

**FOOD FOR THOUGHT! THE OMNI BRAIN DIET**

# OMNI

**THE BRAIN AND AGING: MYTHS AND REALITIES •  
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STORIES YOU CANNOT!**



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The mind holds infinite mysteries, as suggested by Stanislaw Fernandez' cover illustration. Among the most fascinating is the effect it exerts on our bodies—and consequently our health. (Additional art and photo credits, page 50.)

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# FIRST WORD

## THE FUTURE OF THE BODY. Explorations into the further evolution of human nature

By Michael Murphy

**H**umanity has evolved by means of minor and major steps toward yet another spiritual transition. For certain types of extraordinary human development I believe, herald a third evolutionary transcendence. With them, a new level of existence has begun to appear on earth, one whose patterns cannot be specified by physics, biology, or mainstream social science.

As life developed from inorganic elements and humankind from its primate ancestors, a new evolutionary domain is tentatively rising in the human race, both spontaneously and by transformative principle, and it was made possible by quantum jumps in developments such as the discovery of fire, the emergence of language, and the birth of religious awareness. Certain human attributes that characterize the emergent level of development include the unitive awarenesses described by religious mystics, ego-transcending love for others, self-existent delight, super-abundant vitality, contact with entities or events that are inaccessible to the ordinary senses, and the transmission of thoughts, volitions, and ectstatic states through extraterrestrial modalities.

Most of these attributes are evident, however briefly in the course of everyday life, but their sustained realization comprises a break with ordinary human activity and their lasting integration by many people would constitute a new kind of life on this planet. They are also frequently marked off from ordinary functioning by a sense they convey of something beyond the familiar patterns of our existence. Jewish, Christian, and Moslem mystics, for example, typically attribute them to God's blessedness, mercy, or grace (Buddhists to the omnipresent Buddha-Mind; Hindus to Di-

vinity's shakti, or world-power, and Taoists to the Way, or Tao. When some athletes experience them, they say they are "zoned." Martial artists have called them the action of sunyam, or Emptiness, "through human hands and feet." And more commonly, when we have a spiritual insight that lifts us to certitude we have not experienced before, or when we surprise ourselves by accomplishing some extraordinary deed, we might say that "something came over us," that we were "carried away." The recognition of ego-transcendent powers is reflected in religious terms and our common language. That recognition of a "Something beyond," I propose, coupled with our inability to specify its operations in us, points toward a new kind of human development. We don't know where our new vision, love, or joy came from, or how we effected our marvelous deed precisely because such things are unfamiliar and because their mechanisms are related to something mysterious in us.

Their radical novelty and non-ordinary causes, then, suggest that extraordinary capacities are instances of a new type of evolution that has no patterns which distinguish it from ordinary psychological development. Conversely, however, it might be concluded that because they resist verification by standard scientific procedures and often appear to violate certain scientific assumptions, some of these extraordinary human attributes do not—or cannot—exist. And indeed, that is what many scientists and philosophers argue. The fact that telepathic empathy (or spiritual healing) cannot be demonstrated in controlled experiments proves ipso facto that such things are figments of the imagination. However, the apparent violation of nat-

ural laws that scientists invoke against extraordinary functioning can be taken as signs that such functioning is part of a new domain, one that transcends ordinary human activity and methods developed to study it.

Every domain that science has illumined has required unique approaches and appropriate instruments. Astronomy needed the optical telescope and Newton's calculus, depth psychology has depended upon subjective report. None of these fields could have developed without concepts and methods adequate to them. And the same holds for extraordinary human attributes. They, too, must be studied and developed with appropriate methods and theories, including anthropological field studies, psychical research, and contemplative discipline.

I believe that the self-evident break with normal consciousness and behavior, the transcendence of certain needs, and the self-mastery of mind and flesh characteristic of melanormal functioning would, if realized by enough people, create a new kind of life on this planet. This new life would involve new types of social interaction, new styles of energy consumption, greater care for the physical environment, more wisdom in dealing with human aggressiveness, new rituals of work and play. As it began to appear among large groups, such functioning might not appear, at first, so dramatic that it comprised a new kind of evolution, but it would, I believe, eventually exhibit features and regularities we cannot predict from the patterns of ordinary human existence. ☩

**The fact that certain human events apparently violate assumptions of contemporary science does not require us to deny the existence of them.**





# ARTS

## THROUGH THE LOOKING GLASS,

The artist's subject is her mother, a victim of Alzheimer's

By Joe Dziemianowicz

**W**hile pioneers in the hot new field of visual reality tinker with technology in allowing one person to literally see through another person's eyes, some visual artists offer the same perspective through their work. Their visual arts, at their best, succeed in transporting audiences into a specific individual's sense, that—if only momentarily—gives the viewer a new vantage point from which to see the world.

Artist Kim Howeza Zabba provides an extraordinary example of an artist's ability to go beyond mere metaphor and to give concrete shape and meaning to the concept of seeing the world through another's eyes. In 1993 she began work on a series of 62 paintings called *Voyage Back to the Mind: Looking Through the Eyes of Alzheimer's*. The artist's subject is her mother, the former journalist Lou Howeza, who has suffered from Alzheimer's disease since 1983.

Zabba began painting about her mother's inner experience after Howeza, then 85, was no longer able to put her thoughts clearly on paper. The paintings evoke despair, illustrating a proud personality's growing disorientation and distress. Using chaotic and surrealistic images, Zabba's work artistically reflects the Alzheimer's-induced disorientation that has turned her mother's life into what she calls "an Alice-in-Wonderland existence."

The artist uses overlapping images to depict her mother's tortured inability to express herself verbally in several works, including "Never Kiss Before They Die" and "Commodified Message." Shapes overlap or flow from one amorphous form into another. Faces and figures appear in unexpected places. "I wanted to paint what was going on in her

mind, to go in there and try to feel what she was feeling," Zabba says. That would be no easy task considering how inexplicable the disease can seem.

Alzheimer's, a degenerative brain disorder, begins with occasional memory lapses and progresses relentlessly to total psychological decline and dependence. The disease has no known cure, and worldwide, it afflicts an estimated 33 million people over the age of 65, according to the Alzheimer's Association in Chicago, Illinois.

Researching the origins and progression of the disease, Zabba learned how the intellectual impairment associated with it stems from microscopic brain-cell changes called neurofibrillary tangles. As the tangles multiply, memory, attention, and orientation in time and space deteriorate. "I kept thinking about the tangles, literal and figurative, in her brain," says Zabba. Painting a

com for her mother's future inspires the darker, "most acid, intense, and mysterious" works of her voyage—as in "To the Bright Light of Death III." It speaks most clearly of the disease's inevitable finale.

Howea's personal journey has been a slow one. Living with her husband in their Ponchatoula, Louisiana, home, she can never be left alone because of the overwhelming terror that solitude brings. "Her night hallucinations and wanderings have increased in frequency and intensity," Zabba says.

While some viewers find the series upsetting, others report that it has given them a new way to relate to the disease and a better understanding of the Alzheimer's patient's private voyage. The paintings were exhibited in March at Louisiana State University in Baton Rouge, where Zabba will receive her master's of fine art this month, two weeks after Mother's Day.

Looking to the future, the artist hopes to publish a book which she says is neither "artbook nor science book. It's not autobiography or even mother-daughter. It is instead all of those things."

The book will contain color photographs of the art as well as written text by Zabba. But probably the most precious writing will be the personal notes from the artist's mother's journal. It is these that one could see the generative effects of the disease most clearly.

As Howeza wrote in her last journal entry before losing the ability to communicate on paper, "I wish that you could know when something new comes up whether it's normal old age or the result of Al. I doubt that there's very much difference. Whatever it is, it is rotten." **DG**



titled "Tangled Memories I-V" symbolize the short-circuited, face-thin-tel recall. In "Tangled I," Howeza appears silhouetted against the crook of a sturdy tree, explosive areas of red, blue, and green vines flowing out around the void where her brain should be. Zabba's con-

**Zabba's "To the Bright Light of Death III" (acrylic)**

## THE EMPTY MIRROR: A bizarre brain injury sheds light on the conscious mind

By Jeff Goldberg

**T**he plight of patient "E. H." was reminiscent of a *Twilight Zone* episode. One morning she woke up unable to recognize the faces of her husband and daughter. Although she could still identify her loved ones by voice and physical mannerisms, there were two faces in a crowd, stripped of meaning.

Tests performed at the University of Iowa College of Medicine by neurologist Antonio Damasio revealed that E. H. had suffered a stroke, resulting in a rare condition called face agnosia

in which brain damage impairs only a victim's ability to recognize faces while all other mental functions remain intact. E. H. could not identify the face of a single relative or friend either in person or from photographs, nor could she learn to recognize new faces such as Damasio's. Yet she displayed normal learning and memory, read without difficulty, and she had 20/20 vision in both eyes.

Such case histories are not isolated anomalies in Damasio's clinical practice. For 20 years he has studied face agnosia in an effort not only to diagnose its cause, but to identify underlying brain structures responsible for the ability to recognize the vast catalog of faces encountered in a lifetime.

To probe for answers to the mysteries of face recognition and its sudden loss, Damasio routinely relies on his wife Hanna, a neurologist and anatomist, who specializes in advanced imaging systems like magnetic resonance and CAT scans. These tools enable her to create detailed graphic reconstructions of the damaged areas responsible for the symptoms of face agnosia and other

puzzling amnesia syndromes. While the inability to recognize faces can be symptomatic of a more widespread deterioration of brain cells, such as in late-stage Alzheimer's disease, the Damasios have found that injuries causing the pure form of face agnosia are usually confined to specific regions. Most often affected are areas Damasio calls convergence zones, which link circuits of neurons processing visual information with other streams of sensory information, like the sound of

Damasio's conclusion that face recognition—and perhaps awareness in general—takes place simultaneously on levels of brain processing circuitry was dramatically illustrated in a recent experiment. Using a device similar to the detector Damasio and Daniel Tranel measured skin-conductance responses of four patients with severe face agnosia, but no other intellectual impairment, to see how they would respond on a nonconscious level to photographs of family physicians, famous actors, and politicians. In every case, the patients pronounced physical responses indicated that some form of recognition was occurring, even though they could not verbally distinguish familiar faces from strange.

Damasio thinks such "covert" recognition may be a type of internal-alert mechanism, triggering the succession of orchestrated responses that ultimately converge in the conscious flesh we call recognition. "Recognition in the true sense must be conscious," Damasio adds. "When you recognize your mother or the president on TV, you register not only the physical characteristics of that face and the fact that you've seen it before, but much of the history making that face unique is recalled simultaneously. In these patients, the brain is clearly signaling it knows a particular face, but the person cannot solve the mystery behind the mask." **DO**



a voice or the movement of someone's gestures. These convergence zones are connected to higher brain centers of memory function and storage.

These many levels of circuitry normally contribute to the sense of familiarity we feel when we see someone we know. But in patients with face agnosia, the circuit is broken at some critical juncture. They can still recognize an individual's voice or gait. Nor do they lose the general concept of faces or the ability to recognize

**She may know this as the face of a happy young woman, but not know it's the face of her daughter. Even her own face in the mirror is unfamiliar; a reflection devoid of identity.**

# POLITICAL SCIENCE

## ORIGINAL SPIN:

Has reality been entirely banished from politics?

By Tom Dworetzky

In politics there's an unbridgeable gap between real thoughts about real problems and the easy message that will get you into office. Into this breach flock quacksmen and concoditors, all flapping their sound bites and good visuals like patient medicine—guaranteed to cure whatever ails you.

Such manipulators aren't new, of course. In the 1990s French sociologist Gustave Le Bon wrote in his groundbreaking work, *The Crowd*, that if you repeat a lie often enough from enough different sources, people will begin to believe it is true. This is arguably the prime axiom of spin.

Today the science of spin has reached new Orwellian heights—or depths—with the perfection of a sound-bite pseudoreality. In the

dark ages of public speaking, about 1968, when the average sound bite was over 40 seconds, a former TV producer named Roger Ailes rode into town with a better idea, according to spin scholar and professor of communications Daniel Hallin of the University of California, San Diego. "Ailes worked with the Nixon campaign producing TV appearances. He did them as if they were TV shows. Among other things, he'd measure Nixon's answers and, if they were too long, tell him to shorten them."

