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VOL 14 NO 12 SEPTEMBER 1992

DEPARTMENTS

Expanding the human mind, a favorite *Omni* topic, is explored again in this issue, as Stanislaw Fernandes' cover art suggests. Can drugs improve our memory and reasoning ability? (Additional art and photo credits, page 76)

FEATURES

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FIRST WORD

NASA'S POST–COLD WAR CHALLENGE
Turn ballistic-missile swords into commercial-booster plowshares

By Ben Bova

With the collapse of the USSR and the end of the Cold War, America's space efforts face a new challenge that is also a gleaming new opportunity: cooperation.

There is talk at high levels in Washington and Moscow about some forms of cooperation in space. There is also considerable reluctance down at the working levels of NASA and the White House, about cooperating with the Russians.

What about the fledgling private companies that want to create new industries in space? Is there any way for them to cooperate with the Russians fruitfully?

The answer is a definite yes. In fact, there is a way of cooperation that will (1) help move private enterprise into space, (2) help bolster the Russian economy, and (3) also help to speed nuclear disarmament.

The United States and Russia are beginning to dismantle thousands of ballistic missiles and their hydrogen-bomb warheads. Destroy the warheads, certainly. But instead of scrapping the missiles, why not offer them as low-cost boosters for commercial space launches?

The goal is to make space launches cheaper. Several American companies such as Martin Marietta, General Dynamics, and Orbital Sciences are struggling to create an industry out of space-launching services.

But the commercial utilization of space has been hampered by the high costs of getting there. Work on low-gravity materials processing, remote sensing of Earth's environment, global personal telephone services, and other industrial/commercial possibilities are being held back by the cost of placing hardware in orbit.

If the United States and Russia made their decommissioned ballistic missiles available instead of scrapping them, it could present the fledgling space-launching industry with an unparalleled opportunity. It could also bring desperately needed hard currency into the Russian economy. The Russians may already perceive this possibility. They launched an SS-19 this year in an apparent test to see if the missile could be used for space launches.

Moreover, cheaper launch services would help to usher in a renaissance for unmanned scientific satellites and deep-space probes. Many space scientists are going the small-is-better route nowadays, calling for smaller and cheaper but more numerous unmanned scientific missions. By offering booster rockets at "war surplus" prices, the cost of scientific space missions could be greatly reduced.

Roald Sagdeev, former chief of the Soviet Institute for Space Research, pleaded with the United States Congress in March for cooperative efforts. The Russians have the world's only existing space station, *Mir*, and the world's heavyweight-champion rocket booster, *Energia*. These are "international treasures," Sagdeev told a Senate committee, but they may be "an endangered species" because of the economic chaos in Russia.

NASA could use the *Energia* to lift its space station *Freedom* into orbit. Currently NASA plans to use 20-some launches of the space shuttle to ferry *Freedom* into orbit, piece by piece, over a period of several years. *Energia* could do the job in one or two launches. To date, NASA has pointedly ignored this possibility.

NASA has shown some interest in Russia's *Soyuz-TM*, an Apollo-type spacecraft that could be used as an emergency escape vehicle aboard the long-delayed space station *Freedom*.

That's fine for NASA's purposes. But if space is ever to become the economic bonanza that its enthusiasts believe it can be, the cost of getting there has to come down. Governments are not in business to make profits, private companies are.

It will take a great deal of trust on all sides to even begin turning the ballistic-missile swords into commercial-booster plowshares. Yet it can be done. And by making thousands of SS-19s and Minutemen and all the other missiles available at bargain prices, the governments of these two former enemies can help to increase the world's store of wealth—which is the ultimate bulwark against war.

In a world filled with surprises and odd twists of fate, it would be supremely ironic if the former communists of Russia joined hands with the fledgling capitalists of America to open finally the space frontier to commercial exploitation. But stranger things have happened. And very recently, too. ∞

Former editorial director of *Omni* and President Emeritus of the National Space Society, author Ben Bova's latest novel is *Mars*.

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COMMUNICATIONS

READERS' WRITES:

Our growing population, shrinking education, and disappearing molecules

Ghostly Mention

Bill Lawren's article "The Case of the Ghost Molecules" in your June 1992 issue gave an excellent blow-by-blow account of the trials and tribulations that Dr. Jacques Benveniste experienced when he submitted his work to *Nature*. However the author made only passing reference to homeopathic medicine, the subject which Benveniste's experiments most clearly substantiate. Readers might benefit from knowing that the *British Medical Journal* published a review of 107 controlled clinical trials in which homeopathic medicines were used, 81 of which showed efficacy from the homeopathic microdoses. Despite the persistent attacks against homeopathy during the past 150 years, this ridiculed but resilient medical art and science may indeed play an important role in twenty-first-century medicine.

Dana Ullman, M.P.H.
Berkeley, CA

Molecules are molecules, whether in water or in air. The implications of Benveniste's discovery are staggering!

J.E. Byrd
Hardy, VA

Population Explosion

I read everything I can find about the population issue and was thrilled to find an interview with Garrett Hardin in your June 1992 issue. In the late 1960s, when I was in high school, my brother gave me a copy of Garrett Hardin's essay "Tragedy of the Commons" to read. It had a profound impact on me, shaping my personal and political life. He is still, to me, the wisest and most practical voice on the topic of population. Thank you for the article. It has helped me clarify my position on a sensitive and complicated problem.

Carolyn Hilles
Milton, MA

I was startled to see a reference to our Hutterite communities in Cathy Spencer's interview with Garrett Hardin. I would have found it amusing had it not been for the use Hardin makes of our life to justify his philosophy of heartlessness. Hardin is factually inaccurate about us. Historically Hutterite communities in Moravia in the sixteenth century which had a diversified economic base reached an average size of 300, with the largest communities attaining a population of 800. As a more recent example of the success of a larger commons, I can point to the Hutterite communities in the Eastern United States and Europe, of which there are now eight. These communities, with an economic base of light industry, range in size from 120 to over 400 people. All share a common purse among them, so that, in effect, we constitute a commons of over 1,500 people. We continue to grow in number and have not encountered the limit which Hardin believes exists.

Paul C. Fox, MD
Farmington, PA

Regarding Garrett Hardin's quote, "like a blueprint, a fetus doesn't have the same value as the house itself": If you leave a blueprint alone, you won't find that in nine months it has become a house, complete with plumbing and a built-in security system.

Terry Lee
Doylestown, PA

Where does Hardin get off lecturing the world on overpopulation when he himself has had four children?

Bill McCormick
Charlottesville, VA

"A" Is for Appalled

Thank you for printing Keith Ferrell's article about education [June 1992]. I am a freshman in high school. I was appalled when I came to my new school from Juneau, Alaska. Books in the school library are at least 20 years old, and the nurse's office is the trailer of a truck! I've heard because of spending cuts, the school plans to close the library and fire all the counselors. I am sickened by the way people let their future drain away into ignorance.

Jason Butler
Napa, CA

FORUM

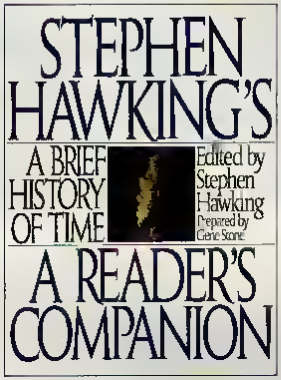
A BRIEF HISTORY OF TIME REVISITED:
A new film makes complex science accessible and entertaining

By Keith Ferrell

There's a new movie out that accomplishes a neat rare trick. It communicates large scientific ideas clearly and dramatically, paints an honest and unidealized portrait of a scientist and the scientific process, and manages to maintain a pleasant narrative rhythm.

The film is called *A Brief History of Time* and is based on Stephen Hawking's best-selling introduction to cosmological concepts, as well as on elements of Hawking's own life.

Errol Morris's film may reach even more people than Stephen Hawking's book.



Now if one were pressed to pick the book least likely to be made into a film, much less a terrific film, *Brief History* might have topped the list. I mean, how can you make a movie about theoretical physics? All those numbers, all those ideas, all those aspects that can't be touched or seen? What kind of filmmaker could do justice to that sort of project?

The answer is a very talented filmmaker named Errol Morris. You might remember his *Thin Blue Line*, a documentary about the Houston police department, one of the very few films that actually exerted an effect on the real world. Now Morris has turned his considerable attention to science, and the results, we may hope, will prove as effective in exciting interest in matters scientific as *Thin Blue Line* was in righting official injustices.

The *Brief History* film is made for a wide audience, and the director wisely takes his time getting into the science. In the first half of the film, Morris focuses as much on the personalities involved in Hawking's life as on the theoretical side, using interviews with relatives, friends, and colleagues to sketch the development of Hawking the human being as well as Hawking the scientist. While some time is naturally spent on Hawking's battle with a debilitating disease, an equal or even greater amount of time is spent looking at other aspects of his life: his childhood, school days, marriage. The picture that emerges is of a surprisingly "normal" individual who happens to be quite ill and quite a genius.

With the human side established, Morris spends the balance of the film on a freewheeling—but always under directorial control—journey through space, time, and cosmological theory. Guiding the viewer along the way are some of modern cosmology's brightest stars: Kip Thorne, Fred Hoyle, Dennis Sciama, Roger Penrose.

And, of course, Hawking himself. He floats at the center of the film, opinionated, insightful, occasionally contentious, always worth listening to.

There is, indeed, a bit of a Hawking boom under way. *Brief History* itself continues to sell in the millions of copies worldwide. Bantam has just published a companion to the book and film, called *Stephen Hawking's A Brief History of Time: A Reader's Companion*. The volume, edited by Hawking himself, reproduces most of the interviews from the film, along with others that were left on the cutting-room floor. It is helpful, after seeing the film, to have what is essentially a transcript available for reference. A biography of Hawking has just been published, and others are reportedly in the works. Certainly Morris's film will focus a new round of attention on Hawking.

The film is good enough, and provocative enough, to focus the attention of a wide public audience on science itself. It's probably too much to expect it to displace *Batman*, but *Brief History* just might catch on with a sizable share of the movie-going public. Many of us will doubtless be in line for a copy of the videotape when it becomes available. This one's a keeper.

Who knows? We could hope that Morris's success will prompt a wholesale return to scientific documentaries from other filmmakers and studios. Imagine the sorts of films we might see: Penrose's *Emperor's New Mind*, Clarke's *How the World Was One*, Toffler's *PowerShift*. Now there's a lineup.

The film should also focus attention on its director. Errol Morris is an ambitious director, and with *A Brief History of Time*, his ambition has resulted in one of the finest science documentaries ever made. One cannot restrict the subject matter a film director works with, nor should we want to. Morris's ambition and abilities may carry him next to a subject as far removed from science as *Brief History* is from the environs of the Houston police department. If so, so be it.

But we can wish that he will return, at least occasionally, to scientific subjects, illuminating them with his distinctive sense of pace, structure, and clarity. Mr. Morris, your audience awaits. ☐

WHEELS

SELF-PARKING CARS
A PC-sized computer in the trunk does it all

By Steve Ditlea

When Heiko Barske demonstrated Volkswagen's Futura research vehicle in New York's Central Park, a passerby, a silver-haired woman who was obviously financially well off, came up to him and said, "I'll give you whatever you want for that car." It wasn't the concept car's distinctive egg-shaped chassis, gull-wing doors, or striking red-and-white interior that elicited this offer. "I can't parallel park," explained the woman, responding enthusiastically to the officially named IRVW (Integrated Research Volkswagen) Futura's distinction of being the first automatic self-parking car.

An automobile that can park itself at the push of a button ranks low among the priorities of automotive experts, as *Omni* learned when representatives of consumer, government, and auto-manufacturing groups all refused to comment on the desirability of such a feature. Yet anyone who has ever flunked parallel parking on a driving test, or had to shuffle backward and forward over and over to fit into a barely adequate space, or had a parked car dented by another driver's maneuvers will immediately appreciate the utility of a self-parking car.

"We find it on many people's wish lists," says Barske, Volkswagen's executive director of research, "but when they hear the price, they are considerably less likely to buy it." Estimating that the self-parking system on the Futura would add about $3,000 to the cost of a consumer car, he nonetheless admits, "I would like to have one of these myself."

What makes the self-parking car possible is Volkswagen's innovative independent four-wheel steering technology using electric motors instead of standard mechanical or hydraulic systems. The Futura is also equipped with narrow-beam infrared laser sensors for measuring distances to vehicles in front and back and broad-range ultrasonic sensors for detecting the distance to the curb. A PC-sized computer in the trunk coordinates all components by monitoring data for a particular parking space and controlling front and rear steering, acceleration, braking, and gearbox setting.

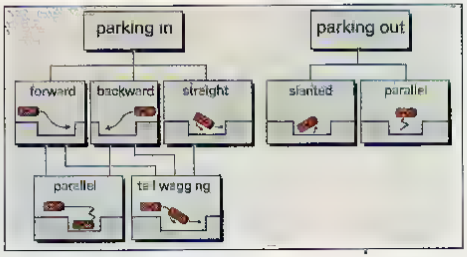
To initiate a parking maneuver, the driver can stop ahead of, beside, or behind a parking space. After assessing whether the space is adequate, the computer indicates on the instrument panel its choice among five possible approaches—forward, backward, straight parallel, or "tail-wagging." Once the driver agrees to its selection by pushing a button, the car does all the rest, minimizing interference with oncoming traffic and leaving itself in the optimum position for a quick, smooth exit which can also be automatic. At any time the driver can opt for manual override.

"Whenever you turn on automatic parking," says Barske, "you can't help wondering whether it will work. It's an odd feeling. After all, you're accustomed to controlling your automobile on your own." For anyone too squeamish to sit in it during parking, a driver can get out first, shut the door, and watch the car park itself while unoccupied.

Volkswagen hasn't been the only auto maker exploring new technology for parking cars. One Japanese maker of minicars for the Nippon domestic market exhibited a semiautomated parking system in a test car at the Tokyo Auto Show. Other foreign companies are rumored to be developing autoparking systems under wraps. United States car makers take note!

Barske himself is now at work back in Germany on a useful precursor to self-parking autos, an option which may be offered on Volkswagens in as little as two years—a distance-detection system to avoid collisions during parking. "You'll have an optical signal on the instrument panel and sound to alert a driver to nearby obstacles." He estimates the cost of such a safeguard at around $100, well within most car buyers' means. The same distance sensors could also serve to avert collisions on the road. With such safety features in the offing, a little attention from automotive experts could hasten the day when manually parking a car will be as obsolete as hand-cranking an engine. ◻◻

"Any serious application of self-parking would have to include more safety features," Barske says. "It must be absolutely fail-safe."



POLITICAL SCIENCE

TEENS:
Will TV become their virtual (and only) reality?

By Tom Dworetzky

As more of our experience comes from TV, our new sixth sense, we drift into a netherworld of reality.

Los Angeles, 'round midnight, on a flickering cathode-ray tube somewhere in the shadow of the *Hollywood* sign. Dick Van Dyke and his perky life!

CLICK! quiz-show prizes in all shapes and sizes!

CLICK! Yugoslavian man blown up by mortar round!

CLICK! L.A. in flames!

CLICK! Come to Cancun!

CLICK! Not!

CLICK! Hunk in jeans!

CLICK! Babe in shower!

CLICK! Car!

CLICK! Pain!

CLICK! Pill!

CLICK! Rain!

CLICK! Flood!

CLICK! Fire!

CLICK! War!

CLICK! Pestilence!

CLICK! Famine!

CLICK! Death!

CLICK. Ahem. 'Xcuse me. Just turned off the tube for a sec so I could speak for the unspoken. Tube as reality. Reality as tube. Trust me. This is really me speaking. I'm not fiction, like Murphy Brown. I'm real. Like Candice Bergen. Of course, Candice Bergen isn't real either. Not to you and me. But we've seen her on TV being herself—or at least pretending to be herself. And that's as good as real, ain't it?

This stew of docudrama, raw tape, doctored photo ops, films, videos, miniseries, sitcoms, tragicoms, and every imaginable hybrid smooshes together into an ahistorical pastiche. It's online full time—a cyberspace, headbanging, mind-number through kaleidoscopic vistas that mutate, vibrate, and rock. What does it do to people who've grown up immersed in this mash of juxtaposed footage, especially today's teens? They experience a collage of undifferentiated mass that's either so real, it's cost some videographer his life to get—or it's the doctored, never-realism of sitcoms and other shows.

For all of us, the flow of infotainment is flooded with an overwhelming postmodern lack of verifiable certainty. What you see is an 'almost' experience, never actually felt in a visceral way, negative or positive. There are no physical stimuli such as pleasure or pain connected to the visual and audio perceptions. This creates in the viewer a permanent state of suspended belief. That it's on the box doesn't make it real—or unreal. It only makes it on the box, a 20-inch picture in your living room. Tube reality resembles a memory from youth recollected in old age, gnarled by retelling, long overlaid by embellishment.

Out in the physical world, most of the time, we usually gain sensory impressions strong enough to let us discriminate between the real and imagined. Beyond that, when we're *out there* looking, smelling, tasting, touching, and hearing, we can also anchor our perceptions in our own point of view. This gives us the perspective to determine basic things, like the relative size of an object or the closeness of a sound. A point of view also allows us to know the relationship of one scene to another—to establish cause and effect. In the world of TV, the unseen hand of an editor is always at work, selecting what we see, and what we don't, and the order that events appear to have. But as we wire more options into the TV and as more of our primary experience comes from this new sixth sense, we drift into the netherworld of docufictu, where real is only relative to what's in the box. We all choose to believe our own reality. It's a consensus, normal thing. For example, I don't think trees whisper to me and neither do the large majority of my friends. As a result, we have formed a consensus that says normal people don't hear trees talking.

Little by little these consensuses add up and form the bases of meaning in our thinking, in our communications, and ultimately in our individual psychological cores and group culture. There exist in anthropological literature enough well-documented cases of "ennui-leading-to-death" in societies that are undergoing radical change to substantiate just how important this cultural meaning is to the individual. Take it away, and the meaninglessness of life can be fatally overwhelming.

Molded by TV, teens today see a world of jump cuts between easy 22-minute solutions to life crises on fictional shows and the disconnected brilliance of historical events, from ribbon cuttings to mass murders, bereft of context—historical, psychological, cultural, or ethical. Slabs of information are plastered across the frontal lobes, each weighing however many minutes it sits there, baking onto the neurons. JFK, Dick Van Dyke, Archie Bunker, Pol Pot, cannibal murders, and cancan dancers in Las Vegas revues. How can any of us tell what is really real and what is not? ∞

ELECTRONIC UNIVERSE

GREEN SCREENS:
Silicon simulations promote ecological awareness

By Gregg Keizer

Global Effect reveals a bitter truth: Pollution and progress go hand in hand.

If you think this summer was hot, wait until global warming kicks in. And if you want to hit the beach but live a dozen or so miles inland, just be patient. The sea should rise up and march the water's edge right to your doorstep.

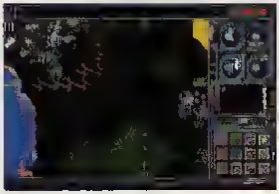
Doomsday weather forecasting? Maybe. Or maybe it's just a taste of the future, courtesy of some PC games that let you play with global ecologies, mold planets to your liking, and rain imaginary disasters upon the silicon creatures on the screen.

Maxis' *SimEarth* (IBM PC, Macintosh, Amiga), the classic world builder, is more biology lesson than anything, for it turns you into a Darwinian promoter of life forms. You set primitive life on the evolution trail and then manipulate its environment enough to keep it alive. If you're really good, you can goad a species into intelligence and then watch it wreck the planet. Along the way, *SimEarth* lets you pour meteors onto the world, spew volcanic ash into the atmosphere, and even raise and lower the temperature for some greenhouse fun.

Less comprehensive and a lot less realistic, but more fun to play, is Millennium's *Global Effect* (IBM PC, Amiga), a cross between *SimCity*, the engaging urban-management game from the publisher of *SimEarth*, and a slam-bam war game. Like *SimCity*, *Global Effect* makes you work to set up municipalities. You must establish power supplies, provide water and sewer systems, and limit urban sprawl. But once you've made a viable city or two, you can either turn your attention to cleaning up the environmental mess you've made or pour money into building the weapons that will defend your hard-won progress from the computer or human enemy.

Admittedly, building cities isn't as much fun in *Global Effect*. Unlike *SimCity's* microcosmic view where highways are crowded with cars and you get to construct sports palaces to placate the masses, *Global Effect* concentrates on the macro view of power and pollution.

Cities demand reliable power, and although you can do the ecologically correct thing with solar and wind power, to grow a decent city you'll have to dirty the atmosphere with oil- or coal-fired



power plants or risk contamination from nuclear powered generators. The effects of such decisions—Do you let the brownouts stunt growth or damn the carbon dioxide count?—are easily seen when you pull up any of several graphic reports on the health of the planet.

Every action in *Global Effect* costs power from the bar at the side of the screen; it's usually frighteningly low and can easily frustrate your attempts to build and maintain even a single city. With some practice, though, and an early commitment to polluting the planet (I had a hard time keeping a city unless I dirtied the air with fossil fuels), you'll soon be managing global development on a grand scale.

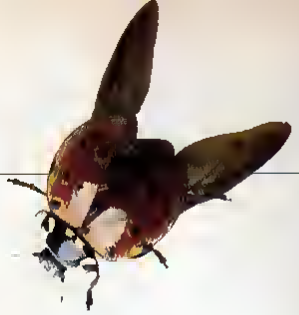
One or two people can play *Global Effect*, or you can take on a computer competitor. Playing solitaire may be educational at times, but it's not as entertaining as tackling an opponent. War toys are part of *Global Effect*, too—something that *SimEarth* lacks. Mine uranium and build nuclear power plants, and you can tip missiles with atomic warheads to deter the enemy; you'll want a ring of radar stations to give you time to react if the enemy launches rockets. There's nothing like a war to ruin a planet.

