

TOP 10 SCIENCE FRAUDS OF ALL TIME

ONLINE

**RIGHT TO
LIFE = RIGHT
TO DEATH
(FOR ALL OF US)**

**HARVEST OF
HOPE: SUE
FOR COCAINE**

**SCIENCE
CONTROVERSY:
MOLECULAR
MEMORY**

**ISAAC ASIMOV
REMEMBERED**



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We are what we eat, suggests artist Bruce Jensen (from *Allen Tongue* by Steven Leigh, a Byron Preiss-Bantam Spectra book), who illustrates how we have literally absorbed the technology that allows us to record and transmit every imaginable sound. (Art and photo credits, page 87)

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FIRST WORD

BACK TO THE BAT CAVE

An ingenious snare to lure our kids into science

By Fred Chappell

The Bat Cave was an intriguing place. There the Dynamic Duo took a break from bopping bad guys while they studied clues that would lead them to bop more of them. Their gloomy and mysterious hide-out was filled with marvelous arcane scientific equipment.

"Robin, now that we've activated the neurons in this sample, the spectrometer will tell us if the slug matches the one we found at the crime scene."

"Right, Batman! The spectrometer counts the gamma rays the alloy emits!"

They were not only tough, mettlesome, and acrobatic, they were smart and scientifically knowledgeable. It was obvious that when they were not battling the Joker, they were reading the latest technical journals and conducting experiments. A lot of kids want-

ed to be like Batman and Robin: caped crusaders who were also wizard scientists.

These years we hear every day that American education lags behind that of the other developed nations, particularly in science. We hear that there is a need to attract young people to scientific studies. They seem to be turned off, not finding science interesting. Might it not help to bring back the allurements to science the Bat Cave offered?

That's why I'd propose creation of a new group of superheroes. Perhaps they could be called something like The Science Squadron and maybe they could all be buddies, in the manner of the Justice League of America. Their mission would be the same as those of superheroes everywhere—to put the bad guys behind bars. But their methods would lean more heavily on scientific education than on slashing right uppercuts.

The members of the Science Squadron—all eight of them, or maybe a dozen—would be drawn from both genders as well as from different ethnic and socioeconomic backgrounds and age groups. The youngsters who would be following their exploits need a broad range of personalities to identify with. The Squadron also should represent a spectrum of scientific disciplines: astronomy, zoology, Newtonian physics, particle physics, chemistry, biochemistry, botany, photography, and so forth, including mathematics most emphatically.

These heroes would inhabit their own comic book, of course, and a Saturday-morning-TV cartoon show. But they would also be found in other places: not only in computer games but in learning-program software, not only in textbook illustrations but in school-newspaper comic strips. They

would even visit science classes in person, vivid in Spandex, fit and trim and eager to explain by what scientific principles they found evidence to bring The Crowler to justice, as well as Toxic Warran and the Red Claw.

The actors who take the roles of Science Squadron members to grammar and junior high schools would have to be well prepped, able to explain not only how "The Case of the Stolen Dinosaur" was solved through molecular analysis of bicodons but also what electrophoresis is and dialysis and ion exchange. Very importantly, these actors must be able to field spontaneous questions from students.

But the Squadron would come not merely to lecture but to enlist student aid in solving crimes. They would provide background for students in "The Case of the Devil Skateboard" and would propose suggestions, but would rely upon the reasoning powers of their young colleagues to solve the case. Later the whole adventure could be told in Science Squadron Comics and the contributions of students acknowledged with prizes and awards.

The notion might not work. As a long-time teacher, I'm used to pedagogical schemes coming in at 15 percent to 85 percent of their planned effectiveness. But at least it is an idea, and if teachers agreed to it and could get the support of groups like the National Science Foundation and Ted Turner Enterprises and the National Education Association, then perhaps it could be tried out. Maybe the Molecule Master, Star Girl, Spekter, Dr. Theorem, and the doughty others could attract young people to the laboratory and to the concepts that lie beyond it. The point is simple. It is fun to be a superhero, but it takes knowledge as well as strength. **DC**

Can we get a new breed of superheroes to work in the service of science education? Here's a suggestion about how to reinstate lagging attention.



FORUM

SOME DIRECTION FOR OUR SCHOOLS

Our politicians' educational priorities are out of touch with students' needs

By Keith Ferrell

Perhaps no crisis more directly affects the direction and future of our society than the crisis in public education. Our schools are deteriorating, good teachers are abandoning the profession in lessening numbers, students perceive little value in the subjects they're taught, officials of other nations openly mock our educational standards and institutions.

And our candidates are largely ignoring the issue.

Education, when it's stressed at all on the campaign trail, is most often mentioned as a means of restoring our industrial competitiveness. Education, then, becomes an aspect of our economy rather than a fundament of our culture. Vocational education, one can imagine, outweighs all other aspects of education in an election year, at least in the candidates' eyes.

What a confusion of priorities! It is as though our elected officials—and those who wish to join their numbers—understand less about economic competi-

tiveness than they do about education, and less about the nature of our nation than about the economy or our schools.

Our economy and our society thrived because our public schools produced graduates who could read and write. But we also thrived because the nature of public school education imparted to many if not most of those students the ability to use reading and writing as means of coping with the world, not simply of filling out job applications or unemployment forms. Literacy was viewed as a right, essential to functioning in a democracy. If you were illiterate, you could not only cope with the world around you—even manage to prosper—but you could also reach out to the larger world, drawing on its resources to further enhance your understanding of its nature, its delights, its challenges.

Literacy was a tool rather than a skill. There's an advantage here. Tools can be continually sharpened and reused. Skills grow outmoded.

Through reading, one could approach history, learn from great writers and thinkers, find entertainment and diversion, navigate through an often confusing world. Encounters with history, with science, with other cultures, with critics of one's own culture, all were made possible for those who learned to use reading as a tool rather than as a limited skill.

Writing, as it was once taught, was also a tool. In public schools, generations of students learned that the parts of a sentence combine to make a thought, and that a written thought can itself be a powerful tool for advancement, for change, for analysis.

Naturally adjunctive to this approach was the ability to fill out forms, read applications

Nor should our educational past be over-romanticized. There were problems, injustices, oversights, prejudices, slights. Which is to say that our educational process was a living thing. That might be more than we could say for it today.

Consider an alternative. Suppose we return to the idea of education for the sake of social well-being rather than economic health or industrial productivity. What would happen to a candidate who reminded the populace that education for the sake of education serves not only the economy, but also the larger society and its culture? Could one get elected on the strength of a commitment to revamping our educational system so that students are once more provided with lifelong tools rather than occasional skills, with the ability to learn throughout life rather than a limited capacity to function well enough to get by for now?

An approach like that, given teeth and put into action over a generation, would yield social results and economic benefits. We are told constantly of the need to provide citizens with skills that will enable them to compete in the Information Age world, but we only rarely hear suggestions that what are needed are the tools that will enable citizens to turn information into knowledge. The two are quite different, yet when education is discussed in the current political environment, it's information that gets all the attention. Education, knowledge, true learning, receive only the most minimal lip service, if that.

Yet I think a candidate who espoused a real commitment to real education could stand a real chance of winning office. Stronger things have happened, I suppose. It's just not going to happen this election year. **GG**

Give our students the right tools and they will build a future worth living in.



POLITICAL SCIENCE

PROMISES, PROMISES:

What did Bush say? What did he do?

By Tom Dworetzky

The Environmental President has had four years to fulfill his campaign promises. So let's ask the question, "How's he doin'?"

GLOBAL WARMING He said: "Those who think we're powerless to do anything about the greenhouse effect are forgetting about the White House effect. As president, I intend to do something about it."

He did. For the last three years, the Bushman balked at any concrete steps to reduce carbon-dioxide emissions. At the last G-7 summit, the United States refused to join with Europeans who wanted stricter standards on CO₂ emissions.

His answer: more study. Maybe Nano was really fiddling with a spreadsheet while Rome burned. Bush's so-called energy plan would increase CO₂ emissions by 25 percent over 25 years.

THE CLEAN-AIR ACT He said: He'd make it as tough as possible. In 1989, he called the air-pollution threat "a freight train coming down the track."

He did. At the same time, his council on competitiveness strong-armed the EPA and demanded over 100 changes in its Clean Air regulations. The Quayle-led council, for example, would allow companies to increase pollution levels beyond present limits merely by informing state regulators that they were going to do so. The state would then have just a week to object.

WETLANDS He said: "Our national goal should be no net loss of wetlands."

He did. A teeny 1991 redefinition of what constitutes a wetland, and presto—the administration jeopardized 30 million acres of them, an area about the size of New York State. Who needs 'em? The birds for one. Did you know if you screw up a migration



pattern for just a little while, the birds on that flyway disappear?

ENERGY He said: "America must work toward energy independence. We've got to plan for the future now." That was in July 1989.

He did. The Department of Energy budget contained only 4 percent for research on renewables and conservation.

PESTICIDES AND FOOD SAFETY In October 1989, he called for food-safety legislation to protect children and grownups from unsafe levels of pesticide exposure.

He did. Bush's legislation would force some states to weaken their food-safety standards. The bill also leaves in place loopholes allowing U.S. chemical firms to export pesticides banned here as too dangerous—pesticides then used on food shipped back to the United States. In 1990, U.S. chemical firms exported almost 4 million pounds of banned pesticides during a three-month peri-

od. Bush opposed legislation to end this practice.

OCEANS He said: "I am going to stop ocean dumping." (Fall 1988) "We need a president who is going to clean up that ocean. I am that man."

He did. In August 1991, the EPA endorsed a plan to dump up to 250 million cubic yards of dredge disposal 17 miles east of the Chesapeake Bay. In 1989, the administration's mismanagement left the total responsibility for cleaning up the Valdez mess to Exxon. It then allowed Exxon to quit cleanup for the winter in mid-September—although Exxon continued drilling for and shipping Alaskan oil after that time.

TOXIC CLEANUP He said: "We must speed up the cleanup process of toxic waste dumps."

He did. Of 1,075 superfund sites (already laughably underestimating the size of the toxic-dump problem), the number cleaned up "scored" from 37 to 63 during his reign. Plus, corporate polluters are now allowed to determine the scope and pace of their own cleanups. A sweetheart deal.

PLUS: The seasonal antarctic ozone hole is now a record 10 million square miles. After years of stalling, the prez has suddenly found CFC religion after the so-called ozone hole now seems to menace Kennedysport. Now he calls for all deliberate haste in banning the ozone eaters from production. Yet he instructed U.S. delegates to a 1990 international conference on ozone depletion to block a plan to give developing nations \$25 million over three years to assist them in reducing their CFC use.

SO, HOW'S HE DOIN'? Considering the shape the environment's in, I'm glad the Environment President ignored the recession. We couldn't have afforded the Economy President. **DD**

The 1992 Bush budget request calls for slashing conservation and renewable energy research to 2.5 percent.

EARTH

CULTURE SCULPTURE

Preserving images of threatened Amazonian tribes

By Linda Marsa

Felipe Lettensten nimbly alights from the boat which has ferried him to the shores of the Marubo village on the Iuri River, a tributary of the Amazon in Brazil. He greets the curious tribespeople clustered on the edge of the riverbank with the familiarity of a small-town mayor, overcoming their natural suspicions of the white man with his guileless warmth.

The Peruvian-born Swedish sculptor tells the tribe elders he has journeyed hundreds of miles to honor them by creating life-sized statues of them that will endure long after the tribe is extinct. He shows them statues of other tribes he has completed to reassure the natives—most of whom

old cultures of the Americas' indigenous peoples.

The compactly built sculptor and his ten-person crew have traveled thousands of miles throughout the Amazon basin on their dilapidated, double-decker, wooden river boat, a sort of floating studio. Lettensten bought the boat in 1988 for \$16,000 and dubbed it *Inca Pachacutec*, for the fabled Inca king who ruled the Andes at the height of the Inca Empire.

Funded largely out of his own pocket (he even sold his farm near Lima, Peru, to pay for his expeditions), Lettensten has created likenesses of 137 Indians from more than 60 tribes throughout the Americas, primarily in Peru and Brazil. But until recently, his Indiana Jones-style cultural sojourns were dismissed as the pipe dream of an eccentric artist. This is no longer the case. With the celebration of the five-hundredth anniversary of Columbus' arrival in the Americas, the 36-year-old sculptor and his "Sons of Our Land" project has become a Latin American sensation.

Three major exhibitions of his work drew nearly half a million visitors to Lima in the late 1980s. Currently, two dozen of his statues are featured at Eco '90, the international ecological fair in Rio de Janeiro, and a smaller collection is touring the United States. "Felipe is a good artist," says Arturo Jimenez Borja, president of the National Museum of Peru. "But beyond the art itself, his obvious love for the indigenous culture is what is so appealing."

Significantly, 22 of Lettensten's homages to the continent's native tribes are the centerpiece of the America's Pavilion at Expo '92 in Seville, Spain. Columbus' debarkation point to the New World. "In the five hundred years since, we've killed seventy million Indians and made them the poorest

people on the continent," says Lettensten, gesturing with strong, weathered hands. "Columbus is dead—he doesn't need a monument. But the Indians deserve one."

His concern for the plight of primitive peoples borders on passion. "The descendants of the Spanish settlers were taught to despise the Indians," says the artist himself, the son of Swedish industrialists who emigrated to Peru. "But my family admired them. I grew up around them and learned to love them."

Lettensten seems driven to keep some vestige of their dying traditions intact. The artist's elfin face, surrounded by a halo of blonde ringlets, glows with pleasure as he deftly splatters plaster of Paris on the model he has chosen to represent the Marubo tribe. She is an 18-year-old girl who patiently stands holding a large jug over her shoulder. She is encoiled while the plaster hardens (Lettensten threaded strings around her body before applying the plaster to make it easier to remove.) After about ten minutes, the girl is freed, section by section, along the lines formed by the string. The mold will later be reassembled by Lettensten and his assistants in his cavernous Lima studio. There they will construct the statue out of plaster and coat it with a bronze-like finish. "The memory of her comes alive in my house," says Lettensten.

Eventually Lettensten, who is reluctant to sell the statues because he believes it would be a sacrilege to profit from them, would like to travel to Asia, Africa, and the South Pacific to immortalize vanishing tribes living in those regions. "It is a great gift to be able to create something that is eternal," says Lettensten. "This is what I plan to do for the rest of my life." □



Thanks to the works of a Peruvian artist, ancient tribes will be remembered long after they are gone.

are reluctant to even be photographed—that he means them no harm.

It is a scene that has been repeated dozens of times over the past six years in remote Amazon Valley settlements, located with the help of local anthropologists. Lettensten is on a personal crusade to preserve the centuries-

WHEELS

BIG AUDIO DYNAMITE

Better blues, mellow noise, EZ-funk, alternative rock

By Jeffrey Zygmunt



Digital compact cassette should be a big win for motorists because the decks also play today's standard cassettes. People can keep their existing libraries of mobile music.

When the newest version of the Mazda RX-7 sports car arrives this month, it brings an acoustically customized music system. Factoring in ev-

erything that affects sound—the distance between listeners and loudspeakers, the absorptive or reflective characteristics of fabrics and surfaces, shade the car, the size and shape of the interior—engineers tailored a system of amplifiers and speakers to create the best possible audio for the RX-7. The result is concert-hall clarity that can make a car one of the best places for enjoying recorded music and provide escape from the tedium of travel and commuting. "You can hear a triangle in there," says Bose Corporation marketing executive Jack Wilson as he listens to a symphonic score in an Audi 100. Like the RX-7, it has a speaker system designed by Bose. "We're trying to reproduce music in its natural state, as you would hear it in a concert hall," Wilson says.

Baldersdash, once Al Brotsky who began installing car stereos 38 years ago when he founded Al and Ed's AutoSound, now with 24 shops around Los Angeles. To Brotsky, factory-designed audio systems are dictatorial and undemocratic. "Don't tell me how I have to listen to music," he rants. Brotsky is part of the aftermarket, the term for equipment people add after they buy a car. Aftermarket stereo systems are installed and tuned for individual drivers. But the acoustically tailored approach seems to optimize the audio system to each particular car line, meaning that the Bose music system for a Corvette is different from the Bose system for an Acura NSX.

Currently, Bose systems are available mostly on higher-

priced luxury and sports cars. The concept arose ten years ago when Bose teamed up with GM's Delco Electronics to tailor systems for Cadillac. Today the speaker company JBL engineers systems for Ford, Infiniti for Chrysler. Bose systems are built into numerous U.S., European, and Japanese cars.

The speaker question grows more critical as digital music infiltrates automobiles. Compact-disc players are already common. When digital radio arrives in the mid 1990s, it will replace today's interference-prone broadcasts with radio waves that carry



music as strings of computer data. Deciphering the signal much as a CD player reconstructs encoded music, digital car radios will sound as clear as the voices of fellow passengers. Meanwhile, CD inventor Philips louts its digital compact cassette, a tape system that records in digital mode.

Next comes the digital signal processor (DSP) system, designed by Panasonic for the Acura Vigor. DSP lets listeners select six sound modes, mimicking the tonal quality of concert hall, church, jazz club, blues bar. The arena setting presents sports broadcasts with spacious echoes. But digital-music machines stream for something more. "The most critical element in a system

is the loudspeaker because that's what reproduces the sound," Wilson says.

Traditionally, the best speaker systems, coupled with better radios and tape decks, come from the aftermarket. "There are only a few original-equipment systems that, to my ears, sound very good," says Bill Wolfe, editor of Car Stereo Review. On average, \$1,500 buys a high-quality fully installed aftermarket audio setup, though \$600 to \$700 gets "a very good system," he says.

But original-equipment makers are eagerly catching up, spurred on as new luxury cars woo buyers with music. The Infiniti Q45 from Nissan comes with a rich-sounding Bose system. Wolfe says the Nakamichi-designed system in Lexus cars from Toyota, available for about \$2,000, is about as good as any. The bigger challenge may be to make engineered sound affordable for more drivers. That's hard, because acoustically customized design, which can begin when a car is early on the drawing boards, is long and intensive. For the Mercedes-Benz S-series cars, Bose undertook a six-year engineering effort that included the development of a two-inch "centerfill" speaker and a seven-channel electronics package.

Noting that "good music makes sense for everybody," Michael Rosen, director of new products for Bose's original-equipment division, aims to reduce the cost of acoustically customized music systems. "We hope to get more clever so we can bring the enjoyment of music to as many car buyers as we can," he says. Car makers are increasingly interested in music systems as they become more eager to outdo competitors. "I see a lot of customer satisfaction that is astonishing," says Rosen. □

SPACE

THE LAST EXPLORERS

Will the budget axe drop on our invaluable planetary exploration program?

By Brenda Forman

Planetary exploration is the jewel of the U.S. space program—and we are effectively copping out of it. Over the past 30 years, we've mounted increasingly sophisticated missions that have thrilled on-lookers around the world. Fragile spacecraft traveling hundreds of millions of miles through space have beamed back to us the most exciting photographs in history: the tumbled landscape and pink sky of Mars, the tortured surface of Venus, the glorious turbulence of Jupiter, a newly discovered ring around Neptune.

Where now ready to go up against the deepest questions of the ages: Where did life come from? What forces have shaped our planet? And are we alone?

But instead, the meticulous undertaking, beset by incessant budget cuts and funding delays,

phere of Saturn's moon Titan.

But in the budget for fiscal year 1992, Congress put a cap on CRAF-Cassini funding; if the program exceeded that cap, the CRAF portion would have to be dropped. Still worse, the budget request for fiscal year 1993 that President Bush recently sent to Congress included no money at all for CRAF. Thus, CRAF faces cancellation unless Congress decides to appropriate funds for it—an exceedingly unlikely proposition. Sadly, with CRAF gone, Cassini's survival looks uncertain.

Meanwhile, the Magellan spacecraft continues to do dazzling work, mapping the surface of Venus in exquisite detail. This superb spacecraft could easily scan the surface for months or even years to come. But that won't happen—because the Magellan program, having met its goals, runs out

these die or sacrifice crucial content, the best planetary scientists will leave the field. Why waste the best years of your career waiting for a program that the nation won't support?

And yet it is such a bargain! In the past ten years, our planetary spacecraft have explored some 50 new worlds—at a cost of mere pennies per world for each American. The annual budget for planetary exploration runs only about \$450 million—less than 5 percent of NASA's entire budget, which itself pales beside the budgets of most federal agencies.

And irony of ironies, planetary exploration has no heavyweight champion in Congress because it's so cheap! Solar-system probes don't give rise to multimillion-dollar contracts—so nobody goes to bat for them at budget time.

Meanwhile, other countries take solar-system exploration seriously as the magnificent undertaking it is. (Sad but true, our space exploration triumphs receive far more media coverage overseas than here at home.) The European Space Agency has reactivated Giotto, the spacecraft it dispatched to Halley's Comet in 1986 as part of the international "Halley Armada" (the United States dropped out), and sent it on to an unprecedented second rendezvous this time with a comet called Gigg-Skilopus. Similarly, Japan recently sent its first spacecraft to the moon and has turned its attention to preparing a Mars exploration mission.