This revolution-over-packaging dovetailed nicely with the commercial pressure starting to squeeze down on local news. Fancy consultants toured the country exhorting stations to pick up the pace of their broadcasts—to make them more like entertainment by shortening segments and sound bites. In years since, similar pressures have forced similar Machiavellianizing of the network news and print media, too.

These changes radically modified the source-news relationship, especially when combined with the three golden rules of modern spinmanagement: 1. *Read my lips*: Talk in sound bites. 2. No matter what the question, keep repeating your message so there aren't any other usable quotes from you. 3. Don't give the press any news to report other than what you want covered.

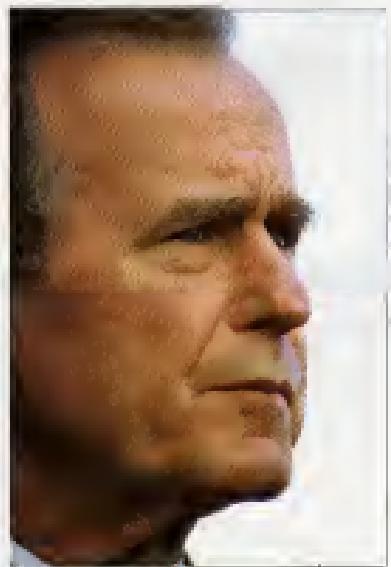
In self-defense—since we journalists know when we're getting torqued—we've responded by opening the package with what are called news-analysis pieces. In these we take apart the ads and examine the spin—not the content. We reduce the political debate to a horse race between competing media campaigns.

By focusing on the horse-race aspect and not the underlying issue, the press, the candidates

and nation focus on the desperation of the thing rather than the thing itself. We spend all our time critiquing ad campaigns. We pick a president by the way he handles an ad campaign. "Is this even a good way to discuss political issues?" ask Hallin. "Through thirty-second ads? Well, it's easier for a journalist like me to analyze an ad campaign in technical terms than to talk about the truth or wisdom of a political plan. On the technical side I can produce polls that show how effective the ads were. I can get communications experts to opine on the pros and cons of any campaign. On the other hand, I haven't the faintest idea how to explain why giving us each a dollar a day more [Bush's tax plan] will fix the economy. I haven't even figured out how a straight, across-the-board 13 percent no-loophole income tax [Jerry Brown's tax plan] will prevent the rich from structuring their incomes so they don't show any. I'm not sure any of the politicians or their advisors can explain this stuff. Part of the problem is that underneath all the pomp and circumstance of politics is complete reality in which problems don't always come in explainable cause and effect, don't always have solutions, and in which chance, fate, destiny, luck—whatever you call it—plays a large and chaotic part. All combine to tell us things none of us want to hear about the vicissitudes of the human condition. So unpleasant is the news that while we may not shoot the messenger, we will never elect him either."

That's why we'd all rather nibble on sound bites and assess the ad campaigns. To bitterly Plato's Republic (the allegory of the cave). It's easier to sit about the shadows on the cave wall and leave the fire alone. **DD**

Two golden  
rules of  
spin management:  
*Read my  
lips—talk in sound  
bites and,  
no matter what the  
questions, keep  
repeating  
your messages.*



"JUMP UP AND KISS ME," I SAID.



Of course, I was simply saying the name of my favorite rum drink.

\*  
Tim Tim the bartender made it with Myer's Original Dark Rum. It makes a "Jump Up and Kiss Me" juice as dark and stirring.

\*  
"Why the monkey?" I asked.  
\*  
"He gets the bananas for my drinks," said Tim Tim. "I pay him presents."



How to Jump Up and Kiss Sours: 1/2 oz. Myer's Original Dark Rum, 4 oz. pineapple juice, 3/4 oz. lime juice, dash of bitters.

# DIGS

## TAKING THE GUESSWORK OUT OF DATING

A new technique accurately determines the age of ancient cave paintings

By Kathleen McAuliffe

**V**ibrantly colored figures silently march across a cave wall in southwest Texas. Nearby, another wall undulates with monochrome abstract geometric forms—wavy lines, circles, crisscrosses—repeating hypnotically.

The drawings stretch from floor to ceiling in the limestone caves and overhangs of the lower Pecos River region. Occupied from roughly 8,000 a.c. until the Spanish invasion in the sixteenth century, these ancient galleries house some of the oldest and most impressive rock art in the New World.

Advances in plasma chemistry have helped researchers determine the age of

pictographs' content and style to "guesstimate" their age. Alas, this approach leaves much room for error. At best, says anthropologist Harry Shaffer of Texas A&M University in College Station, "we could say that a pictograph was painted within a time frame of some 2,000 to 3,000 years."

To overcome this limitation, Shaffer sought the assistance of colleague Marvin Rowe, a chemistry professor with expertise in dating meteorites and other cosmological objects. Rowe found the cave-painting dilemma both intriguing and challenging. "I'm ac-

plishing advances in plasma chemistry to separate the paint's organic components from inorganic contaminants that distort the age reading." For testing, Rowe's team gathers paint chips that have leached off the walls and escape paint off them. But "unfortunately," Rowe says, "we get a lot more rock than paint." To isolate the organic source of carbon, the scientists treat the specimen with an oxygen plasma. It combines only with the organic carbon in the paint because the carbon in the limestone rock is already in a fully oxidized, stable state. The reaction of the plasma and the organic carbon produces gaseous carbon dioxide, which is collected as dry ice and dated by well-established accelerator-mass-spectrometry methods that compare the number of radioactive carbon isotopes and stable carbon isotopes in the sample.

In the first trial, the technique found the painted fragment to be 3,665 years old (plus or minus 100 years), a date that jibed perfectly with an independent archaeological estimate that suggested the pictograph was between 4,100 and 3,200 years old.

Since the first trial, the researchers have tested several more pictographs from the lower Pecos as well as still-older pigments from caves in Brazil. Once again, the results were compatible with archaeological expectations.

If the new approach continues to prove accurate, Shaffer hopes to gain fresh insights into the role that pictographs played in these long-vanished cultures. "Perhaps the symbols in the pictographs were used to communicate with supernatural forces," he speculates. "If so, maybe we'll find a correlation between cave outbreaks and times of famine, overpopulation, and other up-heavals in the culture." **DO**



These cave paintings found near the Pecos River in southwest Texas.

Anthropologists attribute the Texas cave art to Native American carabiner-gatherers of Aztec descent, but they don't know when the long-vanished tribes created the paintings. Until recently, there existed no reliable means of dating the pictographs; standard carbon-dating techniques cannot distinguish between the carbon in the paint and the carbon in the limestone "canvases."

Consequently anthropologists have been forced to rely on the

customized to measuring the age of artifacts in billions of years, not thousands of years," he explains. But me and chemist Marvin Rowe and Jon Russ appear to have come up with a winning solution. Their technique can date pictographs made from paints containing a wide range of organic "binders"—blood, urine, honey, and many other natural substances used by primitive people to bind together pigments.

The new dating technique ex-

# FUNDS

## THE GREENHOUSE EFFECT Cashing in on environmentally sound investments

By Linda Mares

If concern for the fate of the earth dictate your investment choices, you can now be on the side of the angels—and still make a bundle of money.



It's the classic David and Goliath story. But in this instance the folks with the slingshot are the managers at the helms of the nation's top environmental mutual funds—and the guys with the black eyes are the high-priced Wall Street mavens. New Agey cell karma, but environmentalist investors take a more moralistic stance: Virtue pays—and pays quite well.

In 1981, the environmental sector funds that invest only in companies which genuinely contribute to cleaning up the environment turned in excellent performances. EcoLogical Trust was up 36.0 percent; the Global Environmental Fund posted gains of 24 percent; and New Alternatives was up 25.6 percent. Schield Progressive Environmental Fund started 1982 with a 17 percent gain. These funds rigidly screen out the corporate bad guys from their portfolios. Almost all of the funds that claim to discriminate didn't even keep pace with the Dow.

"There's never been a head-on challenge like this—and the environmentalists won," crowds Peter Camago, president of Progressive Asset Management in Oakland, California, brokerage

that specializes in socially responsible investments. "The proves the prevailing wisdom—altruistic profits for principles—is wrong—dead wrong."

Before you take the plunge though, experts warn that all that glitters is not green. Many mutual funds are using the trend toward clean and green as an advertising gimmick to cash in on the tidal waves of interest in ecologically sound investments. Some environmental funds have holdings in companies like Browning-Farms Industries and Waste Management, the nation's largest waste collection and disposal companies, which collectively paid more than \$46 million in fines to the EPA and other agencies in the past decade and have been hit with over a thousand citations at 50 dump sites. Hardly sterling examples of social worthiness.

Environmental funds had a tremendous appeal when they first hit the market in 1981, but now put a lot of thought in applying social criteria," says James Phillips, vice president of the socially responsible investment division of Sunco & Company in Los Angeles. He says only three public funds use stringent social screens: Schield Progressive, New Alternatives, and EcoLogical Trust. (The Global Environmental Fund is also a glowing green, but it sells to pension funds and the affluent, with a minimum buy-in to individuals of \$50,000.)

The first environmentally oriented fund, New Alternatives, which invests in alternative energy like geothermal plants, solar energy and natural gas, was launched in 1982 by Maurice and David Schoenwald, a father-and-son team of left-leaning lawyers in Great Neck, New York. It has since multiplied from holdings of \$100,000 collected mostly from family and friends of the same po-

litical persuasion, to assets of over \$24 million.

But it's still a family affair. Mom edits the fund's newsletter while father and son perform legal services gratis and research new companies by scouring trade journals and soliciting tips from shareholders. "We've got a lot of scientists and professors who are on the cutting edge and they've come up with some real winners," says Maurice. Their unorthodox approach works. New Alternatives, he says, has tripled its value since inception.

"If they're not good guys, we don't own them," says Marshall Schield, head of the Schield Progressive Environmental Fund, which has over \$3 million in holdings. But he isn't just a moralistic do-gooder. Schield bets on well entrenched and enlightened companies—in air pollution control, in hazardous waste disposal—which are poised to capitalize in the booming market.

The EcoLogical Trust is "the first Wall Street fund"—it's sponsored by Merrill Lynch—"to use social-screening criteria," says Camago, who advises Merrill Lynch on the environmental record of the trust's investments. It's a unit trust, which is different from a mutual fund: rather than buying and selling stocks, it owns a portfolio of 29 stocks which it maintains until a specified maturity date when the shareholders' money is liquidated. Units are sold through five big brokerages: Dean Witter, Merrill Lynch, Prudential, Prudential-Bache, and Shawson Lehman-Hutton.

What's on the horizon? "High tech is the emerging sector," says Phillips. "high-tech approaches to purifying water and energy and treating waste. The best bet, though, is to steer clear of the gamblers—read the prospectus to see what's in the portfolio." **ED**

# ELECTRONIC UNIVERSE

## POWER TRIP-

With computer simulations, you control the world and beyond

By Gregg Keizer

We waged war on barbarian hordes, built the Seven Wonders of the World (Sewer), and made peace with Hendish enemies. I've ridden a tower of fire into space, gone zero-g in the sleek black-and-white shuttle, and glided to ground in the California desert—all without putting myself out of my chair.

No, no megalomaniac here. No summing through cheap novels. Grownups—at least those who aren't factors or politicians—don't like to play pretend without a bit of help. That's where the home computer lends a hand. Both of these simulated adventures see

literally correct voyage to the stars. The end game has you constructing a starship and launching colonists across space.

*Civilization* is initially a dark place—literally—for you only see what you've explored. By moving your units around, you uncover the map. At the same time, you produce armies, navies and infrastructure to defend cities, irrigate and mine the land for resources and fend off the ubiquitous barbarian incursions and competing civilizations.

But this game—and it is more game than simulation—is not merely a 30-year-old's version of toy soldiers. You manage production, push your people down technological paths, entertain and feed the folk, trade with your neighbors, and establish diplomatic relations with immigrant opponents.

No easy task. Wearing all these hats, *Civilization* puts you in a catch direction at once and unless you manage efficiently you'll end up in the dustbin of history. That's the challenge. You get to play with human experience on a grand scale (only the more cerebral *SimEarth* simulation from Max is closer a wiser net), making decisions that affect millions of imaginary citizens. You won't find a more engrossing simulation on the shelves this year.

