen, page 517, G. Hagen, page 518, G. Hagen, page 519, G. Hagen, page 520, G. Hagen, page 521, G. Hagen, page 522, G. Hagen, page 523, G. Hagen, page 524, G. Hagen, page 525, G. Hagen, page 526, G. Hagen, page 527, G. Hagen, page 528, G. Hagen, page 529, G. Hagen, page 530, G. Hagen, page 531, G. Hagen, page 532, G. Hagen, page 533, G. Hagen, page 534, G. Hagen, page 535, G. Hagen, page 536, G. Hagen, page 537, G. Hagen, page 538, G. Hagen, page 539, G. Hagen, page 540, G. Hagen, page 541, G. Hagen, page 542, G. Hagen, page 543, G. Hagen, page 544, G. Hagen, page 545, G. Hagen, page 546, G. Hagen, page 547, G. Hagen, page 548, G. Hagen, page 549, G. Hagen, page 550, G. Hagen, page 551, G. Hagen, page 552, G. Hagen, page 553, G. Hagen, page 554, G. Hagen, page 555, G. Hagen, page 556, G. Hagen, page 557, G. Hagen, page 558, G. Hagen, page 559, G. Hagen, page 560, G. Hagen, page 561, G. Hagen, page 562, G. Hagen, page 563, G. Hagen, page 564, G. Hagen, page 565, G. Hagen, page 566, G. Hagen, page 567, G. Hagen, page 568, G. Hagen, page 569, G. Hagen, page 570, G. Hagen, page 571, G. Hagen, page 572, G. Hagen, page 573, G. Hagen, page 574, G. Hagen, page 575, G. Hagen, page 576, G. Hagen, page 577, G. Hagen, page 578, G. Hagen, page 579, G. Hagen, page 580, G. Hagen, page 581, G. Hagen, page 582, G. Hagen, page 583, G. Hagen, page 584, G. Hagen, page 585, G. Hagen, page 586, G. Hagen, page 587, G. Hagen, page 588, G. Hagen, page 589, G. Hagen, page 590, G. Hagen, page 591, G. Hagen, page 592, G. Hagen, page 593, G. Hagen, page 594, G. Hagen, page 595, G. Hagen, page 596, G. Hagen, page 597, G. Hagen, page 598, G. Hagen, page 599, G. Hagen, page 600, G. Hagen, page 601, G. Hagen, page 602, G. Hagen, page 603, G. Hagen, page 604, G. Hagen, page 605, G. Hagen, page 606, G. Hagen, page 607, G. Hagen, page 608, G. Hagen, page 609, G. Hagen, page 610, G. Hagen, page 611, G. Hagen, page 612, G. Hagen, page 613, G. Hagen, page 614, G. Hagen, page 615, G. Hagen, page 616, G. Hagen, page 617, G. Hagen, page 618, G. Hagen, page 619, G. Hagen, page 620, G. Hagen, page 621, G. Hagen, page 622, G. Hagen, page 623, G. Hagen, page 624, G. Hagen, page 625, G. Hagen, page 626, G. Hagen, page 627, G. Hagen, page 628, G. Hagen, page 629, G. Hagen, page 630, G. Hagen, page 631, G. Hagen, page 632, G. Hagen, page 633, G. Hagen, page 634, G. Hagen, page 635, G. Hagen, page 636, G. Hagen, page 637, G. Hagen, page 638, G. Hagen, page 639, G. Hagen, page 640, G. Hagen, page 641, G. Hagen, page 642, G. Hagen, page 643, G. Hagen, page 644, G. Hagen, page 645, G. Hagen, page 646, G. Hagen, page 647, G. Hagen, page 648, G. Hagen, page 649, G. Hagen, page 650, G. Hagen, page 651, G. Hagen, page 652, G. Hagen, page 653, G. Hagen, page 654, G. Hagen, page 655, G. Hagen, page 656, G. Hagen, page 657, G. Hagen, page 658, G. Hagen, page 659, G. Hagen, page 660, G. Hagen, page 661, G. Hagen, page 662, G. Hagen, page 663, G. Hagen, page 664, G. Hagen, page 665, G. Hagen, page 666, G. Hagen, page 667, G. Hagen, page 668, G. Hagen, page 669, G. Hagen, page 670, G. Hagen, page 671, G. Hagen, page 672, G. Hagen, page 673, G. Hagen, page 674, G. Hagen, page 675, G. Hagen, page 676, G. Hagen, page 677, G. Hagen, page 678, G. Hagen, page 679, G. Hagen, page 680, G. Hagen, page 681, G. Hagen, page 682, G. Hagen, page 683, G. Hagen, page 684, G. Hagen, page 685, G. Hagen, page 686, G. Hagen, page 687, G. Hagen, page 688, G. Hagen, page 689, G. Hagen, page 690, G. Hagen, page 691, G. Hagen, page 692, G. Hagen, page 693, G. Hagen, page 694, G. Hagen, page 