Americans like to call themselves pioneers, but our country shamefully neglects the truest modern manifestation of the pioneering spirit. Let's not repeat our sad retreat from Apollo's accomplishments. Time, let's value our triumphs as they deserve and carry them forward into a future worthy of their past. **DD**

Bedeviled by budgetary politics, NASA has jeopardized the survival of Cassini, the spacecraft intended to journey to Saturn.



now faces this distressing possibility of stagnation, stalls, or even slow death.

The latest victim is CRAF-Cassini. The designers intended the CRAF (Comet Rendezvous Asteroid Flyby) spacecraft to fly with a comet for two or three years to observe how the comet changes as it approaches the sun. Meanwhile, plans called for the Cassini craft to orbit Saturn for several years and to drop the European Huygens probe into the atmos-

phere of Saturn's moon Titan. But in the budget for fiscal year 1992, Congress put a cap on CRAF-Cassini funding; if the program exceeded that cap, the CRAF portion would have to be dropped. Still worse, the budget request for fiscal year 1993 that President Bush recently sent to Congress included no money at all for CRAF. Thus, CRAF faces cancellation unless Congress decides to appropriate funds for it—an exceedingly unlikely proposition. Sadly, with CRAF gone, Cassini's survival looks uncertain.

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BOOKS

A MARTIAN ODYSSEY:

An all-expense-paid trip to the Red Planet with Ben Bova

By Robert K. J. Kilheffer

The red world and the blue are brothers." Ben Bova declares at the start of *Mars*, his epic near-future novel of space exploration (Bantam, June 1992). Mars is the most nearly Earthlike of all the sun's planets, and it has dominated the human imagination since before the time of Stonehenge. The Red Planet provided in the visions of the early science-fiction writers as well. It was the source of H. G. Wells's invaders, the site of Edgar Rice Burroughs's Barsoomian adventures, and Ray Bradbury's chronicles. Now, amid signs of renewed enthusiasm for a manned mission to Mars, veteran SF writer and former *Grazer* editor Bova offers a detailed, knowledgeable, and wistfully entertaining look at what such a mission might be like.

During the 1960s and 1970s, Mars received less and less attention from science-fiction writers. Paradoxically, the wealth of accumulating new data, which peaked with the 1976 Viking landings, turned writers away. The emerging image of Mars had no baroque cities, no canals, and (most importantly) no Martians—no life at all. There seemed little for the imagination to work with. But lately writers appear to have gotten over the disappointment and are embracing the real Mars as a setting (or a goal). Robert L. Forward in *Martian Rainbow* (Del Rey 1991), S. C. Sykes in *Red Genesis* (Bantam, 1991), and Terry Bisson in *Voyage to the Red Planet* (Warner, 1990). SF grand master Jack Williamson has a Mars novel, *Boschheid*, coming from Tor Books in July. Frederick Pohl's *Mining the Crt*, a now novel about Martian colonization, is due from Del Rey in August, and Kim Stanley Robinson plans a series of three Mars novels, *Red Mars*, *Green Mars*, and *Blue*

Mars, the first of which will appear from Bantam next year. Bova's book may not be the most wildly speculative of these, yet as it is less than 30 years from now, but it is probably the most scientifically accurate.

In terms of narrative structures and techniques, *Mars* is nothing remarkable. Bova handles the first mission to Mars the way James Michener handles the histories of Texas and Hawaii. He uses straightforward language, a host of characters, a wealth of detail, and thinly disguised lectures

he finds in its desert landscapes and huge extinct volcanoes a wonder and beauty that outstrips even Burroughs's *Jantasio* Barsoom. In place of wild adventure, Bova concentrates on the excitement of scientific exploration. In an early scene, the first explorers on the surface find a rock with a mysterious greenish vein—could it be life? The book is bursting with data, from analyses of Mars' atmosphere to speculations on its geothermal history, but Bova never lets his lectures grow boring. Like Robert Heinlein, he manages to slip in important data dumps without ever losing the reader's attention or the thread of the plot.

Despite some anachronistic references to the "Soviet Union," Bova's Mars mission is firmly rooted in the post-Cold War era. The two teams are composed of scientists and astronauts from around the world. Through his characters, Bova addresses the many scientific, political, economic, and social issues a real Mars mission will face: racial and international tensions, budgetary worries, personal ambitions, sexual tensions, heterosexual jealousies. Bova deals with the issues adequately but not in depth, because for Bova, the value and necessity of a Mars mission are beyond question, beyond politics and economics and petty differences. We will go to Mars, says Bova, speaking through Jamie Weikman, "Because we have to. The human race has to. We're explorers. It's what makes us human."

The question Bova leaves to his readers is not if, but when. He has produced an intelligent, entertaining story that may also serve as a rallying cry, spurring us all to pool our resources and get back into space.

"Mars waits for us," says Bova. Let's go. **DC**



to examine his daunting subject. His characters are likable and well drawn: from Jamie Weikman, the half-Navaho protagonist, and Joanna Brumado, the shy but brilliant daughter of the Mars mission's chief spokesman, to the stolid Russian mission commander Mikhail Vosnesensky and Edith Elgin, Jamie's opportunistic newswoman girlfriend.

But, as in Michener's books, the information is the real heart of *Mars*. Bova presents Mars as our best scientific data shows it, and

With a firm foundation in the realities of science and space travel, Bova's book is the most accurate Mars novel ever.

GAMES

THE RULES OF THE GAME:

Exercise your brain with our quiz on sports regulations

By Scott Morris

In this Olympic year, we focus our attention on sports and the ways they change.

In general, new technology is accepted when it can improve performance without giving unfair advantage, decreasing safety or altering the spirit of the game. Occasionally, an advance is deemed too dangerous. For example, skiing outfits made from certain heat- and pressure-beepled synthetic fabrics cut down friction with not only the air but also the snow. A fallen skier wearing one of these suits keeps sliding until he or she hits something. Prohibited in Alpine skiing, these super-slick fabrics can be worn in luge and speed skiing.

Sometimes athletes themselves become so accomplished that they force a change in the sport. In 1964, Uwe Hohn of East Germany set a new world record in the javelin of 343 feet, 10 inches. In many track-and-

only 318 feet, 1 inch.

Our quiz, split into two parts, tests your knowledge of the rules of both Olympic and non-Olympic sports. For each example given below, circle either L (legal) or I (illegal). Questions are listed in alphabetical order by sport. The second half of the quiz will appear in next month's issue.

1. Badminton players use a plastic shuttlecock in tournament play. (L, I)
2. A college baseball player uses an aluminum or plastic bat. (L, I)
3. A bowler scratches his ball with steel wool before a game. (L, I)
4. An Olympic boxer is 38 years old. (L, I)
5. A boxer has a beard. (L, I)
6. An Olympic cyclist wears red pants. (L, I)

Good call: A sport accepts new technology when it elevates

7. A discus thrower hits a 10-mile-per-hour tailwind. (L, I)
8. A figure skater performs all spins clockwise. (L, I)
9. A female figure skater wears a skeleton suit. (L, I)
10. A freestyle Friesbe player wears a thumb on the end of a finger. (L, I)

ANSWERS

1. I. Only feathered bodies may be used in competitive badminton.
2. L. Aluminum bats are legal in amateur and college play but not in the pros. They're lighter and can be swung faster than solid-wood bats—about 4 miles per hour faster, producing a 10-percent increase in the distance of hits, according to one study.
3. L. Abrasives may be used on bowling balls before play begins.
4. I. Olympic boxers may be no younger than 17 and no older than 37. Boxing is the only Olympic sport with a

pedals down.

5. L. Cyclists may fill their bike tires with any gas.
6. L. While the rules of discus gave no allowance for wind speed, a tailwind is a definite disadvantage. By contrast, throwing into a headwind of 16 feet per second can increase the distance of a throw by up to 10 percent because of the disc's aerodynamics.
7. L. However, skaters seldom spin or jump clockwise.
8. L. Ladies may wear sleeveless costumes. However, men must still wear sleeves.
9. I. Friesbe freestylers usually use plastic fingernails attached to their real fingernails with superglue to reduce the friction on a spinning disc. Since the sport's rules consider these prosthetic devices—they're placed on existing parts—they are allowed while the nonprosthetic thumb is not.

REMAINING ANSWERS TO LAST MONTH'S PUZZLES

8. Move only one match to make the horse face another direction.



9. Tails. If you spin a shiny new penny very fast on a smooth, glass surface and let it die down naturally, it will show tails far more often than heads. On a new penny, the edge isn't quite flat. It's tilted slightly toward heads, making the tail side just a bit larger. **OO**



field arenas, a throw like that would come dangerously close to the running track, where a track event would probably be held at the same time. So officials changed the javelin's design in 1986, moving its center of gravity forward so that it can't be thrown as far. Thus, the current record is



performance fairly and safely as the oversized tennis racket does.

7. A cyclist attaches a tether between his chest and the bike's stem. (L, I)
8. A cyclist fills his bike's tires with helium instead of air. (L, I)



- maximum age limit.
5. I. Boxing rules prohibit beards.
6. L. Until the last Olympics, cyclists had to wear black pants and either white socks or no socks.
7. I. The cord transfers leg force away from lifting the cyclist up and instead channels it into pressing the

REQUIEM

ISAAC ASIMOV 1920-1992

ISAAC ASIMOV LOVED CLARITY ABOVE ALL ELSE, SAVE HIS WIFE AND FAMILY. HE SHARED THIS LOVE OF CLEAR THINKING AND CLEAR WRITING WITH HIS READERS AND AUDIENCES FOR MORE THAN HALF A CENTURY.

That, on the occasion of his death, is cause as much for thanks as for sorrow. The great science communicator of our century, which is to say the greatest science communicator of all time, Isaac Asimov did more to serve the cause of rational humanism than any dozen writers or thinkers one could name.

There is a temptation in eulogizing Isaac simply to list his accomplishments. Close to 600 books, awards and honors beyond number, fame and wealth, a delightful home and social life. Along with John W. Campbell, Robert A. Heinlein, and Arthur C. Clarke, he created modern science fiction, and a case can be made that Asimov's influence loomed largest of all. Certainly Asimov saw concepts from his fiction become paradigms in the practical world. The Three Laws of Robotics—Asimov's Laws—are the prime example of this, having made their way from the pages of his fiction into debates over the nature of the robotic and other artificial intelligences we are in the process of building. Asimov's Laws may last as long as his books.

In his fiction, Asimov's ambition was without boundary. He tackled every aspect of the sciences and made his way through most of the humanities as well: Shakespeare, the Bible, quantum mechanics, overpopulation, biography, sex, the return of science fiction, physiology, exploration, the quirks and conundrums of his own personality—Isaac was not only willing to try it all, he did try it all, and succeeded far more often than he failed. Outside of science fiction, his novels and stories have not received the literary attention they deserve, although his lifelong denigration of critics may have prompted Isaac to view critical neglect as a blessing. Nevertheless, there is more of literary substance to his fiction than one might guess from book jackets or reviews. His prose perked readers along effortlessly. His dialogue, in some ways stilted, bore a great deal of the stories' weight. When Isaac's characters spoke, they spoke about something. Ideas flowed among them, propelling the stories along even as they prompted reflection and consideration on the part of the reader. One became a participant in the grand debates that raged among Isaac's creations.

And his characters? Not for Isaac to be known for self-indulgent plumbing of the neurotic soul. His people often displayed neuroses, sure, but they also displayed their ability to reach accommodation with their foibles, even to turn those foibles into assets. Much as one might suppose, their creator had. Isaac's characters displayed feelings, goals, and dreams. Only occasionally can you feel Asimov tugging at their strings. More often than not, they tug at yours. Again, one is tempted toward the catalog: Susan Calvin and her robots, Han Seldon and psychohistory, Lije Baley and R. Daneel Olivaw probing mysteries in a scientific age, Andrew the artificial man who longed to be human. There are more, and they will live forever in the stories that house them.

Asimov stories are often called relentlessly logical, and up to a certain point that's true. But more is present than logic. One story, "The Ugly Little Boy," is undoubtedly as logical and ph-

less in its understanding of history and the forces of nature as any fiction ever written. At the same time, the story is filled with emotion, real emotion, not the histrionics and melodrama that too often pass for emotion in fiction. Read it and weep. The cliché goes, read "The Ugly Little Boy" and try not to.

Of course, the greatest of all of Asimov's characters was Isaac himself. As comfortable on the speaker's desk as behind the writer's keyboard, he constantly shared himself with fans and audiences. Over the last two decades, he shared a growing wisdom about our species, colored by a certain weariness over what we do to ourselves and our world. He was too much the storyteller to sermonize too often, yet the sermons—the teachings—are there in his work, worth your time and everyone's.

Isaac Asimov was, finally, a great writer and important—in many ways, the Dickens of our electronic, scientific, information-oriented age. His work will long outlast his body, or yours, or mine, or even those of the immortal machines he envisioned. The universe of whose multifold wonders he wrote in so many forms and modes seems a dimmer place with Isaac Asimov gone. That's neither logical nor rational, but it's true.—Keith Parnell



STYLE

NATURAL COLLECTION:

Thanks to the ecofashion movement, the human race may not go out of fashion

By Michelle Kearns



Esprit's EcoCollection features buttons from Ecuador's tagua tree and recycled glass from Ghana as natural cotton waists.

Sawdust, metal shavings, disposable diapers, coffee filters, foam rubber—garbage? Nope. Put these common, everyday landfill items together and you make the latest in environmentally correct apparel: hiking shoes.

"We're recycling things that won't biodegrade," says Scott Taylor, vice president of Deja Inc., the Portland-based company responsible for the sporty Deja shoe. "We take the trim waste from disposable diapers, reprocess it into a new yarn, and weave it into shoe fabric." The company, whose footwear debuts nationwide next year, joins a new breed of clothing manufacturers dedicated to the eco-ethic that garments can both look good and protect the planet.

The trend—represented in everything from T-shirts and jeans to top designer collections—couldn't come at a better time. As it turns out, even apparently benign clothing isn't as environmentally as it appears. Take a "100-percent" natural cotton shirt. Most cotton threads begin as

plants nursed with generous doses of pesticides, herbicides, and defoliants. Off the farm, cottons offenses multiply. Threads are typically washed, softened, straightened, bleached, and dyed—processes that pollute.

Organically grown cotton duds present one new planet-protecting option. And some companies are skipping as many traditional manufacturing steps as possible to save water and energy and eliminate chemical waste. The mail-order green giant, Seventh Generation, for example, touts shirts, sweaters and sweats fashioned from unbleached, undyed, and organic cotton.

For earth-friendly color, some eco-clothiers are turning to synthetic "bi-functional" dyes. Higgins Naturalis, for example, uses the dyes to colorize polo shirts, tank-tops, sweaters, and sweats in 20 hues, from moss green to burgundy. The dyes are slightly more expensive than the industry standard (and predictably unpopular), but the dyeing technique reduces the amount of water, energy, and dye waste by fixating the color more completely to fabric.

Mother Nature has also come up with her own color solution: cotton that grows in shades of brown and green. Developed by Sally Fox, who dubs her wares Fashionia, the cotton is now woven into unisex striped T-shirts made by Esprit and in traditionally styled jeans and jackets by Levi Strauss & Co., called Naturals. The caramel-colored fabric feels like suede and doesn't fade over time like most jeans.

As green fashion sensibilities catch on with consumers, fashion experts predict American style itself may change. Bright white summer

wardrobe staples could be the first casualties—most have not only been bleached, but also dyed white. "White stuff looks peculiar to me now," says Katherine Tiddens, owner of Terra Verde Trading Co., an ecological department store.

Even Giorgio Armani now designs pants in unbleached, undyed linen. "It's the beginning of a groundswell," confirms John Kuri, chairman of the menswear department at New York's Fashion Institute of Technology. "There's going to be a retuning of the industry—more vegetable hues, fabric with nuts and acorns, linens."

But eco-style also applies to fashion details. Next season's clothing lines will sport earth-friendly zippers, buttons, and even elastic. Lynda Grossie,



the developer of EcoCollection, Esprit's new environmental line, discovered most suppliers sell ball buckles, zippers, rivets, and buttons made from rust-prone metals. To prevent oxidation, they require electroplating, another polluting process. Esprit's solution: rust-proof copper alloys.

Clothing companies are also finding fashion solutions in the jungle. The tagua tree from the rain forests of Ecuador produces an alternative to plastic buttons. Demand for the tree's ivory-like nuts, carved and sewn on shirt fronts by manufacturers such as Esprit, Smith & Hawken, and Patagonia, has created a sustainable income for locals.

Eco-fashion details are also found here at home. Recycled inner tubes are now turning up on canvas accessories. As Cameron Trotter of Used Rubber U.S.A. suggests, "Thread marks can be beautiful." **GG**





CONTINUUM

THE ROAD TO RIO

Forging a new environmentally conscious world order. Plus, the bait catfish can't resist, and global warming brings stormy weather

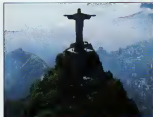
Lester R. Brown, president of the Worldwatch Institute based in Washington, D.C., talks with Steve Lerner about the impact of the United Nations Conference on Environment and Development (UNCED).

Lerner: You have said that the principal message to emerge out of UNCED may be that we can no longer separate the future habitability of the planet from the current distribution of wealth. Brown: There has been an economic gap between the industrial and developing countries for a long time. Up until now, a major rationale for rich nations assisting Third World countries has been the East-West ideological conflict. Providing assistance to Third World countries has been used to get them to line up on one side or the other of the ideological divide. There has also been a certain humanistic rationale for providing assistance to Third World countries. But I think we are moving into a period where the nature of the relationship may change because poor countries now have something that rich countries need: namely, their cooperation in helping to protect the earth's basic life-support systems.

One of the differences between the Rio conference and its predecessor in Stockholm in 1972 is that the Stockholm conference focused largely on industrial pollution of both air and water that was largely seen as a local problem, although even then there were some transboundary issues evolving. The principal issues at Rio will be global warming, the need to protect the earth's remaining biological diversity, and, to a lesser degree, the depletion of the stratospheric ozone layer.

No country can solve these problems alone. These are threats that can be successfully dealt with only by collaborative international action. If, for example, a single developing country of some size were to continue to manufacture and use CFCs, it would eventually deplete the stratospheric ozone layer over the entire planet.

There are many people in poor countries who are trying to survive until the next harvest. And not all of them make it. For them, the stratospheric ozone layer—that



"Christ the Redeemer" looks down upon Rio, host of Earth Summit, June 3-14

they have never seen and don't understand—or the protection of biological diversity, or the stabilization of climate, are rather remote problems. These issues don't have anything to do with surviving the next several months. These circumstances, in effect, define the challenge. The question is: How do you create a situation in which people who are preoccupied with short-term survival needs can begin to think about the long term?

Finding a solution to this issue will require new thinking at the international level. It will require a focus on

satisfaction of basic human needs, creating conditions that will lead to population stabilization, which in turn will mean raising education levels, improving health care, and providing opportunities for women other than child bearing. It will also require some new thinking about working together to ensure the future habitability of the planet.

Lerner: What will distinguish the Rio conference from those that have gone before? Brown: I see the Rio conference as the event that will officially mark the transition from the old era, which was one dominated by the East-West ideological conflict, to a new era that will be dominated by the need for ecological sustainability—the need to build an environmentally sustainable global economy. This effort inevitably brings together the two great issues of our time: namely, poverty and environment. And it brings them together in a way that they have not been brought together before except in a conceptual sense. Many people have recognized the environment/poverty link. But these two issues have not officially been linked in the way that I think they will be at Earth Summit. The Rio conference, I believe, will underline the extent to which we all now share a common destiny, something that we may have talked about from time to time in the past but which we have not really faced in a real way.

Excerpt from *Beyond the Earth Summit: Conversations with Advocates of Sustainable Development* by Steve Lerner, Common Knowledge Press, Bolinas, California



CONTINUUM

LET'S SAVE THE PASSENGER, TOO



Driver's-side air bags, shown to help prevent injury during accidents, are standard equipment in

many new cars. But few models offer passenger-side air bags. A simple silicon chip may change that. The device, which costs just a few cents to mass produce, is called a semiconductor bridge (SCB) and was developed by engineers at Sandia National Laboratories in Albuquerque, New Mexico.

Currently, a hot-wire system heated by electric current triggers a driver's-side air bag to inflate. It sets off explosive cartridges that

chemical at Sandia. Moreover, it heats in microseconds instead of the milliseconds a hot-wire system requires, and it could be retrofitted into vehicles that now have only driver's-side air bags, according to Bickes.

"It can literally be used anywhere a hot wire is used," he says.—George Nobbis

WRITING LETTERS FOR SPACE

In 1991, Congressional forces canceled Space Station Freedom in subcommittee, jeopardizing the entire manned space program. Fortunately, a vote of the full House of Representatives reversed this decision, prompted in part by a massive grassroots campaign organized by Spacecause. Anti-space forces,

however, have begun mobilizing once again.

Because of the crucial importance of Space Station Freedom to the United States, the following organizations have joined together to sponsor a letter-writing contest: Final Frontier, NASA Tech Briefs, National Space Society, Omni Spacecause, and Spacepac.