Less satisfying, though more typical, is *Shuttle* from Virgin Games (IBM PCs and compatibles). Most simulators mimic hardware—an F-16, a nuclear submarine, an Apache helicopter. The idea's simple: It's unlikely you'll get the chance to play with one in real life, so the computer's your only shot.

Shuttle hands you the keys to

the most complex, most expensive piece of machinery ever made. Almost as intricate as the real thing, the simulated spaceship is no quick study but then neither is NASA's. Resembling an aircraft flight simulator in places, *Shuttle* sets for less than a state-of-the-art look and feel. And it's a good thing the shuttle fuel is inexhaustible—in the early stages, you'll check them up with sobering regularity.

You tackle one mission after another, some real, some imaginary. The first, a re-creation of the shuttle's final unpowered test flight, is an eye-opening demonstration of the shuttle's pathetic flight characteristics. Other missions range on deploying or recovering satellites, launching the Hubble telescope and assembling pieces of the still-hillocky Space Station.

From roll-out and lift-off to orbital insertion and final landing, you run everything with bewildering banks of switches, controls and screens at your disposal. Your biggest job is just figuring out what to do, though you can ask the program to help you out. Open cabin vents, load the orbital code, pressurize the propulsion system. Then, when you roost into space (heated if your PC has a sound board) you can float around in the MMU (Manned Maneuvering Unit) self-propelled backpack and grapple with the RMS (Remote Manipulator System) robot arm.

Don't strap yourself into *Shuttle* if you're looking for a rollicking good time or a quick schmantine kick. The simulation is more work than a way to spend leisure time. Pleasure comes from mastering the process.

That's okay. Either way—whether manning cultural ramparts or bringing the shuttle safely home—you get a crack at an extraordinary experience. It may be simulated but it's not second-rate. **DD**

Master of the  
world  
*Civilization*  
lets you  
call the shots.



a PC as prep master, the computer builds the world and then lets you take a walk on the wild side without risking life or lunch.

Computer simulations may sound off-so-serious, but the best are as fun to play as any head-bashing videogame. Take Microprose's *Civilization* (IBM PCs and compatibles). This empire-pre-construction kit casts you as the ruler of a people who want more than just a few cows and open pasture. You lead them to culture and progress, first by settling cities and exploring the new world and then by conquering or capturing your enemies. The goal isn't strictly world domination (though you must come awfully close to succeed), but a more po-

# EARTH

## SHOCK STEADY: Smart buildings guard against bad vibrations

By Chern Sander

**Earthquake-resistant structures like these may soon dot the urban landscape.**

**O**n the corner of a crowded Tokyo street looms an 11-story glass and steel structure that looks much like any other. In fact, this three-year-old office building holds a distinct advantage over its neighbors on the block. It protects against earthquakes. In its short life, the world's first "smart" building has reduced seismic vibration by as much as 80 percent.

The Kyobashi Seiro building is one of two smart structures—designed to control a tower's dangerous oscillations rather than simply resist them—that are revolutionizing earthquake engineering. "Until now, buildings have been passive—but it's simply irrelevant—a seismic impact," says Dr. Barni Mosh, a civil engineering profes-

sor at the University of Southern California. "Engineers are now looking at ways to make them actively respond to various kinds of earthquake motion."

Like the Japanese prototypes, future buildings—as well as older structures that are retrofitted with smart technology—will rely on an extensive network of embedded sensors that detect motion and then react moment to moment to the unpredictable thrusting and rolling of an earthquake. As a dancer continually returns to her center of gravity, the building would always strive to maintain its "sense of balance."

So far researchers have targeted three techniques to control the shakiness: massive weights that glide back and forth on a track to counterbalance the building as it sways; flexible cables or braces spanning the building's length that pull it back to center when it begins to oscillate; and jet thrusters powered by water or compressed air that generate a countering force against the building's shudders.

With each method, the sensor network would carry information from seismic vibrations to a central computer which in turn would analyze the data, programming the weights, cables or rods etc. to respond accordingly. Time elapsed from vibration to response: 1/100 second. "The shaking would be suppressed before human beings would even feel it," says Dr. B. Chi Liu, program director for the Earthquake Hazard Mitigation Project at the National Science Foundation (NSF).

Although the technology behind smart structures is not new,

Liu says it may take another ten years to develop a reliable, cost-effective technology for general use. To spur interest, the NSF is offering \$5 million in research grants over the next five years.

Even so, engineers still face significant technical hurdles. Ironically, one of the biggest threats to the high-tech systems are mundane breakdowns such as cooling hoses bursting. "The control systems would sit dormant for so long—having to respond once every ten to twenty years—the likelihood is that some part will fail when you need it," says Dr. William Hall, the chairman of the civil engineering department at the University of Illinois.

Natural disasters, moreover, provide no room for error. "A fraction of a second can mean the difference in saving lives or a building collapsing," Mosh says. To compound the situation, these complex computer-driven systems would have to work during emergency situations when power outages are common. For better results, engineers have considered combining active controls with passive ones—for instance, building smart structures on huge rubber pads that help dissipate much of an earthquake's initial shaking.

Smart technologies could even play a role against other damaging forces, says Dr. Tau T. Soong of the National Center for Earthquake Engineering Research at SUNY Buffalo. "These systems don't care if the oscillations come from earthquakes, high winds, or flooding," he says. "They adapt to how the structure behaves." **CD**





# CONTINUUM

## GLOBAL WARMING

It's here for real—or is it? Plus, what plants say to each other, and why oil and Saturdays don't mix

The remarkably warm summers of 1988, 1989, and 1990 first brought forth mainstream announcements from the scientific community of a global warming trend—most notably James Hansen of NASA's Goddard Institute for Space Studies. Creator of a computer model which simulates global temperature, and one of the first scientists to sound the alarm in 1981, Hansen now lobbies regularly on Capitol Hill for improved environmental policy. Most recently NASA announced that an ozone hole may actually be about to open up over New England (that's as in Bonnevilleport, noted Senator Al Gore) as well as the northernmost parts of Canada, Europe, and Russia.

The outpouring of speculation on global warming is culminating this summer in two important events: an exhibition co-sponsored by the American Museum of Natural

History (AMNH) and the Environmental Defense Fund opening May 15 (turn to "Interactive Museums," page 80) and the Earth Summit in Brazil in June. Amid all the predictions of global catastrophe, it is difficult to remember that no one can really predict future climatic change—be it incidental or catastrophic—that we don't know more than we know, and that if this is that big, it is not just a national problem. Warmth does not necessarily mean future destruction; nor does the absence of a warming trend free us to destroy the environment.

What exactly is the forecast? If you ask some physicists like Michael Oppenheimer, a senior scientist at the Environmental Defense Fund and co-author of *Dead Heat: The Race Against the Greenhouse Effect*, it is quite bleak indeed. Oppenheimer reports with assurance that we have entered an "era of human control of climate" during which the things we do will bring on large changes in the surface of the planet—the seas will likely rise and inundate islands and low-lying coastal regions, and there will be large-scale changes in entire ecosystems."

**The Global Warming exhibit will make the hot environmental issues graphically accessible to**



**us. Sample screens (above) from the interactive programs Computer Modeling, What's Your Score? and The Climate Puzzle.**

What immediate Capitol Hill response—with the upcoming Earth Summit—may result in a more tangible federal push, at least to eliminate the chlorofluorocarbons that destroy the ozone? Yet a recent press release issued by the Science and Environmental Policy Project in Washington, DC, denounces the proposed global environmental regulations which will be discussed at Earth Summit as the work of "activists anxious to stop economic growth" and questions the assumption that "catastrophic global warming follows from the burning of fossil fuels." To the surprise of the releases—forty-odd U.S. atmospheric scientists—"catastrophic global-warming predictions are unsupported by the scientific evidence."

You see the dilemma. One group says global warming is a myth, another warns of global catastrophe, and our elected officials still debate the issue. I think of a line from *A Midsummer Night's Dream*: "Lord, what looks these mortals fit! They really not certain the planet's in jeopardy—it's been around about four and a half billion years. It will sunburstfully? Will we?"—AUDREY LIQUINS



# CONTINUUM

There is always room for gel rocket fuel, which combines the best features of solid and liquid propellants.

## FUEL THAT WIGGLES

Hair gel comes in a gel, toothpaste comes in a gel, yello comes in a gel—and now so does rocket fuel.

Genesee's Aerojet Propulsion Division developed the new type of fuel under a \$23 million contract from the Army. To make the gel, the company adds ether polymers or other compounds to conventional rocket propellants or oxidizers, thickening the fuel to a yello-like consistency. Once fired through fuel injectors, the gel turns back into a liquid and burns like conventional rocket fuel.

A gel combines the best of both liquid and solid rocket fuels. As with liquid fuels, a gel-fueled rocket engine can be stopped, restarted, and throttled up and back. Like solid fuels, gels present less of a safety hazard than liquids if they're accidentally spilled. "With a liquid, if you puncture the [fuel] tank, [the fuel] flows all over the floor, and you have a real problem on your hands," says Al Olson, program manager at Aerojet. "And if both the oxidizer and the fuel are punctured, you have an ignition right away. But if you gel them, the likelihood of their making contact is reduced dramatically."

Although NASA once considered using gel propellants on the space shuttle, Aerojet's current work on gels is aimed more for use in the Strategic Defense Initiative. The company plans to build and ground-test a full-stage rocket using gels by 1994. —Devera Pine



Shhh! If you're really quiet, you might hear the roots of desert plants communicating with each other.

## INTRATERRESTRIAL COMMUNICATION

The desert holds many mysteries, but one of the most puzzling, if not most glamorous, is why common *Ambrosia* arrange themselves in different formations. *Ambrosia dumosa* (burro weed), for example, grows in tightly packed clumps while *Larrea divaricata* (creosote bush) spreads itself out.

Recent experiments by Bruce Mahall, a botanist at the University of California at Santa Barbara, and his colleague Regan Callaway suggest an answer. The plant roots communicate with each other. Larrea plants, for instance, release toxins into the soil, conveying chemical information—like "keep away"—to the roots of their neighbors.

Ambrosia roots react differently to the presence of other plants. When two roots of the same ambrosia plant touch, they continue growing right next to each other. However, when roots from two different ambrosia plants touch (or an ambrosia root

touches a larrea plant's root), the ambrosia root that made contact stops growing. Other roots from that same ambrosia plant then branch out in different directions until they touch something else. Mahall and Callaway conclude that ambrosia roots exhibit "detection and avoidance" behavior as well as "self-recognition."

Further studies may ex-

**LUNAR MATERIAL BROUGHT TO EARTH BY ASTRONAUTS ARMSTRONG, ALDRIN, AND COLLINS IS CALLED BLACK ARMALCOTE IN THEIR HONOR.**

plain the structure of plant communities, giving us "another tool to determine the proper spacing of crops in agricultural systems," Mahall says. —Steve Nada

"What we anticipate seldom occurs; what we least expect generally happens." —Benjamin Disraeli

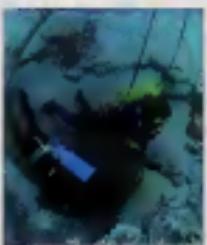
UNITED STATES

## AGED PORT

It took a University of Colorado at Boulder history professor almost twice as long to solve the puzzle of how Roman engineers designed the ancient, sunken harbor of Caesarea Maritima than it took the workers of Herod the Great, the king of Judea, to build it in the first place.

A marine archaeology team headed by Robert Hohfelder discovered in the summer of 1990 that the builders of the harbor near the modern day city of Haifa, Israel, constructed the pilings used to support the city's breakwaters in a unique checkerboard pattern. The Roman engineers filled some of the pilings with a cement made of volcanic ash and left others empty, to be filled with sand churned up by the harsh coastal storms of the eastern Mediterranean.

The main breakwater stretches out into the sea for about 800 yards; the others, for 325 yards. By alternating filled molds with



Divers excavate the entrance to the ancient harbor of Caesarea

empty ones, the cost-conscious Romans saved years of work, estimates Hohfelder, who began studying Caesarea in 1978.

According to the first-century scholar and soldier Josephus, the harbor of Caesarea was built between 22 B.C. and 15 A.D. It flourished only until Herod's death in 4 B.C., but for a time it was a major port on a magnificent scale. Its gates guarded by six colossal bronze statues—never recovered—presumably by the Roman Emperor Augustus or his family, with whom the wily Herod sought to trade. Due either to earthquakes or bad maintenance—Hohfelder suspects the latter—the sea swallowed up the harbor before the eighth century, long after its brisk trade with Rome, Constantinople, Britain, and even China had ebbed.