The game even gives you plenty of planets to play with, from an ice-bound world to a worn-out globe where resources are scanty. Or you can try your hand at fixing planets suffering from the aftereffects of industrialization or nuclear holocaust.

Of course, *SimEarth* and *Global Effect* aren't the only ecological software around. Chris Crawford Games' *Balance of the Planet* (IBM PC, Macintosh) from Software Toolworks asks you to juggle the world's needs—from overpopulation and hunger to disease and carbon emissions—as you strive for utopia. Earthquest Inc.'s *Earthquest* (IBM, Macintosh), more of an electronic encyclopedia than a real game, lets you solve environmental problems on our own world.

Such simulations should be required playing in the White House, the halls of Congress, and at the United Nations. They won't give politicians answers to global warming, weapons saturation, or ozone depletion, but they may give them a peek into a possible future. And maybe scare them enough to come up with some real solutions, not just ones played out in software. ∞

KID STUFF



THE YOUNG SCIENTIST'S LIBRARY:
Science books for kids make learning easy and fun

By Robert K. J. Killheffer

Have you tried to find a chemistry set at a Toys 'R' Us lately? They're hard to come by amid the clutter of cartoon tie-ins and Ninja Turtles, so it's little wonder that American children are said to have less knowledge of the sciences than the children of other nations. But we need not abandon all hope. Amid the welter of illustrated fairy tales and politically correct nature poems crowding the children's book market, there is a wide variety of quality science books which can introduce the wonders of scientific inquiry to a younger audience.

One of the best ways to interest young readers is the hands-on approach. Few kids will sit still for a long, dry lecture on the principles of motion, but a couple of simple experiments can often provide the same lessons—and make them stick. Each volume of Janice VanCleave's "Science for Every Kid" series (John Wiley & Sons) offers 101 experiments illustrating a broad range of scientific concepts. The *Physics* volume, for instance, covers light and sound, gravity and inertia, simple machines, and electricity. VanCleave's experiments are designed for young scientists to tackle on their own, relying on easily obtained materials (though a few suggest adult supervision). If the Science for Every Kid series lacks any significant element, it's background information. VanCleave assumes a basic knowledge of each field—younger experimenters will probably need an instructor's briefing. Despite this, VanCleave's series offers comprehensive, hands-on introductions to their subjects. Other volumes cover biology, earth science, chemistry, and math.

Nell Ardley's "Science Book Of" activity series (Harcourt Brace Jovanovich/Gulliver) offers a good dose of general prefatory information and a bright, clear, eye-catching design; its activities are less experiments than exercises in building replicas of basic technologies. In the *Machines* volume, kids build a mini-wheelbarrow to study levers and a hand-powered fan to learn about gears. The *Energy* volume uses a pinwheel to explain kinetic energy and a shoe-box Newton's Cradle to demonstrate laws of energy transfer and conservation. Fun and informative, but some of the projects may require adult assistance—particularly the electrical activities in the *Energy* book. Other topics include *Air*, *Water*, *Light*, and *Sound*.

Another way to inject excitement into science is through dynamic, reader-friendly visual presentations. These visual "encyclopedias" blend clear and concise text with invigorating designs, photographs, and illustrations, and their pictures can be worth a few thousand words when explaining scientific concepts.

The most consistently impressive producer of visual science books is Dorling Kindersley, a U.K.-based company with a small U.S. division. Some books are published in the United States under the Dorling Kindersley imprint, including the "See & Explore Library." Like all Dorling Kindersley books, See & Explore

A homemade flashlight, colorful beetles, and a useful lizard bring the world of science to life.

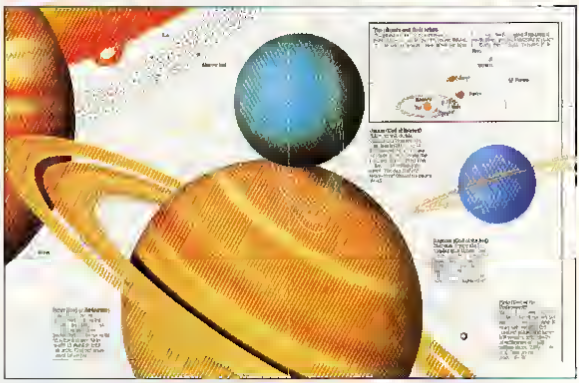
"At least in the children's book market, science seems to be alive and well."

Eye-catching layouts, detailed diagrams, and superb photos make visual science books a delight for kids of all ages—and their parents, too.

titles are lavishly illustrated and carefully designed for maximum readability. Each two page spread features a main text and a large central image, numerous sidebars, and detailed captions offering a wide variety of subsidiary information. Sue Becklake's *Space: Stars, Planets, and Spacecraft* provides vivid images of the planets and more distant bodies such as galaxies and nebulae as well as detailed illustrations of spacecraft. David Burnie's *Machines and How They Work* includes cutaway diagrams of timepieces—from ancient water clocks and sundials to a wristwatch and a grandfather clock—an automobile engine, and more, with accompanying text explaining the principles behind the various devices. Other volumes include *Dinosaurs and How They Lived* and *Sharks and Other Creatures of the Deep*.

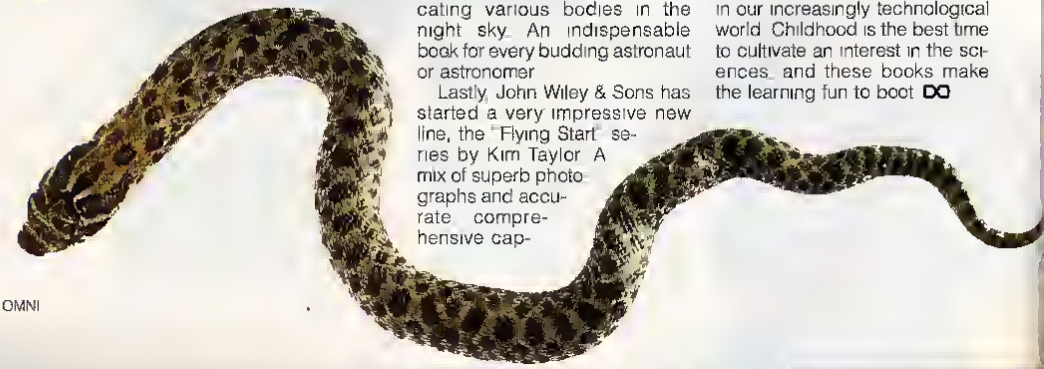
Some of the Dorling Kindersley series are published in the United States by other houses. Alfred A. Knopf, for instance, offers the "Eyewitness" and "Eyewitness Juniors" series. Ranging from *Arms & Armor* to *Rocks & Minerals* and *Reptile*, the Eyewitness volumes are immensely entertaining and informative, filled with stunning color photographs and captions providing a broad range of information, from general background to historical anecdotes and trivia. In the *Reptile* book, kids learn not only basic reptile characteristics, but also strange facts of tortoise and lizard reproduction, how snakes move, how ancient societies viewed different reptiles, and how quickly endangered reptile species are vanishing. Eyewitness Juniors offers similar pleasures to younger readers, focusing on bizarre and amazing facts about the natural world. Volumes include *Amazing Crocodiles and Reptiles*, *Amazing Fish*, and *Amazing Monkeys*.

One of the most exciting Dorling Kindersley projects has been published in this country by Harcourt Brace Jovanovich's Gulliver Books imprint. *The Space Atlas*, by Heather Couper and Nigel Henbest. This is a book I wish I'd had as a kid. Covering everything from the history of space exploration through the intricacies of the known planets to the sun and other stars, this oversized volume includes the most complex, fact-filled spreads of any of the visual science books out there today. Each spread has a Facts & Figures sidebar of numerical data and an Activities sidebar with simple instructions for locating various bodies in the night sky. An indispensable book for every budding astronaut or astronomer.



Lastly, John Wiley & Sons has started a very impressive new line, the "Flying Start" series by Kim Taylor. A mix of superb photographs and accurate comprehensive captions. Taylor's books make the best use of visual presentation to teach specific science concepts. In the *Action* volume, for example, kids learn definitions of speed and trajectory and explore concepts of inertia and kinetic energy—and Taylor is the only writer I've found who provides a correct explanation of "centrifugal" force (properly known as centripetal acceleration). Other volumes include *Light* and *Structure*.

At least in the children's book market, science seems to be alive and well. Give your kids some of these books—or get your local libraries to order them if they haven't already—and give the next generation a head start in our increasingly technological world. Childhood is the best time to cultivate an interest in the sciences, and these books make the learning fun to boot. ∞



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STARS

A TELESCOPE OF ONE'S OWN
Students go to Tennessee to stargaze from a California mountaintop

By Steve Nadis

Nashville is better known for country music than astronomy—and for good reason. Clouds and an almost perpetual haze make it "an absolutely lousy place for stargazing," laments Greg Henry an astronomer at Tennessee State University (TSU). But that will soon change. By this fall the university will have a first-rate telescope—located at one of the world's prime observing sites—that students and faculty can operate without ever leaving the Tennessee campus.

The 32-inch telescope will sit atop 5,800-foot Mt. Wilson, some 20 miles north of Pasadena, California. It, like the 16-inch telescope on Mt. Hopkins in Arizona that TSU shares with Vanderbilt University, is completely automated. TSU astronomers can program the computer-driven "roboscope" months or years in advance to make specific observations, with the resulting data transmitted by telephone and modem to a PC in Nashville.

The arrangement offers many advantages, perhaps the foremost being convenience. "I can let the robotic telescope run unattended for a month and retrieve all the data in the time it takes to heat up a pot of coffee," Henry says. The telescope can examine 100 stars on a single night, hauling in four times more data than a human observer could collect with precision never before attainable. The technology makes long-term-monitoring projects possible for the first time, while sparing astronomers the chore of staying up all night on a freezing mountain with their eyes glued to a tiny eyepiece. Robotic telescopes not only gather raw data, they also convert it to a meaningful form. "Now virtually all of our time can be spent analyzing the data and finding out something new about the universe," Henry adds.

As an added bonus, automated observatories provide a kind of geographic freedom. On Mt. Wilson, TSU astronomers will have suitable conditions for star viewing—that is, a clear, dark sky—about half the nights of the year. By contrast, in Nashville (or anywhere else east of the Mississippi), they could obtain high-quality data on fewer than 10 percent of the nights.

The TSU team plans to use the new telescope to measure minute brightness variations (on the order of one-tenth of a percent) in 100 sunlike stars, making clear skies essential. "The slightest trace of clouds renders these measurements worthless," Henry says. The astronomers want to gain insight into one of the persistent mysteries of astrophysics. What causes the sun's magnetic activity (as reflected by magnetic storms and sunspots) to vary in 11-year cycles? On top of this is another mystery—the prolonged periods of magnetic quiescence that occur about once every two centuries, exerting a little-understood influence on the earth's climate. (The "Little Ice Age" of the 1600s coincided with just such a period.)

"By using the laboratory of other stars similar to our sun, we hope to find out how our sun changes," explains Harvard-Smithsonian astrophysicist Sallie Baliunas, deputy director of the Mt. Wilson Institute. "Rather than waiting a couple of hundred years to see if the sun changes the global climate dramatically, we can find out in a few years by looking at the changes in a hundred solar-type stars." After a decade of observations, adds TSU astronomer Joel Eaton, "we should have a better idea as to whether the sun is going to be more or less active in the next century and what effect that will have on our climate."

Despite the project's public-policy implications, education remains the primary objective. Tennessee State is one of 115 Historically Black Colleges and Universities in the United States; blacks and other minorities make up about two-thirds of the student body. As the first such university to own a research-grade telescope, the school hopes to introduce more minority students to astronomy. "There are probably fewer than ten minority astrophysicists in the whole country," says Michael Busby, who directs the TSU center that runs the Mt. Wilson project. "If we can do anything to get more young folks interested in the field, we'll feel pretty good about that."

The goal is broader than just grooming a few minority astronomers, Henry says. "People don't come to TSU to pursue astronomy because we have no department. But students will have a chance to participate in vital scientific research and find out what this work is all about." He promises that every student who joins the effort will get more than just a taste of astronomical research. "This is not an adventure. It's a job." DC

Students at Tennessee State University will use their new telescope in California to study long-term changes in stars similar to our sun.

CONTINUUM

ONCE UPON A TIME

Keeping alive the power of imagination. Plus, why world leaders get testy in the summertime, and bees with great memories—that aren't theirs

Hushed below the billows of a white tent in East Tennessee, an audience of several hundred is transported by Jay O'Callahan to a shed by the Nova Scotia sea. The time is no longer the 1990s with its fin-de-millennium Zeitgeist but the war-torn 1940s fraught with its own uncertainty. Magically, O'Callahan has metamorphosed into a 15-year-old Nova Scotia girl—despite his graying whiskers.

At the National Storytelling Festival, an annual celebration held in Jonesborough (Tennessee's oldest town), elaborate leaps through the time-space continuum are achieved via that most powerful of all transporters, the human imagination. In an effort to counterbalance the current hi-tech onslaught of audio and video hyperstimulation, O'Callahan and his co-conspirators are promulgating a revolutionary revival. While the national attention span shrinks to sound-bite minuteness, as Jackie Torrence relates the adventures of Wiley and the Hairy Man or the vicissitudes of Br'er Rabbit, the rapt faces of children, sitting cross-legged, packed in the front row attest that this is a revolution *backward* in time.

Jackie Torrence: Lift every voice

Of African-American heritage, Torrence is recalling the days when her great-great-grandsires beguiled the hours with stories that were African legends grafted onto Euro-American tales. Anndrena Belcher, who sometimes favors a theatrical style clad in a pinafore with a crimson hat and matching lipstick, says the impetus of storytelling is to 'create those images that validate our cultural roots.' Belcher believes it is the "power of the family story that gives us our sense of identity, of our place in history and of our ability to create. It's a soul-searching process to get at our own definition.' Indeed, each festival participant re-creates for a new audience his or her own personal heritage. Joseph Bruchac celebrates his Abenaki ancestors in his Indian tales. Syd Lieberman promotes the Jewish folklore tradition, Doc McConnell conjures up the good-ol'-boys yarn swapping of his Tennessee childhood.

October 1992 marks the festival's twentieth anniversary. In 1973, Jimmy Neil Smith, a journalism teacher from the Jonesborough high school, was inspired by a radio broadcast of Jerry Clower's Mississippi coon-hunting tales to organize a get together of regional story spinners. At last year's festival, 6,500 dedicated enthusiasts convened in five huge tents under the walnut trees for a weekend of rib tickling, heart stirring, toe-tapping entertainment courtesy of several dozen storytellers, from Ray Hicks, a local from the mountains of Western North Carolina, to Eddie Lenihan, an import who trekked from the coast of Western Ireland. The entire shindig is organized by NAPPS, the National Association for the Preservation and Perpetuation of Storytelling.

The kick for the audience is not only in hearing the stories themselves but also in experiencing the sheer mesmerizing joy of the telling, in being privy to the ancient and illustrious art of the oral tradition. Some children of the video age—and now the music video age—might find it incredible that a single human being, unenhanced by synthesizers, sampling, or strobe lights, could possibly keep anyone interested for a minute, let alone an hour.

Aside from entertaining and educating, many storytellers are actively involved in using storytelling as therapy, as an antidote to the troubling, violent images with which we are daily bombarded by the media. "Every culture created stories to give people role models," Belcher says. "The hero is put in an extreme situation to show people how to respond. He is the little guy who uses wit and imagination and creativity." Belcher says heroes from all over the world have many things in common and their stories can be applied to current situations. '*Jack* is *Ivan* in Russia and *Juan* among Hispanics. But kids have to figure out how to survive on the playground without guns." O'Callahan has worked with troubled kids—as he describes them: 'kids who like being wild and have been written off.' But, he says, encouraging them to tell their own stories can counteract the mystique of the violent images they see on TV. "If they can make that leap, they start image-shaping like mad; they suddenly can channel all that energy they have in a creative way that's exciting and fun. They can get that wild feeling from storytelling." (For information, contact NAPPS, P.O. Box 309, Jonesborough, Tennessee 37659, telephone 800-952-8392.)

—MELANIE MENAGH

CONTINUUM

LONG DAYS, SHORT TEMPERS

As the dog days of summer approach, beware the dogs of war. So says Gabriel Schreiber, an Israeli biochemist and psychiatrist who believes that the season's long days inflame the aggressiveness of national leaders.

Schreiber and his colleagues at the Beer-Sheva Mental Health Centre and Ben Gurion University have shown that psychiatric patients with affective or emotional disorders are more aggressive during longer days. So, with the advent of the Gulf War, he wondered if that seasonal aggressiveness applied to political and military leaders as well. "They are not psychiatric patients," says Schreiber, "but many have psychiatric disorders."

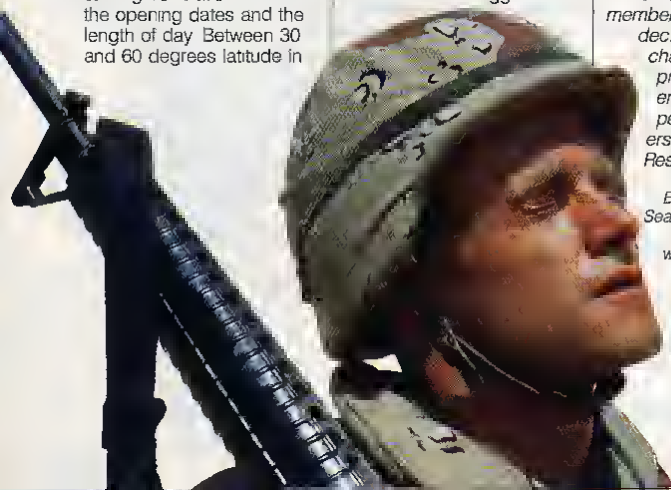
He and his colleagues studied more than 2,000 different wars and found a striking correlation between the opening dates and the length of day. Between 30 and 60 degrees latitude in the Northern Hemisphere, less than 50 wars began in January. That number rose steadily through the spring and early summer to peak at more than 200 in August, then dropped back to near 50 in December. Warfare in the Southern Hemisphere displayed a mirror image. Hostility at the equator showed virtually no seasonal variation.

Schreiber acknowledges that more wars may begin during the summer in part because armies prefer fighting in good weather. But he believes light plays a crucial role. Extended periods of light may affect brain chemistry, he says, increasing the release of neurotransmitters such as serotonin, associated with aggression. "Light affects our biological clock," he adds, which regulates behaviors and bodily functions ranging from alertness to sex drive.

But long days may bring more than pain and suffering. "Aggressiveness is not always bad," Schreiber says. "Part of it can be creativity." He is now examining thousands of poems to find out if the Muses accompany the war god Ares on his summer tour of Earth.

—Billy Allstetter

THE MOST DISTANT STARS ARE LOCATED ABOUT FIVE BILLION LIGHT-YEARS FROM EARTH, OR 30,000 BILLION BILLION MILES AWAY.



Blame it on the weather. Season-related psychiatric disorders may dictate when soldiers go to war.

FORESTS TO PULPWOOD: SIERRA MADRE IN DANGER

Global Response is an environmental group that takes action by encouraging members to write to the decision makers in charge of specific projects harmful to the environment. Omni will periodically inform readers of particular Global Response actions. To join Global Response, write to Box 7490, Boulder, Colorado 80306-7490.

The real treasure of the Sierra Madre, a mountain range in northwestern Mexico, is biological. Jaguars, gray wolves, thick-billed parrots, and other rare fauna roam within a temperate forest uncatalogued by scientists. The forest provides food and medicine for the Tarahumara, Northern Tepehuane, and Mountain Pima Indians, who practice low-impact agriculture. Water from the mountains swells U.S. and Mexican rivers.

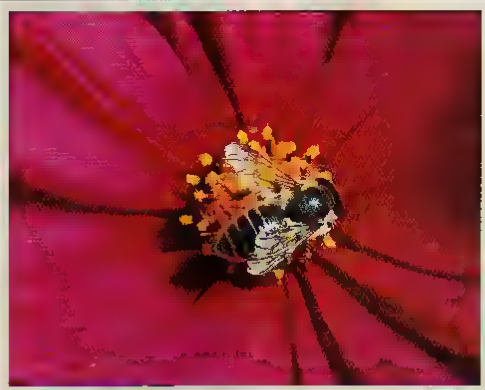
A World Bank loan to Mexico of $45.5 million will trigger a massive logging project over millions of acres. The bank is withholding the loan pending the completion of base-line studies.

With a letter-writing campaign to the World Bank, Global Response hopes to ensure guarantees for the environment and native peoples. "The World Bank takes on huge projects and leaves the details to others, but the details count now," says Barney Burns, an anthropologist and archaeologist with Native Seed/SEARCH, a Tucson, Arizona, organization that has nominated the region as a center of plant diversity.

Address letters of concern to Hans Binswanger, the senior advisor of the World Bank's technical department, at Room I-4049, World Bank, 1818 H St. NW, Washington, DC 20433. —Liz Caile

"Little things affect little minds."