If you share their concern over the fate of the space program, please write a letter to your U.S. representatives and U.S. senators expressing your support for the program and, in particular, full funding for Space Station Freedom. The relevant addresses are: Representative (name), Washington, DC 20515, and Senator (name), Washington, DC 20510.

You may enter letters of 200 words or less into the

contest by sending a copy of the letter and your name, address, age, and phone number to Spacecause by October 15, 1992. The winner in the children's category (ages under 17) will receive a week-long session at the U.S. Space Camp in Huntsville, Alabama; the adult winner will receive a three-day stay. The prizes do not include transportation. Also, all of the sponsoring organizations, including Omni, will publish the one letter judged best overall.

If you want to learn about other opportunities to take effective action in support of the space program, send Spacecause a contribution of \$10 or more. You will be added to Spacecause's mailing list for two years.

Send contest entries and/or contributions to Mark

THE WATER-LIVING PLANKTON COCCOOTHOPHORA: IS SO SMALL THAT 500 OF THE PLANTS COULD FIT ON THE HEAD OF A PIN.

produce a heated gas, which enters the air bag and ignites a propellant that, in turn, releases a burst of nitrogen to inflate the bag. This process draws a substantial amount of energy from the battery, and additional air bags would require much larger inflation systems. But the SCB requires one-tenth of the energy of a hot-wire system and is one-hundredth its size, says Robert W. Bickes, Jr., a physical



Did comets bring life to Earth?

LETHAL LIFE

A chemist at the University of Illinois at Chicago proposes that hydrogen cyanide, which is lethal to humans, and water—two of the most common molecules in the universe—may have triggered the molecular chains that started life on Earth.

Liquid hydrogen cyanide, when exposed to a

base such as ammonia, polymerizes and turns black, much like the dark matter found on the asteroids and comets, according to Clifford Matthews. Since some of the problem exclusively present when life began on Earth can be derived from hydrogen cyanide polymers and water these molecules could have been carried to the early Earth by the comets and asteroids that slammed into the young planet, thus helping to create life, Matthews says.

"Actually, this theory could not have been thought of until recently," Matthews says. "Now it's possible, thanks to the spectral data brought back from Halley's Comet missions [which

detected hydrogen cyanide and its separate components] and advanced ground-based telescopes analyzing the surfaces of asteroids."

If Matthews is correct, hydrogen cyanide polymers could also explain the presence of much of the dark matter in today's solar system, such as the dark hemisphere of Saturn's satellite Iapetus. But for now, he and other scientists continue to search for more evidence of hydrogen cyanide polymers. "It's amazing to think that something that can kill us may have been responsible for bringing life to the earth," he says.

—Patricia Barrow-Sweeney

WALKING TALL— AND COOL



Coolman our upright ancestor

How come humans ended up walking on two legs? Because they found it cooler that way, says a British researcher.

On the African savanna about 4 million years ago, our ancestors found that walking upright exposed less skin to direct sunshine and enabled cooler air to circulate more freely over their upper-body regions, according to Peter Wheeler,

director of biological and earth sciences at Liverpool Polytechnic University.

In the past, other scholars proposed that bipedalism evolved because it allowed humans to look over tall grasses or lift their hands free for carrying babies or wielding tools. But Wheeler's theory concentrates on "the single most stressful feature of the environment at the time—the strong solar radiation and the lack of drinking water," he says.

Using a calculation based on a model of an Australopithecine, the ape-like creature that evolved into early hominids, Wheeler found that walking upright would have been a much cooler mode of locomotion, requiring less drinking water than the traditional knuckle-

walking. "I estimated that a knuckle-walker would have needed about 2.5 liters of water a day, a biped about 1.5 liters," he says.

By walking upright, early Australopithecines could also wonder greater distances to collect food in the intense heat of the day. It became advantageous for them to lose the thick fur of ancestral apes, which protected against direct solar radiation but prevented heat loss from the skin. Wheeler believes his theory thus explains why humans are the only naked apes. Further, the cooling effect of walking upright allowed humans to become taller and thinner and for their brains—sensitive to overheating—to increase in size.

—Ivor Smithe

a mission-oriented project it's a demonstration of technical capability," says Hughes spokesman H. D. Watkins.

More tests will be run this year at the White Sands, New Mexico, missile range. The missile's developers still must prove that a collision between a well-armed LEAP moving at five to seven kilometers per second and

**BOYS ARE MORE THAN
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OR NEARSIGHTED**

**THE TERMINAL VELOCITY
OF A RAINDROP IS 30
FEET PER SECOND, OR 22
MILES PER HOUR**

Hopkins, President, Spacecausa, Department A, 3435 Ocean Park Boulevard, Suite 201-S, Santa Monica, California 90405

THE LITTLE MISSILE THAT COULD

What good is a minuscule missile without a warhead? Plenty, according to the Missile Systems Group of Hughes Aircraft in Canoga Park, California. Researchers there have developed a miniature missile, slightly larger than a coffee can, that uses kinetic energy instead of an explosive warhead to destroy its target.

The 12-pound rocket, called LEAP for Lightweight Exo-Atmospheric Projectile, uses eight tiny air-mounted

thrusters to control its movements in space. The thrusters expel high-speed bursts of warmed hydrazine gas, steering the projectile under the direction of an onboard computer that distributes the gas to the appropriate thrusters. In tests last summer at Edwards Air Force Base, the thrusters, less than an inch long and weighing barely three grams each, fired more than 1,200 times in the seven-second test, each one generating a pound of thrust in pulses of power that lasted just one-thousandth of a second. They kept LEAP oriented ten feet above the ground while an infrared optical scanner and the onboard computer successfully tracked a simulated target.

Able to be launched either from the ground or from orbit, the missile is a byproduct of research for the Star Wars defense system. "This is not

an incoming rocket going slightly faster would produce enough kinetic energy to destroy the attacker without explosives—George Nizobe



This LEAP is no gun, but it'll have an impact on missile technology



CONTINUUM



(Are you sure it's where you don't?

THE INCREDIBLE SHRINKING PENIS

As the world gets smaller, the Diagnostic and Statistical Manual of the American Psychiatric Association, a delineator of all psychiatric maladies, must get larger to accommodate culture-specific syndromes, according to psychiatrist Allen Gaw. One such disorder that the Boston-based Gaw wants to see in the next edition is called *koro*. Victims believe that their genitals, particularly the penis, are shrinking and that once retraction is complete, they will die.

Koro primarily strikes Chinese and Southeast Asians, according to Gaw.

It tends to occur in epidemics like the one that swept through Hainan Island, China, in 1984 and 1985, affecting some 2,000 men. Rumors had spread that spirits, who in folk belief inhabit or possess individuals, were stealing penises from the living. Gaw cites phobias of men and women—sing or clompe—or even their friends—to hold on to their supposedly retracting genitals.

Koro should be included in the American Psychiatric Association's Diagnostic and Statistical Manual "so it can be compatible with the organization's acknowledgment of cultural influences on certain psychiatric illnesses," Gaw says. In addition, the syndrome is for the most part unrecognized in the United States, even though Asian refugees, immigrant, and tourist populations are rising. "and we are seeing a few cases," he says.

—Paul McCarthy

STORM WARNING

The global-warming phenomenon just keeps coming up with one surprise after another. Researchers have already warned that it will probably create higher tides, flooding coastal areas. Now scientists at Woods Hole Oceanographic Institution predict that warmer ocean temperatures may dramatically increase the number and severity of hurricanes and typhoons that hit coastal cities in North America and the Far East.

THE OCEANS HAVE ENOUGH SALT TO COVER THE CONTINENTS WITH A BLANKET 500 FEET THICK.

Hurricanes begin as unstable weather systems in the eastern portion of the mid-Atlantic Ocean and intensify as they move west toward the Gulf of Mexico. (Typhoons begin in the eastern Pacific Ocean and move toward the China

CAFFEINE MAKES ITS WAY TO THE BRAIN ABOUT 30 MINUTES AFTER IT'S INGESTED AND CONTINUES TO STIMULATE THE NERVOUS SYSTEM FOR UP TO EIGHT HOURS AFTERWARD.

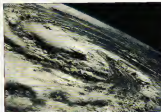
seas.) Warm pools of tropical ocean water fuel the escalating storms, creating large pressure gradients that whip up high winds. The warmer the water, the greater the likelihood that a storm will intensify to hurricane strength. And if the greenhouse effect bakes the planet, the bend of hot water between the Tropic of Cancer and the Tropic of Capricorn will heat up further, turning more storms into more hurricanes of more violent strength.

The characteristic path of hurricanes may change as well. In the north Atlantic, hurricanes typically hit the West Indies or Florida and then veer north to wreak havoc along the Carolina coasts. But as the pools of hot water widen latitudinally

due to ocean warming, hurricanes may track further north more frequently, threatening cities like New York and Washington, DC, which seldom see the powerful storms.

An increase in hurricanes certainly won't be the only result of global warming. The phenomenon may melt the polar ice caps as predicted, raising the sea level at coastal areas, but the change will occur slowly, giving urban planners time to construct dikes and other structures. "In the short term, there is a much greater potential for damage from an increasing incidence of hurricanes," says Woods Hole senior scientist David Aubrey. "They're just hard to defend against."

—Mark Pacheco



Global warming means more—and more violent—storms



CONTINUUM

AN IRRESISTIBLE LURE



The fisherman's dream has finally

come true. Modern science has developed a substance that drives catfish into a feeding frenzy. Even a minuscule amount of the formula—called Gotta Bito—will have catfish crawling all over one another to clomp the baited hook.

Gotta Bito resulted from 15 years of research on the basic physiology of taste and smell. Physiologist John Caprio of Louisiana State University used catfish for his research because they're "swimming tongues—they have taste buds all over their bodies," he says. While experimenting with different combinations of the amino acids that trigger both taste and smell responses in catfish, Caprio and his colleague Tina Valentinović stumbled on a blend that was hard to drive the fish crazy. Just a few drops in a tank of water had them biting at the aquarium walls and even trying to eat rocks.

Caprio cautions that he and Valentinović haven't tested Gotta Bito's effects on other game fish. "I'm not saying it won't work," he says. "I'm just saying it's not designed for other fish." Still, LSU has applied for two patents on the stuff, and Gotta Bito has sent the fishing industry into a feeding frenzy of its own. "We've been inundated," Caprio says. "Name a sport fishing company, and it's called us." —Bill Lawrence

SNACKING IN YOUR SLEEP

Do you eat like a bird and still gain weight? Believe it or not, you may be eating in your sleep.

Sleep-eating is an unusual but far-from-rare phenomenon, according to Neil Kavey, director of the Sleep Disorders Center at New York's Columbia Presbyterian Medical Center. Kavey recently wired up three people thought to be sleep-eaters in a scientific attempt to show that they would try to eat in their sleep. Sure enough, they did.

Kavey has worked with about 15 sleep-eaters, who, he says, have "a strong preoccupation with food during the day." Typically dieters, they can control themselves while awake, but their compulsion to eat takes over while they sleep. Common sleep-eaters, by contrast, have more of a physiological



BY 1995, 61.4 MILLION WOMEN WILL BE IN THE WORK FORCE, MAKING UP 60 PERCENT OF ITS STRENGTH.

than a psychological need to prow. Kavey says.

Sleep-eaters eat a lot during their nocturnal munching, often devouring bizarre combinations of foods and even raw foods. "And they never clean up," Kavey says.

Treatment includes behav-



To sleep, persistence is chosen.

WELCOME TO MY NIGHTMARE

Do you have a lot of bad dreams? Well, so does almost everybody else.

Research conducted by University of Arizona psychologists James Wood and Richard Bootzin suggests that nightmares occur quite frequently at least among young adults. In addition, nightmares increase during stressful times. And contrary to other reports, the researchers claim that the frequency of these scary dreams does not help to indicate the presence of a psychiatric disorder.

During a 1990 study, Wood and Bootzin asked 220 undergraduates to keep a daily dream log for two weeks. Judging from these records, the average

student has 24 nightmares a year, more than twice as many as previously thought. (In prior analyses, subjects estimated the number of nightmares they had.) Chronically anxious people, it seems, don't have more nightmares than less worried people, but they may be more likely to remember them.

In a 1982 study of 89 students, Wood and Bootzin found that during particularly stressful periods, the probability of having a nightmare doubles. These findings correlate with their analysis of students living in the San Francisco area in the first few weeks following the 1989 earthquake. Those students suffered twice as many nightmares, on average, as their contemporaries in Tucson. However, Wood says, "we still don't know whether people exposed to traumatic stress are more susceptible to nightmares in the long run."

Indeed, many questions about nightmares have yet to be analyzed in a systematic way. "There haven't almost been fewer studies on nightmares than sequels about the ones on Eln Street," Wood says. —Steve Nadia

ioral therapies such as locking the kitchen or refrigerator.

According to Kavey, this is the first study to show that suspected sleep-eaters are indeed waking and eating in their sleep. "Whether it's a separate syndrome or part of

classical sleepwalking, we just don't know."

—Paul McCarthy

"A doctor can bury his mistakes, but an architect can only advise his client to plant vines."

—Frank Lloyd Wright



ARTICLE BY LINDA MARSA

On an early spring afternoon in March 1987, two scientists hunched over a small desk in a hotel room in Frankfurt, Germany—the pair pressured by their governments to end more than two years of bitter battles over who first isolated the AIDS virus. Robert Gallo, one of the National Institutes of Health's most powerful and protected scientists, and Luc Montagnier, a virologist with Paris Pasteur Institute, hammered out a "definitive scientific history" of their stunning achievements.

The account that emerged from the

years of acrimony and the wrenching downfall of Gallo, one of the giants of science and the only scientist ever to win two Albert Lasker awards, perhaps our nation's most prestigious biomedical honor. The battle for scientific supremacy, however, destroyed more than egos. While Gallo and Montagnier were wasting precious time taking potshots at each other across the Atlantic—instead of using their considerable talents to find a cure—this plague was claiming thousands of lives. And on this score, the French

SCIENTIFIC

FRAUD

As mounting scandals shake the public trust, researchers struggle to reconstruct science's shattered reputation.

Hotel-room meeting spawned an agreement between the French and American governments. Montagnier and Gallo would share the credit for the discovery and their governments would jointly patent the rights to the test for detecting the AIDS virus. Officially, the occasion marked the end of a controversy that erupted in 1985 when evidence surfaced that Gallo's AIDS-causing HIV virus was virtually the genetic twin of a virus sent to him in 1983 by Montagnier. The matter rested, however, until 1989 when the Chicago Tribune published a 50,000-word exposé on Robert Gallo that finally provoked federal investigators to probe more deeply into the events in his lab in 1983.

Now one of the more ignominious chapters in the annals of science appears to be grinding to a conclusion. A blue-ribbon scientific panel, set up to monitor an internal NIH investigation of the affair, accused Gallo of "intellectual recklessness of a high degree." The panel members, nominated by the National Academy of Sciences, criticized Gallo for his failure to acknowledge having grown and studied an AIDS virus sent to him by the French. Gallo is also the target of a federal inquiry investigating charges of perjury and patent fraud related to his patent application for the AIDS test.

As *Omni* went to press, the NIH was reportedly ready to clear Gallo of charges of misconduct. The unpublished report addresses—and ultimately rejects—most of the charges against Gallo. The resolution, however, is tainted by

are hardly saints. In 1985, the health officials in France stalled scanning the American test for the AIDS virus to give French scientists a chance to devise their own. In the intervening five months, virtually half the hemophiliacs in France became infected with HIV through the untreated blood supply. The unconscionable act eventually erupted into a national scandal that threatened to topple the Mitterand government.

In the United States, the Robert Gallo debacle is just the latest in a rash of recent scandals that have rocked the scientific community and tarnished its once pristine image. Incidents of sloppy science, misconduct, plagiarism, manipulation or faking of data, and outright criminal behavior have made front-page news with alarming regularity. Even Nobel Laureate David Baltimore's career suffered when he stubbornly refused to admit the possibility that a colleague committed fraud in a scientific paper he co-authored. But the Gallo affair underscores, perhaps more than others, that when scientists go astray, it represents no mere breach of protocol. People's lives are put at stake.

Indeed, these disturbing revelations of wrongdoing by reputable researchers have eroded public confidence, prompted Congressional oversight committees to launch costly investigations, and forced universities and federal agencies to develop more rigorous policing mechanisms to flush out the charlatans. Some worry about the fate of the next generation of scientists. And oth-

ILLUSTRATION BY BRAD HOLLAND

lale of the next generation of scientists. And others question what this means for the future of science, a collaborative enterprise that must be conducted in an atmosphere of trust to thrive. "Honor is integral to the scientific method," says Bernadine Healy, director of the National Institutes of Health. "Without it, science would crumble."

Whether misconduct is more prevalent, however, cannot be documented. The agencies that dispense many of the federal research grants—the National Institutes of Health (NIH), which has a budget of \$8 billion and supports about 100,000 scientists, and the National Science Foundation (NSF), which runs on \$2.6 billion a year—do not keep statistics on fraud. But out of about 18,000 grants the NSF made in 1991, only 52 cases of misconduct were reported to the agency, according to Donald Buzzelli, a staff associate for oversight in the NSF's Office of Inspector General.

But scientists themselves report the actual incidence of misconduct is much higher. In a November 1991 survey of 1,500 scientists conducted by the American Association for the Advancement of Science (AAAS), more than a quarter of respondents said they had witnessed lying, falsifying, or outright theft of research in the past decade. "There's no hard evidence, but my gut feeling is the problem has gotten much worse in the past five years," says Walter Stewart, an NIH staff scientist who's participated in several fraud investigations. "There's been a collapse of the professional consensus that you have to behave correctly. But the consequences of failing to face up to ethical necessities are devastating and profound. Science is about discovering the truth—if dishonesty is condoned in one sphere, it spreads like a disease and infects the whole process."

Of course, charges of cheating, corner cutting, and deception are not new. Many great scientists—Galileo, Mendel, Newton, and Dalton, among them—fudged or concocted data to make their experimental models compelling. They rationalized the arguments of their rivals. But on the whole, science used to resemble the priesthood: individuals were called to the profession, which operated on the honor system. Scientists were, says one Congressional aide, "the white-coated guardians of truth searching after the grail of knowledge."

Researchers chafed at outside intrusions and insisted their self-correcting system of internal checks was enough to catch any miscreants. Peer review panels scrutinize grant applications before any money is awarded. Evidence of

GRAND ILLUSIONS

THE TOP TEN KNOWN OR SUSPECTED SCIENCE FRAUDS



Even history's greats miscondacted science.

1. Galileo Gal-ilar? Galileo Galilei (1564–1642) is considered the founder of the modern scientific method. But he wrote about experiments that were so difficult to reproduce that many doubt he actually conducted them.

2. Star-crossed Science. Compelling evidence indicates Johannes Kepler (1571–1630), the father of modern astronomy, doctored his calculations to bolster his theory that the planets move in elliptical orbits, not in circles, around the sun.

3. A Matter of Some Gravity. Isaac Newton (1642–1727) crunched numbers to make the predictive power of his universal gravitational theory carry more weight. Scientists have since noted he "adjusted" his calculations on the velocity of sound and on the processors of the equinox so they would support his theory.

4. Bad Chemistry. John Dalton, the great nineteenth-century chemist, reported numerous findings from experiments conducted in 1804–1805 that no chemist since has been able to reproduce. Scientists now believe he fudged his data.

5. Mendelian Misconduct. Abbe Gregor Mendel's (1865) experimental results were so perfect that later researchers were convinced he falsified his data, which formed the basis of modern genetics.

6. Fishy Physics. Robert A. Millikan won the Nobel prize in 1923 for measuring the electrical charge of an electron. But scientists later discovered he falsified to report the unfavorable results of related research conducted between 1910 and 1913.

7. Skullduggery. The Piltdown Man is generally considered the greatest scientific hoax of all time. In 1908, a pair of a skull hailed as proof of the missing link between apes and humans was unearthed in an English gravel pit on Piltdown Common, in Sussex. In the 1950s, however, researchers using modern dating techniques revealed the skull was actually an ape jaw with part of a human skull attached that had been stained to appear old.

8. Spurious Superiority. Sir Cyril Burt, a pioneering British psychologist, deliberately made up more than three decades of data, from the mid 1940s until 1966, to back up his bogus theory on the relationship between heredity and intelligence. He claimed human intelligence was 75 percent inherited, thereby reinforcing the British class system.

9. Of Mice and Mendacity. William T. Sumner, a researcher at the Sloan-Kettering Institute for Cancer Research, colored white skin grafts black with a ball-tip pen to fake the results of skin-transparent experiments in mice in the mid Seventies. He was trying to prove that human skin, if maintained in an organ culture for several weeks, becomes universally transplantable without risk of rejection.

10. Heartbreaker. John Darsee, a heart researcher at Emory University in Atlanta and at Harvard in the early 1980s, falsified data that formed the basis for about 100 scientific publications on heart disease. The Darsee case was especially troubling because 47 other researchers co-authored his papers and never caught on to the fraud.

scientific journals send articles submitted for publication to "referees," other experts in the field, to determine the significance and validity of the findings. And once articles are published, researchers attempt to replicate the results to double-check their accuracy.