"Every search we seem to find another piece of the jigsaw puzzle," Hohfelder says. The sea has long fascinated marine archaeologists baffled by the ability of a preindustrial society to master such complex engineering techniques.

Hohfelder, history professor Kenneth Holum of the University of Maryland, and Avner Raban, a maritime civilization specialist from the University of Haifa, plan to concentrate this summer on the layers of sediment that conceal the sunken port, sifting through artifacts in an effort to pinpoint when Caesarea fell from glory.—George Nobbs



Oil makes water Sunday drivers are pretty relaxing, but Saturday oil-tanker crews are downright dangerous

## IT'S SATURDAY—DO YOU KNOW WHERE YOUR OIL TANKER IS?

Deep into a study relating oil spills to stock market activity, economist Eban Goodstein stumbled upon a startling fact: Major oil spills that are likely to be linked to human error occur more often on Saturday than on any other day of the week. The weekend phenomenon is responsible for the loss of an average of 163,000 gallons of oil in U.S. waters every year, according to the Skidmore College associate professor, who quickly shifted the focus of his study. "Eliminating the Saturday effect would be like having one less major tanker spill each year," he says.

Goodstein's data gleaned from the New York Times, among other sources, focuses on spills caused by vessel-guidance errors—specifically groundings, sinkings, and collisions. More of these accidents involve human mistakes than do spills resulting from explo-

sive storms or leaks. But Goodstein stops short of assigning blame for the preponderance of Saturday accidents. Increased traffic in harbors, reduced staffing, or "weekend psychology" may all play a role, he says.

Whatever the cause, Goodstein believes he has an effective solution: Insurance companies need to penalize their clients if they

BESIDES INVENTING DYNAMITE, ALFRED NOBEL ALSO CREATED PLYWOOD AND WAS ONE OF THE FIRST DESIGNERS OF PRE-FABRICATED HOUSING.

spill on Saturday in the same way that automobile insurance companies will penalize you if you have repeated accidents," he suggests. "There's roughly a third more spills on Saturdays, so make transport firms pay thirty percent more of whatever damage occurs on Saturday." —Beth Howard



## CONTINUUM

### THE SAHARA ON THE MOVE

You'd expect a desert—especially one as large as the Sahara, to stay in one place. Well, not exactly. For years, the Sahara has been thought to move steadily southward. But, 12 years of digital evidence from polar-orbiting meteorological satellites indicates that the southern edge of the great African desert actually moves back and forth, north and south, along a boundary that extends from the Atlantic



The Sahara just can't seem to settle down. It moves this way then that way—from 11 to 110 kilometers each year, scientists have discovered.

Ocean in West Africa to the Red Sea in the east.

Overgrazing and fuelwood gathering, believed since 1915 to have been the culprits in the Sahara's

movement, bear little responsibility. Climatic variations expressed as rainfall are the real culprits, according to Compton J. Tucker and Wilbur W. Newcomb of

the Biospheric Sciences Branch of NASA's Goddard Space Flight Center in Greenbelt, Maryland, and Harold Dregne of Texas Tech University in Lubbock.

Measuring precipitation in an area the size of the Sahara, which was 8.6 million square kilometers in 1980 and about 9.3 million in 1990, is not easy. Instead, Tucker and his colleagues used what they call a vegetation index. This approach gave them constant measurements and accurate readings of retreating or advancing plant life in the Sahara. They found that from 1980 to 1984, the desert advanced from 11 to 99 kilometers yearly, retreating 110 kilometers in 1985 and 35 kilo-

meters the next year. This ebb-and-flow pattern puts the desert's mean position today 130 kilometers south of where it was in 1980.

Our study indicates that no one can say whether the Sahara is or is not expanding," Tucker says. "Only a longtime monitoring project lasting at least twenty to thirty years could determine that."

In a related study, scientists from the Universities of Virginia and New Hampshire discovered that the Sahara has a potential

effect on the Black Water River region of the Amazon basin. Data from high-flying aircraft and ground-based instruments show that about 13 million tons of nutrient-rich dust from Africa are pulled in annually by fast-moving storm systems in the Amazon, according to Robert Talbot, an atmospheric chemist at New Hampshire. The nutrients—compounds such as phosphates and nitrates, vital to the Amazon soil—find their way to the ground in rainfall. —George Nobbs

### THE LONGEST SURVIVAL TIME WITHOUT ANY SOLID FOOD: 382 DAYS

IN THE WEIGHTLESS CONDITIONS OF SPACE, AN ASTRONAUT'S HEART SHRINKS.

MORE THAN THREE MILLION ARTIFICIAL BODY PARTS HAVE BEEN INSTALLED IN AMERICANS.

Why must  
all good things  
come to an end?



Why Ask Why?  
Try Bud Dry.

Its smooth,  
dry taste is  
DryBrewed,  
not watered down.  
To drink light,  
yet satisfy  
completely.  
For refreshment  
that's beyond  
question.

KNOW WHEN TO SAY WHEN



# CONTINUUM

## SAVE THE RAIN FOREST AT YOUR LOCAL THEATER.

Want to help the environment? Go see a movie.

Specifically, go see *FernGully: The Last Rainforest*, released in April by Twentieth Century-Fox. The producers and actors of the animated musical feature, set in the Australian rain forest, are donating a portion of the profits, including revenue from overseas and video releases, to environmental causes. The Sierra Club, Greenpeace, and the Rainforest Foundation will split 4 percent of the movie's gross profits, and 5 percent of the net profits will go into a special fund to be administered by Tom Lowey, assistant secretary for external affairs at the Smithsonian Institution and one of the country's premier experts on rain forests. Lowey and *FernGully's* producers want

to distribute the money primarily to grassroots organizations involved in preserving the world's rain forests and the thousands of species that live within them.

"This planet is not invincible," says Peter Faiman, one of the film's producers. "It's not being political to acknowledge this; it's common sense and our responsibility."

Based on the soon-to-be published children's stories of Australian author Diana Young, *FernGully* follows teenage fairy Crysta as she meets a human boy and leads the struggle against the evil spirit of pollution and destruction threatening the rain forest. Semiranda Mathis, who appeared in *Pump Up the Volume*, provides Crysta's voice, while her *Volume* co-star Christian Slater plays Crysta's earth friend Pipe. Roben Willems lends his comic talents to Baby Koda, an addled escapee from a

biology lab. Elton John and Jimmy Buffett, among other artists, have contributed songs to the soundtrack.

Director Bill Kroger, whose animated short *Technological Disaster* received an Oscar nomination in 1989, founded Disney's fabled animation studios as head animation director. Tony Fudelle, a veteran of *The Little Mermaid*—Enn Murphy

## THE UNEXPECTED TALENTS OF MAN'S BEST FRIEND

Eight-year-old Erin Leth from Quincy, Massachusetts, suffers from pattern-induced seizure disorder. Despite receiving the best medical care available, Erin still has about 20 seizures a day triggered by simply looking at patterns on a TV or computer screen, clothing, a printed page, or elsewhere. Her best hope may now lie with Shadow, a two-year-old golden retriever that joined the Leth family in December. The dog is being trained to cushion Erin should she collapse during a seizure, roll her onto her back, and seek help from others. Shadow's trainers at Michigan-based Paws With A Cause hope that the dog will eventually prevent some seizures by distracting Erin before she drifts into a tonic

Other organizations have also found dogs useful for seizure-prone people. Some of the dogs trained at the Prison Pet Partnership, a vocational program at the Washington Correction Center for Women in Gig Harbor, can even predict seizures 5

to 45 minutes before they occur, an ability that apparently cannot be taught. Dogs possessing this talent provide an invaluable service by warning their owners. One of the dogs trained at the center, for example, alerted its young owner of an impending seizure while the child was performing on a balance beam, preventing what would likely have been a serious accident.

A study underway at the New York City-based Epilep-



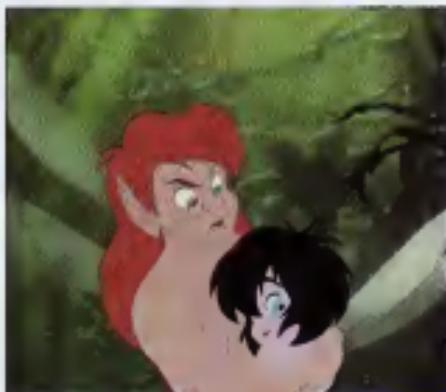
Some dogs can predict seizures in their owners.

sy Institute aims to figure out the dogs' mystifying talent. "If we can find out what these seizure dogs do instinctively, it's possible that other dogs could be trained to tune in to the same cues," explains the institute's executive director, Roni Berner.

—Steve Nada

"One thing I have learned in a long life: that all our science, measured against reality, is primitive and childlike—and yet it is the most precious thing we have."

—Albert Einstein





# CONTINUUM



*Fisheries could greatly benefit from a technique that helps fish and other aquatic animals take medicine.*

## OPEN YOUR GILLS AND SAY AHH

Fish need their medicine, just like people do. But delivering it can be a little tricky. Lifting fish out of the water and vaccinating them is tedious and expensive—not to mention hard on the fish. The alternative, allowing fish to absorb medication put into the water around them, offers little improvement; often, they simply can't absorb the necessary dose.

Researchers at the University of Maryland and the Massachusetts Institute of Technology think they've found a way around this problem. They added a sample reproductive hormone to a tank full of goldfish and then applied an ultrasound probe to the water's surface for 10 to 15 minutes. The goldfish exposed to ultrasound absorbed 10 to 20 times as much of the hormone as a control group not exposed to ultrasound, according to lead researcher Yonathan Zohar.

Zohar, an associate professor at the University of Maryland Center of Marine Biotechnology and Agricultural Experiment Station, theorizes that the ultrasound changes the permeability of the skin and gills of the fish, allowing them to more easily absorb substances from the water.

"The big potential for this technique," Zohar says, "is to enhance the administration and uptake of vaccines and antibiotics to fish and other aquatic animals."

The technique "could have tremendous benefits," says Per Heggenlund, presi-

**A HEADLESS COCK, ROACH WILL LIVE FOR SEVERAL WEEKS BEFORE FINALLY DYING OF STARVATION.**

**ONE SQUARE INCH OF HUMAN SKIN CONTAINS 19 MILLION CELLS**

dent of AquaSeed Corporation in Seattle, Washington, which raises and sells fish embryos. "If he's able to increase the uptake by that amount, I think it's phenomenal." —Bob Schaefer

## WATER IN THE AIR

Frank Harbert would be proud. In preparation for the *Dune*-like environment that global warming may bring, a Michigan inventor has developed a water cooler that needs no water.

The *Aqua-Cycle Creator Series 2001* looks much like your standard gather-around-the-office drinking fountain, but instead of being attached to pipes in the wall, it contains an advanced dehumidifier, a chilled cooler that operates below the dew point to wring moisture from the air. A triple-purification process—carbon-filter deionizer, and ultraviolet light—cleanses the creaktops as they're as pure as triple-distilled water. Under optimum conditions of 80°F and 60-percent humidity, says inventor Bill Mason, it can produce three to five gallons of water a day at a cost of 10¢ to 20¢ a gallon—significantly cheaper than bottled water. And since the 140-pound unit is on wheels, it can easily be rolled to any 110-volt outlet.

Priced at about \$2,500, the cooler is now selling in the warm, moist regions of the United States, including Florida and the California coast. Mason has also begun marketing it in Asia and in the Middle East—he sent one to Kuwait before

**IN 1859, THOMAS AUSTIN RELEASED 24 RABBITS IN AUSTRALIA; WITHIN SIX YEARS, THE POPULATION GREW TO TWO MILLION.**

## ROBOTS IN JAPAN PAY UNION DUES

the Iraq invasion. "It's the right peacetime technology to send them," he says. "They're paying \$2.50 a gallon for good water, with no backup."

While the cooler pulls water from thin air, the dehumidifier fights mold and mildew, the ultraviolet light kills airborne bacteria, and the palm-sized air compressor helps cool the air. Mason is now designing one to fit under kitchen counters.