—Benjamin Disraeli



I remember being here before—no that was somebody else
Scientists have transplanted memories from one bee to another

MEMORIES OF WHERE WE WERE

Memory seems rather insubstantial and hard to capture But not to scientists at Wolverhamp ton Polytechnic in England They successfully transplanted the memories of adult bees into bee embryos that shortly after birth, could find their way back to the donors' hives

The researchers first extracted proteins and molecules from the brains of bees that had already learned the routes back to their hives They then injected the extracts into developing bees with an extremely fine syringe drilling a microscopic hole through the wax capping an embryo in a honeycomb Early results suggest that the injected bees can navigate their way home after the scientists place them in a field a mile away Normally they would need to spend some time familiarizing themselves with their surroundings and picking out clues like colored plants before tackling a flight home

"The findings contrasted with those for newly born bees that hadn't been given transplants and couldn't find their way back," says senior physiological psychology lecturer Steve Ray who has devoted five years to the experiment "This was intriguing "

Ray's team also found that treated insects began foraging for food soon after being released an activity that a bee doesn't normally undertake until later in life "Usually a newborn bee will stay inside the hive and do house duties." Ray adds "But ours appear to have taken on the behavior of the donor bees "—Ivor Smullen

IS IT NINE MONTHS YET?

Expectant parents have long wondered what triggers labor Doctors wonder too, as they seek better ways to control premature birth the leading cause of infant mortality and birth related defects Now scientists have evidence that the crucial signal comes from the brain of the fetus

Working with sheep—which are for scientific purposes a useful model of human reproduction—that the paraventricular nucleus acts as a tiny computer collecting data from the rest of the developing fetus When all critical organs have become sufficiently mature the paraventricular nucleus sends out a signal initiating a sequence of hormonal changes that ultimately results in labor

Does a similar mechanism start labor in other mammals, including humans? Very likely, Nathanielsz says "That the signal to start labor comes from the fetal brain makes good common

ABOUT 20 YEARS AGO, SCIENTISTS DISCOVERED THE SHATTERED SKELETON OF A NOW-EXTINCT GIANT SOUTH AMERICAN SLOTH LYING NEXT TO A METEORITE THE VERDICT THE BEAST WAS KILLED BY THE FALLING METEORITE

Thomas J McDonald and Peter W Nathanielsz of the College of Veterinary Medicine at Cornell University in Ithaca New York, have traced the initial signal to an area of the brain called the paraventricular nucleus The scientists surgically destroyed the pea-sized paraventricular nuclei in several fetal lambs and then left the fetuses safely in the womb The lambs' mothers failed to go into labor at the appropriate time and the lambs had to eventually be delivered by Caesarean section In contrast, lambs in a control group, which underwent surgery but retained their paraventricular nuclei, arrived right on schedule

Nathanielsz speculates sense" he notes "The fetus itself can best determine when it's ready to take on the challenges of living in the outside world "

—Ann Jane Tierney

Lambs decide when to be born

CONTINUUM

GURGLE ONCE IF YOU CAN HEAR THIS

Most American parents—98 percent in fact—don't bother to have their newborn babies' hearing checked, running the risk of undetected problems that can cause severe speech-development difficulties later on. Such tests can be time-consuming, expensive, and occasionally, inaccurate.

Natus Medical of Foster City, California, appears to have overcome those objections with a portable device it calls the Algo 1 Plus Infant Hearing Screener. The machine uses analog-to-digital conversion chips, a microprocessor, and pattern-recognition technology to detect changes in infants' electrical brain waves.

The device sends a series of whisper-like, 35-decibel sounds through foam-cushioned headphones placed over newborn babies' ears. "Their ear drums vibrate, the neurons fire, and most of them sleep right through it," oblivious to three electrodes fastened to their heads, says Natus president William Moore. The device automatically compares the brain-stem responses with normal ones to determine if the child needs to see an audiology specialist.

> A RADIO-BROADCAST VOICE WILL BE HEARD 13,000 MILES AWAY BEFORE IT IS HEARD AT THE BACK OF THE ROOM IN WHICH IT ORIGINATED.

In the past, many doctors advised parents to wait until their child was a year old to test hearing, relying on family medical history and low birth weight to warn them that a child was at risk. The conventional hearing tests administered at that age usually cost between $100 and $400. The Natus device, aimed at the hospital market, allows screening at birth by a nurse or trained volunteer. It sells for about $11,000, and each test should cost only about $10.—George Nobbe

Can this baby hear the sound of its own 'Waaah'?

"A grouch escapes so many little annoyances that it almost pays to be one."
—Kin Hubbard

FIGHTING FIRE WITH TECHNOLOGY

The forest fire is one of our oldest enemies, and in some respects, the way we battle it has changed little over the years. To protect against inhaling smoke and toxic gas, for example, many firefighters still wear a simple wet bandana. That may change, however, with the development of a lightweight respirator with changeable, electrically charged fiberglass filters that can do the job much more efficiently.

Scientists at Lawrence Livermore National Laboratory in California successfully tested these full-face masks last fall when a helicopter crew struggled against a huge brush fire near Vina, 90 miles north of Sacramento. The three-pound plastic-and-rubber masks enabled ten firefighters to stay at the smoky scene longer and reduced eye, nose, and throat irritation.

The futuristic-looking mask has two protruding filters containing activated charcoal cartridges that sift out the noxious smoke and acid gas, cleansing the air before the firefighter inhales it. The filters can't screen out deadly carbon monoxide, but a sensor attached to the respirator flashes a warning

Firefighters can breathe easier

light when that gas reaches dangerous levels, according to Donald Beason, who worked on the mechanical design. "A filter's life varies with the amount of the gas it's exposed to, but it'll generally last from four to six hours," he adds.

Livermore scientists continue to fine-tune the device, which should sell for about $300. Lab officials hasten to add that because their mask contains no oxygen unit, which accounts for most of the weight of other respirators, it cannot be used to fight indoor fires.

—George Nobbe

"Science may have found a cure for most evils, but it has found no remedy for the worst of them all—the apathy of human beings."
—Helen Keller

CONTINUUM

MEALTIME FOR MICROBES

In hopes of lessening the damage caused by oil spills at sea, researchers have proposed many cleanup methods, including the use of natural oil-eating microbes. Unfortunately, a vast oil slick tends to smother such oxygen-breathing microbes, slowing their progress drastically or rendering them altogether useless.

Now scientists at the Lockheed Missile and Space Marine Systems Division in Sunnyvale, California, have come up with a method that could lick this suffocating setback. The process, called Prestine Sea, uses an oil-eating microbe called Marine-D, a fertilizer to supply nutrients not found in the oil, and a clay called Petro-Lock. The clay causes the oil slick to curdle into chunky cakes, allowing the microbes to get to the surface oxygen to breathe. This curdling technique also gives the microbes a better opportunity to sink their proverbial teeth into the oil, according to project manager Tom Worthington.

As nature intended. Lockheed hopes its new oil-spill treatment will leave ocean water this clean.

An oil slick treated with Prestine Sea becomes a solid rather than a liquid, making the resulting curdled oil masses less dangerous and more manageable. "If they do reach the shore," notes Worthington of these lightweight oil globules, "you can just pick them up."

Initial studies indicate that the Prestine Sea treatment produces nontoxic byproducts, mostly a fatty acid eaten by zooplankton. The microbes themselves, which increase rapidly in population while feeding on the oil slick, finally die when the oil is consumed, sinking to the ocean bottom.

Initial tests using 2,800-gallon water tanks have found that in 36 days, the Prestine Sea treatment digested about 75 percent of the oil in a simulated spill. If it gets approved for commercial use, the compound would be sprayed over oil spills from airplanes or ships and then reapplied as needed, with sensor buoys and setellites monitoring the status of the oil slick. Meanwhile, the oil-digesting Marine-D microbes are being stored on rice bran, patiently awaiting the dinner bell.—Mark Sunlin

THE AVERAGE PERSON SHEDS ABOUT ONE-AND-A-HALF POUNDS OF SKIN A YEAR

IF CONTINUALLY SUCKLED, A LACTATING WOMAN WILL PRODUCE MILK FOR SEVERAL YEARS

"The cinema is not a slice of life but a piece of cake."
—Alfred Hitchcock

CLASS OF 2001

ARTICLE BY
BETH HOWARD

Today's youth will be tomorrow's power players. *Omni* takes a look at the generation that will usher in the next century.

PHOTOGRAPHS
BY DAVID
MICHAEL KENNEDY

I spot an iridescent-haired dude wearing heavy black boots, swaggering through the verdant campus of Santa Monica High School and suddenly feel old and terminally square. What, I wonder, is it like to be an American teen in 1992? It's no idle thought. By 2030 these kids, middle-aged, will run the world I live in. What will they turn into, thanks to the powerful forces shaping them today?

Foremost, the stats show it's no longer an Ozzie and Harriet world. More children live in poverty than two decades ago, and teen pregnancy is greater for Americans than for any other Western society. SAT scores continue to plummet, and suicide and homicide rates are triple what they were 20 years ago. Kids are even less healthy than they used to be. The last two decades have seen a 50-percent increase in obesity among children and adolescents. The conclusion? This could be the most stressed-out generation in recent history, says Tufts University child psychologist David Elkind.

Ask kids about life, and you'll perceive a backdrop of violence that infects all classes and regions. In poverty-prone urban areas, fully automatic weapons are common. Even in posher neighborhoods, kids can't attend public school without having knives or guns brandished in their faces. Four eleventh graders from the affluent California high school for example, knowingly drill me on the differences between 'wannabes," "crews,' and gangs—the progressive steps into gang involvement. Indeed, they're forced to form allegiances with gang members for "backup"—basically how many people you have who will fight for you if you get into trouble," explains 15-year-old Zachary, a white kid in the middle-class community far from riot-torn South Central Los Angeles.

Teens who manage to avoid violence face other great threats. According to the American Council for Drug Education, one teen in three is approached to buy or use drugs by age 16. Kids today have access to a wider array of addictive and dangerous drugs than their parents who pioneered the drug terrain in the 1960s. In addition to marijuana, cocaine, and LSD, there's a deadly new chemical on the block: crack.

Youth's sexual experimentation, moreover, comes shockingly early, aided and abetted by MTV's explicit messages—a radical shift from Donna Reed–era sitcoms where husbands and wives slept in separate beds. Over 30 percent of 15-year-old girls have experienced sexual intercourse today, as compared with two percent in 1979. The sobering consequences of kids' sexual sophistication, a soon-to-come explosion in teen AIDS cases.

At the same time, the picture for youth is not entirely black. The growing worldliness of their woes mirrors teens' new maturity—the responsibilities many shoulder within changing family structures, for example. Today a significant number of children are thrust into adult roles by economics and divorce and the concomitant increase in single-parent households. "The post-modern family initially was balanced toward the needs of children," Elkind says. "Now the balance has shifted in the other direction."

Their grown-up burdens make kids more knowledgeable about political and social issues, such as racism and the environment. Many of them are exercising their potent political clout to create change. And others are using their facility with new technologies, such as computers, to find solutions to society's ills. Some youth today are already on the cutting edge, leading the struggle to set a positive tone for the future of the globe. Sure, kids now grow up fast and hard. But they're proving pretty resilient, too. They may face greater pressures than past generations, but they're also striving to get a headstart on the future. Here's a look at the Class of 2001—green hair and all.

CAFÉ SOBRIETY

It's 10:00 p.m. Do you know where your children are? Used to be if you went looking for your kids on a Friday night, chances were good you'd find them throwing up warm beer at a keg party. Now you're just as likely to find them sipping a cup of coffee in a dimly lit room, listening to poetry that doesn't rhyme, or just kicking back at their local cafe.

Coffeehouses used to be the domain of earnest young men and women engaged in serious discussions on art, politics, and ideas. But increasingly, they're attracting the average kid with nothing else to do on a Friday night as well as a particular 1990s brand of teenager—the "baby sobe," an alcohol or drug abuser by age 16, a veteran of a 12-step program by age 17. In Los Angeles alone, dozens of coffeehouses are offering everything from live music to performance art in an effort to win teen dollars.

"Right now it's the cool thing to do," says 15-year-old Cameron Anderson, lounging on a well-worn sofa in a pair of ripped jeans at Santa Monica's Congo Square.

While many of today's cafes offer entertainment, even the occasional cover charge, a few are bucking the trend by remaining true to their roots, a no-frills place to relax, study, or peruse an alternative newspaper while sipping a cup of java. Some even double as avant garde bookstores.

How long the coffeehouse craze will last is hard to say. While the Boston-based Coffee Connection now runs 11 houses and plans to open more, Cameron, for one, thinks the café scene is just a fad. "The true artists and writers will always come,' she says, "but the pretentious types will soon find something else to do."

—Peter Callahan

TEEN ANGLES

They were surprised and relieved when Patriot missiles actually fired during the Persian Gulf War.

They're into the Sixties. They get more comfort from the family pet than their parents.

Who are they? How do we know what they think?

They are American teenagers. And those telling us what they think and feel are Irma Zandl, founder of Xtreme, and Marian Salzman, who heads BKG Youth, two gurus of the American teen scene. The two companies study teenage trends, attitudes, and consumer behavior for clients, including Procter and Gamble, Esprit de Corp, MTV, and Chase Manhattan Bank.

"Companies targeting youths ages six to twenty-two have a unique opportunity to mold brand preferences and influence purchasing of this 'first-usa' market," says Salzman.

Targeting teens, of course, requires something more than traditional market research. The 42-year-old Zandl visits clubs, concerts, and kids' homes. Her five-year-old company was the first to tell clients about the marketing possibilities of rap music.

For its part, BKG not only updates its database of 40,000 teenagers regularly, but also tracks trends through teachers and guidance counselors. The firm produces an annual National Teen Summit, packages books for teens, and provides young talent to television and radio shows.

BKG's latest findings: Millions of American kids are gravitating toward gardening and plant care. But youth volunteerism in social organizations is waning in favor of individualized help, such as visiting the elderly or helping a person with AIDS.—Kathy Seal

DESIGNS OF THE TIMES

Life is rough and the streets are tough. We all know it, so why not show it.

The rap-singer, homeboy look—saggy pants, big shirts, and baseball caps—has entered the urban middle class, not far behind the "buzz cut" and the "fade," but with a difference. Kids may be adopting the threatening look, but they've left behind the negative association of gang colors.

Instead, they're taking inspiration from African tribal colors: red, yellow

Number of teens: 34,819,400

Number of teens and young adults killed every day by firearms: 23

Number of junior and senior high-school students who drink alcohol every week: 8 million

green and black. In-your-face slogans such as "By Any Means Necessary" and "Peace in the Hood" stamped on clothes make positive social as well as fashion statements—especially after recent urban riots. And increasingly, 'X'—for the slain black leader, Malcolm X—marks the spot on many garments.

Teen rebellion has been around a long time. Every generation has its own anti-hero, from James Dean to Axl Rose. "Teens feel power in changing styles," says Barbara Cadow, psychologist at the University of Southern California. Significantly, the bad guys for the Nineties are gang members whose "bad" style nice kids appropriate to look cool. One fashion critic even noted the oversized look takes inspiration from ill-fitting prison garb.

Clothes that may seem threatening to 30-somethings, however, help teens express their feelings about their culture. For example, fashion details mirror teen concerns—witness the popularity of jewelry made with condoms. Or they reflect adult responsibilities. Spotted recently: teenage girls wearing pacifiers.

—Suzanne Stone

LOOK EAST, YOUNG MAN

Psychologists asked fifth graders in Chicago and Beijing the same question: If five-sixths of the members of a 24-member stamp club collected only foreign stamps, how many members did so? Fifty-nine percent of Beijing children gave the correct answer. Japanese and Taiwanese kids scored similarly. Only 9 percent of the Chicago kids got it right.

Although there's no overall difference in intelligence, the differences in mathematical achievement of American children and their Asian counterparts are staggering," says James W. Stigler, author with Harold W. Stevenson of *The Learning Gap: Why Our Schools Are Failing and What We Can Learn from Japanese and Chinese Education*. The book is hitting a nerve among educators concerned that American students are lagging behind their cohorts across the world.

Small wonder. American businesses, the authors report, spend some $25 billion each year on remedial education for their employees—virtually all of whom attended public schools. In the global work force in which today's teens will compete, the odds are already against them.

Japanese teachers tend to focus lessons on a practical problem. Rather than lecturing, the teacher guides students through a discussion of alternative solutions. One fifth-grade Japanese teacher, for example, led a 40-minute discussion about whether a beer bottle, pitcher, teapot, or vase would hold the most water. By the end of class, she had graphed the answer on the board without ever discussing how to make a graph.

Taking a cue from Asian instructors, the National Council of Teachers of Mathematics recently adopted guidelines that endorse such encouragement of student thinking and exploration—rather than narrow emphasis on the correct answer. Other solutions: boost spending for education, and, surprisingly, *increase* class size slightly. Japanese teachers, for example, learn to pose questions that encourage students at different levels to think, allowing the instructor to teach more kids at one time.—Kathy Seal

GREEN TEENS

Representatives from the Children's Earth Fund had to stretch to reach the microphones, but their testimony still rang loud and clear on Capitol Hill. Representing 200,000 classrooms and 15 children's environmental groups, the students testified earlier this year at the Senate's special children's hearing on global warming, imploring President George Bush and Congress to lead the worldwide effort against the destructive phenomenon.

The youthful ambassadors represent just one example of the greening of young America. The environment is the number-one concern of today's youth, according to a recent

Number of teens who become sexually active every day: 7,742

Percentage of United States teens who said they would volunteer for the Gulf War effort in December 1990 if needed: 24

Percentage who wouldn't: 75

telephone survey conducted by Peter D Hart Research Associates a Washington-based public-opinion analyst And kids are taking on the cause with a vengeance their parents rarely exhibit, joining environmental groups such as Help Our World (HOW) and Students Tackle Ocean Plastics (STOP) Four years after its founding, the Student Environmental Action Coalition, which organizes activists, now boasts 30,000 members on some 2,200 high-school and college campuses

But the campus isn't the only environmental front for concerned youth The teenaged Toxic Avengers of El Puente, Brooklyn, attend outreach meetings of the Radiac Research Corporation, a hazardous-waste-disposal company bordering a residential area, protesting among other things the faintness of the company's alarm system

Kids are the family members who bug their parents to buy environmentally responsible products and worry about the future of the ozone layer, according to the Hart poll Jumping on the eco bandwagon is especially appealing to kids ages 8 to 12, who are often in the throes of deciding what's right and wrong, says John Javna, publisher of the EarthWorks Press, which recently released *Kid Heroes of the Environment* "Kids know saving the planet is simple, logical and ethical," he says

Activism is the next step "Teens who learned about ecology in elementary school now can do something about it," says Coalition spokesman Randy Viscio —Kathleen Doheny

KONSUMER KIDS

They have bucks to burn and access to the mall With a little help from their friends, they decide what and when they will buy Not content to spend their own money, they often put in their two cents' worth on family purchases as well

No wonder these "tweens'—consumers from about ages 9 to 16—are the new darlings of marketing strategists and demographers Tweens spend an estimated $14 billion a year, says James U McNeal, professor of marketing at Texas A & M University Pretty impressive when you consider their average weekly income ranges from just $4 to $15, including allowance and "earnings" from lawn mowing and other chores, says Allison Cohen of Ally & Gargano, a New York advertising agency

When they're spending their own money, tweens gravitate toward foods, toys, movies, video and other games, makeup, electronics, and clothing deemed nonessential by parents But tweens also influence billions of dollars in parental purchases That leverage climbs each year as more children growing up in single-parent homes take on such tasks as the family shopping

Saturday morning cartoons once constituted the best way to reach teen buyers The share of kid viewers decreased by 15 percent between 1986 and 1991, however, sending advertisers to children's magazines like *Sports Illustrated for Kids*, a genre that has nearly doubled in the past five years

Significantly, the products they're pitching amount to more than junk Kids will save for big-ticket items such as fancy athletic shoes, Cohen found Already, it seems, they've learned to balance impulse shopping with common sense —Kathleen Doheny

WHIZ KIDS

Over its 51-year history, the annual Westinghouse Science Talent Search has become America's premier showcase for teen talent—for good reason Of more than 2,000 top-40 finalists, five have gone on to become Nobel laureates, two have received the Fields Medal, math's highest honor, eight have won "genius awards" from the MacArthur Foundation, and 28 have joined the National Academy of Sciences

What some of these kids are doing in labs rivals the work that won Nobel prizes not many years ago," notes one high-school science chairman whose department has produced many Westinghouse finalists So if you want to know what scientists

Volume of wine coolers consumed by American teens annually, per teen: 1.5 gallons

Of 1,000 teens, number who say they learn because it makes them happy: 1

Number of teens who drop out of school every day of the school year: 2,478

who will shape the next century are thinking, recent Westinghouse winners are a good place to start.

Some are already benefiting science—and society. For instance, NASA used the calculations by this year's second-place winner, Claudine Madras, 16, which predicted the rotation rate of the asteroid Gaspra, to plan how to photograph the asteroid during the *Galileo* spacecraft flyby in 1991. And Kurt Thorn, 16, earned the year's top prize for assessing water pollution in New York's rivers by examining clam shells with a synchrotron x-ray fluorescence microprobe.

—Cherri Senders

TEENSPEAK

Ever feel *clueless* [confused] when talking to a teen? Well, take a *chill pill* [relax]. Understanding teenspeak just seems like *nailing jello to a tree* [doing the impossible].

"Slang is a way of clinging to people in the same boat as you," suggests Connie Eble, associate professor of English at the University of North Carolina, who authored *College Slang 101* to help translate for those ashore. Another guide to studentspeak, *Slang U*, by UCLA linguistics professor Pamela Munro.

Inner-city youth have a language all their own, closer to their own experience, says Peter Martin Commanday, who has studied New York street slang for 25 years. Recently heard among the city kids he observes: *beaming up* [getting high] and *snuffing someone* [killing someone]. And in the age of safe *boinking* [sex], it's not surprising that slang *meisters* [experts] have noted new words such as *party hat, life jacket, raincoat,* and *bone cover* [condom].