In isolated instances, such as the cold fusion controversy, the system still appears to work. In March of 1989, the University of Utah announced that two chemists, Martin Fleischmann and Stanley Pons, had harnessed the source of the sun's energy and had produced cold fusion in a test tube of heavy water. Elected chemists and physicists formed teams to confirm these astonishing findings. As the weeks passed, though, the scientists could find no evidence of fusion and concluded the Utah experiment was flawed.

"My guess is when they made their claim, they genuinely believed it. Therefore they were guilty of sloppy science—not fraud," says Robert Park, a professor of physics at the University of Maryland and director of the Washington, DC, office of the American Physical Society. But the chief reason scientists tried to replicate cold fusion is because these experiments could be done on a tabletop with their lunch money.

In today's financially constrained climate, though, researchers rarely repeat each other's work. "Nobody gets funding to do replications, so science is not the self-cleansing apparatus it once was," says Jules Hailum, director of the NIH's Office of Scientific Integrity (OSI). Flawed or even flagrantly spurious science has slipped through these supposedly fail-safe mechanisms.

Deception, by its nature, must be clandestine. So the job of keeping science clean has fallen to whistle blowers. Yet, far from welcoming or supporting whistle blowers, some research institutions treat them shabbily. Sometimes they even drive them out of the profession—raising serious doubts as to whether science can be trusted to govern itself. Something has gone awry. But what?

"This is all about money," argues Robert Bell, an economics professor at Brooklyn College and author of *Spurious Science* (John Wiley), a troubling—and exhaustively researched—indictment of shoddy scientific practices.

Like the Pentagon's defense contractors, the science community has evolved into another patronage system which enriches those at the top. Universities have a vested interest in not finding anyone guilty of fraud. Because if they do, they may have to return the delinquent researcher's grants. When someone blows the whistle, universities set up investigatory panels, which are,

almost inevitably kangaroo courts that cover up abuses.

Indeed, science is big business, and all the awesome advances of the past two decades cost plenty. The electron microscope, ultracentrifuges and gene sequencers that have emerged in the past decade as standard laboratory equipment cost well into five figures. Sophisticated imaging devices, like PET scanners, cost upwards of \$1 million. Laboratories like Baltimore's, where as many as 80 people—graduate students, postdoctoral fellows, technicians, and junior researchers—struggle for space, equipment, attention, and glory, require hundreds of thousands of dollars a year to run.

Unfortunately, this dramatic escalation in costs for equipment and research comes at a time when funding sources are dwindling. Nobel laureate physicist Leon Lederman, the former

Science must
police itself. The future
of research is
intimately linked with the
seriousness
to which we address
the issue
of scientific conduct.

president of the AAAS, conducted a recent survey of researchers at 50 universities. He calculated that 1990 federal funding for scientific research at these institutions was only 20 percent higher than in 1988, while the number of scientists has doubled. Small wonder that the jockeying for grants often looks more like Roller Derby than rivalry among highly educated professionals.

Almost by default, top scientists have been cast in the role of empire builders. They jet to scientific meetings around the world to network with equally eminent colleagues or woo big university donors, while their underlings grind out massive volumes of research and grant proposals to keep the laboratory engines lubricated with money. Rarely do science's superstars conduct the hands-on research that made them famous or monitor the new crop of young scientists or even closely monitor the results of every experiment conducted in their laboratories.

Added to this is the fierce competition to make a key discovery. And prog-

ress up the ranks depends more on the number of papers a scientist has published than on competence. "The game of acquiring a long list of publications is a relatively new development as evidenced by the fact that just two decades ago, the current problems with paper inflation were unthinkable," notes William Broad and Nicholas Wade in *Strayers of the Truth* (Simon and Schuster). "In 1968, James Watson—who won the 1962 Nobel Prize for deciphering the structure of DNA in 1953—had on his curriculum vitae eighteen papers. Today, the bibliography of a candidate facing a similar climb often lists fifty or even one hundred papers."

Yet nature refuses to behave the way researchers would like. Often experiments don't turn out the expected results, so scientists are forced to try a fresh approach—and pray they get more money to keep going.

But the pressures to hit a home run each time tempt scientists to cut corners, to round off numbers so that results appear more impressive, to overlook anomalous findings that would put the data in a less favorable light—or to just cheat. While "most scientists are scrupulously honest and deplore scurrilous behavior," says the NIH's Hasty, they are nevertheless reluctant to inform on others. "They don't rally to alter corrupt situations because they see whistle blowers get burned," says Bell. "They're seen as spoilers who've upset the patronage gravy train."

Like Robert Sprague, Just before Christmas in 1983, the psychology professor and director of the Institute for Research on Human Development at the University of Illinois, made the most agonizing decision of his life. He sent a lengthy letter to the National Institute of Mental Health (NIMH), accusing Stephen Breuning, a former protégé and close friend, of falsifying data.

Breuning, while a psychologist at the University of Pittsburgh, had carried out drug studies on severely retarded children who often mutilated themselves by banging their heads against the wall. These children were calmed with powerful tranquilizers known as neuroleptics. But neuroleptics had an unfortunate side effect: They seemed to cause tardive dyskinesia—involuntary muscle spasms such as flapping arms, or wagging tongues.

Breuning questioned whether these drugs were beneficial. Experiments he conducted between 1980 and 1983 indicated they did more harm than good and that controversial stimulants, including Ritalin, far more effectively controlled the wild, self-destructive behavior

with fewer adverse side effects. Colleagues praised his work, which helped shape public health policy.

But Sprague felt there was something fishy about Breuning's work. There were glaring inconsistencies and his results were just a little too perfect. In the real world, nobody produces 100-percent conversions. Poring over Breuning's data, Sprague realized that his friend had cheated. He was heartback—and outraged.

After he sent his detailed dispatch outlining three separate incidents of fraud to the NIMH, Sprague expected swift action. In fact, the NIMH ordered the University of Pittsburgh to convene a panel to look into one of Sprague's allegations. Breuning consequently confessed to filing research reports containing false statements when he was confronted with the charges.

But Sprague didn't expect that his life would turn into a Franz Kafka novel: that the NIMH would make him the target of a probe or sharply cut his grants. NIMH officials stoutly deny these incidents had any relation to the Breuning case even though the institute had fully funded Sprague the preceding 17 years. Nor did the scientist imagine the gut-wrenching affair would drag on for more than three years before a gleefully slow NIMH panel rendered its final verdict. "Virtually all of Breuning's work was fabricated and that Sprague's work and accusations were beyond reproach," The University of Pittsburgh was forced to return \$163,000 in federal grants and Breuning was subsequently convicted on criminal charges for falsifying medical research.

What happened to Margot O'Toole is even more egregious. In 1986, she worked as a postdoctoral fellow in the MIT laboratory of Theresia Imanishi-Kari. That year, Imanishi-Kari co-authored with MIT's Whitehead Institute's director, David Baltimore, a scientific paper published in the journal *Cell*. The article purported to show that antibodies expressed by one mouse could be made to mimic those of another mouse. O'Toole accidentally came across Imanishi-Kari's laboratory notes and noticed serious discrepancies. "It was obvious from these records that the experiment had not yielded the published results," she says. O'Toole took her concerns to Imanishi-Kari and later reported her suspicions to Baltimore and MIT officials. Baltimore dismissed her claims, calling O'Toole a "disoriented" postdoctoral fellow. Suddenly, O'Toole became a pariah. She lost her position and could not find another one. Finally, she took a job answering phones for her brother's moving company.

CONTINUED ON PAGE 82

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SILK FOR COCAINE

BY AUDREY LIQUINIS

Between the 800-kilometer-long Western Cordillera and the Central Cordillera ranges of the South American Andes lies the Cauca Valley, perhaps one of the world's lushest. The soil here is so rich, it can yield up to five crops a year. Between green mountains and equatorial forests, graceful coffee trees line pastures and hills. One road, the winding and scenic Pan-American Highway, cuts through the valley and connects the major cities of Cali and Popayán; it's on the State Department's list of not-safe-to-travel routes. Guerrillas patrol the hills and protect the farmers who grow the coca leaf.

In the hills, small farmsteads are covered with coca plants. Four times a year, the campesinos harvest the illicit crop and sell the leaves to a middleman who delivers the product to processors in the Amazon Triangle. There is no infrastructure in this part of Colombia—no passable roads to bring produce to market—no electricity to support industry. There are no services—no schools beyond the third grade, no hospitals, not even a doctor. The farmers are impoverished and far removed from commerce. They don't choose to grow coca. They have to.

In parts of the South American Andes, the coca plant predates the Inca Empire. "It's part of the culture of our ancestors," says Cauca farmer Don Victor Narváez. "The practice of chewing was passed down from generation to generation." Like all peasants in the region, Narváez has a third-grade education, but he is the leader of Santa Cruz, a community of 150 families, just as his father



was. "Our farms were not great coca plantations," he says. "We grew coca on small plots for family consumption, chewing the leaf so we could work and cure stomach illness."

Around 1950, roasted coca started turning up for sale in the markets, and by 1964, there was an active black market for leaves sold directly to drug processors. "We gave up chewing our coca and started selling it," Narváez says. The coca black market made the peasant farmer rich—until about 1985. The coca bonanza, however, was a distortion of the culture of the peasant. He knew unbelievable wealth—\$900 a month for coca compared to the average \$60—and a constant market for his crop for a few years. With no electricity in the area, farmers bought appliances to put on display, refrigerators in which they stored their money. Peasants built elaborate

homes, construction work and domestic help created new forms of employment. In those days of plenty, farmers purchased rather than raised food. Champagne, ordered from Bogotá, was regularly shipped into the backlands.

The benefits, however, were short-lived. First, coca prices dropped—despite a consistently high drug market—leaving the Andean farmer more impoverished than he had been before. "The price of the leaf no longer pays for the expense of growing coca," Narváez says. Then the Colombian government began to eradicate the coca plant, sending the army into the valley to burn fields and arrest and imprison the heads of families. Farmers had neglected their other crops, fruits and vegetables; as well as the legal cash crop, coffee. Without coca, the peasants literally starved. Some peasants left the region, migrating to Bogotá to look for work. (In Colombia alone, it is estimated that 300 families abandon their farms daily and move to the cities.) Other Cauca farmers joined the guerrillas after experiencing the ruthless destruction by the Colombian government of the community's source of income. Today the FARC (Fuerzas Armadas Revolucionarias de Colombia) guerrillas control the entire area. "The next trial for our families was the coca habit," says Narváez. "Most of our kids were addicted. The region was on the verge of madness—there was crime, a breakdown of the system, and no one wanted to do anything but grow coca."

In a small section of this drug-war-

Above: A man handles raw silk. Sets in the cocoon (left), the caterpillar turns into a chrysalis and then into a moth.



tern region, however, some of the campesinos are forgoing their coca plants for mulberry trees. Mulberry leaves feed silkworms, which spin cocoons—a high-priced international commodity. Today, 40 families in the west silkworm in coca country. Growing silk not only cuts off drug production, it frees the peasant from dependence on the drug market for his livelihood, allows him to keep his land, and halts the migration to Bogotá slums. By establishing a crop that will effectively deter farmers from planting coca, the silk farmers hope to rejuvenate the twin communities of Santa Cruz and Pan de Azúcar. In fact, they envision the hills of the Cauca Valley covered with mulberry. The project, called *Silk for Life*, is the brainchild of farmer's advocate Patricia Conway. "Farmers earn three times what they get for coca leaves when they produce silk," she says. A silk farmer can make \$300 a month while a coca farmer now makes less than \$100 a month. "The idea of raising cocoons and not cocaine is logical, economical, and just makes sense," she says. "Indeed, the United States sends in arms to suppress and terrorize farmers who raise cocaine." In 1981, the United States sent Colombia \$125.6 million in assistance for narcotics interdiction as well as Green Beret training and military personnel. The 1982 budget allocates \$134.1 million for the drug war in Colombia alone. Needless to say, recently reported a quietly escalating but very real Pentagon drug war—Bush's Andean Initiative—complete with covert operations and involving thousands of American troops and more than a billion dollars a year.

Silk for Life farmers are determined to play a role in the drug crisis which is tearing apart their communities and families. By creating a model silk farm, they hope to prove alternatives to coca exist and that the silk for cocaine swap is economically viable. "Silk is the most profitable of all the crops we've grown," Narvaez says. "It doesn't need expensive fer-

tilizer or elaborate installations like coffee does. The wonderful thing is that each family member gets involved—silk becomes a family business." Because the campesinos no longer engage in an illicit crop, Narvaez says, "they're not afraid they can't have to hide from the police."

Four-thousand-year-old silk farming may be about the most ecologically gentle—"small, green, easy, and clean," Conway says. Mulberry trees are so organic, they actually reclaim damaged land. Because chemicals are poisonous to silkworms, the mulberry can't be chemically fed. In fact, silk farmers must convince neighbors upward not to spray. In this hemisphere, even without its significance as a substitute crop, silk is just good business, Conway adds. "We should see the farmers as co-



Caterpillars use whatever is available—branches, twigs, or plastic disks—to make cocoons.

cellent business partners rather than our enemies, the way Washington portrays them. We should offer them financial assistance and on credit." Instead, officials in Bogotá and in Washington mistrust the peasant and ridicule the idea of growing silk instead of coca. Efforts by farmers to help themselves are dismissed as futile by authorities—ours as well as theirs.

"I have seen Bush's war on drugs bring this country to the brink of civil war," Conway says. "The rural areas of Cauca have been deliberately abandoned by Colombia and are now controlled by the guerrillas." In October of 1980, four thousand campesinos staged a four-day "sit in" on the Pan-American Highway to protest the level of poverty and the lack of human services. When the ar-

my tanks rolled in, farmers lined their own children across the road. "American-supplied tanks stopped just in front of the kids," Conway says. "It was an amazing statement only to ask for justice and justice." The standoff ended when the Colombian government promised to provide a health-care program for the peasants—a promise Colombia never kept.

Wisconsin-born Conway has been a farmer's activist and educator for two decades. She first went to Colombia in 1962 and volunteered as a nurse and health-care officer in the Bogotá slums. There she met Myriam Ramirez who lived with three small children in a cardboard "house." The thing had just blown over. Conway's first assignment: to walk the streets of Bogotá at night collecting discarded cardboard to rebuild Ramirez's home. "It took us six weeks to find the cardboard and rebuild her place," Conway says. Then they added a 5 x 8 structure so Conway could live in the community of farmers.

Myriam was very eloquent about the plight of the farmer in Colombia," Conway says. "She pointed a picture of her native Cauca, farm life and the coca business." When Conway visit-

ed Ramirez's family in the twin communities of Santa Cruz and Pan de Azúcar, she fell in love with the region. A piece of land with coca plants was for sale—\$100. "I bought it to see what else would grow, though it was worth owning just to set up a lounge chair and look out at the mountains." At that point, Ramirez and Conway decided to form a small economic-development community. Determined to find a crop—any crop besides coca—that would grow in the valley, the *Silk for Life* project was born.

It was Bogotá entomologist Rodrigo Torres who told Conway about the developing silk industry in Colombia. In 1979, Colombia's Coffee Growers Federation began to experiment with growing mulberry trees as a way to diversify and employ coffee

farmers in the months when coffee beans aren't harvested. Along with Colombia's National Rehabilitation Plan, the Federation set up a program of technical assistance for sericulture and worked with Coseida, a Colombian-Korean silk venture, to grow silkworms and market cocoons. By 1987, the Coffee Federation had 124 hectares in silk production (1 hectare = 2.4 acres).

Conway and a delegation of farmers from Santa Cruz and Pan de Azúcar traveled five hours by jeep to Timbio, the center of the Coffee Federation's silk production. To the surprise of the farmers, Coffee Federation officials refused to assist them, ostensibly because they were out of geographic range. But a small group of Timbio silk farmers decided to help the Santa Cruz farmers try to produce silk in the middle of coca country. They chose Narváez's farm as the experimental site. "Growing mulberries and harvesting silk usually takes eight months," Conway says. "Without assistance from the Coffee Federation, it took us three years. We experimented. We taught ourselves." Because of the lack of transportation, Silk for Life brought in mulberry sticks in bundles of a hundred at a time until 15,000 plants had been accumulated. Using sticks instead of rooted plants meant it took 13 months to establish

a field. Silk for Life also had to generate the funds to help Narváez buy an extra hectare of land in Santa Cruz and convert an adobe house into a worm house. When the mulberries were ready for harvest, farmer Dona Elvira bought silkworms and transported them by jeep to Santa Cruz on a hot, six-hour trip. Cocoons were first harvested in Santa Cruz in 1990 and sold to Coseida.

The silk-rearing cultures of Asia believe that the quality of silk is contingent upon the quality of life of each silkworm. And each silkworm requires constant care and attention. A new silkworm cycle begins every five weeks when the larvae are ready to feed on mulberry leaves. After gorging for three weeks, the silkworm anchors itself on a cocooning frame and magically casts out the milky-long filament's spins symmetrically around itself. Enclosed now in a cocoon, the silkworm magically transforms into a moth, which emerges, mates, lays eggs and dies. But most farmed cocoons are not allowed to emerge. Baked to kill the pupae, they're then sold to Korean-owned companies in Colombia where the cocoons are unraveled into thread.

Only 80 percent of cocoons farmed are actually used for reeling into thread. The rest are usually destroyed. In 1990, a Chinese delega-

tion living in Timbio told silk farmer Elvira Gómez that these cocoons could be bought back and hand spun into silk yarn. The women began to teach each other how to degum cocoons—seasn, the gluey protein substance produced with the thread, must be removed in boiling water—and spin silk. "Boas and boxes of beautiful hand-spun silk were piling up in the back rooms of the coop," Conway says. "I decided to sell silk in the United States." Conway met Kory Evans, a professional weaver in Milwaukee who was teaching Hmong women to weave as part of a development program affiliated with the Milwaukee Area Technical College. The Hmong are a farming people who fled from Laos and Vietnam, one of the biggest communities in Milwaukee. Evans and Conway joined forces.

Today, the Silk for Life Workshop in Milwaukee imports 150 pounds of Caucho yarn a month, which Hmong women weave into white oparis scarves, placemats, and handbags. The Milwaukee workshop sells its products in their shop and through their own and other catalogs. "Our goal has been to help women who are unemployable in our culture," Evans says. "In addition to the Hmong, other disadvantaged women—single women and ex-offenders—come to the workshop and learn to weave." For these inner-city women, working the looms is more than just a job. Weaving Andean yarn in Milwaukee connects them to Colombian peasant women who are trying to eradicate the coca plant, a problem that directly affects the communities in Milwaukee.

But Silk for Life is also a growing business venture. Last year it created silk-blend fibers—repeated spun silk mixed with Wisconsin wool. In Caucho, 150 women are hand-spinning silk thread in 14 different colors. And the Narváez family—Don Victor and his sons—have taken over silkworm-cultivation efforts in Santa Cruz. With technical assistance and capital from Silk for Life, the farmers have organized themselves into ASSCOCA (Asociación Sericultorale de South of Caucho). The people in the region form groups de amistad—groups of friends who plant or harvest one family farm before they move on to a neighbor's farm. A captain oversees silk production and works out a training and

CONTINUED ON PAGE 32



Silk farmers (above) cultivate mulberries to feed voracious caterpillars. A silkworm (right) spins a cocoon in two or three days.



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THE CASE OF THE GHOST MOLECULES

ARTICLE BY BILL LAWREN

A French immunologist says he has unveiled the mystery of molecular memory, but a team of ghostbusters disputes his claims.

PHOTOGRAPH BY HENNER PREPFI

The apartment, on a quiet cul-de-sac overlooking Paris' Montparnasse cemetery, is a curious mix of sheer affluence and cheerful jumble—a bathrobe thrown carelessly over an expensive Italian leather couch, a chaotic pile of papers and photographs crowning an antique mahogany desk. The apartment's owner is a study in contradictions, too.

A respected and much-cited immunologist, Dr. Jacques Benveniste directs the Immunopharmacology of Allergy and Inflammation unit at INSERM (the French National Institute of Health and Medical Research). But he has also taken a walk on the

wild side. Traveling down what many of his colleagues call the path of destruction, he has conducted a series of controversial new experiments on a weird and disputed phenomenon known as molecular memory. The memory works, he says, when water molecules store and release information in a previously undetected way through a subtle electromagnetic language that enables one molecule to record the "essence" of a sound, much like a tape recorder records a sound. If confirmed, Benveniste's work would vindicate the discredited field of homeopathy, which holds that disease can often be treated and cured using infinitesimal amounts of medicine diluted in water. More important, says Benveniste, his research could lead to "the medicine of the future," in which doctors tap into the electromagnetic molecular communication system to perform surgery without knives, prevent

diseases without using vaccines, and effect cures without drugs.

"Take a simple example," Benveniste explains. "You have a stomachache. Then you take a gram of aspirin, and it invades your entire body. It upsets your stomach, it blocks your blood coagulating mechanism, so if you cut yourself an hour later you're in trouble. But if we understood the body's electromagnetic language, we could send the tooth the signal for aspirin instead of taking a pill."

These are radical assertions, and they leave most mainstream scientists cold. "A delusion," says John Maddox, editor of the respected scientific journal *Nature*, which published some of the first reports of Benveniste's work.