—Jim Stak

*"There are people who take the heart out of you, and there are people who put it back."* —Elizabeth David



*How dry I am: This water cooler needs no water.*



In this feature, adapted from her bestselling book, OMNI's co-founder examines ways we can use our heads to keep our bodies more youthful

## MENTAL MUSCLE

BY KATHY KEETON

Some people just don't seem to know how old they are. My grandmother never revealed her age to anyone—probably not even to herself! The grandmother of a friend continued to write stirring letters to the local newspaper until he died at ninety-four. An eighty-year-old writer friend takes time off between books to go mountain climbing.

What do these people have in common? A single phrase sums it up: They continue to grow. Like the Roman senator Cato, who learned Greek at the age of eighty, or Goethe, who was past eighty when he wrote *Faust*, or even George Burns, who plans to tap dance on stage on his hundredth birthday—some people never lose their desire to live, their ongoing willingness to learn new things, tackle new tasks, and, perhaps most important, to hold onto the conviction that they're only as old as they feel.

"Mid life is not a period of crisis but of development," says psychologist Gilbert Brim, director of a massive MacArthur Foundation-sponsored cross-disciplinary research program that's investigating every conceivable aspect of middle age—from attitudes and aspirations to brain function and hormone levels. "Study after study of the middle-aged has been done," says Brim, "without discovering that any significant part of the population has a mid-life crisis."

Far from it. When the American Board of Family Practice polled 1,200 adults, as many as 88 percent of them said that middle age is a

time of warmth, of increasing closeness to their mates, their children, and their friends.

Perhaps to a larger degree than we realize, getting old is all in the mind—or, to be more accurate, in that most vital of all organs, the brain. The brain changes with age, although the details of those changes remain a matter of some controversy. Scientists used to accept, for example, that aging brains lose cells—anywhere from 10,000 to 50,000 a day. This would imply an overall brain-size reduction of about 10 percent between youth and old age. The part of the brain that seems to be hardest hit is the substantia nigra, which controls some aspects of movement and may thus be implicated in the development of Parkinson's disease. The substantia nigra's cell count is thought to drop from about 600,000 in youth to around 100,000 by the time we reach eighty.

Conventional wisdom held that this irreversible decline in the brain's cell population made us more forgetful and less mentally acute as we aged. Today, though, fewer and fewer scientists are willing to accept such a pessimistic picture.

Robert Terry, professor of neurosciences and pathology at the University of California at San Diego, uses a special imaging technique to look at the aging brain in a new light. He's discovered that many neurons don't actually die. Instead, they simply shrink, but in doing so, they lose access of their connections, causing them to perform less well.

In the States and elsewhere, researchers at Cambridge University in England and Rochester University in the United States found that some aging or damaged brain cells actually send out new "branches"—spidery projections called dendrites. These continue to grow longer and sprout new branches even as we pass our ninetieth birthdays. Some experts have even speculated that dendrite branching are the physical embodiments of what has been called "the wisdom of the ages."

Recently, scientists discovered clues that dendrite branching is stimulated by brain chemicals known as nerve-growth factors. There may be dozens or even hundreds of these chemicals, and they are generating tremendous excitement in laboratories around the world.

At Sweden's University of Lund, Anders Björklund immerses elderly rats in a Morris maze—a tank filled with murky water that hides a submerged platform. Once the rat finds the platform and scrambles onto it, the rat is raised out of the water and to safety, then the process is repeated. The trick for the rat during subsequent dunkings is to remember the location of the platform.

Rats that received injections of a nerve-growth factor after their test-immersion remembered where the platform was and swam right for it. Other rats that got no nerve-growth factor fared around, finding the platform only by accident. Some scientists think that in the years ahead, nerve-growth factors may serve as the basis for treatment

ILLUSTRATION BY ETIENNE DELESSERT

## ATTITUDES TOWARD AGING MAY PLAY A LARGE ROLE IN HOW WE FUNCTION AS WE GROW OLDER

of Parkinson's and Alzheimer's.

In the meantime, many researchers are beginning to conclude that the deterioration of aging brains has been greatly exaggerated. "Senility or impaired cognitive function doesn't seem to appear independent of physical health problems," says Marion Perlmutter, a psychologist and gerontologist at the University of Michigan.

"Older people may not be as quick in timed tests," says Robert Terry, "but they don't lose judgment, orientation, or vocabulary. There is no way that people like Picasso, the cellist Pablo Casals, or Martha Graham could have continued to function on half a brain."

Brain researcher Marian Diamond, a professor of integrative biology at the University of California at Berkeley, put groups of aging lab rats into what amounted to a rat Disneyland—an environment full of toys, swings, ladders, treadmills, and wheels that kept them active and stimulated. It turned out that the rats who lived in Disneyland had bigger and better functioning brains than their impoverished cousins, up to the ripe old age of three, or the human equivalent of ninety!

In many ways, then, putting the brakes on mental aging may depend on a positive and aroused response to the challenges presented by the world around us. The same is true, apparently, of our attitudes toward ourselves and others. It is said, for example, that people who are shy and timid may actually be compromising their longevity. Research by the psychologist Jerome Kagan of Harvard University has shown that children as young as two years old who were very quiet and cautious in the presence of strangers had accelerated heart rates, more muscle tension, and higher levels of the stress hormone cortisol in their saliva. If that shyness persists into adulthood, Kagan thinks it would make those people more prone to panic attacks.

If shyness can increase your risk of developing health problems, pessimism can evidently be worse. For more than forty years a team of psychologists led by Dartmouth Medical School's George E. Vaillant has been tracking the connection between mental attitudes and physical health in a group of Harvard graduates. Their findings? The men who had the bleakest outlook on life at the age of twenty-five suffered



Kathy Keeton, co-founder and president of ONRI, author of the bestseller *Longevity*.

from the most serious illnesses when they were in their sixties. Vaillant's colleagues Christopher Peterson of the University of Michigan and Martin E. P. Seligman of the University of Pennsylvania found a similar pattern when they studied major-league baseball stars. Players with a dark view of themselves and the world—those who tended to blame losses or stumps on internal factors ("I just don't seem to give a damn") and see bad times as preordained in the natural order ("That's the way the world is")—lived shorter lives than more optimistic players.

Seligman thinks that a pessimistic and passive outlook has a direct and deep effect on the immune system and its ability to fight off diseases. "In animals," he says, "if you manipulate helplessness, you can produce natural killer cells that don't kill T-cells that don't proliferate, and animals that grow tumors at a faster rate and reject them at a lower rate." He thinks the same may be true of humans. A bleak outlook means a weakened immune system.

Repressed anger, depression, pessimism, egocentrism, shyness—all negative attitudes, all potential life shorteners. Add them up and they spell stress, which may be the most dangerous of all mind killers. In contemporary society, a typical day is loaded with stress: this may be the most stressful epoch in history. So as stress increases, it becomes hazardous to your health. Stress helps produce high blood pres-

sure (hypertension), which currently afflicts sixty million Americans. It's been implicated as a factor in the development of atherosclerosis, heart disease, and some kinds of cancer.

How to eliminate stress? There's no way to do it entirely. Even if we could do it, it might be unhealthy. Studies have shown that a certain amount of stress is actually good for us in that it keeps our minds and bodies alert and awake. The important thing is to learn how to deal with stress. There's a clue to this in some recent research carried out by James A. McCubbin, a psychophysiologist at the University of Kentucky College of Medicine. McCubbin found that young men who were in the early stages of hypertension disease showed diminished levels of opioids—calming chemicals that our brains produce in response to stress. The key word here is calm. McCubbin's work suggests that there's a natural mechanism in the brain that helps us stay cool when we're challenged by stressful events. It's when that mechanism breaks down that stress becomes truly dangerous.

The question is, how do we gain control of our innate anti-stress mechanisms? How do we train our brains to stay cool under fire? There are enough suggestions around to generate libraries full of self-help books. Scores of asthma and health spas are dedicated to one anti-stress approach or another. My preference (learned from working on *Longevity* and *Oriental* magazines, which put main touch with the very latest scientific findings) is a sort of mixed strategy involving a combination of diet, diet supplements, and exercise classes. Every year or so I make a point of learning how to do something new and enjoyable, whether it's video games, scuba diving, windsurfing, or tennis. I eat healthy portions of complex carbohydrates, especially pasta, because these are thought to have a calming effect and may actually help the brain produce opioids.

It takes a healthy sense of the absurd to find life consistently funny, and this same appreciation for the offbeat and the off-center can in itself help one live longer. That's the conclusion of David Weeks, a psychologist at the Royal Edinburgh Hospital in Scotland. Weeks studied two hundred people whom he classifies as eccentric or unconventional—

al Benwell her oddities. Weeks says, "these people have a very strong sense of self and purpose in life. They're curious; they have a robust sense of humor, and they love ideas." Their eccentricities, Weeks concludes, are symptoms of an unflagging zest for life and an unending appreciation of its rewards. "To an eccentric," Weeks says, "anything is possible—perhaps even living to be a hundred or more."

The kind of zest that characterizes the truly eccentric can be put to work for all of us. The key—and it can't be repeated enough—is to stay busy and involved. If you're like me, you may have found that the busier you are, the happier you are—and the more you take on, the more you get done. It seems to me that during the periods when I'm at my most active, I never get sick—it just doesn't occur to me, and even if it did, I couldn't afford the time.

Tap the potential we extending power that comes from taking charge of your own life. If you feel that you've lost that sense of control and purpose, do whatever you have to do to regain it. Being in charge, says the Yale University psychologist Judith Rodin, is "of central importance in influencing psychological and physical health, and perhaps even longevity."

"In the mid-Sev-

enties, Rodin and her colleagues tested the notion on the elderly residents of a nursing home in New Haven, Connecticut. The residents, aged sixty-nine to ninety, were divided into two groups. The first group was told that the staff wanted to make the home a happy place in which to live. They were told, "We want to know anything that you want, and we'll do it for you." The second group was told to take charge of things. They were told, for example, "We're having a movie next week, but you tell us when you want to see it."

Eighteen months later, the psychologists checked in on the two groups. Sure enough, the people in the take-charge group were much more alert, more active, and significantly happier than their passive peers. Their healthy attitude had tangible rewards in terms of physical health. They had lower levels of the stress hormone cortisol and a greatly reduced need for medication in general. The ultimate payoff, in addition to better health and greater happiness, was longer life. At the end of a year and a half, twice as many of the take-changers were still alive and kicking.

So, identify the things in life that are important to you—if it may be a career, creativity, kinetics, politics, or the feeling of satisfaction that comes from serv-

ing your community—and put yourself in command. Assert yourself, express yourself, and take control. You'll be more satisfied with yourself and your life, and you might live longer too.

Over the past ten years, there's been an explosion of evidence linking the power of the mind to the health of the body, and experts in the new field of psychoneuroimmunology, or PNI, are gaining a greater understanding of how the brain and the body can cooperate to fight off illness. It's been discovered, for one thing, that there are nerve fibers in the thymus—the immune system's master gland, as well as in the spleen, the lymph nodes, and the bone marrow—all vital parts of the immune system. Some immune system cells have receptors for neuropeptides, chemicals that are produced within the brain itself. In other words, there's a growing body of evidence to suggest that the brain talk directly to the immune system via the electrochemical version of AT&T.

Sometimes this electrochemical link between brain and body can be mobilized to produce astonishing, seemingly miraculous results. A middle-aged woman is diagnosed with terminal lung cancer and given only a few months to live. "I can't die," she says. "I have four children to raise." Ten years later her cancer is remission, she watches her youngest child graduate from college. A man with a terrible secret—he knows that his father has committed murder—suddenly develops throat cancer. The night before surgery to remove the tumor, he breaks down and tearfully reveals his father's crime. Within four hours he's able to eat for the first time in a week, and the surgery is canceled. Four days later, the tumor has entirely disappeared.

How can we learn to turn on those self-repair mechanisms?

One method that has already had a long history of remarkable success is "guided imagery." In this technique, first developed in the Sixties by psychologists O. Carl Simonton and Stephanie Simonton, patients are encouraged to develop a sharply focused mental picture of the "enemy"—a cluster of cancer cells, for example. They're then trained to imagine their own defenders—the immune system's T-lymphocytes, or natural killer cells—attacking the invading disease cells and fighting them off. Sometimes the imagery can be realistic—one woman fought off lung cancer after her daughter, a nurse, put an x-ray of a healthy lung beside her bed. At other times, they may be slightly surreal: One eight-year-old girl mobilized her immune system against cancer by imagining that the cancer cells were

CONTINUED ON PAGE 34

I THINK WE'VE JUST  
INVENTED  
**FAST FOOD..**

RUN!!!