Here's other *fresh* [happening] lingo:

5000 goodbye, from the recalled Audi 5000
babelonia popular girls
Velveeta cap 'n' chedda' generally negative
daddy the best
faced embarrassed
heinous bad
Hitlerific unendurable
jazzed pleased
jeeba marijuana
stupid fresh excellent
trendinistas campus activists
tree huggers, earth muffin environmentalists
tubesteak, unit male genitalia
way very
word! expression of agreement

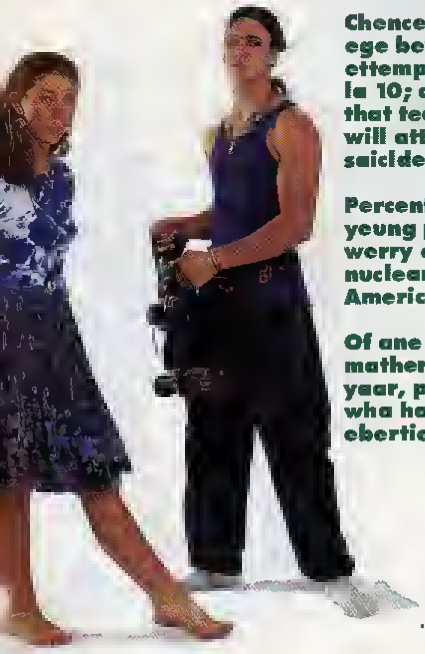
—Shari Rudavsky

SEX, LOVE, AND HOMEWORK

For the first time last year, the number of pregnant students at one urban high school exceeded the number of expectant teachers. Every day, 604 teens across the country contract syphilis or gonorrhea. And the incidence of AIDS among American teens has jumped 25 percent since 1990.

While teenagers are more sexually active then ever before, their formal sexual education amounts to little more than "just say no," suggests a landmark study by the Alan Guttmacher Institute. Surveying 162 of the nation's largest school districts, researchers found that educators are doing "too little, too late" to curb the teen sexual revolution and its repercussions—rising rates of teen pregnancy and sexually transmitted disease.

Among the study's more troubling findings: Although the vast majority of schools offer sex or AIDS education in some form, teachers spend only a total of 6.5 hours per year on the subject, with less than two hours a year focused on contraception and disease prevention. Students typically fail to receive instruction until ninth or tenth grade—after many are already sexually active. Worse, forced to develop their own teaching materials, many teachers disseminate inaccurate or incomplete sex information or preach abstinence. "Less than 10 percent of the schools are teaching comprehensive sex education," laments Debra Haffner, executive director of the Sex Information and Education Council of the United States (SIECUS) which recently unveiled new sex ed guidelines. "What most kids are getting are plumbing lessons in human anatomy."—Cherri Senders



Chence thet teeage boys will ettempt saicide: 1 in 10; chaaca that teenege girls will attempt saicide: 1 in 5

Percentage of yeung peeple wha werry cbaat a nuclear attack en America: 25

Of ane millien teen mathers every yaar, percentage wha have ebertieas: 25






Scenes from Smart Bars: In the Bay Area, where pop is defined and trends are set and the future happens first, kids dance all night to house music at parties called raves, organized by groups like Mr. Floppies Flop House.

"THOUGH RAVE CULTURE HAS ITS ROOTS IN THE SIXTIES, THE DRIVING FORCE IS PURE NINETIES TECHNOCULTURE. THE *NEW EDGE* IS WHERE HAIGHT-ASHBURY MEETS SILICON VALLEY."

ARTICLE

BRAIN GAIN: DRUGS THAT BOOST INTELLIGENCE

BY JULIE ERLICH

For ravers, cyberpunks, hackers phone phreeks, and technophiles treading the *New Edge*, reality is something to be enhanced altered, or tailored to our needs If you've got a computer, a modem, a data glove, who needs Fed Ex, faxes, or even sex? Just boot up and jack in to the matrix You've got cyberspace at your fingertips The only limitation is your brain, and tens of thousands will attest, there are ways to broaden your bandwidth, upload your memory, and upgrade your hardwere The millennium is almost here—and so are "smart drugs' (SDs)

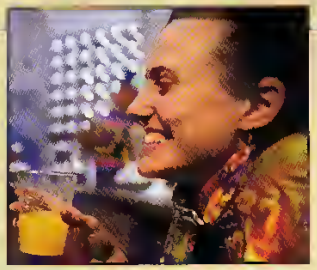
He hands me a red plastic cup filled with something orange It tastes like Tang My first Think Drink All it is, he essures me, is a mix of vitamins and fructose with a measure of choline, phenylalanine, and ephedra and e "dash' of caffeine "There's the left brein and the right brain, and this membrane which connects them called the corpus callosum," he says He pops a piracetam from its tinfoil backing and offers me one "Basically, we're talking about two computers in the brain linked by a date bus and piracetam speeds up data transmission These ere drugs for the Information Age '

So they say so he thinks I don't know what to think The drinks and the drugs are said to improve memory, concentretion, alertness, problem-solving ability, as well es delay the cognitive effects of aging Smart phermaceuticals like piracetam said to enhance cerebral metabolism, are prescribed in Europe Japan and China for stroke and memory impairment Users here are calling them miracle drugs The drinks, they say, "wake up your brain " They ought to Ephedra (an herb), phenylalanine (an amino acid), and caffeine are stimulants Choline, a nutrient, is necessary for memory function All are dietary supplements available at health-food stores

In San Francisco, where the future happens first, kids dance all night to electronically synthesized house music at parties called raves organized by groups like Toontown, Mr Floppies Flop House, and The Gathering Toontown's New Year's Eve celebration—7,000 people attended at $25 a pop—was advertised as a psychedelic apocalypse The entertainment included a holographic gallery, a brain-




The drinks of choice at smart bars such as Toontown's Nutrient Cafe are Think Drinks—Intellex and Renew-You. The drinks, users say, improve memory and delay the cognitive effects of aging.



"SMART DRUG ADVOCATES RUN THE GAMUT FROM COMPUTER NERDS AND CYBERPUNKS TO AIDS ACTIVISTS AND LIFE EXTENSION ENTHUSIASTS."

machine room, virtual reality, interactive video screens, and the Nutrient Cafe run by Cat, who serves drinks with names like Intellex and Renew-You (Other smart bars serve concoctions such as Psuper Psonic Psyber Tonic and Energy Elixir) And Ecstasy, or MDMA, is the preferred chemical for opening the doors of perception Ecstasy has a psychoactive effect that dissolves inhibitions, breaks down boundaries, and promotes feelings of interconnectedness and well-being

Though rave culture has its roots in the Sixties the driving force is pure Nineties technoculture The *New Edge* is where Haight-Ashbury meets Silicon Valley It s a sensibility that owes as much to the possibilities of virtual reality and artificial intelligence as to

PHARMACEUTICALS:

Nootropic. Derived from the Greek meaning "acting on the mind," nootropics are chemically related to the GABA (gamma-aminobutyric acid) system of neurotransmitters, which regulate the electrical and chemical balance of the brain through an inhibitory action. Though the mechanism of action is unknown, researchers believe nootropics enhance brain metabolism and improve memory and learning. They are virtually without toxic effects. Nootropics, as well as many other smart pharmaceuticals, generally have a "bell-curve dose response"—if you take too much, they can have the opposite of the desired effect—confusion and poor recall. The following nootropics have not been approved by the FDA, although all have been submitted for approval.

Piracetam. The original nootropic was developed by C. E. Giurgea (who coined the term "nootropic") in the 1960s for Belgian-based UCB labs. It is structurally similar to the amino acid pyroglutamate. In clinical trials, it has shown to be effective for the treatment of dyslexic children and memory disturbances in people undergoing electric-shock therapy.

Praminacetam. A variation of the piracetam molecule, it was developed by Parke-Davis as a treatment for Alzheimer's disease.

Oxiracetam. Developed by the Italian pharmaceutical firm ICF to treat Alzheimer's, it has been widely investigated by Ciba Geigy.

Anriracetam. Developed to treat age-related memory problems, it and ...ttention-deficit syndrome in children. Hoffmann-La Roche holds the patent. The rights have been assigned to foreign firms.

Idebenone. A leading nootropic in Japan whose 1990 sales were upwards of $300 million. It is widely prescribed for cognitive enhancement as well as for Alzheimer's. Idebenone is chemically related to coenzyme Q_{10}, a molecule found in high concentrations in the heart. Like CoQ_{10}, Idebenone has antioxidant effects which neutralize immune-destroying, age-accelerating agents known as free radicals. It is currently in phase II of testing for Alzheimer's in the United States.

Other smart pharmaceuticals

Hydergine. Synthesized in the 1940s by LSD discoverer Albert Hoffman, it is the only cognitive enhancer with FDA approval. Because it increases the brain's ability to utilize oxygen, physicians originally used it to treat Alzheimer's patients. It didn't work. Non-toxic and nonaddictive.

Vasopressin. Derived from a hormone secreted by the pituitary gland and originally developed to treat diabetes, it has been widely researched for its effects on memory and mental alertness. One of the most popular and effective smart pharmaceuticals, users believe vasopressin elevates mood and counteracts the mental effects of alcohol and marijuana, which suppress the release of vasopressin. A nasal spray, it goes directly into the blood stream. Side effects can include ...cramps and nasal congestion.

Deprenyl. Touted as the "anti-aging aphrodisiac," it was originally developed by Hungarian pharmacologist Jozsef Knoll to ease the symptoms of Parkinson's disease. In laboratory rats, Deprenyl was found to lengthen their life spans as well as increase their libido. Deprenyl enhances the brain's release of dopamine—the lack of which is implicated in the aging process. Researchers also believe dopamine is responsible for primal emotions like lust and hate. Chemically related to amphetamine, users claim Deprenyl enhances mental function, increases sex drive, and has an antidepressant effect. Side effects can include overstimulation, insomnia, and nausea.

Dilantin. One of the most widely prescribed drugs in the United States for controlling epileptic seizures, it stabilizes electrical activity in brain cells. Reported to improve IQ scores, long-term memory, and verbal intelligence in healthy adults, users say it also counteracts jet lag and eases obsessive thinking. Side effects can include gum overgrowth.

Lucidril. Not available in the United States, Lucidril breaks down to DMAE (a naturally occurring nutrient found in seafood) in the bloodstream. Users claim it increases alertness, improves memory function, aids in brain oxygenation, and may help delay the aging process because of its antioxidant effect. It helps remove lipofuscin—the stuff age spots are made of. Side effects can include hyperexcitability, insomnia, and, paradoxically, drowsiness and depression.

Timothy Leary and *Neuromancer* author William Gibson.

What's really behind rave culture, Cat says, is "something spiritual which brings people together. It's kind of an internationalist, tribal, global consciousness. It's about information sharing within a global matrix." Cat's been using SDs since 1979, when he first moved to San Francisco. He'd been doing a lot of Ecstasy, smoking a lot of pot, and was beginning to feel burned out. A chemist friend suggested he try phenylalanine—a gram a day. It worked. He felt more energetic. Then he heard about tyrosine, lecithin, ginseng, choline, Ginkgo biloba. Now he uses them as well as Hydergine religiously. "Smart drugs help me focus. When I use Hydergine, I never feel scattered."

The popularity of smart drugs with Ecstasy-imbibing ravers and those who survived the Eighties with a history of drug use, might be explained in part by the theory that the brain's supply of neurotransmitters—particularly dopamine, serotonin, and norepinephrine, which have been depleted by Ecstasy, cocaine, and amphetamines—can be restored by their precursors, amino acids like tyrosine and phenylalanine.

The smart-drug movement grew out of the work of Life Extension gurus Durk Pearson and Sandy Shaw who promote the use of nutritional supplements as a way to optimize mental function and neutralize immune-destroying, age-accelerating agents known as free radicals. The active ingredients of their powdered drink mixes are a variety of amino acids. When amino acids combine, they form proteins that are necessary to the life of all cells and tissues of the body. Some amino acids and nutrients like phenylalanine and choline—both essential brain foods—are converted into the neurotransmitters norepinephrine and acetylcholine. (Neurotransmitters carry messages between brain cells.)

Durk and Sandy (as they're known) license their "designer mind foods" to companies including Smart Products in San Francisco, and Texas-based Omnitrition, which sells franchises to the likes of West Coast marketer Jerry Rubin, and they're used as the basis for many of the Think Drink mixes sold at smart cafés.

Like Jerry Rubin—and Timothy Leary—Durk and Sandy came of age in the Sixties and got rich in the Eighties. And while the Summer of Love may be over, Northern California provides fertile soil for its legacy. What began as an underground scene has evolved into a full-fledged movement. Smart-

drug advocates run the gamut from computer nerds and cyberpunks to AIDS activists and life-extension enthusiasts. Users include students, yuppies, and 30- and 40-somethings who believe SDs give them a mental edge in the competition to absorb and process exponentially increasing bytes of information.

Now, Toontown has leased its own space, and when they host a rave thousands attend. Smart bars are popping up from L.A. to New York, and books like *Smart Drugs and Nutrients* provide information for the uninitiated. *Mondo 2000*, a slick magazine with a cyberpunk slant, is a forum for *New Edge* consciousness.

Part Dada, part tech-head cybernetics, *Mondo* heralds an age when human and machine interact along a seamless continuum. Editor in chief R. U. Sirius (a.k.a. Ken Goffman), a self-described "decadent, soft-core, commercial anarchist," attributes *Mondo*'s success to the "cultural Zeitgeist—a kind of waiting for the apocalypse."

As we ooze toward the millennium, concepts like "getting back to nature," "consciousness expansion," and "free love" acquire a new level of meaning; consciousness, nature, and sex may one day soon be accessed via computer. They may have to be. The environment may be toxic; sex can be lethal.

Biotechnology and genetic engineering have spawned a new generation of possibilities for life extension and intelligence expansion. And the computer nerds of Silicon Valley are perfecting the technologies which will make possible the simulation of reality, the manipulation of biology, and increase our ability to process information.

"We can't cope with what we and technology are becoming without widening the bandwidth," Sirius says. "SDs widen the bandwidth." He believes these technologies are pulling us "toward something we want to become, something we've invented which will free us from biological control."

Mark Heley, one of Toontown's producers who came here from England a year ago, echoes Sirius. "Smart drugs and Virtual Reality are going to change the world," Heley says. They're concepts which are like time bombs. There's a cultural unraveling, and what's coming into existence is "post human—it's like we're becoming a different species." Heley believes the widespread use of pharmaceuticals will result in a major cultural change.

Enthusiasts are spreading the word. John Morgenthaler, co-author with Ward Dean of *Smart Drugs and Nutrients*, advocates the use of medical technology for enhancement purposes rather than for the treatment of disease. "Smart drugs—pharmaceuticals like vasopressin, Lucidril, Deaner—improve brain function. They improve the hardware." No, you won't have more profound thoughts, Morgenthaler admits, but you can improve brain-cell metabolism and oxygen availability. "It's not a software installation, it's better, faster, more powerful hardware." He ought to know—he's tried all of them.

A variety of nootropics (a class of cognitive enhancers, including piracetam and its analogs, which improve metabolism, memory, and attention) as well as other pharmaceuticals said to enhance mental functioning are marketed and sold abroad to combat the effects of senile dementia, Alzheimer's, and stroke. In Italy, for example, hospitals dispense piracetam from bubble gum machines, and people take it every day. Morgenthaler and Dean's book is a kind of users' guide, giving detailed information about how to order smart pharmaceuticals from other countries.

As a result of a loophole in the 1988 Food and Drug Administration's (FDA's) policy guidelines, which allowed the importation of non-FDA-approved drugs to combat AIDS, a number of "offshore buyers clubs" have been offering a wide variety of nonapproved pharmaceuticals as well as foreign ver-

SMART NUTRIENTS:

Amino acids:

Phenylalanine: An essential amino acid (one that is obtained from food or other external sources). It is converted to tyrosine in the body and stimulates the central nervous system.

Tyrosine: Converted to the neurotransmitter dopamine (associated with mood elevation) and then to norepinephrine (believed to regulate the "flight or fight" response). Tyrosine stimulates mental functioning.

Tryptophan: An essential amino acid precursor to the neurotransmitter serotonin which promotes feelings of relaxation and well-being. Users claim tryptophan has antidepressant effects, and it has been widely used as a nonaddictive sleep inducer. In 1990, the FDA removed tryptophan from the market because tainted products made in Japan by Showa Denko resulted in 19 deaths. Though smart-drug advocates say it was the result of unsafe manufacturing conditions in Japan, the FDA contends tryptophan may also have harmful side effects. They cite the 1,500 cases of eosinophilia-myalgia syndrome (EMS), a blood disorder characterized by breathing difficulties, coughing, swelling of the extremities, and fever—also attributed to Showa Denko's tryptophan.

Pyroglutamate or glutimic acid: Found in vegetables, fruits, meat, and dairy products as well as in the brain, pyroglutamate is believed to have cognitive-enhancing and mood-elevating effects.

L-Carnitine: An amino acid that facilitates the action of the neurotransmitters acetylcholine (essential for memory function) and serotonin, and may be related to the production of nerve-growth factor in the body.

Arginine: An amino acid that causes the pituitary gland to release natural growth hormone, it is said to aid in the building of muscle and the burning of fat.

SMART VITAMINS:

B-1 (thiamine), C, and E: Said to have antioxidant effects.

B-3 (niacin): Users claim it helps improve memory.

B-6: Necessary for the manufacture of some neurotransmitters, including dopamine and serotonin.

B-12: Stimulates RNA synthesis in nerve cells.

HERBS, EXTRACTS, AND NUTRIENTS:

Ginkgo biloba: An extract from the tree of the same name, users say it improves cerebral circulation and enhances mental functioning.

Ephedra: An herb traditionally used in China for its stimulating effects, it is a component of some nasal decongestants and can be used to make tea.

Ginseng: Used in Chinese medicine, it's said to improve brain function, concentration, and memory. It can cause high blood pressure.

DMAE (dimethylaminoethanol): A naturally occurring nutrient found in small amounts in human brains. DMAE is also found in seafood (anchovies). DMAE is a stimulant and is said to elevate mood and improve memory. The pharmaceutical Deaner is chemically related to DMAE.

Choline: Precursor to the neurotransmitter acetylcholine; it is essential for memory function.

NEW TREATMENTS:

Nerve-growth factors: One of the most promising treatments for Alzheimer's now being studied by numerous companies. Based on the premise that Alzheimer's causes nerve cells, or neurons, to die, nerve-growth factors can stimulate the growth of new neurons and the regeneration of old ones. The problem is getting these agents into the brain because many substances are not able to cross the blood-brain barrier. One approach being developed by Alkermes of Cambridge, Massachusetts, involves attaching NGF to a molecule and injecting it into the blood stream. Other methods being investigated include putting NGF into biodegradable polymer wavers which can be surgically implanted in the brain, stimulating NGF with neural transplants of fetal brain cells, and injecting genetically engineered cells that produce NGF in the brain.

Human-growth hormone: Originally developed for dwarfism, it has been studied for its rejuvenative effects. It increases muscle mass, skin tone, and energy levels, and stimulates sex drive. Extremely expensive, human-growth hormone is only available through a few limited sources, although it has already found a black market among athletes and body builders as well as those willing to try anything to regain their youth. Long-term effects are unknown. Side effects include arthritis, diabetes, high blood pressure, and heart failure.

FDA POLICIES AND GUIDELINES:

Antidementia guidelines: In the planning stages since 1989, the guidelines will help pharmaceutical companies meet approval requirements for a new class of soon-to-be marketed antidementia drugs to treat Alzheimer's. The guidelines will be finalized only when an effective Alzheimer's drug has been FDA approved.

National Labeling Educational Act: Passed in 1990 and to go into effect in May 1993, it will allow claims of a general nutritional nature to be made on labels of some dietary supplements—but only if the FDA decides the claims are scientifically based (for example, the claim that calcium may reduce the risk of osteoporosis). The NLEA will give the FDA more authority.

Waxman Bill: Currently before Congress, the bill would give the FDA subpoena power, the right to inspect records of manufacturers of dietary supplements, the right to embargo products that are in violation of the Federal Food, Drug, and Cosmetics Act; the right to recall products that are "a risk to public health", and the right to issue violations for civil penalties, and conduct hearings.

DRUGS UNDER DEVELOPMENT TO TREAT ALZHEIMER'S:

Sigma-Tau Alcar (Acetyl-L-Carnitine) facilitates neuronal response to acetylcholine and serotonin. Status: phase III (in human testing).

Lilly/Athena: Amyloid plaque inhibitor. The brains of Alzheimer's patients show the presence of plaque-like deposits. Status: preclinical.

G. D. Searle: Seromycin activates NMDA receptors. When NMDA receptors are blocked, memory and learning are inhibited. Status: phase III (Seromycin has been on the market for 30 years but has been approved only for the treatment of tuberculosis and urinary tract infections.)

Janssen: Sabeluzole, a calcium channel blocker (too much calcium kills neurons and can block NMDA receptors) that affects the neurotransmitter serotonin. Status: phase III.

Parke-Davis: Cognex: slows the breakdown of acetylcholine. Status: investigational new drug (for Alzheimer's patients with doctor's approval).

Du Pont Aviva: enhances the release of acetylcholine, dopamine, and serotonin. Status: phase III.

Regeneron: Developing nerve-growth factors. Status: preclinical. (At least 12 biotechnology companies are developing NGF as a possible treatment for Alzheimer's.

sions of U.S. approved drugs to anyone with a check and a stamp.