"Bizarre," says Henry Metzger, Director of Intramural Research at the National Institute of Arthritis and Musculoskeletal and Skin Diseases in Bethesda, Maryland. "If Benveniste were right, the French wine industry would be distraught, because all you'd have to do is put a drop of wine in a glass of water and you'd have burgundy."

But a few scientists remain agnostic. "It's a little hard to believe," says James A. Scott, a specialist in nuclear medicine at Massachusetts General Hospital in Boston, "but that doesn't mean it's not true." And at least one researcher is supportive. "There are interactions at the molecular level that are not chemical and we don't know very much about them," says Robert Becker, a researcher

at Upstate Medical Center at the State University of New York in Syracuse. "I'm sure that Benveniste is on the right track."

Right or not, Benveniste's work has already generated one of the noisiest and most bizarre controversies in the history of modern science. That controversy began in 1988 when *Nature*, the august British scientific journal, published the results of Benveniste's experiments on "water memory." The controversy culminated—but did not end—when *Nature* sent a team of "ghostbusters" including the famous iconoclast-magician James Randi to Benveniste's laboratory to investigate his claim. During the ensuing mud fight, the *Nature* team accused Benveniste and colleagues of everything

vainly, and Benveniste himself seems somewhat unlikely in the role of crusading scientist. Now 57, he is an elegant Frenchman with a full range of Galic expressions, at least one of which makes him look very much like Marcello Mastroianni. Indeed, there is an unmistakable (and unscientific?) dash to his presence—the balance of his wardrobe tips heavily toward suede and leather, and when he arrives to pick up a reporter at a Paris hotel, it is in a pristine vintage Jaguar.

Yet the experiments began quietly enough when, in the early Eighties, Benveniste was approached by a young doctor at INSERM. Recalls Benveniste, "This young man said to me: 'You know, I am a homeopath.' I said, 'Is that

few simple scientific facts. During human allergic reactions, allergens—dust, for example, or poisons—bind to an antibody called immunoglobulin E or IgE for short. The allergen-IgE combination then triggers white blood cells called basophils, causing them to release some of their contents, a process known as degranulation.

Exploring this basic biology, the researchers created their own allergen in a serum composed of an antibody to IgE (or anti-IgE) in a solution with water. They took this solution through a series of five progressive dilutions so that little or no anti-IgE serum was left. They then exposed white blood cells to this highly dilute solution. Though the amount of anti-IgE in serum was

A TEAM OF GHOSTBUSTERS ARRIVED TO INVESTIGATE THE CLAIMS.



Jacques Benveniste at work directing the Immunopharmacology of Allergy and Inflammation Unit at INSERM (The French National Institute of Health). His work has generated one of the most bizarre controversies in the history of science.

from shoddy science to diabolical thinking. Benveniste responded with loud screams of "witch hunt." In the end, the shouting damaged the reputations of both parties and left Benveniste fighting not only for his job, but also for his scientific life.

It is an unlikely contro-

versy of some kind of sexual disease?" Although Benveniste thought homeopathy was "a bunch of baloney," he gave the doctor permission to conduct a few experiments "as long as it didn't interfere with his real work."

The experiments that followed were based on a

negligible, they reported, measurable degranulation had occurred.

As soon as I saw this," Benveniste says, "I understood that the degranulation could not be due to molecular activity because it normally takes millions of molecules of anti-IgE to produce a reaction. It had to be something else."

Curious, Benveniste decided to go further. He diluted the original solution ten times. "At ten times dilution," he explains, "there is no mathematical chance that even one molecule of anti-IgE will be left in the solution. At ten times dilution, it's just water." Yet even at ten times dilution, Benveniste says, 40 to 80 percent of the basophils degranulated, reacting to what Benveniste says was now "plain water" as if it still contained the anti-IgE serum.

In 1984 Benveniste and immunologist Elisabeth Davesnes, then a student in his lab, repeated the experiments and got similar results. Benveniste wrote up

CONTINUED ON PAGE 73



INTERVIEW

GARRETT HARDIN

"Every time we send food to save lives in the present, we are destroying lives in the future," says a biologist whose ideas may be shocking, but just might preserve the planet

As high winds whipping along the Pacific coast bounced and shook the small propeller plane, I tried to concentrate on my reason for flying to Santa Barbara. I was on my way to interview Garrett Hardin, microbiologist and human ecologist, most widely known—notorious even—for his 1968 essay, "The Tragedy of the Commons," in which he denounces the follies of overpopulation.

I was five months pregnant, and given Hardin's views on population control and prophecies concerning the fate of the environment, I dreaded his response to my condition. To my surprise, the re-

puted harshly opined and fiery aspects of his personality had been greatly exaggerated—I suspect by his many critics. Instead, I found a gentle man suffused with a love of nature, family, and classical music. Despite his 77 years and a polo handicap, Hardin swims laps daily at his Santa Barbara home, which has become a haven surrounded by giant eucalyptus and dense chaparral.

Stronger than his determination to exercise vigorously, however, is his relentless 40-year challenge—in many books, papers, and lectures—to conventional social ideals. His latest book, *Living*

PHOTOGRAPHS BY TOM ZIMBEROFF

Within Limits (released by Oxford University Press this fall), further explores the concept that unrestricted reproductive growth throughout the world threatens to wreak widespread social disaster.

Born in 1915, Hardin grew up in the Midwest where his father's job with the Illinois Central Railroad moved the family from one town to another. Even though they never settled in one place, he found a sense of constancy at his grandfather's farm near Butler, Missouri. Hardin got his degree in zoology in 1936 at the University of Chicago, where he studied under W. A. Allee. At the time, the birthrate in the United States was declining. Books and articles prophesied the end of civilization, the extinction of the human race. But Allee, a professor of ecology, was virtually alone in insisting that the decline was temporary, a mere blip in the population curve. The birthrate, he maintained, would soon start going up again. "So early in my training," explains Hardin, "I was influenced by an unpopular theory. Alone with a small group of biologists, I was concerned about future population growth."

After completing a Ph.D. in microbiology at Stanford, during World War II, Hardin worked for the Carnegie Institution of Washington's Division of Plant Biology on the Stanford Campus, investigating how algae might be used for antibiotics and as a possible human food source. In 1946, he left the project. "The more I thought about producing algae for food," he remarks, "the less use I saw in the research." Developing new food sources would only encourage continued population growth.

Hardin was also influenced by Thomas Malthus, who in 1798 wrote that food would be the limiting factor of population size. When food resources were depleted, Malthus claimed, chaos and massive suffering would ensue, halting population growth. "Malthus was correct when he said there will be limits to increasing population, but wrong about what the limits would be," says Hardin. Since Malthus' prediction, per-capita production of food has increased dramatically in the world. "Overpopulation causes other obstacles," adds Hardin. "We've plenty of food, but we're wasting an awful lot of time trying to go anywhere." Hardin, like Malthus, suspects that if population growth continues at its current rate, chaos will ultimately ensue.

The same year Hardin left the algae project at Stanford, he accepted a teaching position at what is now the University of California at Santa Barbara to teach biology, genetics, evolution, and later human ecology. Retired in 1978, Hardin continues to stimulate debate and provoke controversy with his far-reaching ideas about the human condition.

—Cathy Spencer

PROFESSION:

Professor of Biology, University of California, Santa Barbara, 1946-1978

LIFE FOCUS:

The Human Condition

MOST FAMOUS WORK:

Essay "The Tragedy of the Commons," written in 1968 and reprinted 87 times

CURRENT BOOK:

Living Within Limits
How continued global population growth invites widespread social disorder (Oxford University Press)

CHILDREN:

Four

GRANDCHILDREN:

Four. "My children paid attention to what I said, not what I did."

NOTABLE QUOTE:

"Population is not a global problem. It is produced in each bedroom, in every local activity. So population control needs to be local."

RECENTLY READ:

The Nature of Politics by Roger D. Mookerjee

FAVORITE BOOK:

A Sand County Almanac by Aldo Leopold



“WOMEN WHO WANT LARGE FAMILIES WILL HAVE THEM. THERE IS NO WAY TO TIE THEIR WANTS TO NATIONAL NEEDS WITHOUT SOME SORT OF COERCION.”

Ques: In your 1972 book, *Explaining New Ethics for Survival*, you said you feel as if you are "living in the eye of a hurricane" warning. "What did you mean?"

Hardin: I'm impressed with the reluctance of society to confront certain issues and the ingenuity people show in developing a rhetorical defense against controversial concerns. We don't budge from our positions. Everyone has a computer in his head that does a lot of work on its own. Many difficult conflicts are worked out at a subconscious level. When we run into a roadblock, the conflict is intercepted by the in-house computer and prevented from coming to the conscious level. Any thought brought to the surface is in a censored form. We look only for certain answers, closing our eyes to the possibility of others. This is the roadblock for all discussions of population.

Our censored view about population is reflected in the wide-

ly accepted "child-survival hypothesis." In a primitive community where couples have too many children and large numbers of them are dying, supporters of the child-survival thesis believe we can reduce infant mortality by sending these people the best modern medicine. Obviously, the first effect of reduced infant mortality is an increase in the rate of population growth. But according to this theory, couples in Third World countries have so many children because so many die. A high birthrate is a safety measure to ensure some children's survival. So if child mortality is reduced, these people will supposedly eventually reduce their fertility.

The hypothesis is true in a sense. People do diminish their fertility somewhat. But the result is nevertheless an increase in the number of people that reach age 20. Fewer are born, but more reach adulthood, providing the next generation of breeders. So the population does not decrease

and the hypothesis isn't really true.

Why do we continue to practice the child-hypothesis theory? Because we are tenderhearted. We'd feel terrible if we didn't let others know there are ways to prevent infant mortality. So international Planned Parenthood generally provides medical assistance to reduce infant mortality in Third World countries. We think if we do the right thing—save babies—population control will happen spontaneously.

Ques: In 1967, Paul Ehrlich's *Population Bomb* prompted the formation of the organization Zero Population Growth (ZPG). Was this an effective move toward better understanding of population problems?

Hardin: The policy of ZPG has a fundamental weakness. Use the founders of Planned Parenthood, the members of ZPG were determined to enable women to have the number of children they wanted when they wanted. They believe if women are made aware of the importance of reducing population, ultimately they will want fewer of them. But women who want large families will have them—there's no way to be that individual wants to national needs without some sort of coercion. I saw ZPG headed for failure. But still, it was a step in the right direction for helping to change the climate for population control.

ZPG also had another problem. To put it exceedingly bluntly and in prejudicial terms: In general, people who go to college are more intelligent than those who don't. It would be better to encourage the breeding of more intelligent people rather than the less intelligent. ZPG's entire attraction has been among the college population. So in effect, ZPG is encouraging college-educated people to have fewer children instead of encouraging reduced fertility among the less intelligent.

Ques: Writing "The Tragedy of the Commons" was very difficult, you've said, because "I was reaching conclusions that repelled me and tried desperately to avoid them."

Hardin: The basic concept of that essay was first published in 1933 by the mathematician William Foster Lloyd. He wrote that if a community purse is made available to the public, someone will spend a crown more quickly without thinking than if the crown comes from that person's own purse. Lloyd also said that public land is like a common pasture; if everyone can dip into a common pasture, then that land will be abused. The pasture on private land will be protected by the owner and not overgrazed, so it can be used year after year. Rather than focusing primarily on a common purse, I concentrated on

a common land, common pasture, and developed my essay from there. I tried to show how reproductive freedom, like a common pasture or community purse, is abused. People are allowed to have as many children as they choose without complete responsibility for their care. Society carries the extra burden parents can't undertake.

I kept coming up against a conflict with the idea of individual freedom—that each should do whatever he or she wants and everything will be all right. This is widely believed in Western civilization where individualism has been successful in so many other areas, particularly free enterprise. *Laisses-faire* economics permits an entrepreneur to price his goods any way he wishes. On the free market, the person pricing his products too high will go broke because he doesn't sell enough; the person selling too low will also go broke because he doesn't make a decent profit. Eventually prices balance out. Big and large, this is the way the free market works, and it's a good system.

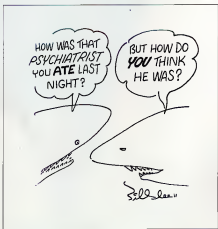
In writing "The Tragedy of the Commons" I resisted giving up the idea of applying the principle of *laisses-faire* economics to population control. Can a free market be applied to how many children a couple raises? Unfortunately,

because some of the expense of having children is *borne* by society, there is not sufficient pressure on the couple to have only the number of children they can take care of. So unlike the equilibrium obtained in the free financial market, a *laisses-faire* system of parentage yields too many children, too poorly taken care of. I finally gave up the idea that free-market principles could be used to control population.

Ques: Haven't a number of people criticized the validity of the concept embodied in "The Tragedy?"

Hardin: Sure. One argument claims that a community of lobster fishermen who fish off the coast of Maine functions as a successful commons. "Therefore Hardin is wrong!" my critics say. What these skeptics miss is that this commons of lobster fishermen has only a few members. They take as much lobster as they want, but the commons is not depleted. A commons only works successfully when a restricted number of people dip into its resources. Numbers become very important.

The example I frequently cite is a successful communistic group of religious farmers, the Hutterites, in the northwestern U.S. and Canada. They are disciples of the Marxist principle: "To each according to his needs," where a gov-



and pot is provided for the entire population. The Hutentes society has found from practical experience, however, that the Marxist concept doesn't work if the community grows beyond 150 people. People start going astray, stop doing their share of the work.

To resolve this problem, when a new community of Hutentes forms, its members immediately lay plans for splitting into two separate groups. They buy another farm as soon as they can, wait until the community grows over 150, they divide into two villages with the same number of old, young, and workers. The Hutentes can't make a commons work over 150. So to my critics I say, "A commons doesn't work if it's made up of too many people, even if they are good." With today's growing populations, the possibility for a successful commons becomes less and less likely.

Qrent: Yet you've also frequently argued that there is no such beast as a global population problem.

Hardin: True. Ropes all over the world have potholes. Now suppose that people suddenly become concerned with "the world pothole problem" and as a result set up the World Pothole Commission to fix the widespread potholes. Would you get the pothole in front of your house fixed faster by a local county agency or a world agency? We'd never get those potholes fixed if we depended on a world authority to do it. Potholes are not a global problem and should not be considered globally. Population isn't a global problem either. It is produced in each bedroom; a very local activity produces it, and so the control of it needs to be local.

Many of my critics believe people of Third World countries can't handle these issues and need outside help. Certainly they can be given information about birth control from other countries, but to give them food or money is a mistake. This is the commons again: If they don't have to pay for it themselves, they won't use it wisely.

Sending food to Ethiopia, for instance, does more harm than good. Each year the production obtained from Ethiopian land declines. The lands are used beyond their carrying capacity because there are far more people than renewable resources. Overproduction occurs. Eventually the soil loses its nutritional value and forests are stripped bare, causing soil erosion and severe floods. The more we encourage population growth by sending more and more food, the more damage is done to the production system. Every time we send food to save lives in the present, we are destroying lives in the future.

Most conventional ethics, such as "I

am my brother's keeper" work only where small numbers of people are involved. Those who initially formulated these ethics I suspect never conceived of a time when people in the U.S. could see others starving to death on TV in "real time" on the opposite side of the world. We must realize our ability to know what's going on in other parts of the world far exceeds our ability to do anything about it. Conventional ethics sound good but don't work when the scale is enlarged. It works in the village, not in the whole world.

Our best chance of solving these problems is to let each country produce as many babies as the government decides is appropriate. This means each country must take care of the babies it produces. No such country should be an escape hatch for a poor country.

But then no nation is really poor if it has a small enough population. I can

“Like a blueprint, a fetus doesn't have the same value as the house itself. There's no point in worrying about a fetus when overpopulation's a problem.”

be rich. Bangladesh, for instance, is a rich country. It's the same size as Iowa. But 115 million people live in Bangladesh, while Iowa supports 3 million. If Bangladesh had 3 million citizens, its people would be living in the lap of luxury. Only one crop can be grown annually in Iowa, whereas in Bangladesh, two or three can grow each year. There's no reason for starvation to occur in Bangladesh. It's a much richer country than Iowa, but not with 115 million people.

Qrent: What form of population control do you favor?

Hardin: Well, the one that sounds the nicest was raised by Charles Darwin's grandson, Charles Galton Darwin. He said increase people's expectations so they don't think they're living the good life unless they have a motorcar. Use the automobile as the symbol for personal luxury. Reduce fertility by pointing out advantages of not having such large families.

The quickest, easiest, and most effective form of population control in the

U.S., that I support wholeheartedly, is to end immigration. Our population growth would be spontaneously controlled. The U.S. accepts more immigrants each year than the other 179 nations of the world combined.

Economist Kenneth Boulding suggested that at birth, every female in the country be endowed with a certain number of green stamps giving her the right to have a certain number of children when she reaches child-bearing age. Depending on the population, the value of these stamps may vary from year to year. Let's say one year each woman is entitled to one and eight-tenths green stamps. If a woman wants to have one child she can sell the eight-tenths to somebody else. If she wants two children, she has to enter the market and buy two-tenths more stamps. This could work in any country.

Qrent: What is your opinion of China's population policy, which prohibits couples from having more than one child?

Hardin: I give the Chinese credit for officially recognizing that they have a problem and for having the nerve to propose the single-child program. China is the only country in the world that recognizes it has too many people. They have failed, however, by not making this coercive universal throughout the country. The one-child policy is only enforced in congested urban areas. People in rural regions continue to have too many children. So the Chinese haven't solved their problems at all.

Qrent: Will population control cause other problems in Chinese society? Might a single child truly become what they call "a little emperor"?

Hardin: The Chinese admit their children are being spoiled, but this is natural behavior. I don't see any particular difficulty developing because less babies are born there. On the contrary, a smaller population should contribute to a better quality of life in China.

As for too many old people, the existence of a dominant elderly populace is not a serious danger anywhere. If an excess of young people exist, the older members of society are encouraged to retire early. When a deficiency of young develops, the elderly will be urged to work longer. The process automatically adjusts itself. How much and for how long a person works before retiring depends on the community.

Qrent: Infanticide as a form of population control is hard to accept, yet you support it in its historical context.

Hardin: Yes. Looking at history with an open mind you'll see that infanticide has been used as an effective population control. In writings about the South Seas, Robert Louis Stevenson expressed

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as astonishment that island peoples practiced infanticide and yet were unusually loving towards children. Stevenson came from Calvinistic Scotland where, by God, children were treated severely. The Scots would never think of killing a child, but they'd never pamper it either. In the South Seas, the reverse occurred. In all societies practicing infanticide, the child is killed within minutes after birth, before bonding can occur. The mother never nurses the child. The South Pacific peoples must have easily seen the problems associated with overpopulation. When you live on an island, you know you live in a limited world.

Through most of history there's been no need for concern about population control. Nature would come along with epidemic diseases and take care of the matter for us. Disease has been the primary population controller in the past. Because widespread disease and famine no longer exist, we have to find another means to stop population increases.

Omni: What scenarios will unfold if world population growth continues at its current rate?

Hardin: Some organizations have done the proper demographic analyses and have the best answers for the fu-

ture. Usually I quote one of these projections. Now having said that, I'll go a step further and say that I don't have confidence in these projections. The pressures from expanding populations will become so great that trends will change. I suspect disasters such as widespread famine will prevent us from reaching the projected numbers.

I reluctantly make this statement because people say "Oh you cruel man, you want to kill people." I don't want to kill anyone, but clearly, crippling conditions already exist in parts of the world due to escalating populations. People in central Africa suffer greatly from the effects of overpopulation; the land has been stripped of vegetation, causing erosion and flooding, leaving little hope for new crops. These countries may yet face a worse disaster, perhaps, in the spread of AIDS.

Omni: In the early Sixties you stopped writing and lecturing about population and decided to speak out in favor of abortion. Why?

Hardin: First, I didn't want to fight two battles at once. I didn't want people to oppose population control if they were not in favor of abortion. It's quite possible to be against abortion and still be in favor of population control. Until the mid Fifties, I strongly opposed abortion.

Then in 1958, I read *Abortion in the United States*, an account of a conference of doctors and Planned Parenthood professionals.

I'd always thought abortion was an extremely dangerous operation. Reading this book, I discovered abortions, when performed by competent medical professionals, were only one-fourth as dangerous as normal childbirth. (Today a normal childbirth is ten times more dangerous.) Other evidence presented at this conference suggested that having an abortion was a psychologically sound procedure—less harmful mentally for a woman than being compelled to have a child she didn't want. By 1962, I'd moved around to the other side and became a strong supporter of legalized abortion. By spring 1963, I was ready to go public with my ideas. Certainly the time was right for me to speak out on legalized abortion.

Omni: The Supreme Court decision legalizing abortion in 1973 stated, "The unborn have never been recognized in the law as persons in the whole sense." Why is this significant?

Hardin: The argument for and against abortion today encompasses this very issue: Is a fetus a person? Are all lives equally valuable? Biologists don't believe all life has the same worth. In many instances, qualification is important. Evidence is clear in nature. About 50 percent of all conceptions in mammals perish before birth. By having fewer offspring, mammals are able to take better care of their young. The conceptions that perish are virtually without value; if they persisted, the continued existence of the species might be jeopardized.