## ARTICLE

**O**n the bright screen in front of me, an electronic counter is keeping a running tally of my annual production of carbon dioxide—the primary greenhouse gas! It indicates the number of pounds per year of the stuff I am responsible for creating. As I input the number of miles I drive per week, the number of bags of garbage I generate, my monthly gas and electric bills, whether or not I have a refrigerator or air conditioner, and other such information about my energy-rich lifestyle, the counter goes up and up. Finally I put in the number of miles I fly annually. To my horror the counter

jumps from 13,000 pounds per year to an appalling 58,000! And just to drive home the point, the program's designer, Jeff Jones, caps it off by telling me the national average per person between 30,000 and 40,000 pounds per year. I feel crushed.

What I've just been playing with is one of a batch of interactive multimedia programs Jones is designing for Global Warming: Understanding the Forecast, a new exhibit opening in May at the American Museum of Natural History (AMNH) in New York City. Developed in collaboration with the Environmental Defense Fund

(EDF), Global Warming marks the start of a new era for this prestigious museum and points the way to the future of exhibition design. In a radical departure from the museum's usual format, there will be very few artifacts, and the exhibit will feature four separate interactive multimedia programs. Each is a highly innovative and sophisticated way of introducing visitors to the most pressing environmental problem facing our planet today—global warming. All four interactive programs are being directed by Jones, an effish 27-year-old who's already one of the most experienced multi-

media programmers in the country. His team includes EDF scientists, and graphic artists Paul Zelevansky, Gia Testani, and Gerhard Schlanzky. As museum visitors will quickly realize, slick visual presentation of information is a hallmark of the new and exciting medium.

Interactive multimedia is the quintessential buzzword of the early Nineties. Under its umbrella fall many things, as the "multi" part of the name implies. It sounds a mouthful, but essentially it's a simple and elegant concept. The basic principle is that with a computer acting as controller, many different kinds of media can be integrated together and accessed by the user in a way that suits his or her particular needs and desires. The idea is that if users can contribute their own experiences, they are far more likely to remain interested and want to continue exploring—hence the "interactive" part of the name. Even if we both sit down in front of the same system, you get to explore it your way and I get to explore it my way. The "multimedia" part comes from the integration of different media—for example a system may include a video disc containing video segments and a hard-copy disk of CD-ROM containing computer

simulations, digitized images, text, and sound.

But as desktop computers become powerful enough to handle video images, computer animations, and digital sound reproduction, it is also now possible to implement interactive multimedia programs on computers alone. That's something communications experts have been waxing lyrical about for years, but until now, the technology available wasn't adequate to realize the promise of the idea. Now, at last, it is. The new exhibition coming up at the AMNH proves that multimedia has come of age. Where's Your Scowl, just

## ARTICLE

one of the programs in the 70,000-square-foot Global Warming exhibit, allows you to calculate how much you personally contribute to the growing amount of carbon dioxide in our atmosphere. This is where I learned that I am responsible for an appalling 58,000 pounds per year! I was a crushing indictment of my lifestyle, which I'd always thought of as rather frugal, but then Jones told me the system is designed to look at people's private lives only. Being a writer, I work at home, thus my tally included both my private and professional carbon-dioxide production. I did, however, learn the true

cost to the environment of air travel—apparently the most inefficient and environmentally destructive form of transport by far. I vowed to try and cut down.

According to Jones, who looked privately amused as I channeled myself, the aim of the program is to make people aware of the personal aspects of the greenhouse effect—to make us realize that it is not just an abstract problem "out there" but something we all play a part in. And that is one of the great potentials of interactive technology—rather than just passively receiving information, we can get actively involved in the pro-

## INTERACTIVE MUSEUMS

BY MARGARET WERTHEIM

LIFE  
WILL SHOW  
EVOLUTIONARY  
RELATIONSHIPS  
FOR EVERY  
KIND OF ORGANISM  
FROM  
SIMPLE CELLED  
BACTERIA TO  
PALEOCAMELS



EXHIBIT:  
COMPUTER  
MODELING,  
PROGRAM  
SHOWS HOW  
SCIENTISTS  
BUILD A  
CLIMATE  
MODEL



THE BIG  
PICTURE:  
FROM THE  
PLANETARY  
CLIMATE  
SYSTEM,  
TO THE  
MOLECULAR  
WORLD



cess of acquiring and even generating information that is personally relevant.

In the Global Warming exhibit, each of the four interactives deals with different aspects of the problem. Between them they allow the visitor to explore and investigate a whole range of issues, from the level of the planetary climate system down to the level of the forests, ecosystems, and cities, ending at the molecular level where you can explore how the carbon cycle works and how different gases affect the atmosphere and global temperatures.

It's a tremendous amount of information to incorporate in a single exhibition, and as such, it will be a superb national resource for helping us all to learn about this complex problem. But its very complexity demands that there be a simple approach to attacking it. "I always start from people's own experience," Jones says. "From things they know about and can relate to, then expand their knowledge out from there." All the programs begin with instantly recognizable images or situations and contain various layers of information so that the user can get a broad perspective or more detailed accounts of particular aspects of a problem. Choices are made by using a trackball to point the cursor at different icons (little images) and option buttons on the screen. When you make a new selection, you're presented with either a computer animation or a graphic segment that explains what you've selected.

In *What's Your Score?*, users are initially presented with an animated cityscape. When you move the cursor onto different elements of the scene—say a trash can, a car, a subway train, or a light shining in an apartment—you get a short, narrated animation describing how that element contrib-

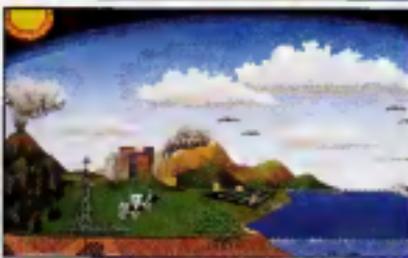
utes to the production of carbon dioxide in the atmosphere. From this city scene you can focus on, say, the exhaust pipe of the car and see an animation which describes how scientists calculate the amount of CO<sub>2</sub> produced by burning gasoline.

In another program, called *Computer Modeling*, you can watch a simulation of how increasing carbon-dioxide levels in the atmosphere cause the planet to heat up. This simulation is created using images from the National Oceanic and Atmospheric Administra-

tion for eight months. Global Warming will tour around the country for at least three years. Other stops include the Los Angeles County Museum of Natural History, the Carnegie Science Center in Pittsburgh, Pennsylvania, and the National Museum of Natural History at the Smithsonian Institution in Washington, DC. Already the AMNH has had so much interest that Sam Taylor, the museum's director of exhibitions, says they are considering cloning the exhibit so there can be two shows touring simultaneously. There's even been inter-

est being shown by the new breed of young programmers like Jeff Jones—people who are computer literate but are first and foremost communicators. A graduate of New York University's Interactive Telecommunications Program where he now teaches part-time, Jones is constantly stretching the limits of currently available technology to create a more vibrant interactive experience. He's often on the phone to software companies like Macromedia, pushing for new features to be incorporated into both software and hardware. And, indeed, multimedia software and hardware is booming. Interactive multimedia will be to the Nineties what word processing was to the Eighties—and look at how quickly that developed. In less than a decade we've gone from crude text-editing to full-blown electronic publishing. Jones says he is looking to the future and considering more advanced hardware capable of extremely sophisticated simulations and more interactivity.

Interactive multimedia at the AMNH isn't just confined to the Global Warming exhibition; it will also be used in the new Hall of Human Biology and Evolution, which opens in 1993. In particular, there will be a number of programs that define what a human being is. Most of these programs are being produced independently from the museum. The most highly interactive is called *Hominid Hunter*, a game-like program in which users play at being paleoanthropologists looking for fossil remains. Once you find some bones you have to decide how you're going to study them, but since all science is conducted in the real world of financial constraints, budding hominid hunters will find themselves playing against a depleting grant fund. When your grant runs



**EVERYTHING'S RELATED: CLOUDS, SUN, AIR, CITIES, CARS**

in Rockville, Maryland, and from NASA's Goddard Institute for Space Studies.

*Computer Modeling* shows how scientists use computers to model the planet and predict climate changes. It gives visitors a chance to see what goes into building a climate model and then allows them to explore how more complex real-life ones work. The third program explores how the different elements of the climate all interrelate—the clouds, the oceans, the forests, the sun, the air and also human discoveries and phenomena, including the building of megacities. The fourth program will look at what's being done to address the problem. It will investigate the relationship between global warming and issues such as deforestation and the burning of fossil fuels.

After exhibiting in New

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Interactive multimedia at

out, so does your research time. Learning through games is a concept which Willard Whitson, exhibit designer of the new hall, believes is going to prove extremely successful.

In another section of the Evolution Hall will be three related programs about primates, mammals, and DNA. Visitors will be able to control how they see the images; for instance you'll be able to slow them down, speed them up, or replay segments depending on what interests you. Also in this hall there will be an electronic newspaper which can be constantly updated to include new findings. The field of evolution, particularly human evolution, is very contentious, and new data and theories are coming to light all the time. "The electronic newspaper will allow the public to see the debate," Whitson says—to see that science isn't cut-and-dried. For instance, no one knows exactly which evolutionary path humans took, a topic currently being debated by paleoanthropologists. With the electronic newspaper, the museum will keep us posted on the latest developments in science.

Perhaps AMNH's most ambitious interactive is one which allows visitors to explore evolutionary relationships between organisms. Designed and implemented by Arborecence, a small, high-

ly imaginative company in San Francisco, the program will be part of the Fossil Hall which is being renovated and will be completed in 1994. The interactive planned for the Fossil Hall is a spinoff of LIFEmap, a program Arborecence originally produced for the California Academy of Sciences in San Francisco where it is currently up and running. Operating on eight separate Macintosh computers, LIFEmap shows evolutionary relationships for every kind of organism we know about, from single-celled bacteria to dinosaurs and mammals (including humans).

Starting with simple life forms, visitors can progress up the tree of evolution, learning along the way how scientists believe life evolved on our planet. The program, which was developed under the expert guidance of more than 20 Academy scientists, visualizes evolutionary relationships based on cladistics—the science of classifying life forms.

In its current form in San Francisco, LIFEmap uses mainly still images. In the program's new incarnation at the American Museum of Natural History, however, every organism and new evolutionary trait will be illustrated with a short video segment or computer animation. Designed by Chris Krueger and Amy Pertachuk, one program shows the skele-

ton of a *tyrannosaurus* as it walks. You can see how every bone of the dinosaur moves. Pertachuk explained that they scanned in a photograph of a real *tyrannosaurus* skeleton from the museum's collection and then animated each bone separately. The great beast lives again.

I also saw a simulation of the most strongly supported theory about how flight evolved, which suggests that wings developed from the arms of ground-based animals. As I watched an image of arm bones metamorphosed into wing bones, which grew feathers and took off and flew across the screen, it was a fantastic visualization of a scientific theory. The evolution of flight is still a matter of debate, but this simulation gave me a sense of what it is that evolutionary biologists are trying to unravel. It brought biology to life and made an elaborate theory immediately understandable.

The LIFEmap exhibit at AMNH won't cover the whole of life on Earth, just vertebrates—fish, reptiles (including dinosaurs), amphibians, birds, mammals, and their early relatives. The whole point of the project, Krueger says, is "to take a subject that is very complex and make it into something which is fun in a picture-book kind of way—but also there's lots of real science in there as well." And that's one of the great powers of interactive multimedia—you can present a complex subject as an unfolding story with color and movement, sound and music, text and images.

According to Pertachuk, the program is "like a living textbook—we can change it and it can evolve. There can be a first edition and a twentieth edition," and with each edition, new features and new information can be incorporated. "It's just going to get better and better," she says. The program can also be adapted to make use of new technology such as faster computers or more sophisticated software.

It's not only the American Museum of Natural History that is getting into interactive exhibits. They are springing up all over the country. The National Geographic Society's museum in Washington features exhibits about the earth's geography and history, while the Computer Museum in Boston uses interactive videodiscs to familiarize visitors with computers. The Franklin Institute Science Museum in Philadelphia, the Smithsonian Institution in Washington, the New York Hall of Science in Corona, and the Canadian Museum of Civilization in Hull, Quebec, are just a few of the others now utilizing this technology. As Sam Taylor boldly declared—"this is just the beginning." □



The patient has trouble keeping his food down.