And growing numbers of Americans, including people with AIDS and Alzheimer's disease, are turning their backs on the medical establishment and medicating themselves. In the process, they're bypassing the FDA, and the FDA isn't pleased. *Nightline* recently estimated that 100,000 Americans now use smart drugs. Currently, over 100 cognitive enhancers are under development by major pharmaceutical firms worldwide, including SmithKline, Parke-Davis, and Du Pont, to name just a few. Many hope to cash in on the billions an effective treatment for Alzheimer's would net. And new treatments like nerve-growth factor and human-growth hormone present tantalizing possibilities for those socking the fountain of youth. (Nerve-growth factor stimulates the growth of new neurons and the regeneration of old ones. Human-growth hormone is being studied for its rejuvenative effects. See the sidebar "New Treatments.")

Smart pharmaceuticals such as Hydergine are often found to have therapeutic uses other than those for which they were originally approved. Though the FDA approval process mandates that drugs can only be marketed for their "approved uses," physicians do prescribe them for unapproved uses. Other pharmaceuticals which have been studied for their efficacy in treating memory impairment due to age or disease and touted by advocates for their cognitive-enhancing properties can have serious side effects. They include those originally approved in the United States to treat diabetes (vasopressin), Parkinson's disease (Deprenyl), and epilepsy (Dilantin).

Ward Dean, a gerontologist in Pensacola, Florida, is something of a renegade in the medical establishment. He believes the aging process is the one chronic, universally fatal disease that everyone over the age of 30 catches. Dean discovered nootropics in Korea where he attended medical school. Like Japan, Korea has a high incidence of stroke. "The first thing we did for stoke victims was give Hydergine and piracetam," he says, "and they reported increases in memory and other cognitive functions."

In his practice, Dean prescribes a variety of nutrients and smart drugs—primarily Hydergine and piracetam—to his patients. "They depend on the functioning of their brains," he says. "As they get older, they realize their memory isn't as sharp as it used to be—the ability to process new material is declining." To Dean, the FDA is the single greatest impediment to medical research in the country.

Take Mark Rennie's anecdotal testimony. Club impresario, lawyer, man-about-San Francisco, Rennie is also a partner in Smart Products along with Jim English. "When I started using SDs it was like I had a dirty windshield and somebody finally cleaned it," he says. "We live in a toxic-waste dump, and

CONTINUED ON PAGE 67

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OVERTURES

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Only the art of diplomacy can make First Contact a success.

Hazeltine gazed at the pattern taking up half the lobby wall. "Not bad for a coat of paint."

"It's not paint," Walsach said. "We don't know what it is."

"A joke, Ron," Hazeltine said, but Walsach wasn't listening. "... thought it was monomolecular but it just seems that way. It's two-three layers integrated somehow, right down on the nuclear level, if not deeper ..."

Narrowing his eyes, Hazeltine turned to the pattern again. A pleasing design, once you got used to its essential strangeness. A tangle of lines, some thicker than others, sweeping across the wall in delicate curves that seemed on the verge of falling into a recognizable outline without ever quite doing so. The eye was drawn by it, following the lines from one end to the other. At this distance it seemed dull black, but Hazeltine knew that a sheen appeared closer up, and that it definitely changed color at irregular intervals. It had been there a little over a week.

Walsach had fallen silent and was staring sadly down at the table between them. "So it's quite advanced, you think?" Hazeltine asked him.

Closing his eyes, Walsach let out a blast of breath, then got up and paced toward the wall. "I'd like to know where the neutrinos are coming from, I'd like to know what the power source is, I'd like to know how it's modulated, I'd like to know ..." He sighed. "A few things."

"But it's unquestionably a signal?"

Walsach swung back to him, a hangdog look on his face. "That's what Maimonides says."

Hazeltine merely nodded. Walsach was depressed that the team at Maimonides had beaten him to discovering the neutrino pulses. Well, he had nothing to be ashamed of. The work crew here had walked past the thing for three days before realizing that it wasn't artwork put up by the decorators.

Tenting his fingers, Hazeltine gazed down at them. "So in effect, we've been bugged."

Walsach walked back over, shaking his head. "Well, the exo gang doesn't want us to jump to conclusions."

Hazeltine grimaced. He'd sent the exobiologists packing yesterday ... this morning, on this world, Spinoza. They'd done nothing but argue, with most of what they had to say nonsense, as far as he was concerned. Aside from that,

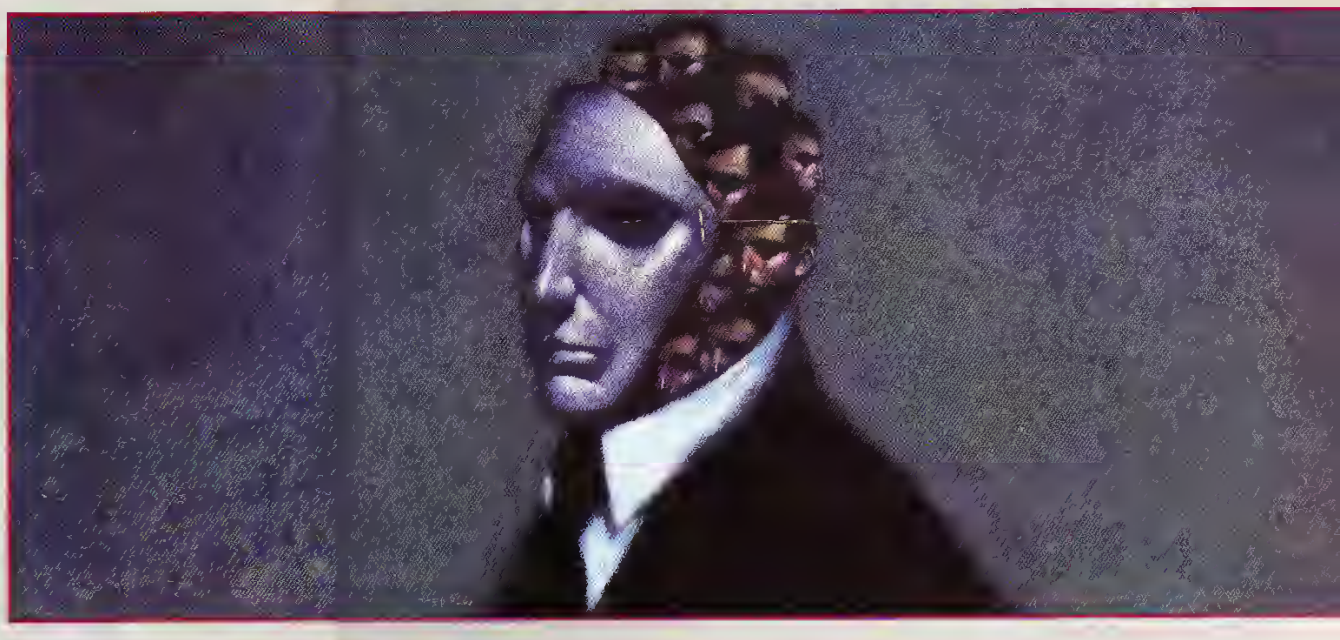


ILLUSTRATION BY TIM TEEBKEN

he'd seen the carnivals that the various teams, units, and committees had made of the other sites on Maimonides, and Teller and wanted none of it. "But it's absorbing photons at all wavelengths, and you believe it's picking up sound as well."

Walsach shrugged.

"Your opinion, Ron."

"Mr. Moderator . . . ." He looked up and smiled. "Alex. You're damn right we've been bugged."

There were footsteps from the hall and one of the construction crew appeared, a piece of equipment floating behind him. Hazeltine watched with amusement as his steps quickened and he made a wide detour around the pattern. He didn't look in their direction once.

"What I don't understand is why." Walsach was facing the wall once more, scratching his head. "They want to find out about humans, okay. But why put it in plain sight? You walk out of the portal and there it is. Hits you right in the eye." He looked over at Hazeltine. "I mean, they could have hidden it anywhere."

Hazeltine made a sound of agreement. There were plenty of theories among the exo people: a test, a challenge, a puzzle, but no consensus whatever. After all, it had only been a week. A hundred years ago they'd been thinking in terms of decades and centuries in dealing with a problem like this, and even then there had been worries. "One thing that we do know," he said slowly, "is that they are not human. The reason may be incomprehensible in our terms. But whatever it is, we can be sure that in their context it's a good one."

"I suppose." Walsach said moodily.

A buzz of conversation drifted from the hallway, the construction team going off shift. It died suddenly, the crew emerging in absolute silence, huddled together as they passed. A few gave Hazeltine surly or reproachful looks, and one woman actually glared. Hazeltine simply smiled back at them. They'd obviously heard that he'd vetoed any military presence.

A moment later they were gone, and he was about to speak when there was a sudden thump of running feet. He turned just as the worker who'd come through earlier burst around the corner, wild-eyed and out of breath. He skidded to a halt, staring at the two of them in shocked surprise, then nodded nervously as he walked to the portal. Hazeltine managed to keep himself from laughing until he'd gone through.

"Well, that's it," Walsach said. "Nobody else within fifty lights."

Rising, Hazeltine said, "I believe that Thatcher is forty light-years solward, but a good point nonetheless."

He walked Walsach to the portal. "You'll be back tomorrow, I assume?"

"Yeah." Walsach said, scratching his temple. "I'll want to go over the data with my kids, particularly the stuff from Maimonides, so it might not be early, but . . . ." He stopped speaking, finger pointed at his skull. "Did you say 'back,' Mr. Moderator?"

Hazeltine nodded.

"You're not staying out here?"

"Yes." Hazeltine said. "I have an overwhelming desire to sleep in the director's suite. I've never had the opportunity."

Walsach gave a low laugh and shook his head. "Awful long nights here—fifteen hours, I mean . . . ." He studied Hazeltine's expression and shrugged. "Well, I guess you know what you're doing."

> "Just above the horizon was a nebula, the limbs reaching out to embrace a third of the sky. People would come from all over for a sight like this."

Squeezing his arm, Hazeltine smiled. "Tomorrow, then." Walsach went through without another word.

Hazeltine turned and walked to the pattern. He studied the swooping, near-gaudy whorls, the seemingly random splash of dots in the center. A chill touched him and he glanced back at the portal as if to assure himself that it was still open.

A single step and he could be back on Earth. . . . He dismissed the thought. Someone had to stay, and he was a moderator, after all. It wasn't a matter of choice for him. But even if it had been, he would have made the same decision. He might have doubts, but of this one thing he was sure. The universe was not a hammer aimed at mankind's head.

He gazed at the pattern for another moment then walked to the elevators.

He ate a light meal prepared by the station's autochef: salad, soup, pasta in cheese sauce. He decided against a glass of wine but ordered a cigar and was disappointed when the system told him none were in stock. Understandable: the service units were set up only for basic operation until the building was completed.

Afterward he got up to take a walk. The station was enormous: five stories high, covering six acres. It had to be big to serve as a center for exploring and exploiting an entire new world. Station wasn't quite the word for it, but nobody had come up with anything better.

A spiral staircase led to the top floor. He climbed it and looked about him. Still a lot of work to be done. Scattered equipment and material lay up and down the length of the hallway. The far end seemed to be open to the sky, so he walked in that direction. He recalled they were going to have a restaurant here with its own elevator from the lobby.

He gasped as the hallway opened up, then went slowly across the bare space, not dropping his eyes once.

Just above the horizon was a nebula, multicolored and softly glowing, the limbs reaching out to embrace a third of the sky. He stopped at the roof edge, cocking his head as he studied it. No one had told him about this.

After a time he looked around. A lot of room here, plenty of space for tables. They'd probably put in a glass roof, or maybe leave it half open. That's what he'd do.

Whoever had bought this franchise was one lucky individual. People would come from all over for a sight like this. He smiled to himself. Odd, that something this glorious should be no more than a good reason for a nice night out, the latest marvel on the eating circuit. He wondered if they'd grasp the sheer magnificence of it, rather doubting they would.

He'd have to find out what the nebula was called. A thing like that should have a name.

He was back to admiring it when a sound reached him from below. He looked down, stepping back instinctively from the dark abyss at his feet. The outdoor lights hadn't been put in yet; the crew was probably afraid to go out and get it done.

The sound came once more, a distant thump, directly beneath him. He eased himself to the edge and looked over but saw nothing more than old night.

Local fauna, perhaps, but they were migratory, and there were few large animals in the area now. No other humans around, either—all the exploration teams had been called in last week. That left Them, but would They come

sneaking in under cover of darkness?

Turning on his heel, he headed back for the corridor with one last glance at the shining wonder overhead.

He took the stairs down, pausing at every floor to open the door and listen. At basement level he stepped quietly out into the hall. He'd search here first, then work his way back up.

Walking slowly, he kept close to the wall before realizing what a silly picture that made. He moved to the center, consciously throwing his head back.

There were side corridors branching from the main one. He tried to recall what was down here: the building plant, mostly. Heating, services, comps, supplies, and the portal equipment, of course. He stopped at each corner, listening for a moment before going on.

A hundred yards down he heard a clatter behind him. He swung in that direction. It had been muffled, as if coming from behind a wall. Steadying himself, he was about to take a step when another sound came from the way he'd been headed. He felt a burst of irritation and put his hands on his hips. Wherever the next noise came from, he'd check there first.

Behind him he heard it again. Voices, he was sure of it. He went that way, looking back over his shoulder. Ten yards on was an open door, the service stairs to the lobby. As he approached it someone up above shouted, but the sound was too distorted for him to make out anything.

He went up the stairs quickly, pausing at the last step. Several people were out there, speaking in low voices. He waited until they fell silent, then stepped out.

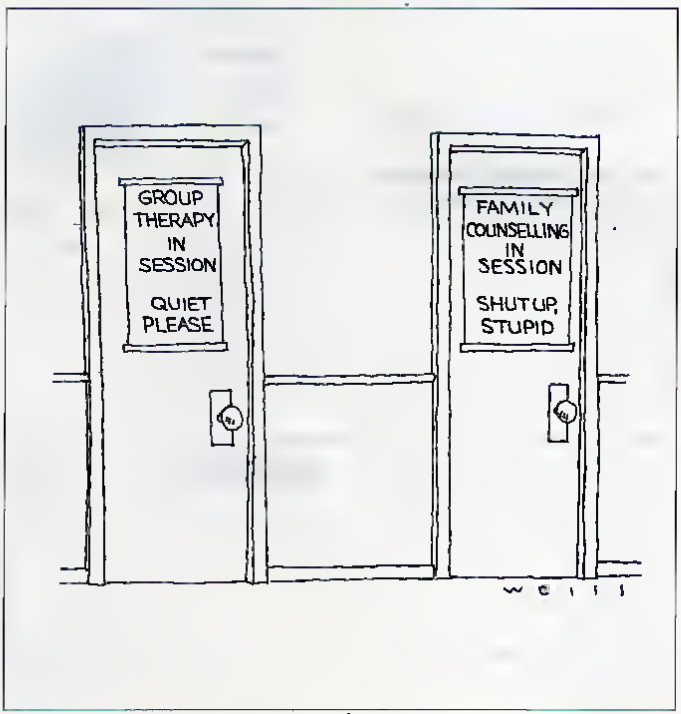
Three men stood in the lobby, one in a suit and two in uniform. As Hazeltine appeared, the civilian looked him over, then gestured to the soldiers, who went back to the portal.

"Moderator Hazeltine," the man said as he approached. Hazeltine nodded: it wasn't a question.

The man was in his late twenties, blond and thin. Teutonic, either Scandinavian or German. He raised his hand and shook Hazeltine's without change of expression. "Gunnar Schone," he said. "I am with—"

"Security," Hazeltine said. He swept an arm toward the chairs and sat down himself.

Schone had not moved. "I'm glad that you heard us," he said. "The intercom is not yet working and I did not wish to search the building without permission."



Hazeltine smiled wordlessly. Quite definitely German, a Saxon, from the accent.

Head turned, Schone eyed the pattern. "That is the artifact?"

"Yes."

A quizzical grimace crossed Schone's face. "It doesn't look like much. But—to business." He dropped into a chair. The blue eyes snapped to Hazeltine. "I take it you have heard of Humanité, Herr Moderator?"

"I have." Humanité, an extremist outfit started during the panic caused by the Great Invader Hoax fifty years before.

Schone nodded. "Then I need not go into detail. We have evidence that the organization has learned of the artifact and is planning to take action."

"Can't you handle that earthside? I'd always assumed that Humanité had been penetrated."

"That's correct, Herr Moderator. They have been, but not completely. They are arranged in a cell structure, and we do not have full access. Aside from which, they were considered of little importance." His eyes moved to the pattern once more. "Until now, of course."

"So?"

"Our contacts tell us that the organization may have considerably more expertise than we had thought—"

Hazeltine shifted in the seat. "What are you saying?"

"According to informants, the group is capable of reprogramming the portals."

"No," Hazeltine said. "That's ridiculous. I'd heard they had wealthy backers, but the equipment alone must cost—"

"I'm afraid, Herr Hazeltine," Schone said wearily, "that they have infiltrated the operational staff."

Hazeltine flung up his hands. "Well, that's just lovely. So much for the occupational testing, I guess."

"There is no sure test for neurotic xenophobia, Herr Moderator."

Hazeltine gazed up at him. "So what's the point?" As if he needed to ask.

Schone folded his arms. "We would like to emplace an armed security unit at this station." He stared at Hazeltine emotionlessly.

"I don't think so."

"Herr Moderator—" Schone began.

"The subject is closed, Mr. Schone. It would be the worst possible move just after we've discovered the nature of the patterns. And besides, I saw the chaos at the other sites. Everybody and his dog shambling around, half with

weapons ... "There was a slight flicker in Schone's expression. Or are they?"

"I'll be frank with you," Schone said. "Sung and Morris followed your lead. They sent back all armed units today."

"Well, that's it then, Mr. Schone." Hazeltine opened his hands. "Is there anything else?"

"Will you allow us to set up a monitoring system?"

Pointing at the pattern, Hazeltine said, "If you can guarantee that it won't be detected by that."

Schone nodded grimly. "Very well then." He rose and headed for the portal.

Hazeltine got up to follow. Before going through, Schone took a last look at the pattern. "You know," he said, "I've considered the fact that this may be another Jefferson affair."

"I doubt it," Hazeltine said. "From what I've heard of that thing's capabilities, anyone creating it would earn himself immortality from that alone. He wouldn't need any hoaxes."

Schone changed the subject. "You truly plan to stay overnight here?"

"Absolutely."

A look of distant amusement crossed Schone's face. "If you need assistance, just come across. I'll be on duty."

"I'll do that, Mr. Schone." He watched as the agent passed through, then sighed and turned away.

It was still dark when he got up. After he shaved and washed, he ordered a cup of coffee and took it to the roof.

There was a thick cluster of stars where the nebula had been, blue-white, close enough so that he could have sworn they showed disks. He looked in the direction that might as well be called east, and there it was, even more glorious than he remembered.

Just beneath the nebula a barely perceptible line of light crossed the horizon, outlining the webbed crowns of what passed for trees here. A short while and the sun would be rising beneath that massive, glowing jewel. His heart began to beat faster. Sunrise would last more than an hour here, with this world's slow rotation.

He sipped from the cup. He'd checked the basement again last night to find everything quiet and all doors locked. There had been no more noises before he'd gone to sleep; he wasn't the type to imagine such things.

He was glad he hadn't mentioned the matter to Schone. Not that the agent could have done much about it, but Hazeltine had no real idea what impact

CONTINUED ON PAGE 70

INTERVIEW

MARTIN SELIGMAN

How to make friends and win presidential elections: Try a little optimism

Healers of the psyche from Freud to the present have taken the accurate perception of "self" to be a hallmark of mental health. Not psychologist Martin Seligman, researcher and director of clinical training at the University of Pennsylvania in Philadelphia, who has achieved fame—and some infamy—by attacking the sacred cows of his profession. A key function of Seligman-style therapy is teaching the art of self-deception. Not that he's advocating obese people reinvent themselves as skinny, or paupers millionaires. Such gross distortions, he'd be the first to admit, are dangerous. What Seligman advocates are subtle, self-aggrandizing lies that foster the illusion that we can achieve positive outcomes in our lives.

Virtually all children and most well-adjusted adults, Seligman's studies reveal, regularly twist reality in a positive direction. He and other investigators have linked these optimistic distortions to greater happiness, achievement, and health. Those who fail to so benignly delude themselves are more prone, they claim, to suffer from depression, lack of productivity, and illness.

A family tragedy, Seligman reveals, shaped his intellectual interests. At 13, he saw his father, a prominent Albany lawyer, stricken by a stroke just after he'd decided to run for high public office. Never regaining his health, his father slipped quickly into being a wheelchair-bound invalid whose moods vacillated wildly between desperation and euphoria. The experience introduced his son to the suffering helplessness engenders

PHOTOGRAPH BY PETER LIEPKE

RECENTLY WRITTEN:
Learned Optimism

WHAT OPTIMISTS HAVE:
Self-serving illusions enabling them to maintain good cheer and health in a universe that is essentially indifferent to their welfare

WHAT PESSIMISTS HAVE:
Logical consistency, a truer assessment of reality

OPTIMISM AND THE PRESIDENCY:
Optimists win more, the greatest presidents were more pessimistic

SELF-SCORE:
Pessimist "But I'd like to think the edge it gives me on realism is an advantage as a scientist. Only a pessimist could write a serious book on how to become a flexible optimist."

A graduate student in psychology at the University of Pennsylvania in 1964, Seligman decided to focus on the role of motivation in mental illness. As a newcomer, he found the psych lab in a state of commotion. "Something's wrong with the dogs—they won't do anything," exclaimed a young researcher. Seligman soon learned that the animals had been subjects in a Pavlovian conditioning trial when their paralysis set in. The dogs were initially presented with a tone followed by a mild but inescapable shock. Several trials led them to associate that sound with imminent punishment. They were then given the same tone in a new chamber. Here they could easily escape the shock by simply jumping over a low partition. But far from learning to avoid the punishment, the dogs responded to the tone by lying down and whimpering.