This happens with humans as well. About half of all pregnancies are lost the first few days after conception. If people say that an embryo is a human being from the moment the sperm enters the egg, then all laws applying to humans must apply to this tiny embryo. This fertilized egg has to be buried with all the expenses applied to a person who dies. Suppose a woman thinks she's pregnant because she's missed her period. A week later she gets it and says, "I guess I was just late." Maybe she wasn't late, maybe she was pregnant and had a spontaneous abortion. In such cases—if the conception might be "life"—whenever a woman is late with her period, the menstrual products will have to be collected and given a proper burial. If people want to change the law and declare that a human is present from the time the sperm enters the egg, they must face these consequences.

A fetus is of so little value, there's no point in worrying about it in a society



"I wish Dr. Bolton would try to improve his bedside manner."

where over- not underpopulation is a problem. We don't need to chase after every last one of these embryos. Like the blueprint of a house, a fetus doesn't have the same value as the house itself. It is not a human being. Just like 10,000 acorns, the loss of these seeds would be not be considered the loss of 10,000 oak trees, or deforestation. If a woman wants an abortion, either because of poverty, poor health, or because she doesn't think she will be a good mother—whatever reason—it's not in society's interest to urge her to have the child. We have enough poorly taken care of children already, we don't need any more. If a woman says she doesn't want a baby, that should be final.

Orrin: What might happen if *Roe v. Wade* is reversed?

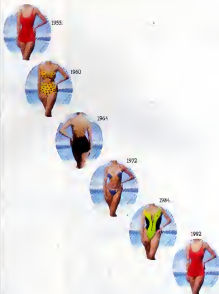
Hardin: It's difficult to predict history, but I can see no good resulting from forcing women to have babies they don't want. Many who oppose legal abortion condemn women who have them as selfish and immoral. I urge people to forget about the problems these women may face and instead consider how reversing the right to have an abortion might affect them. The cost of raising these children will sooner or later reach the general public. As taxpayers, do they really want to support an unwanted child? Studies conducted in Europe show unwanted children have more psychological, educational, and health-related problems than children born to women who want them. It is paradoxical that people who call themselves conservatives oppose abortion. Conservatives usually strive to avoid taxes and high expenses. And yet, by opposing abortion, they ultimately ensure higher taxes. They should be the last to condemn abortion.

Orrin: After the 1973 Supreme Court decision, why did you stop lecturing on this topic?

Hardin: We had essentially won the battle, so so we thought at the time. I decided I could go back to talking about population and its effects. When I first started lecturing on abortion, so few people were talking about it, I figured I was needed even though I was a man. But I was relaying secondhand information. By the early Seventies, women were speaking out on their own. If anything needed to be said about abortion, women could say it better.

Orrin: Might you start speaking out regularly again?

Hardin: It's possible. Whether I start defending *Roe v. Wade* depends on what happens—on whether I get so tied up enough, so irritated that I can't stand being silent. **DD**



You always come back to the basics:



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It always seemed to be snowing in Zurich that winter, but as Peter walked toward the café, he found himself looking up at an astonishingly blue sky.

Cold, still colder than a well-digger's ass, but clear nonetheless. He was so taken aback he stopped. There was a dull sun, looking as frozen as an outdoor Christmas

tree ornament over to the west. The houses and buildings all seemed new-washed; even the slush on the sides of the street was white, not the usual sooty gray. Perhaps the crowd for the opening night might be larger than even he had hoped. If Brecht were still alive, he would have said, "Weather good for a crowd, good for a crowd."

There was a shivering hum in the air, a summer sound from another country and time, the sound of a fan in a faraway room. It got louder. Then above the lake the airship *Herman Göring* it pulled into view like an art deco sausage on its daily run from Fischschaffhausen across the border to Bern. Some mighty Germans aboard, an admiral's and two generals' permans flow from the sail landing ropes just below the swastikas on the stubby fins. Peter's eyes were getting worse (he was in his fifties) but he noticed the flags while the thing was still two kilometers away. The airship passed out of sight beyond the nearest buildings. Its usual course was far northwest of Zurich—one of the Aryans must have wanted a look.

Higher up in the sky he saw the thin slash of white made by the Helsinki-Madrid jet, usually invisible far above the snowy clouds over Switzerland. Peter hadn't seen it for months (not that he'd even been

looking). To people here, the passenger planes were something you only occasionally saw: two summer. Well, maybe that will change tonight, he thought. They'll never look at a jet plane or a rocket the same way again.

Then he asked himself: Who are we looking?

He went on down the street to the Cabaret Kropfen.

The actor doubling in the role of the blind organ grinder was having trouble with his Zucco, so in the last run-through he had to sing a cello. Another headache, thought Peter Brecht's widow sent the offending instrument out. The one thing you could get done in Switzerland was have things fixed. More trouble. The ropes holding some of the props had loosened, they had to be resting.

Peter juggled on a carbaner. "Zero," he said to the actor, "you really should lose some weight." Peter had the voice of a small, scotched Austrian geyser snore.

The other actor (in the Cabaret Kropfen, everyone was an actor, everyone a stoogehead, an usher, waiter, a dishwasher) pulled himself to his full height. He towered over Peter and blocked his view of the stage. He let go of his end of the rope.

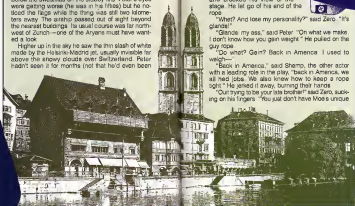
"What? And lose my personality?" said Zero. "It's glando!"

"Glende my ass," said Peter. "On what we make, I don't know how you gain weight." He pulled on the guy rope.

"Do what? Gain? Back in America I used to weigh—"

"Back in America," said Shemp, the other actor with a leading role in the play, "back in America, we all had jobs. We also knew how to keep a rope tight." He jerked it away, burning his hands.

"Out trying to be your late brother!" said Zero, sucking on his fingers. "You just don't have Moe's unique



FICTION

In a world where the Nazis won World War II, some careers might have developed very differently.

The Effects Of Alienation

BY HOWARD WALDROP



personality."

"And he didn't have my looks. Eeep Eeep Eeep Eeep!"

Peter shook his head, twisted a turnbuckle past the striped place on the threads.

"Vaudewille!" said Zero. "God, how I don't miss it!"

"Eight shows a day!" said Shemp. "Your name up in light!"

"The only thing your name is going to be up in is the pay register,"

said Brecht's widow from the cabaret floor where she had returned without a sound. "If you don't get those ropes straightened out!"

"Yes, comrade Ma'am," said Shemp for all of them.

A little after 5 p.m. they finished the last rehearsal and it was time for supper. They'd had to cook that too. A healthy cabbage soup with potatoes and a thick black bread Zero had kneaded up that morning.

Madame Brecht, who wore her hair in a severe bun, joined them. The conversation was light. The Poles, Swedes, English, American, German, French and Lithuanians who made up the ensemble had been together for such a time

they no longer needed to talk. One look, and everybody knew just how everybody else's life was going. When they did speak, it was in a sort of pig-Esperanto, comprised of parts of all their languages, and when the Madame was around, great heaping doses of Hegelian gibberish.

Not that a single one of them didn't believe that being right there, right then wasn't the only place to be.

Bruno, the old German gaffer, was staring into his soup bowl like it was the floor of Pontus Pilate's house.

Shemp whispered to Peter, "Here comes the fuck-



ing Pars story again."

"I was there," said Bruno. "I was in the German Army then. What did I know? I was fifty-three years old and had been drafted."

Madame Brecht started to say something. Peter caught her eye and raised his finger, warning her off.

"Pars!" said the old man, looking up from the table. Pars, the second time we took it. There we were in our mil-

lions, drums beating, bugles blaring, rank on rank of us! There was the Führer in his chariot, Mussolini following behind in his. There they were pulling the Führer down the Champs Elysees, Montgomery and Eisenhower in the lead traces, de Gaulle and Bomber Harris behind. Poor Bomber! He'd been put in at the last moment after they shot Patton down like a dog when he refused.

Then came all the Allied generals with their insignia ripped off. It was a beautiful spring day. It was fifteen years ago."

There were tears streaming down his face, and he looked at the Madame and smiled in a goofy way.

"I remember it well," continued Bruno. "For that night, while looting a store, under the floorboards, I found the writings of Mr. Brecht."

"Thank you for your kind reminiscence, Bruno," said the Madame.

"Suck up!" said Zero, under his breath.

"Just another hard-luck story," said Shemp.

"I like it very much," said Peter to Zero quietly. "It has a certain decadent bourgeois charm."

"Does anyone else have an anecdote about the Master?" asked the Madame, looking around expectantly.

Peter sighed as someone else started in on yet another instructive little dialectic parable.



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THE LEGENDARY TIMEPIECE FROM A MAGICAL TIME

Arguing with Brecht had been like talking to a Communist poet. When the man's mind was made up, that was that. When it wasn't was the only time you could show him he was being a Stalinist putz, only then had he been known to rewrite something.

The first time Peter had met Brecht, Peter had been nineteen and fresh off the last turp truck from Ludow. All he wanted was a Berlin theater job, what Brecht wanted was a talented man. Here ended up doing Brecht's comedy by night and Fritz Lang's movies by day, and in his copious free time learning to spend the increasingly inflated Weimar money, which eventually became too cheap to wipe your butt with. Then Peter found himself in America, via Hitchcock, and Brecht found himself in Switzerland, via Hitler.

Peter sighed, looking around the table. Everybody here had a story. Not like mine, but just like mine. I was making movies and money in America. I was nominated for the Academy Award twice, after playing Orientals and psychopaths and crazy wenches for ten years. There was a war on, I was safe. It was that fat old fat Greenstreet. God rest his soul, who talked me into the USO tour with him. There we were, waiting for Glenn Miller's plane to come in,

near the Swiss border, six shows a day. Hitler almost done in, the biggest suchances we'd ever played to when BLAM—the old world was gone.

And when I quit running, it's "Holla, Herr Brecht, it is I, your long lost admirer, Peter, the doorman."

"And you?" asked Madame. "What can you tell us of our late departed genius?"

Peter ran through thirty years of memories, those of the first, and the ones of the last fifteen years. Yes, age had mellowed the parts of Brecht's mind that needed it. Yes, he had begun to bathe and change clothes more often after his second or third heart attack, which had made things much more pleasant. He had exploited people a little less, possibly he'd forgotten how, or was so used to it that he no longer noticed when he wasn't. No, the mental fiascos had never gone out. Yes, it was hard to carry on their work without the sharp nail of his mind at the center of their theater. He could also have said that Brecht spent the last three years of his life trying to put *The Communist Manifesto* into rhymed couplets. He could have said all that. Instead, he looked at the Madame. Brecht wanted to live his life so that every day at 6 p.m. he could go into his room, lock the door,

read cheap American detective stories and eat cheese to his heart's content. The man must have had bowed muscles like steel strands.

Then Peter got up and left the room.

Walter Brettschneider was the Cultural Attaché to the Reichsconsul in Zurich and was only twenty-five years old. Which meant, of course, that he was a major in the Geheimen Staats Polizei. His job at the Consulate included arranging and attending social and cultural affairs, arrangements for touring groups from the Fatherland to various Swiss cities (Zurich, he thought, rather than Bern, being the only city in the country with any culture at all). His other job was easier—he could have been assigned to one of the Occupied Lands, or South America, or as liaison with the Japanese—which every day was becoming more and more of a chore for the Reich. His friend back in Berlin at the Ministry of Manufacture told him the members of the Greater East Asia Co-Prosperity Sphere had come up with many technical innovations in the last few years; they were now making an automobile as good as the Volkswagen and had radio and television equipment that required only three tubes.

That second job of his consisted of forwarding to Berlin, each year or so, a list of thirty to forty names. Of these, a dozen or fifteen would be picked. These people would suddenly find that their permanent resident alien status in Switzerland was in question, there were certain charges, etc. And then they would be asked by the Swiss to leave the country.

Everyone was satisfied with the arrangement, the Swiss, the Reich, in some strange way the resident aliens as long as they weren't one of the dozen or so. Switzerland itself was mined and booty-tapped and well-defended. If the Reich tried to invade, the Alps would drop on them. Germany controlled everything going in and out—it surrounded the country for two thousand kilometers in every direction—the New Lands, New Russland, New Afrika, New Island, the lands along the shiny new Berlin-Baghdad *eleenbahn*—except the contents of the diplomatic pouches, and some of those, too.

If the Fatherland tried to use the Weapons on the Swiss, they lost all those glibbery numbered assets, and endangered their surrounding territory.

So the system was understood. After all, as the First Fuhrer had said, we have a thousand years, at a dozen a year we will eventually get them all.

Edward, his assistant, knocked and came in.



The thing I like most about the religion is the total lack of hypocrisy.

"Heil Bormann," he said, nonchalantly raising his hand a few inches.

"OK," said Brettschneider, doing likewise.

"You remember that the two younger cousins of the Swabian Minister for Culture are arriving Thursday?" asked Edward.

"I had tried to forget," said Brettschneider. He opened the big 1950 calendar on his desk to February 13th, made a note: "Will you please make sure the schedule in the hall is marked? Why? Why do people come to Switzerland in the winter?"

"I certainly have no idea," said Edward. "What's doing?"

"There's a new show at the Kropotkin tonight. They're not saying what it is, so of course I have to go see."

"Not the kind of place you can take the car—"

"Most assuredly not. But then again, last month they did the decadent American classic *Amesico and Old Lace*. Quite amusing in its original version. Of course, in theirs, the Roosevelt character wasn't Theodore. And Jonathan was made up to look like the Second FGHree—" Brettschneider looked up at the three photos on his wall—Hitler, Himmler, Bormann—Himmler's was one of the old official ones, from eleven

years ago, before the chin operation, not the posthumous *new* official ones—"no, not really the kind of place, the type of plays two young women should see."

"Have a good time," said Edward. "I have to accompany the Reichsmineister's wife to the Turkish thing."

"Oh? Yes? How's your Turkish?"

"It's being given in English. I am led to believe, it'll drop back in later today, in any case."

Edward left Brettschneider staring at the doorway. For all he knew, Edward might be a colonel in the G.S.P.

"It's too bad they don't make Zambesi cigarettes anymore," said Caspar, the scene designer, as he smoked one of Peter's cheap German cigars. "We'd have them free. It was before your time, before you met Brecht, back in the early Twenties. He was always trying to write prize movies and detective novels. Before Marx. He designed an ad campaign for the tobacco company. He took an unlimited supply of Zambesis in payment. He grew to dislike them before the company went out of business. I thought them quite good."

"I'd give anything to smoke a Camel again," said Shemp. They were putting down tablecloths and settings, and lighting the candles out front. Zero was

pumping up the beer spigots over behind the bar. Madame was, as usual, nowhere to be seen, but, say something wrong, you could be sure she would hear it. The woman was fueled by the thought that someone, somewhere, wasn't thinking about Bertolt Brecht.

"I heard they don't make them over there anymore," said Caspar. "The Turks you know? They claim, in Germany, Anshp Brand is the same thing as Camels used to be."

"They're as full of shit as Christmas geese," said Shemp. "God, what I wouldn't give for a slice of goose!"

And so it went until time to open, when the Madame suddenly appeared in front of Peter and said, "You work the door until 1930 hours. Then you may get into costume."

"Yes, comrade Madame," he said.

There was no use arguing with her. It would have been like asking Florida Hutton, why the long face?

He went to the door. Under the covered walkway quite a nice crowd had gathered early. Peter looked at the sign out front with its double silhouette of Kropotkin and Brecht and the hand-painted legend. Tonight—Cabaret Kropotkin—The Zürcher Ensemble—new BRECHT play!

It wasn't really Brecht. It wasn't exactly a play. It wasn't exactly new. They'd been working on it steadily in the three years since Brecht's death.

He undid the latches as the people surged expectantly toward him. He opened the doors, stood back, nodded his head toward the tables.

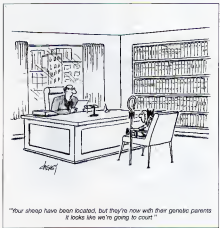
"Troughs open," he said.

Brettschneider arrived a few minutes to eight, went in, nodded to Caspar, who was bartending, and found a spot at a table near the stage with three Swiss students. He listened to their talk a while—it must be nice to live in their world. They were treating the night as a lark, a dangerous place, reputed to be filled with drugs and lady Bolsheviks with mattresses tied to their backs.

Hesse was over in the corner. Brettschneider nodded to him. He doubted the old man saw him, as his eyes were becoming quite bad (he was, after all, 83 years old now), he would go over and say hello during the interval.

There were a few of what passed as Swiss celebrities present, some Germans, a few Swiss arms dealers.

Across the length of the stage was the patented Zürcher Ensemble half-curtain let down on a length of rope. Behind it was the bare back wall. Across this were strung a few blinking lights, like a Christmas tree with too few bulbs. People moved back and forth



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across the stage, quite visible to the audience from the neck up.

The band took its place in front of the curtain—bongo, piano, clarinet—and began a jazz arrangement of "The Internationale"—one or two people stood, and the rest began clapping along. When that was done, they played the old favorite "Moon of Alabama" from the hoganny, and "Don't Sit Under the Apple Tree with Anyone Else but Me." Brettschneider drank a chocolate schnapps and began to feel quite warm. The cabaret was already thick with the blue smoke of a hundred different tobaccos.

Then the lights went down. From the ceiling a sign dropped. Cabaret Kropfen—a half came down from above and fast on the top of the sign, which unfolded into three parts. Cabaret Kropfen—The Zürcher Ensemble Presents Bertolt Brecht's—Die Dreizehnenwisch Spieser! The half-curtain came up. Another sign dropped in. Scene: The Rocket Men's Club. Time: The Future. Mountain.

An actor dressed as a blind man came on with a barrel organ and began singing "The Night We Dropped the Big One on Biggin' Hill."

Zero, Peter and Shemp, in their Rocket Men Cadet uniforms, walk by the bag-

gar who is then escorted offstage by a policeman.

"Here we are at last!" says Zero. "Just out of Basic Training! Our first taste of the Outer Reaches!"

"I'm ready for some inner reaches!" says Shemp.

"Beer again?" says Peter.

The flies pulled up revealing a bar's interior, tables. Dropping in were huge posters of von Braun and Dornberger, and a portrait in the frame reserved for Führers. The audience found it hilarious.

Brettschneider wrote in his notebook. Unnecessary fun made of Hitler's Jr. When things quit falling, unfurling and dropping in from the overheads, there were sweetkiss whirling like propellers and a giant, very pink rocket with a purple nose cone to be seen.

The three students then sang, as appropriate title cards were revealed, "It's Me for the Stars, and the Stars for Me," followed by Zero's "Once You Get Up There." Then one of their instructor of fiers, Major Strasser, came in and had a drink with them.

"But don't you find it cold here?" asks Peter.

"We Germans must get used to all climates, from the Sahara to the poles of Saturn," says the major.

Then the chorines danced on and

sang "Dock Your Rocket Here" and a chorus line, not of cadets but true Rocket Men, danced on, including one small grotesque figure in sunglasses. Brettschneider wrote more " " " H. Jr., beneath his first entry.

The cadets and Rocket Men ran off with the chorines, and a new card dropped in: The Field for Rockets Training. On one side of the fence the three cadets stood at attention; on the other a girl skipped rope to the chant.

"My girlfriend's name is Guernica. Her Daddy bombed Morika."

The Drill Instructor, called Manley Mann, comes on and yells at the cadets.

"Where you going, you stupid lot?"

"Up Up Up!"

"How you gear?"

"Fast Fast Fast!"

"At night, watcha see inna sky?"

"Noo Socialist Moon!"

"Gimme a thousand pushups."

The cadets dropped down, began to count. "One Vengeance Weapon, Two Vengeance Weapon, Three Vengeance Weapon. . . There was stage business with the pushups, most of it dealing with Zero's attempts to do nothing while yelling at the top of his voice.

When they finished, Manley Mann said, "Right. Today we're gonna learn about the MD203 Course Platin' Cal-

CONTINUED ON PAGE 37

GHOST MOLECULES

CONTINUED FROM PAGE 52

his findings in a scientific report, which he submitted to *Nature* in 1985. When the journal asked for confirmation of the results, he formed the experiments out to research teams in Italy, Canada, and Israel. According to Benveniste, those teams reported findings similar to his, and he included them in his own report to the journal.

Nature says it never saw all the results of these trials but nonetheless sent Benveniste's report to a team of expert referees. "The referees," Meddock says now, "couldn't see anything wrong with the experiments, but they didn't believe the results." This left *Nature* somewhat reluctant to publish Benveniste's report, but with no good reason not to. At the same time, Meddock says, reports of Benveniste's unusual findings were about to appear in the French press.

On the horns of a dilemma, *Nature* decided to publish the report but with two unusual conditions. First, the published report would be accompanied by an editorial reservation noting the "incredulity" of the releases in the face of experimental results for which there was "no physical basis." Second, after the report was published, Benveniste would allow a team of investigators recruited by *Nature* to visit his lab and witness the experiments themselves.