## THE EYE OF THE BEHOLDER

### THE ARTIST

I began modestly with still lifes, here in my studio. The logic of the still life is self-evident; its beauty is known to be the classical beauty of form; it does not move, or reveal new and unanticipated facets of being; its will is at all times subservient to the artist's own; its decay is slow enough so to seem imperceptible. (That last summer, my still-lifes, in an ecstasy of concentration, I painted easel-paintings—dancers, humankind! Goddesses, gods, heroes and egomaniacs! They came after me, clinging on, by the strokes of my brush, the mysterious contours and inner substance of noble forms of being.) (As if, as a critic for an influential Roman newspaper later claimed, Caravaggio himself had been reborn, turning his genius to still lifes.) In a delirium of boyish energy, with no purpose beyond the transcription of life into art, that pervaded into the impenetrable. I also painted pumpkins, tomatoes, peppers, onions, chilis, radishes, carrots, beans behind our family villa; the vines began to shrivel; the plants, some of them

# 4

writers were shown  
this painting  
and asked to interpret

the image,  
creating original  
pieces of  
fiction. The result  
is four  
unique visions by

Joyce Carol  
Oates, Lucile Shepard,  
Leigh Kennedy  
and Samuel R. Delaney.



**Painting**  
By Alan Feltus

quite gigantic, grew slobbered; one might have thought it a natural consequence of the season's change, except that the very soil, far continents so rich, is lucious, mottled, gray and anemic, and evidently, diminishing to dust beneath one's feet, could not even the heavy autumn rains could move it. (I once met my sister Lucia in my studio, saying, "Look, Amore! It's gone!"

To the family's astonishment, the entire hillside garden of several acres had vanished. Had erosion been eating away at it from beneath, without our knowledge? In places the lush, fertile gardens were ugly fissures in the earth, as deep as twelve feet, the soil odd and colors as a lunar landscape, and as lifeless. In time, asky, bony weeds grew there—if you look out the casement window you can see them, so stiff and unyielding, even the north winds can't sway them.

My elegant paintings, however, sold—ever more easily. Especially to Romans, where foreign tourists visit, wealthy Americans in particular.

Next, I turned my scrupulous attention upon the family parrot Sheba, an exotic creature imported from Brazil, with exquisite green, yellow, golden, and blood-red feathers, and a saucy crest, and shrewd, watchful, malicious eyes. As I painted, I whistled—and Sheba playfully mimicked my whistle. Sometimes I sang, to please her. "Pretty bird! O beautiful Sheba!" and the creature mimicked my voice, though not my words, crying, "Poor! Poor! Poor! Tonio!" I laughed, and Sheba echoed my laughter, though in a mocking soprano. Why is it that household pets, especially parrots and cats, become tyrants sometimes?—willful as Indian maharajahs in their domestic settings? Our beloved Sheba, thirty years old, was certainly the dominant will in our family since Momma's death the previous year. Even Poppe, Mayor of our provincial town, and by ancestral tradition, a descendant of royalty, was no match for Sheba when she exerted her will squawk-squawk-squawking to get her way.

Of course, the South American parrot is one of the wonders of the natural world. In such brilliant, dazzling, pantyously beauty, why number of laws of character are forgotten, and so it was in our household, with Sheba, whom we praised—I, Antonio, in particular.

My paintings of Sheba, sixteen of them painted within the space of a delirious two-week period, are valued as examples of "primitive genius"—"unschooled classicism"—"provincial magic." Poppe and I exhibited them at a regional fair, and all the canvases were sold; two were awarded prizes; all went written up glowingly in newspapers, and I, Antonio, to my surprise, was the subject of a profile in a national magazine. Poppe acted as my broker, negotiating with buyers of my work, and putting my money in a special account in our local bank, under his name. He then gave me a fixed allowance, out of which I could buy my art supplies. "I hope you are pleased, Antonio?" Poppe asked, stroking his beard—that rich, black, bristling beard that, from earliest boyhood, I could not help but envy. "Yes, Poppe," I said quietly. "Your allowance is a very generous one, for a young man of your age and position," Poppe said, as if testing me. But I said quietly as before. "Yes, Poppe. Very generous."

After the heady success of the fair I never painted another canvas with Sheba's likeness. Following the temperamental vagaries of her species, Sheba began to pick at her breast; until most of the splendid feathers there were gone, she managed to pick even

at her wings and back, and was soon an ugly, blood-stippled sight. Lucia, who, after Momma's death, had spoiled Sheba with all sorts of treats and special attentions, was upset at first, and then despondent. And, unaccountably, angry at me—"If you had not painted her so beautifully, she might still be unblemished," Lucia said. "You—stealing her of her beauty, in this kind of art!"

It was a mercy when, one day, we discovered Sheba lifeless and stiff on the floor of her cage, amid droppings and dried patches of blood. Poor thing! We all wept, including the servants.

And yet, how blissful the morning silence, uninterrupted by Sheba's cries.

I had mentioned that Poppe was Mayor of our town. In fact, Poppe had been first elected to the illustrious post twenty-three years ago, but his term of office had been turbulent, and

he but I, Antonio! There were murmurings of nepotism, and complaints that the commission was far too generous (though, by current standards, as such things are measured, the commission was not excessively high for an experienced artist, at least); but Poppe paid not the slightest heed, and counseled me to behave likewise.

So, with some trepidation, I painted my own father's portrait—the first human subject I ever undertook. Dear Poppe—a vain, blustering, overbearing man, yet touchingly direct in his egoism. "Shall I paint you as you are, Poppe?" I asked politely, "—or as you wish to be remembered?" Poppe, seated in the Mayor's chair by an open window, his hairy head held unnaturally high and his bearing self-consciously regal, replied with childlike ingenuousness, "Why, paint me exactly as I am, silly boy—for that is how people will want to remember me."

The sittings were a strain more for me than for Poppe, who readily passed into an open-eyed daze, saluted by wine and food (our sessions were midday, following Poppe's enormous midday meal, which was nearly as lavish as his evening meal), or, by degrees, sank into a blissful, snoring, leaden sleep. Never had I known that painting—the wielding of a mere brush—could be so arduous. It was as if, in painting my father, from whose veins my own rich blood had partly sprung, I was expunging, from myself, a secret part of myself, unformed until that time. How ugly Poppe was, for a man commonly spoken of as "handsome"—how venal, how party, how self-important, how cruel and mendacious his features! My brush moved groggily at first, and ruined one canvas after another, and had to start over, in disgust, having not the patience (or perhaps the stomach) to rework the original image, layering it in oils until it was covered by another. Gradually, however, I came to terms with Poppe's image—with Poppe. The man's strong-boned face—his black bristling beard—his deep-set, dark, glowering eyes—that smiling grimace that gave his face the look of a nocturnal creature surprised and displeased by daylight. All this I managed to transfer to the canvas, painting for hours without rest, in a trance, day following day. At the conclusion of a session, Poppe merely glanced at the canvas as it began to take shape, and grunted, whether in approval or disapproval I could not know. In any case, uneducated as the man was, he had no true eye for art, and did not even know, as the truism has it, what he believed he should like. He did complain of my slowness, how-

It was  
a mercy when, one day,  
we found  
Sheba lifeless and  
stiff on  
the floor of her cage.  
Poor  
thing! We all wept. ♦

mained by charges of graft and corruption, he had not sought re-election. In subsequent years, other holders of the office were amply charged by their political rivals and enemies (for ours is a contentious province) and the most recent, preceding Poppe's second election, was sent to prison for extorting bribes and embezzlement—so that, as even Poppe's critics were forced to admit, Poppe did not appear half so bad by comparison! So it has always been, for centuries, seemingly for millennia, in this remote, hilly, verdant province north of Rome. Greed, corruption, mendacity, vanity! A history of infamy! Which is why the more sensitive of its property have traditionally turned to the Church (that is, to its ecclesiastic orders, cloistered convents and monasteries) and to the abiding solace of art. For what does it profit a man, that he gain the world, but lose his soul?

Poppe, in his position as Mayor commissioned a portrait of himself, to be hung in the foyer of the mayoral residence—and who was the portraitist to

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**The Crystal Ball of the Celestial Dragon**

ever—"Boy, d'you think you, and I, are going to live forever?" Once seated in his cushioned chair, confident he would not be rudely interrupted (for the Mayor's assistants, without exception older females, did the daily work of the office and did it uncomplainingly, for shockingly modest salaries); Poppa quickly slipped into a daze, or a doze while I, Antonio, labored to bring forth a portrait worthy of my name.

Which, I believe, I have done.

Of course, I have not the original—I have only this photograph, a poor reproduction that does not begin to suggest the portrait's somber yet savage comeliness, its formal elegance, its rich chiaroscuro, an ingenuous rendering of a petty tyrant," as one reviewer has said, "worry of the genius of Goya."

The portrait was angrily denounced by Poppa's successor in office thus never hung in the foyer as intended but it was eagerly purchased—at several times the price of the commission—by one of my New York collectors. Poor Poppa—he did not arrange for the purchase, which would have pleased him enormously.

For Poppa is departed, whether he has gone no one, not even his closest political associates, nor even the beautiful present women with whom he sometimes sleeps, seem to know.

At our final session, Poppa slumped in his chair as usual; and I, as usual, though perhaps more intensely than usual, labored at the ugly, intransigent image on the canvas, until my arm grew so heavy I could scarcely move my brush, and my body was sick with inspiration inside my clothes. I thought of the teachings of the great Englishman Locke, who looked upon man as an object in nature not fundamentally distinct from other objects in nature, and wished, indeed wailed, that the subject of my portrait, though nominally my father, but in essence a mere composite of molecules, atoms, and force-fields of incalculable subtlety, be transposed onto my canvas, rendered into my art, once and for all.

You are surprised, I did not pray to God—but like any artist of genius, I do not believe in God. I do not believe in God because I have no need of God—the artist's credo is that simple.

During that grueling session, however, Poppa played one of his pranks on me. He must have woken out of his sudden sleep, seen me fierce in concentration at the easel, and slipped away without my noticing, oddly, for he was a large, bulky man, and hardly graceful on his feet. But when, at last near dusk, I looked up in triumph, knowing my portrait was finished, I saw that

Poppa was gone—vanished! His throne-like chair was empty though the faded cushion bore the imprint of his solid buttocks; and the head and arm rests gleamed faintly with oil. The door to the stairs stood partly ajar. So obsessed had I been with the painting, I had not even heard Poppa's heavy footfalls on the stairs. I had not even had the opportunity to murmur, "Goodbye, dear Poppa!" as certainly I would have done, had I known he was departing.

For, by a coincidence, surely, it was that very night that Poppa disappeared from our town. Some charged that the mayor had absconded with funds from a mutual cache he and his political cronies had established out of "loot"—or embezzled—municipal funds; others claimed that he must have been abducted, and later murdered—for Poppa never reappeared, no news ever came of him, and his body, the proud

digits of common sense?

Thus, in stealth to record for posterity the ineaments of the low-minded, suspicious, paranoid personality so paradoxically housed in an ample, attractive female body, I painted Lucia's portrait too, without her knowledge—but that is another story.

You may see her here—her likeness, that is—in this photograph, which does not begin to do justice to the original, I am afraid.

The original?—in a private collection, in New York City.

Now will you be seated, over there? Shall we begin?

—Joyce Carol Oates

## VICTORY

Last night I cleaned my legs were dancing. I saw them pale and perfect (my best feature, I've been told), sheared off neatly at mid-thigh, whirling against a starry sky, kicking their way across a plain that might have been the waste west of Al Hafra, where I was shot down. Then some miserable lightning jolted along my spine, waking me, and I have spent the rest of the early morning answering a letter from my mother trying to explain why I intend to stay in Cairo. My pension, I say, will not stretch so far at home, the hashish is not so good, and no matter how cunning the prosthesis, a legless woman faces certain difficulties in finding lovers—I prefer the uncomplicated greed of Egyptian men to the twisted compulsions of American freaks. I hope these brutal half-truths will close the subject. There is nothing left for me in the States. The yellow ribbon tied about the maple in my parent's front yard has long since bleached white as bone.