No stranger to the symptoms of despair, Seligman instantly grasped what was happening. Repeated exposure to inescapable shock "taught" the dogs that nothing they did would make any difference. What Seligman was proposing was heresy. Cornering him at a men's-room urinal after a lecture, a leading proponent of Skinner chastised him. "Animals don't think *anything*; they only behave!" But Seligman forged ahead, convinced that his animal model might explain the sense of helplessness at the core of human depression.

Working with Steve Maier, he repeated and extended earlier studies in learned helplessness now considered landmarks in the field. A key finding of these experiments, however, is that a small percentage of the animals never became passive in the face of adversity. In later studies, a corresponding minority of human subjects also refused to learn to be helpless.

In search of what distinguishes individuals who defy the odds from people who readily succumb, Seligman focused on how people explain good and bad events in their lives. Those who spring back from upsets, he saw, have an optimistic explanatory style often containing delusional components. They tend to overestimate their attractiveness, talents, and other goal-achieving abilities while discounting responsibility for losses and failure. People prone to despair have a pessimistic explanatory style marked by brutal honesty. Neither inclined toward grandiosity nor to seeing themselves especially charmed against life's ills, they are, in Seligman's words, "at the mercy of reality."

These insights have found a broad range of applications outside of therapy. Seligman's Attributional Style Questionnaire [ASQ] ranks individuals on an optimism-pessimism scale. In a longitudinal study of school children, those scoring highest for pessimism were most likely to later suffer depression. High scores for optimism are predictive of excellence in everything from sports to life-insurance sales (a finding that saved Metropolitan Life millions of dollars in personnel selection). And optimism wins votes as well. Analyzing campaign speeches for the prevalence of optimism, Seligman predicted the winners of the 1988 presidential and Senate elections more accurately than veteran political forecasters. His groups have also ranked the November candidates' "optimism quotients."

How can desperadoes acquire the stuff of hope? Seligman delineates a detailed program in his best seller *Learned Optimism*. Twice recognized by the American Psychological Association for distinguished contributions to the field, Seligman was recently singled out for a rare merit award by the National Institute of Mental Health. While fetching yet another award in Washington recently, he met with interviewer Kathleen McAuliffe. After several months of conversation, Seligman broached his latest preoccupation. Just how much can we transform ourselves through the tools of psychology?

Omni: Is contemporary psychotherapy's basic goal—the deepest understanding of self—a misguided goal?

Seligman: When I first trained to become a therapist 20 years ago, I was an agent of both truth and happiness. That's still a central premise of most therapists. But research in our lab and others is increasingly challenging that view. Most commonly, people come to me for treatment of depression. Depressed people, seeing the world much more accurately than happy people, are better at gauging their talent and ability in a given situation.

If a pessimist gets 20 out of 40 questions right in a lab test, and I ask him, "How'd you do?" he'll answer 20 right, 20 wrong. Pose that question to an optimist. The answer is, "I got 30 right and 10 wrong." Even when offered a monetary incentive for accuracy, optimists consistently overestimate their ability. Optimists have a set of self-serving illusions that enable them to maintain good cheer and health in a universe essentially indifferent to their welfare.

Insight therapy—with its emphasis on dredging up unpleasant truths about the past—can sometimes backfire with severely depressed patients. Some individuals become totally unraveled. Good therapy for depression may entail bolstering a set of benign illusions. Depressed people may need to adopt the same self-serving illusions that most normal people hold.

Omni: Optimists may distort reality positively, but surely when pessimism mushrooms into full-blown depression, isn't there just as much negative distortion?

Seligman: I'm sure many therapists would agree with you. Severely depressed patients who are millionaires may think they're penniless. I've treated beautiful men and women who thought they were ugly. But if you take these same individuals into a lab and test them, one finds profoundly depressed people are accurate.

Omni: Even if that's true, is it ethical or wise for therapists to send the message to patients: To thine own self be false?

Seligman: Poet R. P. Blackmuir said that poetry gives us the lie we need to

CONTINUED ON PAGE 78

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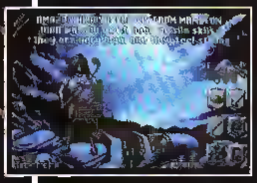

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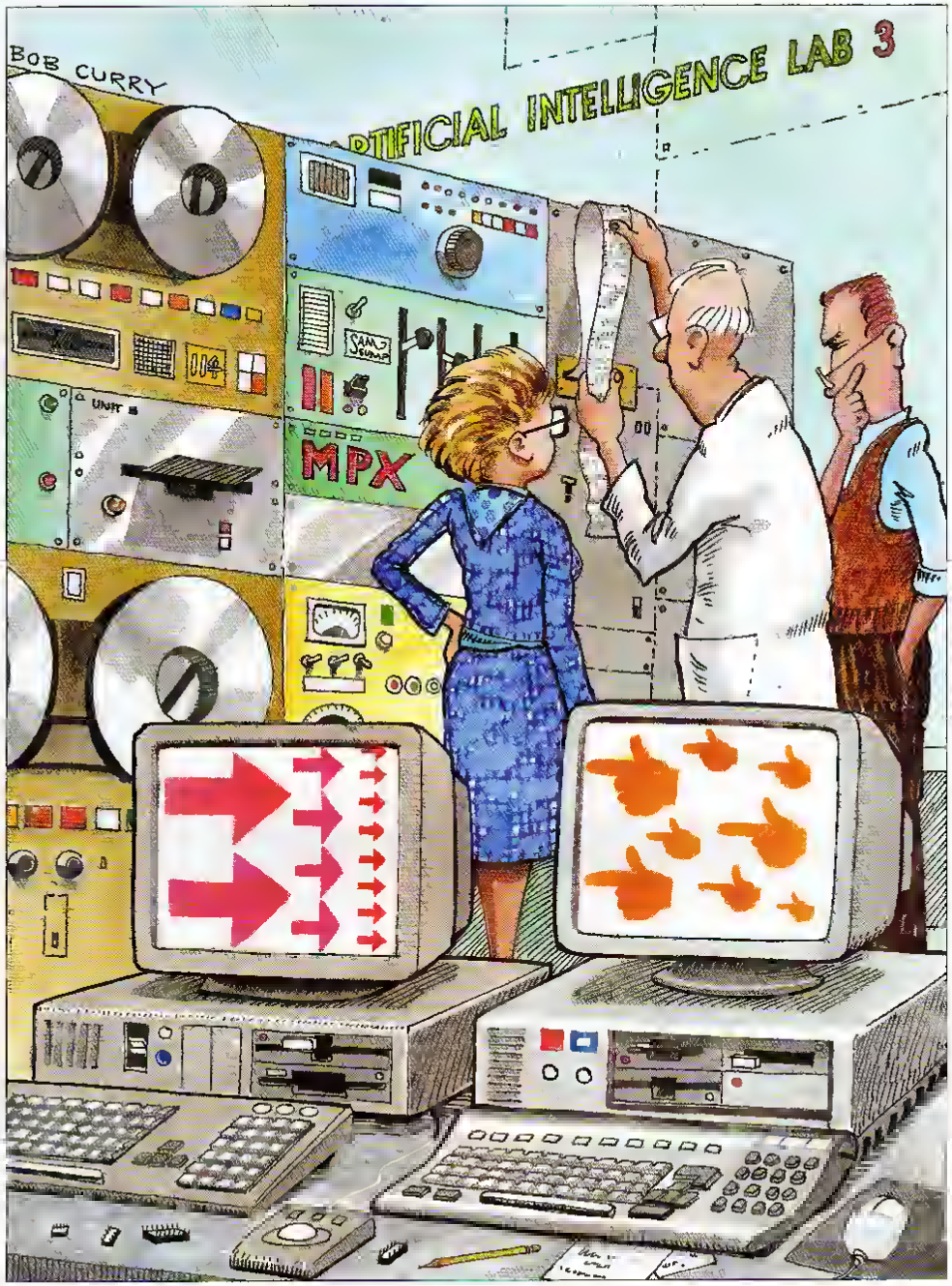

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ANTIMATTER

SECRET LIFE

Since the first alleged UFO sighting in the United States 45 years ago, hundreds of people have reported the experience of alien abduction. Over the decades, bits and pieces of the phenomenon, in which innocent victims claim to be whisked aboard alien craft, have been revealed. We've heard about painful physical examinations, distressing mind-probe procedures, embarrassing egg sampling and sperm harvesting, and unnerving visions of alien-human babies. What we haven't known until now is how all these pieces fit together. Enter Temple University historian David Jacobs, who says he can change all that with his new book, *Secret Life* (Simon and Schuster). Based on interviews and hypnotic regression sessions with 60 abductees over six years, *Secret Life* takes readers step by step through the archetypal abduction experience, "from transportation into the alien ship to the return to earth."

According to Jacobs, all abductions begin with "primary experiences"—embarrassing and often excruciating physical and mental exams. First, aliens "poke and prod every body area and orifice and sometimes take tissue samples," says Jacobs. "They have a bizarre staring procedure through which they seem to inspect abductees' brains. Then they extract sperm and egg samples or perform other unpleasant gynecological or urological exams."

During the second phase of an abduction—Jacobs calls these "secondary experiences"—aliens examine abductees from head to toe with various machines. Then they place victims in front of a screen and compel them to watch a variety of images ranging from scenes of war to disturbing sexual encounters to mundane images of family life. "Aliens apparently do this," says Jacobs, "to probe abductees' mental reactions." At last, abductees enter an "incubatorium," or nursery, housing bizarre-looking alien-human fetuses and children. Abductees say they're forced to hold these children, who are supposedly theirs.

Many, but not all, abductees then suffer through the last stage of an abduction, Jacobs explains. During this final insult, some abductees are submerged in a pool and find themselves breathing under water. Others are forced to undergo sexual acts with other abductees.

In addition to laying out the entire abduction process, Jacobs says, he has made an important research breakthrough: Aliens can confuse abductees with false "screen" memories of everything from nuclear war to visions of Christ. In the past, Jacobs contends, researchers recorded these screen memories as fact.

But Dr. Robert A. Baker, a retired psychologist from the University of Kentucky at Lexington, doesn't think Jacob's research reveals the truth at all. "Many people have fixed ideas and beliefs that are not true," says Baker. "These fixed beliefs, because they are strange, garner attention. Remember, Dr. Jacobs is not a psychologist. Unless one is an *experienced clinician* and is aware of these kinds of personality subtleties, one can be misled."

As for Jacobs, he responds that "if the abductees' stories are accurate, they are revealing one of the most important events ever to befall humankind. If the stories are false, they still constitute a fascinating and inexplicable new psychological and sociocultural phenomenon that's worthy of intense scientific attention."

—Anita Baskin

SPIRITUAL AUTOBIOGRAPHY

Sixteen adults sat around work tables at the New York Open Center, drawing crayon maps of their lives. In most cases, the childlike cartoons unleashed forgotten emotions and incidents that the participants were able to write about in surprisingly powerful prose.

"I find the writing in these workshops better than the writing I used to encounter at Bread Loaf and other writers' conferences," said the best-selling author, Dan Wakefield. The slight, gentle-voiced Wakefield has presided over "spiritual autobiography" workshops since 1988, when his own involvement in a workshop led by a Boston minister resulted in *Returning*, a harrowing and heartening memoir of despair, substance abuse, and ultimately a return to the Christian faith.

In his own workshops, Wakefield keeps the definition of spiritual force simple, borrowing lines from Dylan Thomas: "The force that through the green fuse drives the flower/drives my green age." The aim of his gentle guidance: opening the rusty locks of history, tapping those inherently dramatic moments when the participants felt a sense of larger meaning moving through their lives.

As Wakefield suggests in his 1991 book, *The Story of Your Life*, the past can actually change with the telling. "By remembering and writing down our past," he says, "we can sometimes see it from a different point of view."

Wakefield attributes the transformative power of the workshop to a sense of common humanity and shared spiritual search. This communal spirit, he adds, stands in marked contrast to the poisonous "wolf pack" atmosphere that chokes many professional writing workshops. Making the point on a recent Saturday in downtown Manhattan, two lawyers, two therapists, a dancer, a painter, a Protestant minister, and a Catholic priest, all part of Wakefield's writing group, drew pictures and read to one another, encouraging self-discovery and building a palpable esprit de corps.

—Tracy Cochran

Wakefield: on a spiritual quest.

Riots, strikes, and ethnic conflicts: seismic salutations from the C.I.S.

EARTHQUAKE EMOTIONS

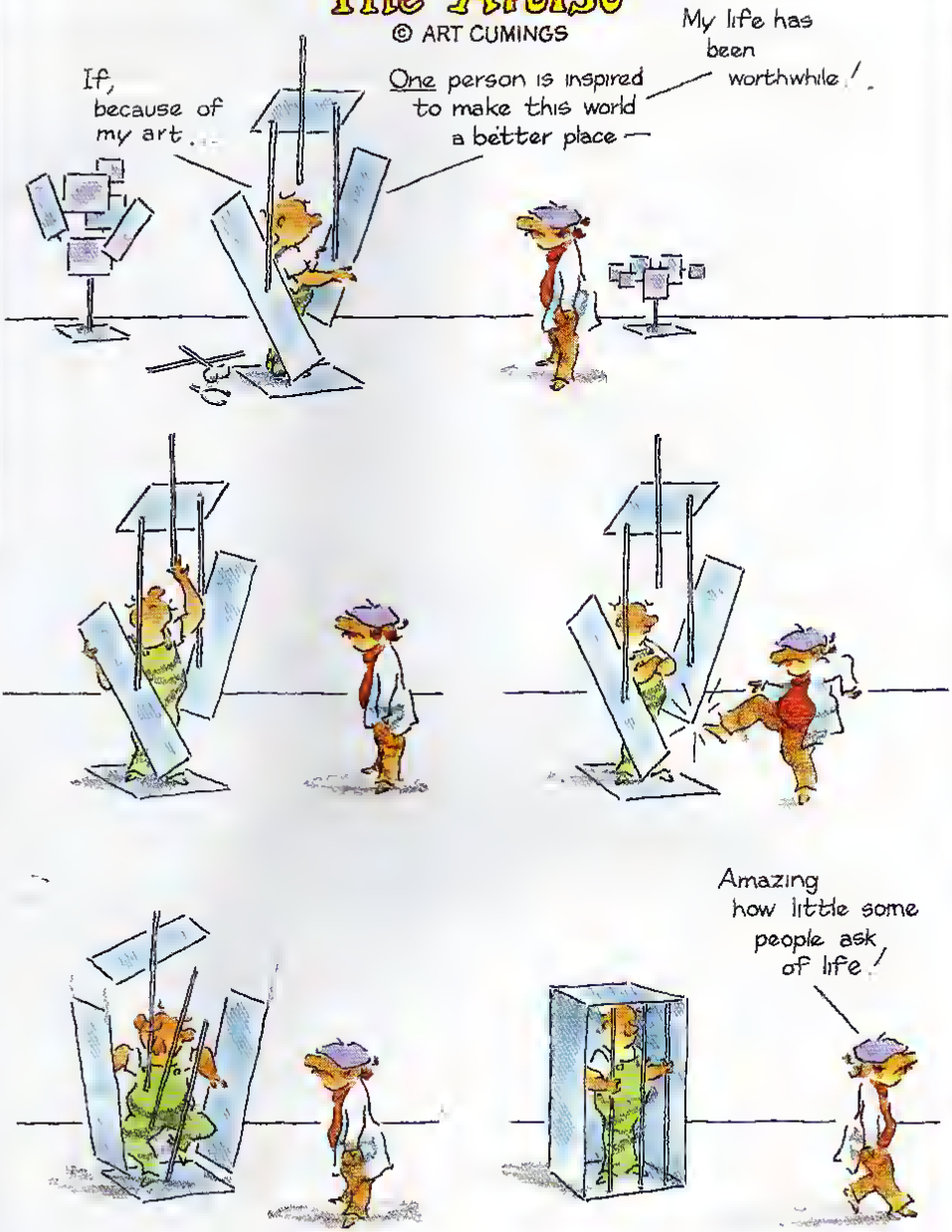
The recent spate of earthquakes in Georgia and Armenia, formerly of the U.S.S.R., inflicted untold human suffering. But now, a Russian scientist suggests that such earthquakes may do more than wreak physical havoc; they may also create *social conflict* even before they strike. The reason, according to Dr. Feliks Yudakhin of the Academy of Sciences of Kyrgyzstan, lies in environmental changes that occur before the main event. "Fluctuations of electromagnetic and gravitational waves and gases emerging from the earth all affect the human organism," he believes, putting people increasingly on edge.

Yudakhin's theory follows on the heels of observations that animals behave erratically in the hours preceding a strong earthquake. But Yudakhin goes on to speculate that this same phenomenon underlies riots, strikes, and ethnic conflicts in the human realm as well.

Tom Heppenheimer, author of *The Coming Quake*, jokes that the phenomenon "might explain the weirdness in Southern California." In a more serious vein, however, he suggests that the social stress in the former U.S.S.R. might be due to a wide variety of political and social factors—none of them related to earthquakes at all.

Over the past year, thousands of Soviet citizens have attributed the recent upheavals in their society to a strange phenomenon in the heavens—UFOs. Now, at least one Russian scientist is looking in the opposite direction to explain his country's ills.—Jim Oberg

The Artist



BRAIN GAIN

CONTINUED FROM PAGE 60

we're not as clear as we used to be." Rennie's been using smart drugs—particularly Hydergine and vasopressin—for more than a decade. "I'm stacking up amino acids. I'm taking Deprenyl, and when I can get it, piracetam. I'll never quit taking Hydergine."

So what are the actual findings? Drugs like Hydergine and piracetam have been extensively researched and tested. The results are more encouraging in rats than in humans. Gary Wenk is a professor of neurology and psychology at the University of Arizona. He also performs independent testing for drug companies. Wenk claims that he's never tested a pharmaceutical for cognitive enhancement that he's found to be effective. The results, he says, are minimal at best, though some drugs like piracetam are "pretty innocuous."

Dean, however, argues that for those suffering from memory impairment, a small benefit is better than none. "It may be a 5-percent improvement," Dean says, "but if you're talking about competitive athletics or business, a 5-percent edge can make the difference. If you're 5-percent sharper than the other guy, you're going to win."

Chief scientific officer at Cortex Pharmaceuticals in Irvine, California, Raymond Bartus has been investigating cognitive enhancers for nearly 20 years. He believes, based on his testing, that for those with a deficit, particularly in the early stages of Alzheimer's, nootropics can help improve memory and attention. "Though the effects are fairly subtle and variable between patients," he says, "they're relatively safe, and they may improve quality of life." Bartus compares today's cognitive enhancers to Piper Cubs before the age of jumbo jets. "They're doing something, but not in all patients. What the FDA's requiring is a drug that works so well that it goes beyond our ability to imagine it because the technology hasn't been invented yet." Besides, he adds, there are no other treatments on the market.

Researchers face a number of problems in testing a cognitive enhancer. Not only is there no consensus about what intelligence is, there are still no objective measurements to diagnose Alzheimer's. And the FDA hasn't been able to come up with a set of guidelines to help researchers meet approval standards for the scores of "antidementia" drugs now in development.

"We just don't know enough about the brain," Wenk says. But when we do, we will be able to design really effective cognitive enhancers. He predicts that Alzheimer's patients will benefit first, and then "we'll work our way back through the decades, and children will be popping enhancers from day one." Until that day, however, Wenk believes people need the protection of the FDA from the "charlatans out there looking to make bucks."

At the center of the controversy are the FDA regulations. The approval process, the most stringent in the world, requires that a drug be proven not only safe, but (since 1962) effective at treating a particular condition. Getting a new drug approved costs an estimated $231 million and requires about 12 years of controlled clinical trials. Once a drug is approved, manufacturers have patent as well as marketing protection for its approved use. Since the approval process only allows for drugs which treat a known condition, enhancement of normal function is not a category that is officially recognized. Furthermore, drug officials say, claims made by smart-drug producers and users are anecdotal and can be attributed to placebo effects.

Last January, the FDA announced an Import Alert, instructing FDA field offices to "automatically detain all imported drugs by six overseas companies" (including InHome Health Services and Interlab) who promote and distribute their products in the United States. Citing safety concerns as well as illegal promotions, the "embargo" includes both non-FDA-approved drugs (piracetam and Lucidril) and foreign versions of drugs approved here—Hydergine and vasopressin. Many of the targeted companies happen to be those that include smart drugs on their rosters.

The smart-drug community says the FDA policy is an attack on their civil liberties by an overweening bureaucracy. Steve Fowkes, editor of numerous newsletters, including *Smart Drug News*, is a Libertarian who's sure we'd be better off without the FDA. "The most common mental-deficit problem in the world is age-related mental decline. This is something the FDA says is *not* a disease." Fowkes believes that if there's a treatment for it, the FDA has no business telling people they can't have it. "The bottom line is, do these drugs work?" he says. "The FDA wants to be the only arbiter of that."

According to Fowkes, smart drugs are among the safest substances there are; they deal with performance enhancement, improving personal power, bringing more control into the hands of the individual. "And most economic institutions are fundamentally opposed to that," he says.

But does the public need protection from what the FDA cites as unsafe manufacturing conditions, unregulated directions for use and unscrupulous "snake-oil salesmen" (as one FDA official described them) who make bogus claims and big bucks? Or is the FDA holding up the works, creating an unnecessary burden for the consumer, and, as some claim, protecting the market for American drug companies?