695, G. Hagen, page 696, G. Hagen, page 697, G. Hagen, page 698, G. Hagen, page 699, G. Hagen, page 700, G. Hagen, page 701, G. Hagen, page 702, G. Hagen, page 703, G. Hagen, page 704, G. Hagen, page 705, G. Hagen, page 706, G. Hagen, page 707, G. Hagen, page 708, G. Hagen, page 709, G. Hagen, page 710, G. Hagen, page 711, G. Hagen, page 712, G. Hagen, page 713, G. Hagen, page 714, G. Hagen, page 715, G. Hagen, page 716, G. Hagen, page 717, G. Hagen, page 718, G. Hagen, page 719, G. Hagen, page 720, G. Hagen, page 721, G. Hagen, page 722, G. Hagen, page 723, G. Hagen, page 724, G. Hagen, page 725, G. Hagen, page 726, G. Hagen, page 727, G. Hagen, page 728, G. Hagen, page 729, G. Hagen, page 730, G. Hagen, page 731, G. Hagen, page 732, G. Hagen, page 733, G. Hagen, page 734, G. Hagen, page 735, G. Hagen, page 736, G. Hagen, page 737, G. Hagen, page 738, G. Hagen, page 739, G. Hagen, page 740, G. Hagen, page 741, G. Hagen, page 742, G. Hagen, page 743, G. Hagen, page 744, G. Hagen, page 745, G. Hagen, page 746, G. Hagen, page 747, G. Hagen, page 748, G. Hagen, page 749, G. Hagen, page 750, G. Hagen, page 751, G. Hagen, page 752, G. Hagen, page 753, G. Hagen, page 754, G. Hagen, page 755, G. Hagen, page 756, G. Hagen, page 757, G. Hagen, page 758, G. Hagen, page 759, G. Hagen, page 760, G. Hagen, page 761, G. Hagen, page 762, G. Hagen, page 763, G. Hagen, page 764, G. Hagen, page 765, G. Hagen, page 766, G. Hagen, page 767, G. Hagen, page 768, G. Hagen, page 769, G. Hagen, page 770, G. Hagen, page 771, G. Hagen, page 772, G. Hagen, page 773, G. Hagen, page 774, G. Hagen, page 775, G. Hagen, page 776, G. Hagen, page 777, G. Hagen, page 778, G. Hagen, page 779, G. Hagen, page 780, G. Hagen, page 781, G. Hagen, page 782, G. Hagen, page 783, G. Hagen, page 784, G. Hagen, page 785, G. Hagen, page 786, G. Hagen, page 787, G. Hagen, page 788, G. Hagen, page 789, G. Hagen, page 790, G. Hagen, page 791, G. Hagen, page 792, G. Hagen, page 793, G. Hagen, page 794, G. Hagen, page 795, G. Hagen, page 796, G. Hagen, page 797, G. Hagen, page 798, G. Hagen, page 799, G. Hagen, page 800, G. Hagen, page 801, G. Hagen, page 802, G. Hagen, page 803, G. Hagen, page 804, G. Hagen, page 805, G. Hagen, page 806, G. Hagen, page 807, G. Hagen, page 808, G. Hagen, page 809, G. Hagen, page 810, G. Hagen, page 811, G. Hagen, page 812, G. Hagen, page 813, G. Hagen, page 814, G. Hagen, page 815, G. Hagen, page 816, G. Hagen, page 817, G. Hagen, page 818, G. Hagen, page 819, G. Hagen, page 820, G. Hagen, page 821, G. Hagen, page 822, G. Hagen, page 823, G. Hagen, page 824, G. Hagen, page 825, G. Hagen, page 826, G. Hagen, page 827, G. Hagen, page 828, G. Hagen, page 829, G. Hagen, page 830, G. Hagen, page 831, G. Hagen, page 832, G. Hagen, page 833, G. Hagen, page 834, G. Hagen, page 835, G. Hagen, page 836, G. Hagen, page 837, G. Hagen, page 838, G. Hagen, page 839, G. Hagen, page 840, G. Hagen, page 841, G. Hagen, page 842, G. Hagen, page 843, G. Hagen, page 844, G. Hagen, page 845, G. Hagen, page 846, G. Hagen, page 847, G. Hagen, page 848, G. Hagen, page 849, G. Hagen, page 850, G. Hagen, page 851, G. Hagen, page 852, G. Hagen, page 853, G. Hagen, page 854, G. Hagen, page 855, G. Hagen, page 856, G. Hagen, page 857, G. Hagen, page 858, G. Hagen, page 859, G. Hagen, page 860, G. Hagen, page 861, G. Hagen, page 862, G. Hagen, page 863, G. Hagen, page 864, G. Hagen, page 865, G. Hagen, page 866, G. Hagen, page 867, G. Hagen, page 868, G. Hagen, page 869, G. Hagen, page 870, G. Hagen, page 871, G. Hagen, page 872, G. Hagen, page 873, G. Hagen, page 8