Benveniste agreed, and on July 4, 1985—almost a week after the report was published—the *Nature* team arrived at Benveniste's INSERM 200 laboratory in Clamart, a suburb 15 minutes south of Paris. The three-man team later dubbed "ghostbusters" by the press, was as unusual as the report it came to investigate. There were no immunologists on the team and only one practicing scientist. One of the investigators was Meddock himself. Another was Walter W. Stewart of the National Institutes of Health in Bethesda, Maryland, who had been one of the paper's referees and who had made a reputation as a sort of scientific sheriff, pursuing a number of research fraud cases. The third member of the team was James Rand, a celebrated magician, MacArthur Foundation Fellow, and self-appointed skeptic who is perhaps best known for his ongoing and highly public battle to expose and discredit psychic Uri Geller.

This strange amalgamation of ghostbusters spent a week in Benveniste's lab. The process "started

quietly enough, with the *Nature* team watching four repeats of Benveniste's experiments. Benveniste says each of these yielded positive results. But the *Nature* team did not agree. In fact, Stewart declared all the results "valueless." His reason: As far as he was concerned, adequate scientific controls had not been in place.

Next came a series of three more trials with the *Nature* team taking extraordinary measures to ensure results could not be manipulated. At one point, Rand wrapped the code for the experiments—designed so that no one could know which test-tubes were yielding which results—in aluminum foil. He folded the foil into a specially sealed envelope and then taped the envelope to the laboratory ceiling.

The results of these experimental runs were negative. To Benveniste, this was not especially surprising—there were many instances, he said, in which basophilic had not reacted to the anti-IgE solution at high dilutions.

But as far as the *Nature* team was concerned, the investigation had put an end to Benveniste's assertions. As Meddock put it, Benveniste's results had been "delusions" to be accounted for by sloppy experimental procedures and bad counting.

On July 29, *Nature* published the ghostbusters' findings. In the same issue, Benveniste wrote an emotional reply, labeling the investigation a "Salem witch hunt" and a "McCarthy-like prosecution" and issuing a ringing appeal to other scientists: "Never, but never let anything like this happen [to you]," he said. "Never let those people get in your lab."

These amounted to the opening shots in what soon became a worldwide and highly public gunfight. For the next six months the pages of *Nature*, *Le Monde*, and even *Time* bristled with opinions, suggestions, accusations, and counteraccusations. While few scientists believed that the results of the high-dilution experiments were valid, many found *Nature's* tactics distasteful and even dangerous. "Demoting to the scientific process," wrote Mark Johnson of MIT. "A threatening circus," said Mass General's James Scott. "Confirmation of what I always suspected," wrote biochemist Keith Snell of the University of Surrey. "Papers for publication in *Nature* are refereed by the editor a magician, and his rabbit."

The *Nature* team stands firm, "Had we known how poor the evidence was," says Stewart. "*Nature* would never have published the paper and we would not have gone to France."

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"We would do it the same way again," says Maddox. "It was the only way to flush it out."

All the publicity hurt. Up for evaluation by his bosses at INSERM, Benveniste's job seemed to hang in the balance. In the end two evaluating committees suggested that Benveniste stop investigating molecular memory. But INSERM director-general Philippe Lazar decided Benveniste could proceed, and in 1989, the high-dilution experiments were quietly resumed. Repeating his original trials with anti-IgE, Benveniste says he's gotten similar results.

At the same time, he launched a series of new experiments to see if highly dilute solutions could provoke reactions not just in cells, but in whole organs. In these experiments, he incubated guinea pigs with egg albumin from hens. He then removed the guinea pigs' hearts, suspended them in a glass cylinder, and kept them "alive" and beating. Finally, he used tubes to drip highly dilute solutions of egg albumin into the disembodied hearts. If the disembodied hearts recognized the egg albumin, Benveniste knew they would have a typical immune reaction. The coronary arteries would dilate, and blood flow would increase.

Even though the solution of egg albumin was so dilute that not a single molecule of the albumin remained, the blood vessels of the heart appeared to respond. They dilated slightly, and blood flow through the heart registered a detectable increase. In other words, the heart seemed to be reacting to what was now plain water as if the egg albumin were still there.

Benveniste quietly presented these results at the April 1991 meeting of the Federation of American Societies for Experimental Biology in Atlanta. With the exception of reports in the *Journal of the French Academy of Sciences* and *New Scientist* magazine, the press did not take note.

The storm over his work temporarily abated. Benveniste is free to ponder the basic questions posed by his curious experimental results: How could a living system—a human cell or an animal organ—react to something that isn't there? How could water "remember" a substance that's gone?

After much reflection, Benveniste could have the answer. He believes that molecules communicate via electromagnetic radiation instead of by exchanging chemicals. Like the signals transmitted by a radio station to a receiver, these electromagnetic signals have different and specific

frequencies, each one prompting a different and specific biochemical reaction. "What my experiments show, in a terribly clumsy way," he says "is that when you highly dilute a solution, you separate the molecule from its electromagnetic message contained in the water."

The medium for these electromagnetic messages, according to Benveniste, is water. This powerful communication he says, has been demonstrated in his experiments again and again. Whether you're talking about anti-IgE or egg albumin, Benveniste notes, the original molecule modulates waves originating from water molecules, causing them to emit electromagnetic signals—and to continue emitting them even after the original reagents are gone. "The message remains in the water," he declares, "just as your voice remains on a tape recording."

●The
message stays in the
water
just as your voice
stays on
a tape recording
after
you stop talking. ●

even when you're no longer talking." In other words, in Benveniste's mind, the whole vast dance of chemistry, of biology—of life itself—is orchestrated by electromagnetic signals passing through water.

Though the idea is controversial, to say the least, evidence from other researchers has begun to fall into place. Scientists such as T. Y. Tsong, a University of Minnesota biochemist whom Benveniste likes to cite for instance, have shown that many cellular functions—including enzyme activity and synthesis of DNA and RNA—are stimulated or suppressed by electromagnetic fields. Tsong thinks that future research will show that electromagnetic radiation may indeed constitute what he calls "the language of the cell." Tsong, of course, is not entirely comfortable with Benveniste. "My work is based on principles that we already know," he says, "and his is based on things we don't yet understand."

Robert Becker adds, "Bioelectro-

magnetics is still beset by an enormous amount of uncertainty but there has to be some kind of energetic reaction to explain molecular communication, and the obvious candidate is electromagnetism." Benveniste's work he says "is a beginning, somebody asking what if?"

And what if Benveniste is right? What if biochemical reactions can indeed be prompted by electromagnetic signals recorded in water? "Once you're able to pick up the signal," says Benveniste, "you have a whole new biology. You can digitize the message, you can make drugs from it. You won't need the physical substance, be it ordinary aspirin or AZT, but simply the signal that constitutes its code."

Benveniste also thinks the electromagnetic language could be used to do non-invasive tests. "You stick your finger in a machine that uses an electromagnetic field to analyze your blood," he explains, and you could even use the body's own code to perform non-invasive surgery, in which a defective heart, for example, "is repaired by sending the appropriate electromagnetic signals to heal its damaged cells." Killer diseases like cancer or AIDS could be prevented or cured by jamming the electromagnetic signals that turn normal cells cancerous or that enable the AIDS virus to find the immune system cells that it targets and eventually destroys.

Some critics think that this sort of speculation—indeed all of Benveniste's high-dilution work—shows that the once-respected immunologist has taken leave of his scientific senses. Even Nobel laureates, notes Eugene Garfield, "have gone off the deep end in pursuit of private passions."

On the other hand, his few supporters think this kind of research may presage the dawn of nothing less than what Becker calls "a new scientific revolution" in which "present dogmatic theories of how the universe works will be replaced." In the meantime, Benveniste continues to work, refusing to let go until someone proves him wrong to his satisfaction. "My enemies say a true scientist doesn't pay attention to erratic data like this," he says. "Even my friends tell me to drop this because I am going to kill myself. But if it's true that we can have molecular activity without molecules, then we have discovered a fundamental process of life."

"I have no private passions," he concludes. "All I have are these data. What am I supposed to do with them—put them back in the drawer?" **DO**



ANTIMATTER

SPACE ICE

The crater in their yard filled with large chunks of ice from the sky

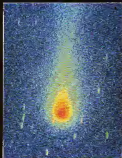
Heisel and Alice Amos were watching television with their grandson when their Wood County, West Virginia, house began to shake. Their son Donald Amos, a chemist at the Sequoyah Nuclear Plant in Chattanooga, was in his truck right outside their front door when something fell from the sky. "I was about fifteen feet away from the spot where it hit," he says. "It made this tremendous thud."

The ground near the television set in their yard was now a crater, one-and-a-half feet in diameter, about six inches deep, filled with large chunks of ice. Smaller pieces, the size of marbles and baseballs, were strewn in a 30-foot radius around the hole.

No one thought for a moment that the ice had come from a faulty ice machine aboard a flying saucer, but many did think it was extraterrestrial. Heisel Amos thought it might actually be a piece of a comet. So did Gail Hartshorn, the director of Emergency Services for Wood County. Acting on this hunch, Hartshorn contacted Louis A. Frank, the University of Iowa physicist who claims the Earth is being bombarded by small comets at the rate of 20 per minute. Frank says these comets, which measure about 30 feet in diameter and weigh about 100 tons apiece, vaporize in the atmosphere and are the source of the Earth's waters. But he is also willing to consider the possibility that, on occasion, some of them fall to the ground as ice.

Hartshorn already knew what this ice fall was not. The National Weather Service had said the ice could not be weather related. There was not a cloud in the sky on that fateful June day, and the midday temperature reached 88 degrees.

The Federal Aviation Administration, for its part,



Small comets may be bombarding the earth at the rate of 20 per minute.

had never heard of a 50-pound chunk of ice falling from a plane. Besides, when ice does fall from aircraft, it is normally blue due to the chemicals used in aircraft toilets.

The story would have ended here had Heisel Amos not had the foresight to collect about six pounds of the transparent ice, wrap it in plastic, and put it in his freezer. To have the ice analyzed, Hartshorn then contacted Michael Frizzell, lab coordinator for the department of chemical engineering and biotechnology at the University of Maryland's Baltimore County campus and research director for the Enigma Project, a Maryland group that documents unexplained phenomena. Ice in hand, Frizzell sent samples to two scientists.

One of the scientists, Victor Fudka, an environmental chemist in Maryland, found that the "ice bomb" contained peculiarly large quantities of silicon, strontium, and barium—all of which are not normally present in drinking water. "I'm willing to safely say that it's not water from an airplane," Fudka agreed.

The other sample went to Robert Seal, a geologist at the United States Geological Survey office in Reston, Virginia, who found that the ice was isotopically identical to atmospheric precipitation, strongly suggesting a terrestrial origin.

But these results do not totally eliminate an extraterrestrial origin for the ice. "If the oceans did come from comets," says Frank, "then you would expect this ice—if it was from a comet—to be much like ordinary precipitation and ocean water."

Frizzell intends to continue his investigation and still hopes to pin down an origin—terrestrial or extraterrestrial—for West Virginia's mystery ice bomb.

—PATRICK HUYGHE



ANTIMATTER

THE GRAY BARKER UFO COLLECTION



Tiny Clarksburg, West Virginia, (population 10,000) is now permanent home to

one of the country's largest collections of personal UFO memorabilia. Housed in a room of the 1839 antebellum Waldomere mansion, one of two buildings that make up the Clarksburg-Harrison public library system, the Gray Barker UFO Collection consists of 30 government surplus file drawers chock-full of correspondence and case histories spanning more than three decades of native-son Barker's contro-

WEST VIRGINIA'S NEW-EST UFO COLLECTION FEATURES NATIVE SON GRAY BARKER.

versial career. The collection includes some 300 books along with 75 groups of magazines and journals, many written by Barker (above). The editor of early newsletters like *The Saucerian* and *Flying Saucer Magazine*, Barker's most enduring contributions to UFO literature were the paranoia-laced *They Knew Too Much About Flying Saucers*

IT'S EXCEPTIONAL

What do mystical states, out-of-body experiences, and UFO reports have in common? According to Rhys White, editor of the newly published journal, *Exceptional Human Experience*, all three represent the power of something apparently outside of a person's conscious self.

"Exceptional human experience can be extremely rewarding, enriching, and exciting," says White, who is currently compiling a research database of unusual experiences reported by people all over the world. "All the examples in the database are exceptional



in some way, although the definition of exceptional is up to the person involved. You can even have an exceptional experience while involved in sports or painting. Something about the experience gives you a larger view of yourself and the world."

According to White,

exceptional experiences are actually commonplace and have been reported in a wide variety of cultures throughout history. They are, however, still considered "exceptional" in the lives of those who have them. "I think everybody has had some kind of exceptional human

(1966) and *Men in Black: The Secret Terror Among Us* (1979).

Barker, who died in 1984 at the age of 58, first began investigating UFOs in 1952, beginning with the local Flatwoods Monster case, a close encounter with a demonic humanoid. His correspondents read like a Who's Who of American UFOlogy, including such pioneering luridities as contactee George Adamski and retired Marine Major Donald Keyhoe.

Collection organizer Ruth Yeager, confessing her own interest in the

paranormal, says the files are characterized by Barker's "torboreance for the ridiculous." One cabinet bears an old bumper sticker: *Flying Saucers Are Real—The Air Force Doesn't Exist!*

So far, the UFO treasure trove, purchased for \$2,000, has had a September opening and drew a crowd at a UFO forum last December.

Historians and other interested parties should peruse with John Nesbitt or librarian Linda Cornett at (304) 624-6512 before viewing the collection.—Dennis Stacy

FEMINIST PSI

If some people can really peer into the future or communicate with the dead, why can't scientists measure psychic powers in the laboratory? It could be, says Lisette Coly, vice president of the New York-based Parapsychology Foundation, because most of the scientists are men—and their masculine-dominated methodology just doesn't work on elusive phenomena, also known as PSI.

To explore whether a female-centered perspective could help unlock the

experience, although they may not want to admit it—even to themselves."

This new journal not only covers such topics as altered states and peak experiences, but also so-called psychic experiences and creative inspiration, with a focus on experiential and qualitative research rather than experimental investigations.

Those interested in subscribing to the journal or contributing anecdotes to the database can contact White at Parapsychology Sources of Information Center, 2 Pine Tree Lane, Dix Hills, New York 11746.

—Keith Henry

secrets of ESP, the Parapsychology Foundation held a Women and Parapsychology conference in Dublin. The eight women scientists who addressed the conference concluded that this is a real possibility. For example, researcher Ruth-Inge Heinze of the University of California's Center for Southeast Asia Studies called for a "softer," anthropological approach to PSI—going into alleged sensitive environments to study them rather than insisting they perform in a lab. Biophysicist Beverly Rubik of Temple University

pointed out that getting away from a combative, male-oriented science vocabulary (terms like the Big Bang theory) and incorporating female archetypes into the study of parapsychology could lead to new insights. Foreign Service Institute researcher Anjum Khilji discussed how Muslim women have preserved female traditions that supposedly foster PSI phenomena.

Joanne McMahon, a conference speaker who heads the Parapsychology Foundation's Eileen J. Garrett Research Library, says that the conference was not "a men-versus-women thing. But it pointed out that when faced with a dilemma or a



Chloë's wife, Milove

research problem, parapsychologists may be able to come up with new answers by considering a feminine perspective and by using a more interdisciplinary approach."

—Sherry Baker

HAUNTED TOURS OF CHICAGO



Chicago-area sightseers looking for something more offbeat than the Art

Institute or the Lincoln Park Zoo might consider a bus tour that stops at Resurrection Cemetery, home of Resurrection Mary, Chicago's most famous ghost, and Robinson Woods Indian Burial Grounds, scene of strange sights and sounds.

These are two stops on Dale Kaczmarek's "Excursions Into the Unknown" tours. Since 1983, Kaczmarek (above), of Oak Lawn, Illinois, has conducted these popular weekend bus tours of Indian burial grounds, murder sites, and haunted historical landmarks in and around Chicago.

"Excursions Into the Unknown" was an outgrowth of Kaczmarek's work as president of the Ghost Research Society. "I thought," says Kaczmarek, "it would be a neat idea for people to experience the aura of haunted places."

But do any of these people actually encounter ghosts on a ghost tour? "We have minor encounters from time to time," claims Kaczmarek, "and we tell people to take

photographs at our most active stops."

Kaczmarek says tourgoers have taken photos of shadowy forms on a staircase in Jane Addams' Hull House on Chicago's south side. And many have experienced a cold spot along the staircase of That Steak Joint, a restaurant on Chicago's north side. While tour-



Scene of the Dillinger shootout

goers haven't witnessed the "disappearing house" along the dirt trail leading to Bachelor's Grove Cemetery in Oak Forest, "people have gone back later and had strange encounters," Kaczmarek likes to explain.

Kaczmarek, who displays his brochures at the Chicago Visitors Bureau, plans new itineraries every year. "There are over a hundred and fifty different haunted locations in the Chicago area," he says. "That's about sixteen years' worth of tours."

—Anita Boskin

OMNI SEARCHSTAKES!

[illegible]

FRAUD

2000-01-01

O'Toole's original spotlighting of science's allegedly self-correcting mechanisms broke down at every checkpoint. It never occurred to the referees assigned to review the paper that there could be anything even slightly shady in an article co-authored by David Baltimore, one of the world's most distinguished scientists. Fellow scientists likely wasted countless hours and money trying to build on the bogus findings. Investigators at Tufts University, MIT, and, initially, at the NIH performed little more than a perfunctory probe of O'Toole's charges. As the *New York Times* wrote in a scathing editorial, "The initial investigations of Dr. O'Toole's complaints smacked of an old-boy network crowding up the wagons to protect scientific regulations."

The truth came to light only when the case fell under the noses of NIH scientist Walter Stewart and Ned Fiedler and the House Subcommittee on Oversight and Investigations, headed by Representative John Dingell. But Baltimore can only blame himself for the scale of the scandal. His defiant insistence that his critics didn't know what they were talking about escalated the relatively minor transgression into what is dubbed a "scientific Watergate." He even orchestrated a letter-writing campaign among his colleagues to stop Dingell's inquiry. And Baltimore retracted the article and halfheartedly apologized to O'Toole only after the Secret Service forensically analyzed Imants-Kan's laboratory notes, proving her data entries were falsified at a large scale.

After five years of vilification before she was finally vindicated, would O'Toole do it again? "Absolutely. Because at the root of this were the most fundamental principles of the entire profession," says O'Toole, who now works for a biotech company in Cambridge.

But these piling scandals may ultimately prove salutary. A number of hopeful signs demonstrate the obviously shaken scientific community—acting out of enlightened self-interest—intends to clean house and stop the university cover-ups: the federal foot dragging, and the witch hunts of whistle blowers, all of which allow abuses to flourish.

The OSI's staff may grow from 19 investigators to 28, including three lawyers, and, to ensure objectivity, the office may be moved away from the NIH. The NSF has issued stricter guidelines regarding misconduct and is keeping a tighter rein on universities. And a 22-member panel of the National Acad-

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ny of Sciences (NAS) in Washington, DC, has worked for more than two years to hammer out the principles of good scientific conduct.

The MIT also now requires ethics programs in graduate students' curriculum. "We operated under the false belief that young scientists would learn ethics in the laboratory by osmosis or by being exposed to good role models," says Stephen J. Bird, a special assistant to the MIT's associate provost, recruited to develop ethics programs there. "But now there's a recognition that ethics need to be explicitly articulated." Other schools including Harvard and Dartmouth, now have similar ethics programs.

In 1988, the American Association for the Advancement of Science gave its Scientific Freedom and Responsibility Award to Robert L. Sprague. In accepting one of science's highest honors, Sprague observed that it wasn't surprising some scientists cheat. After all, they're only human. "What is surprising," charged the soft-spoken, bespectacled psychologist, who hardly resembles a rabble-rousing renegade, "is that the system of science actually works against a spate of appropriate adjudication of suspected misconduct. This is intolerable in a civilized society."

If the science community can eliminate the harmful politicking that has corrupted the research process and restore the high ethical standards—the boldness of vision and the sense of mission that historically has made American science great—it will be because of people like Robert Sprague. "Science better learn to police itself," warns the NIH's Bernadine Healy. The future of research is intimately linked with the awareness to which we address the issue of scientific conduct. Because if we lose the trust on which research is built, we lose everything. □

ELECTRONIC UNIVERSE

AND THE WINNER IS

In our virtual reality, the best of next year may already be here

By Gregg Keizer



there as they find new homes. A few circle back and bite the lips that let them loose.

That's the risk you take when you shoot off your mouth in print. A year down the road, your calls for the future may be only so much grit for the comedy mill. But if you divine divinely, you can ride on the reputation forever, like Jeanne Coopers, Garfield, and Wendy the Gypsy Lady.

I'm willing to stake it all on a Top Ten list even though the year's not half over. If Omnia the

Prognosticators and portents fly from columnists' mouths like so many bats from limestone caves, some darting here, others winging

you build from body parts. Are there that many women playing computer games?

9. Sports commentators wouldn't shut up. John Madden babble and Frank Grifford boria, but you had an alternative this year when you stuck Sports Talk cartridges into your Sega Genesis. Major league games like Joe Montana 2 Sports Talk Football and MLBPA Sports Talk Baseball sport voice-over announcements that interrupt play as regularly as the real thing. At least they don't draw all over the TV.