Don Leggett of the FDA's compliance office contends, "The firms listed in the Import Alert are promoting and selling drugs which are already approved here, which is in violation of FDA policy. And suppliers are advertising lower prices for them. The marketing of unapproved versions of these drugs is illegal." The FDA maintains that offshore companies offer drugs often of "unknown quality with inadequate directions for use and which may pose medical risks." Leggett adds, "These people are self-medicating with prescription drugs, which can be dangerous."

Wenk, concerned about the potential profits involved, sees FDA protection as a benefit. "People are so eager, particularly with Alzheimer's, that they'll spend money on anything," he says. "We have to weigh the costs against the benefits. If something isn't efficacious, why spend money on it?"

What particularly irks the FDA are the claims made by marketers and promoters of SDs. Promoters of unapproved uses for prescription drugs, as well as nutrient marketers who make health claims, have been blatantly challenging the FDA's authority. Last March, in response to the amount of publicity smart drugs have generated, the FDA finally drafted a policy statement intended to clarify its position. Citing television appearances—for example, Jim English and John Morgenthaler on *Nightline* telling people about nutrients and smart drugs—and "word of mouth" promotion, the FDA targeted marketers and promoters of both pharmaceuticals and nutrients said to have cognitive-enhancing effects. Though stating that no injuries had been reported, the FDA warned: "Any product, regardless of its composition, that is clearly associated with SD claims, is illegal and subject to seizure or other actions." The FDA also said it is evaluating strategies for regulating dietary supplements (including amino acids), a 2-billion-dollar-a-year industry.

While the FDA's task force evaluates the status and safety of nutrients and the claims being made about them, it has already sent investigators to Rennie and English's Smart Products San Francisco offices. The Durk and Sandy products they license and distribute—Fast Blast, Memory Fuel, Power Maker—flirt with regulations against claim making. What's more, their newsletter, *Intelli-Scope*, is chock-full of articles and interviews combining testimonial and fact to promote the cognitive-enhancing and antioxidant benefits of their products. Whether or not their claims are true, the FDA is within their jurisdiction.

By law, a substance can be regulated as a drug when it claims a therapeutic effect and is therefore subject to FDA action. This applies to any written, oral or visual promotion that implies an intended use for a product. Manufacturers and distributors often attempt to circumvent restrictions with brochures, newsletters, and ambiguous labeling that advertise healthful effects for their products. Though technically most vitamin and nutrient manufacturers could be considered in violation of the law, a gray area exists regarding what constitutes a health claim. Research reporting new therapeutic possibilities for substances from vitamin E to beta-carotene threatens to blur the distinction between drugs and nutrients and erode FDA regulations.

> "What the FDA's requiring is a drug that works so well that it goes beyond our ability to imagine because the technology hasn't been invented yet."

The FDA doesn't have to show that substances are dangerous to remove them from the marketplace. It has seized both beta-carotene and vitamin C for claims made about their effects. According to Leggett, the association of therapeutic claims with "nutrient" products is led by overzealous marketers. "They're not willing to put up the money, to perform the clinical investigations," he says. "It may be because they can't patent them, but if they make drug claims, they have to play by the rules."

Rennie thinks the real conspiracy is between the FDA and the pharmaceutical manufacturers. "The next American pharmaceutical firm to come up with a nootropic will make billions, and the drug companies want the market swept before that happens," he says. "The FDA testing process is a big con. And this happens in the home of the free. Hey, give us a break."

Whether or not playing by the rules is in the public's best interest is an open question. The publicity surrounding amino acids and their cognitive enhancing potential may be so much hype, but a growing body of research suggests that amino acids may provide a nontoxic, nonaddictive alternative for those trying to overcome addiction to cocaine and amphetamines. Researchers at MIT and Harvard Medical School have also found that the amino acid tyrosine may be effective in treating depression. And Sigma-Tau, a pharmaceutical firm, is currently developing an acetylized version of L-Carnitine, an amino acid, to treat Alzheimer's.

For more than a year, research pharmacist at the Haight-Ashbury Drug Detox Clinic, Gantt Galloway, has been using combinations of amino acids—mainly tyrosine and phenylalanine—in open trials to treat cocaine and amphetamine dependence. "People report they have more energy, less craving, they feel better and they come back for more," he says. Galloway's impression is that the amino-acid combinations keep drug addicts in treatment longer than if they get no medication. He's currently trying to organize a double-blind study using tyrosine. "It's not on patent, though, so it's hard to get funding," Galloway says.

Our view of what we see as drugs and what we see as nutrients changes, and the way we use them is changing. As Wenk puts it, "Fifty years ago, people thought of vitamins as drugs. Now we pop them every day with our breakfast. A nutrient is a drug, and some drugs are actually nutrients. They're all chemicals." In order to keep pace with research findings, SD users contend, the FDA will have to alter its position and rewrite current regulations to reflect the changing technology—which could make marketing restrictions, the approval process, and placebo effects obsolete.

While advocates and users insist on the right to benefit from the smart technologies that exist and others dismiss the claims of cognitive enhancement as anecdotal, everyone agrees on one thing. The smart drugs of today are a window on the cognitive enhancers of the future.

"Smart drugs," says Sirius, "are an indication of the evolving knowledge of brain chemistry. Now the chemicals are awkward and crude. One day there will be a brain implant. You'll be able to push a button to release the chemicals you want."

OVERTURES

CONTINUED FROM PAGE 57

such information might have. Home portal had been forted up unbelievably when he'd come through—beam platforms, special action units, at least two airborne armored brigades. The Peacekeepers were out in force, and if they demanded a formal emergency, they just might get it.

And then a moderator's word would be no better than that of anyone else. He wondered which side Federov would come down on. Great Russians were extremely hard to read, and he'd talked to the commissioner for only a few moments after he'd been briefed.

He turned his gaze to the darkness around him, wondering what eyes might be looking back. Something unimaginable, perhaps, using a form of vision stranger than he could name. It struck him that they might be able see him clearly even in this light, and he raised his cup in a toast before smiling and letting his arm drop once more.

And beyond them, the paranoid tormented eyes of men of his own world. He felt a twist of dismay at what would happen if the Humanite fanatics found the aliens first: a greater disaster he could not imagine. Maybe he should call in security for a quick sweep of the area. . . But no, you don't solve problems by increasing the number of variables.

He'd looked over the station db for all the data available on the group and had been surprised at the amount that came up. They'd arisen just after the invader hoax, that asinine piece of self-promotion by Wallace Njoma, a professional celebrity on Jefferson. Fake artifacts suddenly appearing out of nowhere, tailored to portray the makers as a mad, vicious, militaristic race devoted to war and destruction. Hazeltine had been a boy then, and he could recall the panicky broadcasts on Worldnet, particularly after the first 'translations' had turned up, declaring that the entire area around Tau Ceti was claimed by the Ree, as they were supposed to call themselves, and God help any other race that ever occupied them. Among the stars they held title to was an insignificant ball called Sol.

Humanite had mushroomed forth then, dedicated to defending the human race against the Ree and all other comers. A politician had been behind it, needless to say—a Montenegrin named Bostjic. After Njoma had revealed that it was only an amusing hoax, most public support had evaporated, but the hard core remained: the congenital xenophobes, men who in an earlier age would have joined forgotten cults like the IRA, the Klan, the Know-Nothings. They had gone underground, convinced that even though this crisis had been a false alarm, there would always be a next time.

Hazeltine downed the rest of the coffee. And here was the next time.

The glow on the horizon had spread and taken on the color of dull gold. Above it the nebula hung like God's own handprint. He wondered if it would be visible in daylight.

And if men were hiding out in those dark, strange woods, what did they feel at the sight? Simple indifference, most likely, if not outright horror. There were plenty who looked at the stars in just that way: not part of the world at all, an abyss, the very dark source of fear. What they would make of another race rising out of that bleak pit wasn't worth thinking about.

There came a sound from below: somebody hollering. A minute later he heard running footsteps. He went over and looked down the stairwell.

A mournful voice floated up. "Alex?"

"Here," Hazeltine called. More footsteps and then a brown face gazed up at him. "Jeez," Walsach said. "I didn't know what happened."

Hazeltine smiled down at him. "Come on up," he called softly. "There's something you should see."

Hazeltine sat in the lobby reading the paper Walsach had brought out a copy of today's *Times*, for which he was grateful. Not much going on; the Council had decided to keep a lid on the artifacts for the time being.

As he discarded the front page for the arts section, two workmen walked past. "... like to scrape that thing off," one said. Nigerian, probably a Yoruba.

"Oooh, no mon," the other replied, dreadlocks swinging. "You try that it jump from the wall and chase you right quick."

He was opening the paper when another worker advanced on him. A muscular, hearty young woman, blond hair cut short. The same, in fact, who had glared at him last night.

"Mr. Moderator . . . ?" American?

"Alex."

She eyed him a moment. "Alex. You haven't been down in the supply room, have you?"

Canadian, Hazeltine decided. "No, I haven't. What's wrong?"

She blinked nervously. "Well, there's a lot of stuff on the floor, like somebody dropped it."

Hazeltine set the paper down. "I see. What kind?"

"Crackers, dried fruit, some cans." She bit her lip.

"No, I wasn't down there."

"Okay," she said as she walked off. A few steps on she looked over her shoulder. "And thanks, sir."

Hazeltine watched until she went around the corner. The supply room, just off the main corridor. . . . The aliens had taken a few things earlier, evidently, at least some were missing. But he doubted they'd developed a taste for crackers.

Clearing his throat, he stated his code and stared into the air before him. Nothing appeared, not even the shimmer effect that occurred when the lasers needed tuning. He grunted and got up. Obviously the central comp wasn't online.

He reddened as he looked across the lobby to see Walsach smiling at him. "Not up yet," the physicist called out. "Just in a couple suites." He waved Hazeltine over. "Come on. We're hooked in."

"Anything in particular?" Walsach asked as they went down the hall.

"Yes," Hazeltine muttered. They reached the suite and went inside. "Go ahead," Walsach told him. "It's on me."

Hazeltine glanced about at Walsach's team before speaking. They were paying no attention, busy at various machines.

"Supplies," he said after stating his code. "Food, amounts ordered."

The hologrammed words flashed in to being. "Last night, all orders," Hazeltine said, aware of Walsach's gaze.

A list glowed at him, the first line his own dinner, with others below it. He looked it over. Nine meals: two ham, four steak, and three chicken, one of them curried.

"Other items missing." Another list, displaying what no doubt lay scattered on the floor below.

"Orders for the past week, time of day appended." A longer list appeared, most of them lunches for the workers, but there, three days back, another night order, nine hot meals with a far greater amount of dry and canned goods.

He was about to exit when another thought occurred to him. "How were these ordered?" The holo displayed a takeout symbol.

"Thank you." Hazeltine said. The image vanished and he turned to see Walsach gazing at him in full comprehension.

"There's somebody else out here," Walsach said quietly.

Hazeltine dropped his eyes. He should call in security. He had no choice, really. Those sick fanatics were a matter for other skills than his. But . . .

He raised his head. "Could you set up a detection system for me? Rudimentary. No need for flash."

Walsach frowned at him. "I could, Alex, but . . ." He looked at Hazeltine a minute, then shrugged. "Why not?"

Just then the foreman walked in, a worried look on her face.

After he showered, Hazeltine went directly downstairs. He knew that he should eat something, but he was far too nervous. In the elevator he took out the beeper that Walsach had given him and looked it over. It had been slapped together by the team's hardware man and stuffed into a plastic calculator case. He shook it gingerly, hearing the circuitry and receiver rattle inside. Extremely crude, nothing like what Schone would have put in, but that was exactly the point. All the same, Walsach had assured him it would work. . . .

At least the foreman's problem was taken care of. It seemed that the supply room story had spread and the crew was about ready to drop its tools and head home en masse. A pretty situation, but one made for Hazeltine.

He'd gone from site to site to speak to them. He'd stumbled at first—they were of all backgrounds, and his instincts, honed over the years, kept sending him mixed signals. Finally he simply relaxed and spoke straightforward-

ly that he had reasons for wanting them here, that these beings should see humanity as it was and not behind masks designed by scientists or governments however well-intentioned they might be that in a real way it was they who would be making the contact, and that he was only their spokesman. He asked, without pleading, that they not let fear rule them, that it was crucial, perhaps desperately so, that the aliens know that humanity was not afraid of them. He ended by telling them that whatever happened, they would never regret being where they were now.

If had been enough. They'd gone back to work, all but the handful who had already snuck home.

Tired as he was, he still felt the emotional high of a successful commission. That was what moderators were for, after all: calming touchy situations, settling disputes, acting as freelance negotiators and diplomats without portfolio. He'd spent a lifetime at it—colony to colony, world to world. Palestinians versus Poles, Chinese versus Californians, Cubans versus Mexicans. A tough one, that last—fruit of a half-witted UN project devised by a bureaucrat who believed that all Latins were alike. He'd had to settle there—Bolivar, the world was called—for over six months. But it had turned out well, they'd wanted to appoint him alcalde when it was over.

As he crossed the lobby he looked outside. Dusk, the sun vanished, the light of the nebula not yet visible. He went on through the portal, finding exactly what he'd expected: droves of security men and soldiers armed with everything except shields and spears. Looking around, he saw Schone talking to a Peacekeeper officer. He walked over and tapped him on the shoulder when he finished.

Schone turned, showing no surprise whatsoever.

"Could you arrange for a small unit to be ready at any time? Men you know and trust."

"I already have." Schone said slowly.

"Excellent. I'll discuss it with you later."

"Wait," Schone said. Hazeltine looked back. "You found something."

"Nothing in particular."

"Yes, you did." Schone said. The blue eyes were cold and unblinking. He grasped Hazeltine by the arm. "Is it humans, or . . . ?"

Hazeltine gazed back calmly and Schone let him go.

"Later, then," Hazeltine said, and walked to the portal.

The alarm started beeping as soon as he emerged.

He turned and plunged back. Schone was standing where he'd left him, talking to one of his men. This time he did look surprised. It was nice to see an honest expression on that face, Hazeltine thought as he waved and went back through.

Schone was right behind him, pistol in hand, followed by a dozen uniformed men. "No shooting," Hazeltine said loudly. "You understand? No firing unless I give the signal."

He could read the look that crossed Schone's face. Moderators never gave that kind of signal.

"Do you know where the food supply is kept?" Schone's head moved once and he snapped his fingers behind him. "Outside," he said, and six of the men ran toward the doors. The others ran in good order to the service stairs, Hazeltine right behind them. At the door Schone looked back. "You will wait—" he began, but Hazeltine went on past him.

There was a clatter from below and a cry of, "Goddammit!" Shouts and running feet sounded from the corridor. Schone pushed him aside and ran downstairs. Taking two steps at a time, Hazeltine followed.

"Miss Erstworth, get me the phone number of the company that sold us this intercom system."

At the bottom, a soldier was rubbing his leg and swearing at an overturned machine just outside the door. He picked up his gun and hobbled toward the uproar. Hazeltine quickly overtook him.

At the end of the hallway, three men carrying boxes were pushing through the exit door. The troops spread out against the walls, weapons raised. In the middle of the corridor, Schone stood aiming his pistol.

"No!" Hazeltine shouted. He raced past him and swung around. Schone muttered a curse and lowered the gun. Turning away, Hazeltine saw that two of the men had already vanished. The third was fumbling between his load and the closed door.

"Young man," Hazeltine shouted. The boy looked wildly back, then let the boxes drop and raised a machine pistol, the barrel short and ugly.

Hazeltine inspected him in the dim light. Middle Eastern, one of the most tormented and racially paranoid regions of Earth. The boy cocked the gun and shook it at him. "Get away," he shouted in heavily accented English.

Syrian, possibly the Iraqi border area. Arabic cultural matrix: patriarchal in basis, hierarchical in structure, authoritarian in nature. Harsh and peremptory, then.

Arranging his features in an aloof mask, Hazeltine paced toward him. "I am a moderator," he said. "Whatever it is, it's ended. Drop the weapon and we'll discuss it."

The boy's face twisted and he started cursing in Arabic. Hazeltine caught little of it, not his specialty. He halted twenty feet away. Let him rage for a moment, get it out of his system.

The boy fell silent and glared past him to where the soldiers stood. Hazeltine took another step. "Put the gun down, boy." He pointed at the floor. "Do it now."

Licking his lips, the boy dropped his eyes. Hazeltine waited, hand still raised. Let him make up his own mind.

The eyes rose and locked with his. "You ——," the boy said, his voice barely audible.

"I am a moderator."

He could see the boy relaxing. If it was a moderator it was all right, with a moderator it wasn't surrender.

He bent forward and set the gun on the concrete floor.

Hazeltine crooked his finger. "Come here."

The boy came to him, nearly trotting. Hazeltine took his arm and led him down the corridor. "What is your name?"

"Hafaz Aziz," the boy mumbled.

The soldiers had risen from firing stance, some smiling, one or two shaking their heads. As always, Schone's expression was unreadable.

In the lobby, Hazeltine claimed privilege in order to talk to the boy first. "There are nine of you," he said, "within easy walking distance of the station. And not very well trained, I'm afraid."

The boy's eyes widened and he looked away quickly. Hazeltine could guess what was going through that black-haired head of his—that he should have handled it differently, that with a little more guts and finesse he might have taken Hazeltine hostage, brazened his way out, and been gone along with the others. His situation didn't quite match up with his self-image, and it was hurting him.

"We also know who you are and what you're up to," Hazeltine went on. Aziz simply pouted.

Hazeltine looked over his shoulder. A few feet off stood a cold-faced Schone, along with a Ukrainian Peacekeeper general in special-forces uniform. The lobby had been overrun with brass when they'd returned. Hazeltine had chased all the others back home.

He turned back to the boy "We know that you've been hunting the aliens and haven't had any luck"

Black eyes snapped toward him "The beasts," the boy spat.

"Beasts? How so?"

There was no reply "Then perhaps you'd tell me what the point is? What possible good you could accomplish?"

"Someone must defend our home against these beings," the boy said fiercely He must have realized how silly that sounded "... to act as a sacrifice By our deaths, we would make clear the evil of these creatures. ..."

"And if they're not evil?"

"Then they must know of our power."

Hazeltine could barely keep his eyes from rolling 'Power,' he said. 'So it comes down to that."

The boy blinked at him uncomprehendingly "I suppose that you refuse to tell us where your group is camped?" asked Hazeltine

There was a disgusted "Oh, Christ" from behind him as the boy shook his head Hazeltine rose and waved Schone and the officer aside.

The general smiled dourly at him "Moderator,' he said in pure Midwestern American, 'with your permission I'll dope that punk, hook him up to a Veritex, and squeeze it right out of him."

"And how long will that take?"

"No more than—" the general began just as Schone said, "An hour." Glaring at the agent, the general roared, "Half an hour!"

"And yet we have at least two of his people on their way back You certainly don't expect them to wait for you."

The general looked uncomfortably at Schone. Turning to where the boy waited, Hazeltine gestured for them to follow

He loomed over Aziz, staring down at him coldly, letting his gaze sink in. "You're not aware that we have some idea where the aliens are,' he said finally. 'These men want to drop you there. We believe that the beasts, as you call them, would like to examine a specimen." He stepped away, bobbing his head briskly 'General ..."

"No!" Aziz shrieked, leaping to his feet He stared wildly around him, his arms up. He fixed his eyes on Hazeltine and began babbling, a mixture of Arabic and English a notch in the ridge west of here, a mile past that to a stream, then a grove of the spidery trees ...

The general was already walking toward the doors and the lift platforms that waited outside "No gunplay," Hazeltine called out The officer raised an arm as he vanished

Aziz was being led to the portal, sobbing wretchedly Hazeltine turned away He eyed the pattern for a moment and with a shame-faced smile went to a chair.

"... betray your own race," the man said, his voice and gestures operatic. "You disgust me." At the last word he spat on the carpet

"Not worth an answer, Padilla," Hazeltine said softly

He was big, mustached, and as worn-out and dirty as the rest of his men Hector Padilla, a well-to-do krill rancher from Baja One of his wife's relatives was a portal tech. He'd sent the group through from Hidalgo five days before the rest they'd learn soon enough.

There had been no casualties, not a shot fired other than a single stun grenade The timing could not have been better. The troops appeared just as the supply raiders had returned, with confusion at its height.

> "There was a reddish sheen to the pattern now, and for some reason it looked almost cheerful, as if it were a mild joke shared between friends."

"... eh, we tried." Padilla muttered to himself.

'You could have tried harder The operation seemed a bit ill-planned, to tell you the truth."

Padilla glared at him "It would have gone better if you hadn't stolen our supplies. I knew then that you ..."

Keeping the surprise from his face, Hazeltine glanced around the lobby No one in earshot Most of the troops were hustling Padilla's men through the portal He looked back at Padilla, who was still orating.

"... why you didn't pick us up then I don't know. Playing games, I guess."

Hazeltine nodded distractedly At the portal, Schone pointed toward Padilla and two soldiers came over "Well, yes ..." Hazeltine said his voice drifting off Padilla saw the soldiers approaching and got up. Striking a dramatic pose, he fixed his eyes on Hazeltine "I pray that you don't regret this, Moderator. I pray for us all."

Hazeltine stifled a grin "My thanks, Señor." As Padilla stepped away, he said, "One thing more."

The Mexican looked back

"Tell me, did you ever watch the nebula at night?"

A puzzled look crossed Padilla's face "Sí. What about it?"

Hazeltine waved him on 'Buenas noches."

As Padilla was led away Schone walked over, wearing the look of mild amusement that was as close as he ever got to a smile "Alex," he said, extending his hand "I hope the rest works out as well."

"Perhaps better."

He watched Schone go across, then slowly made his way to the pattern There was a reddish sheen to it now, and for some reason it looked almost cheerful, as if it were a mild joke shared between friends.