LAST WORD

By Terry Runkle

● I want to do all
the old-people things
I see on TV.
I want to be set in my ways.
I want to repeat
myself a lot. Old age
is wasted
on the elderly. ●

The bouncer at the door cracks his knuckles one more time.

"Look, squirt, you're holding up the line. You gotta show me some proper I.D. or do I hafta age you with my knuckles?"

Bud Carter sighs as he digs for his wallet one more time. He produces a yellowed document flowered with a dozen overlapping government seals, with a rotogravure photograph. The photo, though faded and cracked over the decades, is the mirror image of Carter's boyish face.

"What the hell is this supposed to be?" the bouncer bellows.

"It's a draft card, son," Carter replies. "Don't you boys have any respect for a veteran around this joint?"

The bouncer, who's never seen a draft card in his life, examines the card carefully, frowning his eyebrows.

"It don't say nothing about Vietnam here," he says.

Bud rolls his eyes and prepares for the inevitable. "That's because it's from the Spanish-American War, you idiot." Carter is shot-pur a record 32 feet out of the bar. As he dusts himself off, he gathers up the other I.D.'s the bouncer accepted—his autogyro pilot's license, his passenger-pigeon hunting permit, and a miner's permit from the territory of New Mexico. It's been another rough day for Bud Carter, the world's only immortal man.

Carter is at the corner of a legal battle that has been raging in courtrooms for the last decade. In a world where everyone else is exercising and dieting to stay young, Bud has been fighting to have himself surgically aged.

He catches up with him on the streets of Chicago, where he takes his daily walks just like old people do. "When I first realized I was immortal, it seemed like the greatest thing in the world," Carter says. "But I've been nineteen for one hundred four years now, and it's really starting to wear thin. You try living for a century with a major aortic problem."

No one is actually sure why Carter's body has stopped aging. Some believe it's a malfunction of his central nervous system—the result of having been struck in the head by lightning during a John Philip Sousa concert. Carter still refers to his story that he is immortal because he starts each day with a good breakfast, which includes a heaping bowlful of fruit-flavored Sugar Flavored Flakes. Most experts, however, believe the latter claim stems from a lucrative endorsement deal he signed with Kellogg in 1957.

Whatever the cause of his eternal youth, a team of doctors at the University of California in Corona del Mar believes that by surgically stimulating the pituitary gland into releasing various hormones they can accelerate Carter to his natural age of one hundred twenty-three years.

Even though I'm physically only a

teenager, I long for the comfort of old age," Carter claims. "I want to do all the old-people things I see on TV, like sitting on the porch drinking old-fashioned lemonade or yelling at the neighborhood kids when they walk on my lawn. I want to be set in my ways. I want to repeat myself a lot."

"Old age," he sighs, "is wasted on the elderly."

But what about the joys of youth?

"Joys of youth!" he says like the cantankerous geezer he wishes he were. "Remember how much you hated being annoyed? The pressure is just incredible! Every time a trendy new fashion comes along, you have to buy it. Every time there's a new dance step, you have to learn it. You have to learn every catchphrase that comes down the pike and then forget it two weeks later. I still don't know what Twenty-three sidewalk means."

Scientists had hoped we could learn more from his century of knowledge. But Carter claims there isn't anything to learn.

Sure. It's a vast storehouse of knowl-edge," he humbly admits, gesturing with a pipe he recovered from Teddy Roosevelt during the war. "But most of it is the kind of stuff that matters only when you're a teenager. You could find most of it in back issues of *Tiger Beat*. All I have to show for my century on this planet is a dozen closets full of out-of-date clothes and a girlfriend who wears a w-w-w T-shirt! But did I tell you the secret of eternal life? To start each day with a big big bowl of my fruit-flavored flakes."

Carter cocks his head and delivers the message he has delivered to millions of children each Saturday morning for decades. "They're huuuuuuuuuuuuuu SUGAR!" A couple of passersby recognize him and ask for autographs. Then we continue our walk.

As Carter prepares for next month's surgery, which will fulfil his lifelong dream of becoming a doddering, infirm geezer, I have to ask him if there was anything he enjoyed about being eternally young. He pauses on the curb and smiles to himself, his face glowing with fond memories. We start to cross the street.

"I always had a great love life," Carter admits, "because at a young age I learned the ultimate pick-up line. In over a century of dates, it hasn't failed me. It's probably the most significant knowledge I can pass on to you." He pauses for effect and arches his eyebrows. "Just look into her eyes and say:

"Carter's voice is cut off by the horn of a taxi. There's a flash of yellow, a thud, and a limp body lies on the road. As I run toward him, I can see his body neither old and age like a movie vampire. Bud Carter, one hundred twenty-three years old, is dead at last. **DD**

Every Adult Has Seen *Autograph* Since the Age of the Phonograph