8. George Bush's plane went down in the Pacific—again. You and George turned back the clock 50 years with Aces of the Pacific, a WWII air-combat simulator. In a fit of militarized Japan bashing, you dive-bombed carriers, skinned torpedo planes across wavelets, and sent Zero and Betty's flaming into the sea.

7. CBS lost tons of money on the Olympics. Maybe it was because the computer games were more fun to watch than long-distance contests in France and Spain. One of the best was

Michael Jordan Fight simulator, a fluid, first-person-perspective game that put you on the court, trying to stick with Air Jordan through the picks and punches of the NBA.

6. Fantasy role-playing murdered many. One of the longest-running fantasy role-playing games issued another edition the dark and dangerous Ultima VI: The Black Gate. A massive world to explore, full-screen views, and murder-happy opponents made Ultima VI an invigor-

ating change from the too-out-fantasy games of the past.

5. Virtual reality went mall-hopping. Stratospheric price tags didn't keep the first generation of virtual reality machines out of a few of the biggest mall arcades. At \$60,000 a pop, Virtuality's plastic shells and stand-up booths let us don goggled helmets for an up-close-and-personal experience in a 3-D computer-generated world.

4. UFO lands abducts PC. Science fiction turned up the heat when such classics as Dune, Galaxy, and Star Trek (Shamers and Stewart's) made it to game form. Snake Commander, a near-future title in the Wing Commander vein, and Free D.C., a claymation adventure set in the future Capitol, proved that originality works, too.

3. Multimedia exposed itself. On a wing and a prayer, multimedia threw itself into gaming with a couple dozen CD-based titles on the PC and another handful on videogame machines. Though most were rebuffs of earlier, disk-based games, a few—such as Ghouls 'n' Ghosts, a visually stunning haunted mansion adventure—were CD from the plastic platter up.

2. Congress gave NASA \$69.95. While the real-life NASA struggles in budgetary hell, movie-believe managers and astronauts re-created history with Buzz Aldrin's Race into Space. Freshed out with enough technology, missions, and what-ifs to interest even Dan Quayle, this 10th-moon simulation let players explore opportunities missed, not made.

1. Nintendo bought the Mariners. At least it got them off our backs. With the company concentrating on keeping Ken Griffey Jr. happy, it sent its 8-bit system a copy of Final Exit and made more room for the 16-bit Super NES and Sega Genesis. **CD**

Ultima VI's fantasy role-playing and free S.C.I.'s claymation-style adventures helped make 1992 a great year for games.



magazine of the future, then Electronic Universe better keep up.

TOP TEN REASONS WHY 1992 WAS GOOD FOR GAMES

10. Phone cross-dressing was a big hit. Online entertainment—games fought over the phone lines—made a few nippies when The Sierra Network brought multiplayer games and thousands of opponents to you over telephone wire. But is that Lola you're playing or Larry? TSN let you create your own online persona, complete with a computerized portrait



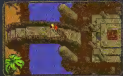
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(Richard Garriot, Ultima VII designer)



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(PC Gamer "The Complete PC Gamer's Guide, Spring/Summer 1992")



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(MPC World, April/May 1992)

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Ultima VII
THE BLACK AND WHITE

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The Artist

© ART CUMINGS

But, as a team
we could electrify
the world!

I know you
hate art done for
shock value.



I take it
that's
a no!

EFFECTS

CONTINUED FROM PAGE 12

culator. Walk smart follow me follow me— and off.

Another card: Six Weeks Later. Cedar Baracks. Night.

Then came Shemp's solo, as he looked out the window at a board-looking stagehand holding up a cardboard moon. He did some comic patter, then went on to sing "I Wish I Had a Little Rocket of My Own."

Then the lights went up, the information sign dropped down, and the half-curtain was lowered to the stage.

Backstage the Madame was furious. "I told you we must take that song out!" she yelled at Shemp. "You realize you made the audience identify with your character? You know that's against all the Master's teachings! You were supposed to sing the Song of the Iron Will!" Shemp weaved like a punch-drunk boxer, running his hands through his dark, lanky hair. "I got mixed up," he said. "They played the wrong music, so I sang it. Yell at the band!"

"You must always always remember the Vernehmungsfakt! You must always remind people they are watching a performance. Why do you think the stagehand holds the prop moon so everyone can see him? Are you an idiot? What were you thinking?"

Shemp paused, looking off on his fingers. "I do. I always do. I don't know yes. Nothing."

Why must I be saddled with morons? Shemp said something under his breath.

"What? What did you say?"

"I said I gotta get a drink of water, or I'm gonna lose my voice next act."

"That's not what you said!"

"Yes it is, comrade Meism."

"Get out of my sight!"

"As once," said Shemp, and disappeared onstage.

Zero sat on a crate in the alleyway. It was bitterly cold, but this was the only place he was sure Madame wouldn't follow him. Peter came out. If up a but one of the waiters had brought him from a customer's ashtray.

We gotta find another way to make a living," said Zero, his breath a fog.

"We've said that every night for sixteen years now," said Peter. "Christ, it's cold!"

"Wasn't it Fitzgerald that said nothing much starts in Switzerland, but lots of things end there?"

"How the fuck should I know?"

said Peter.

"Well, I don't want to be one of the things that ends here," said Zero.

Peter thought of lines from a movie he'd been in long ago, lines dealing with war, expatriation, and death, and started to say one of them, but didn't. Besides, they'd already used the best lines from that movie in the play.

"It's like I told that fat great Lummy actor once," said Peter. "Chuck! I said, if you have to park young men just go for god's sake and do it, and come back and learn your goddamn lines just quit worrying yourself about it!"

"Are you saying I should pick up a little boy?" asked Zero.

Peter shrugged his shoulders. "Where else is there to go but here, Zero?" he asked.

Zero was quiet. Then, "Sometimes I get so tired. Peter. Soon will be old man Like Bruno. Then dead old man.

"But theater!" began Peter.

"—and (brech)!" said Zero.

"—will live forever!" they finished in unison. They laughed and Zero fell off his crate into the snow. Then they brushed themselves off and went back inside.

Breitschneider had made his rounds of the tables during the break. He looked over his notes, made an emendation on one of them. He ate a Kaiser roll, then drank a gin-and-tonic, feeling the pin-needle bite far back in his throat.

Then the band came back, played the last-act overture, and cards dropped back in.

There was a classroom lecture on the future films of Fritz Lang, *Metropolis* and *Frau im Mond*, which then went backwards and forwards to cover other spearsword-looking films: *Himmelskriber*, *FPI Antwortet Nicht*, *Der Tunnel* and *Weltbaurecht!* I started, at which Zero inhaled an confusing Lena Reifenstuhl with the Dusseldorfer Mordere.

Breitschneider wrote unacceptably reference to Reichsminister for Culture.

Then the play moved on to Graduation Day, where the massed cadets (represented by the three actors, some mops and brooms with mustaches painted on them, and a barful of toy soldiers) sang "Up Up for the Fatherland and were handed their rocket insignia.

The actors changed onstage into their powder-blue uniforms (overall) with the jackboots (rubber gishches) as a sign came down: First Assignment: Rocket Man City—Peinemunde.

Another sign: Suddenly—A Propaganda Chorus!

Major Strasser comes up to the three Rocket Men. "Suddenly," he says, "a propaganda crisis!"



Thank Dad
for being more proud
than angry.



Ultimately there's Black:

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'Eeep Eeep Eeep Eeep!' says Shemp, staggering.

"Attention!" says the major. "Our enemies in the U.S.S.R. far beyond the Urals have launched one of their primitive reaction-motor ships. It is bound for the far reaches of the Solar System. Our information is that it is filled with the Collected Works of Marx and Lenin, and the brilliant but non-Aryan playwright Bertolt Brecht!"

(There was a boo from the audience, followed by laughter. The actors on-stage hold still until it was over.)

"Your first assignment is to intercept this missile before it can speed unapproved thinking to Nazi Socialist space, and beyond, and to destroy it!"

There was a blackout, four signs were illuminated, one after the other:

Three Go Out
One Gets Killed
One Goes Mad
One Doesn't Come Back

The first two signs were lit. In the darkness, Zero is in a balswood framework shaped like a small rocket. To his uniform has been added a bent coat hanger representing a space helmet.

His voice is roaring, he is determined. The band is raucous behind him but he sings overpowers it.

"Target in sight!"

It's easy, all right!
Just line up the guns
and watch all the fun—
Goop!

A paper-mâché meteor, painted red and trailing smoke vertically, comes out of the darkness. It smashes into Zero's ship, which flies to flinders. Zero, his coat-hanger helmet now gone, floats up into the air on wires in the dark, a hideous grin on his face.

The spot-light placard: One Goes Mad. Shemp's balswood spaceship: Zero floats directly in front of it. "What?" yells Shemp. He punches things on his instrument panel, running his hands over his coat hanger. "Eeep Eeep Eeep Eeep!" Then he sits bolt upright, unmoving except for the lips, making perfect sense in a monotonous voice, reciting the successive graph plots on a Fibonacci curve, as he and his ship, trailing vertical smoke, are pulled by ropes out of the light into the darkness at the back of the stage.

The spotlight searches around, finds the sign: One Doesn't Come Back. Peter is his ship. He is mumbling the Soldier's Creed. At the other side of the stage, light comes up on a toy rocket. Peter takes out a dart gun, fires twice at the toy, his arm outside the ship's framework as he reloads the rubber-tipped darts. One finally hits the toy rocket—it explodes like a pallet.

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Then an ooga booga horn is blown backstage, causing the audience to jump, and Peter's ship is bathed in flickering red light "Uh-oh," he says "Trouble." Then the band begins to play softly, and he sings "I Wonder What Deborah's Doing in Finding America tonight!"

The ship tilts downwards. Blackout. A sign reads: When the lights come back up the stage is clear. A red silk drop cloth covers the ground. For a full minute, nothing happens. Then Peter's ballroom ship, him inside, rises out of the wings and he lands flat on his back, legs straight out while pieces of wood bounce all over. He stands up, brushes himself off. As he does so, stagehands begin to ripple the red silk, making it look like drifting, gently blowing sand. Peter takes off his coat hanger, takes a deep breath. A book falls from above, bounces at the rear of the moving red stage. Then another follows. Peter looks up. A book slowly lowers toward him on a wire. He reaches up and plucks it from the air. Others fall around him occasionally through the scene. Peter begins to read. His eyes widen even more. He looks up at the audience. He reads more. Then he stands up. "Holy dialectical shit!" he says.

Then the lights come up, and the chorines, stagehands, actors, waiters and dishwasher come in, taking their bows. Zero floozed down from the ceiling on his wires, blowing kisses. Then the Madams come out, glaring at Zero, turned and took a bow to the audience for having survived Brecht.

Then they all passed among the tables, holding out baskets for donations.

Brettschneider stayed at his table drinking, while the audience mingled with the members of the Ensemble. He noticed that he'd written nothing in his notebook since the couple of entries just after intermission. When he saw Peter take something from Madame, put on his coat and go out the door, Brettschneider wrote. Suspects then all followed their usual routines. Then he gathered up his own things, nodded to Casper who was still tending bar, and went back to his home and to bed.

Chait, it's even colder than this morning, thought Peter. He turned off the main avenue, went down a side street. The snow, which this morning had seemed so white and pure, was now gray, crusted, old. Even so, as he turned into a small courtyard, he saw that only a few slats of footprints had come and gone that way the whole day.

Near the middle was a rusty iron gate. He went in with a loud groaning squeal from the metal. On the wall was a brass plate that said Union of Soviet Republics Consular Offices. Peter went to the mail drop, took the envelope out of his left breast pocket. On the outside, written in Madame's hand script was From Your Comrades at the Cabaret Kropotkin. Peter tore open the envelope, took out a few hundred francs, slipped some medical adhesive tape over the torn flap, and it around twice with some twine, and dropped it in the slot.

As Brecht had said. First the bears, then the monkeys. He went back up the avenue, crunching through the frosty ice on the way. The night was still clear, bitterly frigid. He looked up at the waiting slats, and saw the slow-moving dot of Space Platform #6 on its two-hour orbit.

He heard a streetcar bell. He knew of a place he could go and get a cup of malt coffee and watch a fire-place burning for an hour or two, where the thought of Harp Brecht would never cross his mind. He began walking "In the Hall of the Mountain King." **DO**

SILK FOR COCAINE

CONTINUED FROM PAGE 49

credit program. Conway says that start-up production can cost less than \$1,000—for mulberry cuttings, organic fertilizer, a simple bamboo worm house with a tar paper roof, and outside labor for preparing the feed.

Crop substitution has been tried before as part of efforts to stem drug production—without much success. The U.S. Agency for International Development (AID) and the United Nations have had programs in Bolivia and Colombia, respectively. A Bolivian buy-out program, for example, paid farmers \$2,000 a hectare to stop raising coca

and plant Brazil nuts. The only problem Brazil nuts take eight years to harvest—hardly an incentive to get farmers to stop planting coca. In Bolivia, farmers took the money planted the nuts, and just replanted coca elsewhere.

Silk, Conway insists, meets the standards for a successful substitution program—a crop that has international export potential, that is more lucrative than coca, that is easy to get to market, and that is low-tech, well established, and pays cash on the barrelhead like coca does. A report prepared in 1990 for the Venezuelan planning commission by world-renowned sericulturist C. B. Jagannatha Rao, concluded that the Andean countries of Bolivia, Peru, Ecuador, and particularly Co-

lombia are well-suited to the farming of cocoons and production of raw silk. According to Rao, cocoon production is so profitable for the family farmer, sericulture could easily become a useful and successful substitute for coca.

For centuries, sericulture has been the domain of ancient sites centered in China, Japan, Korea, and India; but it could be a tremendous boon to Andean countries, where there is an abundance of labor and a long tradition of textile manufacturing, particularly cotton in Colombia. The region also has ideal conditions for maximum cocoon production. In Japan, where many of the silps have been modernized, the silk farmer can expect two or three rearing periods a year. (The average yearly crop is 500 kilograms of cocoons per hectare with two rearing periods a year.) The Andean farmer, by comparison, can get ten crops a year. According to reports published by the Export Promotion Fund, Colombia's production has reached an average of 1,800 kilograms of cocoons per hectare per year.

But a silk farmer in the Andes is not completely free to farm, price, and sell his cocoons. He is dependent on an intermediary who imports the silkworm eggs, incubates them, and then sells young worms to the farmer. The farmer is then obligated to sell back all his cocoons to the same intermediary who dries and exports them or holds them for use in the Colombian factory. Last spring, in defiance of the system, the Santa Cruz farmers bought silkworm eggs directly from a Korean producer, incubated them in Timbo, transported them by jeep to Santa Cruz where they raised them, and then sold the cocoons to Posada. Santa Cruz's cocoon harvest was probably one of the best-quality harvests Colombia has produced, says Narváez.

In Timbo, ironically, the silk honey-moon seems to be over. The Coffee Federation is spreading the word—"There's no money in silk," they're saying. "Go back to coffee." Farmers are tearing up their mulberry trees. Conway isn't surprised. "I believe the only way silk farming can be successful is on the small family farm with one or two hectares maximum." Weather. Colombian farmers lost money and became disillusioned with silk—all because silk farming cannot be industrialized, which is why it's a Third World crop.

Conway believes the day of the large agribusiness farms, with huge irrigation systems and chemical pesticides and herbicides are over. The planet must rely on small, decentralized organic producers, largely from the Third World, to produce our food and

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fiber. "Unfortunately," Conway says, "the most endangered species on the face of the earth is the Third World farmer—he's a vanishing breed."

Clearly, sericulture could bring a better livelihood to remote, impoverished regions. "The future of the project will be the ability to incubate silkworms at the farms," Narvaaz says. In Santa Cruz, the farmers have even built their own reservoir, hoping to find a way to bring electricity to the region's 300 families. Electricity means self-sufficiency and, the farmers hope, silk-reeling capability in the future. For Narvaaz, the success of the silk project will mean that teachers and health-care practitioners will come to Cauca.

Silk for Life initially piqued the interest of Wisconsin House Representative Jerry Kirovack as well as Vice President Quayle. A 1990 Congressional budget bill recommended that \$200,000 of AID funds go to the project. In July 1991, AID dispersed its first sum to the Colombian government. The ASSOCA received no funds. Conway claims that American officials in Bogotá think crop-substitution efforts are ineffective. An AID official who wishes to remain anonymous seems to agree: "Colombia is different from Bolivia or Peru where crop substitution is more permanent," he says. "The focus of this embassy is to reduce drug trade, the processing and distribution activities. Colombia has made significant efforts in this area, particularly with raids against producers and distributors." And poor farmers "Until recently, our enemy was the Soviet Union," Conway says. "Now we're labeling the South American farmers as the Evil Empire. Our silk project couldn't be further removed from a military one. It's life-sustaining, it takes farmers out of the cocaine."

In a very recent development, Scaliamandre Silk Company based in Long Island City is interested in purchasing 1 million pounds of reeled silk from ASSOCA. At \$25 per pound, the silk farmers could generate up to 25 million dollars in sales. "That's like a \$25 billion contract for a community in the States," Conway says. "To the Cauca farmers, it's absolutely earth shaking." And, Conway says, it means Silk for Life has found the solution to illegal crop cultivation. "We are doing it," she says, "we're living it—no matter what AID officials say."

Conway believes that the link between industrial consumers and small family farmers will revolutionize the way the world does business in the next decade. "Scaliamandre is a pioneer in this new world order," she says, "where farmers and factory owners understand how

the web of life works and each delicate strand respects the other and protects the entire web."

The word about silk is spreading—at the grassroots level anyway. Conway has received requests for assistance from developmental programs in Swaziland, Africa, as well as from organi-

zations throughout South America. "Everyone in the region is waiting to see what will happen," Narvaaz says. "We've been asked to send seeds and tractors to other parts of Cauca. I am certain that in a few years all of the Cauca Valley will be covered with mulberry trees and bamboo worm houses." □

A DREAM DEFERRED

Narvaaz's dream for his valley may just thrive up and die. Several months ago, the Colombian National Police (CNP) discovered that Andean farmers are growing poppies on larger plots than the police had ever anticipated. Clearly, the cocaine traffickers are expanding their marketing opportunities, and poor farmers are once again trying to cash in on yet another black-market drug, this one demanded by the world heroin market. Colombia took immediate action. With crop dusts on loan from the State Department as part of the Andean Initiative, the CNP are spraying glyphosate, the world's biggest-selling herbicide, over three areas of Colombia, including the Cauca Valley. "Between manual and aerial eradication the police have sprayed about 4,000 hectares," says a U.S. official.

Conway is furious and wants Congress to investigate. "Who authorized the program?" she asks. Why was Silk for Life not warned? How do businesses whose organic crops are placed in jeopardy seek an injunction against any further spraying? In response, an aide says that the decision to spray is the prerogative of the Colombian government. Conway believes the "big bad wolf in all this is the U.S." Conway accuses another official, "has a political agenda." That accusation comes from, of all places, Washington, DC (Sources talked to Omv on the condition that they and the agencies they work for remain anonymous.)

In Conway's defense, it should be noted that eradication programs are on the rise in other Latin countries, and diverse groups including farmers, coffee growers, universities, and environmental commissions are sounding an alarm, concerned about the toxicity of the chemicals. President Fujimori of Peru recently warned the U.S. that it could be entering another Vietnam if it goes to war against 250,000 Peruvian coca farmers. Colombian farmers, Conway says, are already in a rage over what they feel is a violation of their private property.

According to Conway, no organi-

zation conducted an environmental impact study to determine how glyphosate will affect the delicate balance of nature in the biodiverse Cauca region—much less has anyone bothered to ask what will happen to children who eat the fruits and vegetables off the sprayed plant? And the farmers wonder how plots distinguish between the plots of poppy and plots of mulberry and corn, they're asking what will happen to the silkworm that eats the sprayed mulberry leaf.

The question, says a representative from Monsanto which produces glyphosate, is moot. "The silkworm will starve, it won't eat sprayed mulberry leaves." The question, says another official, is irrelevant. "Conway's silk project is insignificant compared with the efforts to eradicate poppies." This of itself accuses farmers of creating an environmental disaster, "slashing and burning to clear areas for poppy plants." With one stroke, says this source, the eradication program halts the flood of cheap opium into the United States and saves virgin woodlands—an environmental coup.

Glyphosate controls 90 different weeds, which are listed on a 100-page label with specific directions and warnings. Poppies are not one of the target plants. "Our company does not recommend our products for the use [aerial spraying of poppies] in Colombia," says the representative. As to its safety, two sources claim the stuff is "less toxic than table salt and aspirin." The EPA's scientific advisory panel, however, recommended that it be classified as a Class D carcinogen. Which means, after reviewing the data, the evidence of carcinogenicity is inconclusive.

We are confronted with a web of contradictory statements and positions. What is clear, however, is that the drug war in Latin America, as expressed in Bush's Andean Initiative, is an "obsessed" policy, a narrow focus on drug eradication to the exclusion of the fundamental issue: agricultural alternatives that are successful and provide farmers with a viable income — Murray Cox