Symbol, emblem, puzzle, tool. He studied it, thinking that he had gotten the joke.

They would want to learn how we handle our madmen, he thought. Of course they would That would tell them all they needed to know

"I'm ready," he told the pattern, and walked toward the doors.

Before he even reached them he saw movement out in the darkness and his heart leapt at the magic of it He smiled, the way a man smiles when a great act awaits, but erased it when he recalled what the exo team had told him about bared teeth. Then he let it grow once more. They must know what a smile was by now.

The movement became clearer and Hazeltine slowed in astonishment that was washed away a second later. But yes, he told himself They would look exactly like that, wouldn't they?

Quickening his step, Hazeltine opened the door and walked out into the warm embrace of evening. ∞

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INTERVIEW

CONTINUED FROM PAGE 60

stay alive. One of my roles is to bolster the illusions making life bearable. What I hear from patients is, "I'm going to kill myself unless my life gets better." My contract is to teach them skills making them want to live so that they don't spend half their lives crying.

Omni: Tell me about your vocation as a political forecaster.

Seligman: In 1988, I and my graduate student, Harold Zullow, a political junky, decided to test whether optimism was a factor influencing the Senate races. There were 33 senatorial races and we were able to get the stump speeches of 29 of the 33 candidates. We content-analyzed the speeches for optimism or pessimism and sent our predictions in sealed envelopes to the *New York Times*. By choosing the most optimistic candidates as the winners, we were able to predict 25 of 29 races, including five out of six upsets. We did better than any other forecaster.

Omni: Your predictions were based on a single criterion, optimism, whereas other forecasters and pollsters employed multiple criteria, such as candidates' views, race, religion, and other factors supposedly central to who wins.

Seligman: There's a huge unpolled "hope factor" in the American electorate. People listen for who inspires the most hope. We vote for leaders who make us feel the future is going to be better. Harold and I also looked at the 22 presidential elections from 1900 to 1984 and rated the optimism of the Republican and Democratic nominees. We cut out every sentence of their nomination acceptance speeches, put it on an index card, and had blind raters—individuals who did not know whether the words came from Kennedy, Taft or Johnson—rank the statement for optimism on a 1-to-7 scale. In 18 out of 22 elections, the more optimistic candidate won. There were four exceptions in the twentieth century, three of which were Roosevelt elections, and the fourth was the Nixon-Humphrey race in 1968.

Omni: Humphrey was more optimistic than Nixon?

Seligman: Yes, but after the Chicago riots, Humphrey had to overcome a 16-percent point deficit in the polls and closed within one-half of 1 percent. People say that if the campaign had gone on for one more week, Humphrey would have won.

Omni: How did a pessimist like Roosevelt get elected three times?

Seligman: I just have a guess. Those elections occurred during deep crisis years. In 1936, the nation was still in a profound depression. In 1940, the war is breaking out in Europe. In 1944, we're on the verge of victory. During extreme crises, optimism is diffused and there's a tendency to stay with a proven leader.

Omni: What are your predictions for the upcoming elections?

Seligman: We're analyzing the optimism of Bush and Clinton as well as leading House, Senate and gubernatorial candidates. We'll open our sealed envelope the day before the election.

Omni: Why the day before?

Seligman: We don't want to influence the candidates' styles on the long shot that they'd take our analysis seriously and change their speeches to sound more optimistic.

Omni: Any hints as to what predictions are in that envelope?

Seligman: Nothing. I'll say at this point except that both presidential candidates have had careers marked by remarkable ups and downs. So we're probably dealing with strong optimists here.

Omni: Have campaign managers flocked to you for advice?

Seligman: After we called so many primaries correctly in the last election, the *New York Times* ran a front-page story about us. Immediately we got letters from both parties' campaign people asking us, "What's this all about?" and "Can you help us write more optimistic speeches?" To oblige them, we could take any speech by any candidate and make it more appealing to the electorate by, among other things, changing many adjectives. We did not want to assist in masking candidates' real positions, yet they were taxpayers entitled to the information. So we just sent them reprints of our work with the hope that they wouldn't believe us and, at least for a while, would forget about us.

Omni: Are you afraid your findings will turn political campaigns into issueless pageantries in which each opponent tries to outdo the other for the rosiest vision of the future?

Seligman: If politicians are flagrantly abusing this to deceive the electorate, we can expose them by comparing press conferences and off-the-cuff remarks with prepared speeches. It's hard to fake optimism when you don't have a written text in front of you. We'd try to educate the public about bunk. It's a bridge we haven't yet had to cross. I hope we never do.

Omni: Given the problems the world faces, don't we need pessimists in office more than at any time in history?

Seligman: You may be right. We've analyzed over a century of inaugural addresses going back to Andrew Jackson

and compared each president's optimism ranking to history's rating of his greatness. What gets you elected is sounding like an optimist, but what correlates with greatness is pessimism. The most pessimistic of the presidents managed to get elected by narrow margins but went on to be rated great. Lincoln, FDR, and Truman can be counted in that group. Very optimistic presidents were not, by and large, the great ones.

Omni: Was Reagan the most optimistic in the bunch?

Seligman: No, he's far from our most optimistic president. Eisenhower was more optimistic; George Bush is more optimistic.

Omni: How is pessimism valuable in other occupations?

Seligman: In a big corporation, optimism may be an asset for marketeers, sales persons, and creative people dreaming up new products. But pessimism definitely has a place when it comes to safety engineers, CPAs, financial vice presidents, and others we depend on to raise the yellow flag of caution. And at the top, a company needs a CEO who can balance the jeremiads of pessimists against the charge-ahead optimists. Presidents and other political leaders must do the same thing.

Omni: To function well in society, then, don't people need a good dose of realism?

Seligman: Realism is much a part of the way we need and want to live. But it's a fallacy to assume that virtues cannot be antagonistic. Optimism provides virtues. It fights depression, causes more achievement in the work place, may be a factor in better health. But it has a cost. We don't see the world aright. The psychiatrist prescribing lithium for manic depression may be placing that patient at greater risk of heart dysfunction. Life is buying and selling. The notion that therapy can produce global gains in every arena is an illusion. The clash between truth and happiness has not really penetrated the consciousness of mainstream psychologists.

Omni: And when it does?

Seligman: Society places a high premium on truth. The conflict will make many therapists uncomfortable. But there are ways around the dilemma. It used to be if you were born a pessimist, you were a slave to that catastrophic outlook for life. Likewise for optimists and a rosy-eyed vision of reality, even when a more sober-headed view might be advantageous. But we needn't be slaves to either outlook; we can choose how we think. Styles of thinking can become habits. We can control our thoughts as we can our muscles.

When do we deploy these thinking strategies? We must ask ourselves what are the consequences of failing in a situation. Say you've called up someone you want to interview, but she won't return your calls. Should you call again? The cost of failure is small, just a rebuff. Say there's someone you want to approach at a party. Should you go up and introduce yourself? Again, the cost of failure is negligible. But if you're debating whether or not to have an affair that could ruin your marriage if your spouse found out, then it's time for pessimism. You want to look at reality very clearly in this situation.

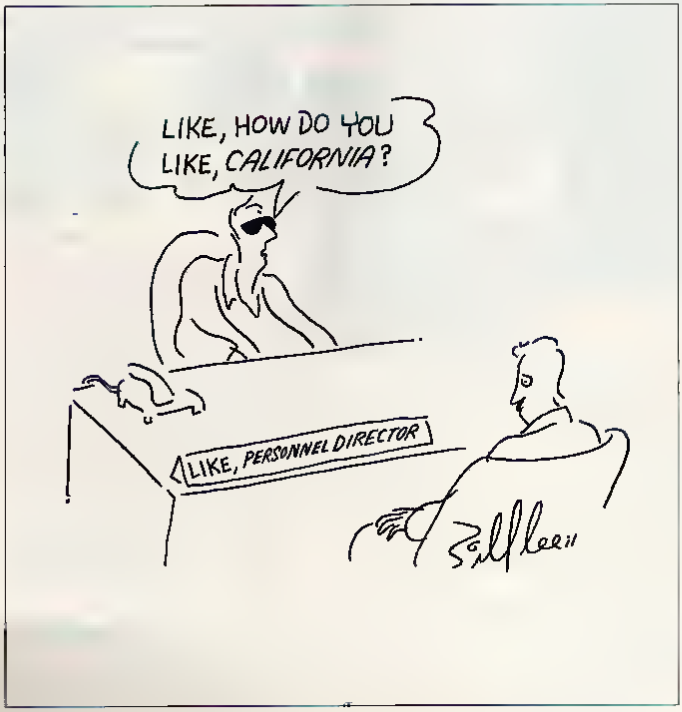
Omni: So a person can flip back and forth between strategies?

Seligman: I do, and my patients claim to be able to do so. That's hardly evidence. But consider how readily you switch back and forth between home, party, and office behavior. Different skills and thinking are involved in each, yet most people switch between personal, affiliative, and achievement modes so readily, they're not aware of how drastically they've changed.

My animal studies in learned helplessness have convinced me that learning underlies pessimism. What baffled me was the minority of subjects who kept trying to avoid the shock. One in three dogs refused to give in to helplessness—as did one in three rats, goldfish, and cockroaches. When I gave humans unsolvable problems, again one in three did not become helpless. About 15 years ago, I began to wonder why. I soon discovered that not all people think about triumphs and defeats the same way.

Optimists, it turns out, have a lopsided view of the universe that makes them resistant to defeat. If something is good, optimists think they did it; the positive effects will affect everything else they try; the goodness will last forever. If something bad happens, they're not to blame, the failure won't affect anything else they try, the negative effects will be fleeting. Optimists have exactly the opposite explanations of good and bad events.

Pessimists are more logically consistent. They subscribe to the same view of causality for good and bad events. They take credit for successes, but are just as even-handed about taking responsibility for defeat. While the optimist sees himself as very special, the pessimist views himself as an outsider might. Consequently, pessimists have fewer means of defending themselves, which is probably the reason they're more vulnerable to feelings of helpless-



ness and depression

Omni: Has optimism research been wrongly derided as pop psychology, armchair theorizing?

Seligman: If we're dealing with armchair theorizing, it's armchair theory in which roughly 400,000 subjects have participated and roughly 400 doctoral dissertations have been written. Numerous studies show these concepts have strong predictive capacity in several areas. Our Attributional Style Questionnaire ranks individuals on an optimism-pessimism scale based on how the person explains a series of vignettes in which good and bad events occur. If we test people and track them over time, we can predict who is going to get depressed and stay depressed. The higher the optimism score, the less likely the individual will become depressed. If the person does become depressed, their recovery is quicker.

We can take people with the same SAT scores and grade-point averages in high school and predict who will do better in college. Optimists do better, exceeding the performance level predicted by standard academic indicators; pessimists do worse. In business, I've tested 300,000 candidates for jobs as insurance salesmen. Working in a field where 9 out of 10 people slam a door in your face, optimists don't quit in large numbers the way pessimists do, and they sell many more policies. I've also tested Olympic swimmers. When defeated, the optimists swam the next race faster, the pessimists more slowly.

In physical health, optimists are more resistant to infectious illness and are better at fending off chronic diseases of middle age. In one study, we looked at 96 men who had their first heart attack in 1980. Within eight years, 15 of the 16 most pessimistic men died of a second heart attack, but only five of the 16 most optimistic men died. These concepts are far from armchair theorizing. A lot of what I do is armchair theorizing, but very little of what I publish is armchair theorizing.

Omni: Many medical authorities still doubt that we can wish away disease with positive thinking.

Seligman: Skepticism is always healthy in science. But some experts, such as Marcia Angell, executive editor of the *New England Journal of Medicine*, have taken their skepticism too far. In my view, people who draw a line between mental and physical processes are living in the seventeenth century. We are not evoking mystical forces to explain how mind effects body. No, we can't observe a billiard ball called *pessimism* hit a billiard ball called an *en-*

dorphin that knocks into a billiard ball called *immune shutdown*. But we can measure substantial statistical relationships among those variables, which is how discoveries in other areas of medicine are made.

Omni: How do you teach a clinically depressed person flexible optimism?

Seligman: Optimism is not a panacea for depression. It often makes sense to give severely depressed patients antidepressant drugs initially to lift their mood so you can work with them. Then they'll be more receptive to learning the skills to counteract pessimistic thinking at the core of their depression. Unlike intelligence, femininity, and many other traits, pessimism can be changed greatly by learning.

The most effective skill for fighting depression is disputing. Unfortunately, it's a skill we often apply in the wrong places. We dispute other people, external sources. To overcome depression, we have to learn to dispute ourselves! Pessimistic people often think negative thoughts about themselves, many of which are irrational. They may be internalizing rantings of their big sister or punitive Little League coach. Learning optimism means learning how to dispute catastrophic thoughts and replace them with self-enhancing thoughts.

Omni: A little advice for the gloomy?

Seligman: Specifically, if something goes wrong, pessimists tend to have hopeless thoughts. They tell themselves, "I'll never get it right," or "I always screw up," or worse, they stamp themselves with a negative label—'I'm a jerk.' My goal would be to get that person to speak to him- or herself more kindly, the way a loving friend might. The person might learn to say, "Things didn't go well today, but I learned a lot from the experience, and I'll do better tomorrow." Instead of negative labels like "jerk," the pessimist would learn to say, "Sometimes I'm not as considerate as I'd like to be, but overall, I'm a kind person."

My other advice for overcoming pessimism is not to ruminate about bad events that happen to you, at least not immediately afterwards. If your boss fires you or you fail an important exam, my recommendation is to do something pleasurable that will distract you from your troubles. I recommend fun distraction because studies show if you think about problems in a negative frame of mind, you come up with fewer solutions. And you're likely to spiral into deeper depression. By boosting mood and self-esteem, people with pessimistic tendencies can break that cycle and free themselves to think more creatively.

Now, a lot of self-improvement therapies don't work. Dieting doesn't work. Diets are no fun. But disputing negative thoughts and avoiding rumination makes you feel better immediately. It's fun. It takes most people a few weeks to get the knack, but once the technique is learned, the less likely they are to relapse. That's well documented.

Omni: Is the self-improvement movement a recent phenomenon?

Seligman: To understand its history I've been studying Judeo-Christian tradition. I've been surprised by the lessons implicit in some of the great Biblical events. Let me test you. How did the Jews escape from Egypt?

Omni: Moses, through his faith in God, was able to part the Red Sea. Moses gave the Jews the courage, strength, and faith to believe they could achieve the miraculous.

Seligman: That's what I thought, too. But we're both wrong. That interpretation has a distinct twentieth-century spin. God really does everything—that's why the Jews are exhorted to remember the Exodus. Moses isn't inspirational. God appears before him and says, "I'm going to command you to do something. I'm going to put the words in your mouth and tell you what to do every step of the way." The Jews do nothing except groan and complain to God, who commands them, drags them out of Egypt, tells Moses what to do, parts the waters. If you look at the great events described in both Old and New Testaments, the same lesson is beaten home. Human beings are powerless. Only God is powerful.

That message dominates Christian thinking up to about 1500. Slowly, however, three movements took root providing the foundations of our modern obsession with self-improvement: the rediscovery of the Greek idea of free will, the birth of modern science in the sixteenth century, and the third, glacially slow, the defeat of monarchs and the rise of self-governing societies. This last begins with the American and French revolutions—their declarations of the independent rights of man—and gains momentum from there.

During the social reforms of 1800 to 1860, the concept of self-improvement arises as a crystallization of these three movements—free will, modern science, and political liberty. Today, we take self-improvement so much for granted, we sometimes forget that there are limits to what we can change about ourselves. A lot of energy is being wasted on self-reform that's destined to fail, such as dieting. A result of constantly dieting is constantly failing, which makes you feel depressed and helpless. But if you actually succeed, you're

starving and a regular consequence of starvation is depression. Psychologist Mandy McCarthy, who calls this the vain pursuit of thinness, claims this is why American women are twice as likely to suffer from depression as American men. In cultures that don't idolize thinness, she doesn't find a sex-bias in depression or eating disorders such as bulimia and anorexia.

Omni: What are other examples of vain pursuits?

Seligman: The androgynous person myth—the notion that we can impose masculine and feminine ideals on our children to coincide with what's politically correct this year. You can give dolls to boys and trucks to girls, but don't think it will make boys more nurturing or girls more interested in mechanics. Masculinity and femininity are not very elastic traits. It's an uphill battle. Sexual preference, what turns you on—breasts, bottoms, whatever—appears to be quite fixed, at least once you start acting on it. Perhaps there's a margin of flexibility among teenagers. On the other hand, the quality of being loving, traits such as kindness, compassion, and consideration, is modifiable and worth exploring in therapy.

Omni: How do you envisage psychology advancing over the next century?

Seligman: Therapy will wither as psychology becomes much more useful to well people. Right now, most individuals don't benefit from psychological intervention until they become mentally disturbed. We'll see much greater emphasis on prevention. At the thirtieth anniversary of the polio vaccine, I asked Jonas Salk, "If you were starting out today what would you want to do?" "I'd still do immunization," he replied, "but it would be psychological rather than biological." That's exactly what I'm engaged in now. I'm launching a program in Philadelphia seeking to teach children proactively the techniques of learned optimism. My goal is to protect them against depression and poor health in adulthood.

In the future, society will be more willing to take an honest look at the biological underpinnings of behavior. There are important biological constraints to what people can and can't learn, can and can't be. By ignoring that fact of life, we've unleashed misery. So much energy has been wasted, so many tears shed. So much guilt and regret has plagued us—all because we've tried to change the unchangeable. In the near future, we'll begin to distinguish what in our nature is fixed and what is malleable. Whatever the answers are, there'll still be a lot humans can do to better themselves. ∞

GAMES

THE FLOATING HOURGLASS
Why does this puzzle seem to defy the laws of physics?

By Scot Morris

Timothy Rowett of London, England, recently sent me an amazing object. An hourglass floats at the top of a cylinder of clear liquid (immediate right photo). Turn the contraption over, and the hourglass remains at the bottom of the tube (far right photo) until about half of the sand has fallen into the bottom compartment. Then the hourglass slowly rises until it reaches the top.

Anyone who has taken a basic physics class sees a paradox here. Why should the hourglass float in one condition and not float in the other? Masses don't change, specific gravities and buoyancies don't change. So why does the glass remain at the bottom until a certain amount of sand has fallen?

I showed this object to a group of scientists, technicians, and educated laymen. They came up with several theories.

1. Water exerts greater pressure at the bottom of a column of water. The pressure keeps the glass at the bottom until the top compartment fills with air, then it rises.

2. The hourglass is made of some material that's very responsive to molecular motion. At the start of the cycle, the falling sand and moving air molecules in the bottom compartment cause that half of the hourglass to expand. It presses out against the walls of the cylinder and cannot move. Only when the molecular motions of sand and air are approximately balanced in the top and bottom halves does the glass begin to rise.

3. The impact of the falling sand on the bottom of the glass exerts a force just strong enough to keep it at the bottom of the tube. As the mound of sand in the bottom gets taller, the individual grains of sand don't have as far to fall, so they exert less force on the bottom, and the hourglass begins to float.

(This "impact" theory rests on the premise that the weight of a system can be altered by internal movements. The thinking reminds me of the classic puzzle of whether a truck full of pigeons that's just over the weight limit of a bridge could cross the bridge if the pigeons flap around inside the truck instead of sitting on their perches.)

I've wanted to get a floating hourglass since Martin Gardner wrote about this paradoxical object in his August 1966 Mathematical Games column in *Scientific American*. Gardner had received one as a gift from Piet Hein, the Danish artist and puzzle inventor who created the Soma Cube and the Superegg. Hein described the paradox in a letter to Gardner: "Imagine if the hourglass were opaque and you didn't know it were an hourglass at all. There it stands at the bottom and changes its weight!"

Hein got his at the Paris airport, not knowing how it worked. He developed a theory that focused on the liquid in the cylinder. What if the tube contained *two* liquids, he suggested, and they didn't mix completely. When the tube is turned over, the heaviest liquid is now on top and pushes down on the hourglass. Only when enough of the heavy liquid has seeped to the bottom of the tube does the hourglass begin to rise. In this theory, the falling sand in the hourglass simply serves to misdirect one's thinking.

Gardner lent his hourglass to a laboratory for testing with polarized light. If Hein's theory were correct, liquid at the top of the tube should have a different refractive index than liquid at the bottom—that is, it should bend light to different degrees, depending on the densities of the liquids. Although the test was extremely sensitive, Gardner reported, the lab could find no evidence of a separation of liquid layers.

Which of the four theories above do you think is correct, or is the true explanation something else altogether? Send your theory, in 100 words or less, to Hourglass, c/o *Omni*, 324 W. Wendover Avenue, Suite 205, Greensboro, North Carolina 27408. I'll send copies of my book, *Omni Games*, to the people who send the five most interesting submissions. In a future issue, I'll report on the correspondence received and reveal the true explanation of how the Floating Hourglass works.

This is one of those rare physics puzzles in which you don't have to inspect the actual object to come up with a solution. To help you along, however, I can report on the following test. If you shine a lamp on the cylinder, the liquid warms up and the hourglass sinks to the bottom. If you then refrigerate the tube, the hourglass floats to the top.

The transparent cylinder in the photo is 7.5 inches tall and 5 inches in circumference. After the tube is turned over, the glass begins to rise after about 1 minute and 15 seconds. All the sand reaches the bottom compartment after about 1 minute and 40 seconds, and the glass rises to the top of the tube in about 3 minutes.

Ray Bathke, owner of the Games & Puzzles shop in London, constructed the hourglass shown. To order one (cost is $39 plus $4 postage and handling), contact Ishi Press, 76 Bonaventura Drive, San Jose, California 95134, (800) 859-2086. ☒