Of course there are no Egyptian lovers, no hashish, no cheap hotel rooms in Cairo—Cairo is but the emblem of some guilt, some unresolved emotional business with the region. My only relatives are the voices of the VA doctors and the clever machines that seek to drag me back from the serenity of my psychological retreat by creating this dream world and coaxing me to act out my feelings of loss. I am not a fool. I understand these things. Yet my sentiments remain unchanged. I prefer a dream life to one of constant pain, palying stones and condescension, of medals, bunting, and empty words. I intend to fight for it. They are after all my dreams, and I know best how to manipulate them. I want to tell them about me like a magic cloak, to create a rich, impenetrable solitude. I stare out the window onto Tewfik Square. On a traffic island at its center stands the colossal statue of Ramses II, ruler now of

I prefer  
a dream life to one of  
constant  
pain and condescension,  
of medals  
and bunting and empty  
words; I  
intend to fight for it. ♦

bearer of a six-hundred-year-old name was never found.

Lucia said, simply gazing at Poppa's portrait. He is dead. Of course.

Poor Poppa—but, more than that, poor Lucia! In our household, it was she who grieved the most bitterly, yet as much out of spite, I think, as genuine sorrow at our loss, for, being a woman, and unmarried, she eventually inherited only a modest portion of Poppa's estate, and his brothers the remainder. I, Antonio, the youngest, received the most, for Poppa, even in his duplicitousness, had been honest enough to allocate my own earnings as a painter to me. (And these earnings were higher than I'd known!—what rascal, poor Poppa!) As the months passed, Lucia not only mourned our father, but cast veiled, reproachful eyes upon me, as if—though, mean-spirited, pursed-lipped, she never said so—my portrait of him was in some way responsible for his death.

But in what way?—by all the para-

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a tiny country of chipped cement and parched grass. We are both victims of foolish obsessions. But I will become no monument to mine. At nine o'clock I spread my photographs, my souvenirs of war, on the table. In one I am standing beside a Cobra gunship. Right helmet in hand, smiling tightly. Touching it I feel the surge of engines, the pulse of rotors (incomes from a black box whose wires lead into my head), and in a second I am aloft, skimming low over the dunes. Behind me phalanxes of M-1 tanks and LAWs, black Stealth queens in their hangar hives, womb bursting with rockets. I hear in the distance the baying patrons of a country swollen with dumb pride, tough talk from old political men with nothing to lose but their reputations. ("What's that? Can't you sharpen the image?" "She's back on the chopper again." "Christ! Get her out of there!") the one fueling the other, the both fueling the prelude apocalypse. Through my night-vision goggles, the sky is a luminous, grainy blue, beaded white with tracer and popcorn blooms of anti-aircraft fire that spray upward from a legendary city, its skyline figured with onion domes and mountains of blood. Statues of Liberty and World Trade Centers. My missiles perform surgical strikes, slice the tops from phallic minarets; blind the

faceted eyes of office buildings. My twin-hymimeter cannon herbs victims along the avenues, teenagers in tight jeans, women in chador, ministerial whores, soldiers of every nation. No need for damage assessment. For each death a fuming black star materializes in my brain. The vengeance I take is purely personal—I am no longer political.

I land in a dusty square at the edge of the soul. Narrow winding streets, stucco walls inset with doors of many colors, the signs above the shops with fringed curtains a neon tangle of Arabic and Roman script. Unmindful of the crowd's babble ("Where the hell is she?" "Some kind of mancat" "Did you program that?" "Fuck not" "Then shut it down!" "You know damn well that it's my hair brains, man"). I idle among stalls selling fruit that grows like immense gems, the stuffed heads of presidents, love potions, helicopter parts, camel saddles, peace accords. At the Shop of Legs, a dark little monkey-man in a fez and a shabby suit displays his wares. Tawny muscular legs, soft lover's legs, model's legs, long and shapely. All hung from the ceiling on steel pipe. "But for you, beautiful lady," he says, "something special." He draws back a crimson curtain to reveal a pair like none other. Inserted with a jeweled circuitry that produces hot-

orange butterflies, emerald serpents, and ruby skulls, images like electric talips on the milky skin. Some of the legs twitch, sensing my presence.

The legs melt with my stumps. We are one, and I feel the circuitry spreading through me warmer than blood. Jade spiders trapeze across my belly, indigo birds bloom on my breasts, golden lions peer out though my eyes. Moon-colored vines twine my secret hair. As I stroll—wrapped in a kind of heated calm, I accept this Arabian night for my new home. It seems sufficiently wild to suit the tempest of my torched spirit. The eyes of men in the cages smoking water pipes harden into scorpions that lift their tails into crescent shapes. Tigers lounge on silk cushions in the shadowed hours. Hours wave like molasses. But gradually chaos is invading the soul. Out of the corners of my eyes I see curious dark shapes scuttling, speaking in crackling voices like the sounds of fire ("I don't like these readings man." "Then do something...damn it! I can't fucking reach her!"). Scents of mustard gas mingle with those of myrrh and star of roses. Nightingales mate in their cages, a fury of brown wings and songs like the whistles of incoming, only sweeter. The doors in the stucco walls swing open offering sanctuary in the darkness beyond them. I make out somno-

CONTINUED ON PAGE 94

Once upon a time, there was a lot less science around than there is now. In fact, in those days a single bright human being could pretty well teach himself (it was almost always a himself in those days) everything there was to know about science. If that person happened to be, say, an Isaac Newton, he could even make major contributions to many separate areas of scientific knowledge, as by himself Newton solved the puzzle of the rainbow, set forth the laws of motion, proposed the theory of universal gravitation—and, oh, yes, took time out to invent calculus along the

way. And if any of those very bright scientists wanted to know what else was going on in science at that moment—as they almost always did, because that's what scientists are like—they could seek membership in, say, England's Royal Society. There they could get together every now and then and, after a dinner of good English roast beef and warm brown English ale, listen to each other report on the very latest scientific developments.

Well, that time is past: The world has grown much bigger and more complicated in the last few hundred years, and so has sci-



## CHASING SCIENCE

Once a year, the world's scientists gather for six days to explain the world as they know it

BY FREDERIK POHL

PAINTING BY WILSON MCLEAN

ence. Science isn't simple anymore, and it certainly isn't small. There's too much to know. All the decades-long training that goes into the making of, say, a first-rate seismologist tells him (or happily quite often now her) nothing at all about forensic biochemistry or quantum chromodynamics. The scientists themselves haven't changed that much, though. What makes a scientist tick is the same yearning tick that drove Newton and Euclid and Einstein and every other great scientist: the tick to know, to know everything there is—to know about everything there is—and that's what the AAAS is all about.

The AAAS—its full name is the American Association for the Advancement of Science—is the largest multidisciplinary scientific society in the United States, if not in the world, with 156,000 individual members and nearly 300 affiliated societies. The AAAS (pronounced triple-A-S) is where the people who measure Neanderthal jawbones in Israeli caves join with the people who study astronomy by collecting meteorites on Antarctica's ice shelves and the people sequencing the human genome. When these wonderfully diverse people get together, once each year, to compare notes, it is not a small occasion. The Bible tells us that God took only six days to make the heavens and the Earth. The scientists, being merely human, don't do as well as that. It takes them just as long—a Thursday through a Tuesday of every year—simply to explain to each other their best current opinions about how all those things work.

But you can't really learn everything about current science even at a AAAS meeting, not unless you can clone yourself 10 or 15 times. Except for the evening plenary lectures, there are seldom fewer than a dozen program events going on at once—and that doesn't count the exhibits, poster sessions, field trips (to nearby scientific centers like Fermilab, the Adler Planetarium, and the Argonne National Laboratory), or the Saturday-night singles bar for the science-oriented unattached.

There are a fair number of science-fiction fans at the AAAS meeting, which should surprise no one because scientists are what a lot of young science-fiction fans grow up to be. Some of them felt right at home because the meeting site, a Hyatt Regency hotel in Chicago, was also the location of the World Science Fiction Convention a few months earlier. At AAAS, the room parties are quieter and there are fewer people wearing hell costumes and Spook ears, but otherwise the place looks much the same.

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When Susan Solomon of the National Oceanic and Atmospheric Administration got up to deliver her evening lecture on "Ozone depletion at the ends of the earth and points between," there were resounding applause from the SF Worldcon. Solomon delivered her lecture in the same Grand Ballroom where Marta Randall had handed out the Hugo awards for science fiction. Beccaria being a fine writer, Marta is a compact person, and she had made a comedy routine out of raising and lowering the microphone as she introduced the Hugo award winners. Susan Solomon is no taller. Since she was introduced by F. Sherwood Rowland, then president-elect of AAAS (and one of the first scientists to do research on ozone depletion), and Rowland is well over six feet tall, the same bony got the same laughs at AAAS.

That was the last funny part,

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◆ To hear  
Marvin Minsky on artificial  
intelligence  
meant missing Roald  
Segelov on  
international cooperation  
and half-a-  
dozen other lectures. ■

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though, because when Solomon got into her lecture, what she had to say was not amusing. Although she is no more than five foot four, she boldly goes where larger (and taller) human beings are reluctant to venture. She was the only woman on a 16-member team that spent an Antarctic spring studying the ozone layer over the bottom of the world. The ozone hole isn't diminishing, Solomon reported. Indeed, at its worst recent period, essentially all the ozone was gone from the thickest part of Antarctica's ozone layer.

At one time, that might not have greatly worried an audience in Chicago, at least not in any personal way. After all, there aren't many creatures in Antarctica likely to suffer skin cancers or cataracts from the excess ultraviolet, and most of us don't worry much about the penguins or the leopard seals. Such indifference wasn't possible anymore, though. Several surveys, one of them released by NASA just days before the meeting, had shown warming signs of impending ozone losses far from the Ant-

arctic—in fact, a belt of them extending completely around the northern hemisphere of the Earth, including the skies over Chicago.

Climate change was a hot subject at AAAS as well, with an entire track of sessions devoted to it. One of the most worrisome prospects of global warming is a continuing increase in the number and violence of storms. As the scientists were discussing that possibility, southern California was being battered by an unprecedented downpour that flooded homes and trailer camps and turned Ventura Boulevard into a waterway, as the Los Angeles River (usually detectable only as a muddy trickle at the bottom of a concrete culvert) abruptly filled and overflowed its banks.

If global warming is indeed caused by the increase in human-generated carbon dioxide in the air (and the two have risen in step since the Industrial Revolution began), then one way to slow it down would be to reduce consumption of fossil fuels. There were plenty of sessions on that subject in the track called "Energy for the Twenty-First Century." The proponents of biofuels had slides to show the success of their research in growing selected strains of poplar trees or grasses to burn in place of coal, oil, or natural gas; the nuclear-power scientists had their designs for fast-slow fusion reactors and even hopes for commercial fusion power plants.

The fusion people, too, had news to report, since a few months earlier a deuterium-tritium experiment had actually produced sizable energy for a comparatively long period of time—the best showing yet for all the fusion-power research. But even if the technical problems of commercializing that deuterium-tritium process could be solved, we're not likely to see a demonstration fusion power plant much before the year 2020, with large-scale power production maybe ten years after that.

Most conservationists would argue that the immediate key to solving energy and global-warming problems lies less in finding new energy sources than in cutting back on the amount of energy used. Home heating is a tempting target. Replacing the windows in America's homes with ones that allow less heat to escape, it was shown, would save more energy than the Alaska pipeline delivers every year.

Transportation was another area ripe for energy savings, and there the hottest new technology was magnetic levitation—transporting people and goods in cars that are magnetically suspended and thus essentially frictionless. James R. Powell and Gordon Danby of

Brookhaven National Laboratory's Henry H. Kohn of Magneplane International, and others described what a nation's maglev system could do. Many Americans (and a lot of legislators) are turned off by the idea of maglev transportation, the scientists pointed out, because they confuse maglev with clunky, ponderous, locomotive-driven trains. But maglev is not a railroad; it has no moving wheels for traction or support; it floats. The maglev vehicle carries no fuel or heavy engine; it's only a shell to hold cargo and passengers, so it's light. It doesn't depend on the fiction of steel driving wheels on steel rails to pull it; so it can accelerate as fast as a jet plane on takeoff, faster than that, if desired—as fast as the passengers can stand it. And it doesn't have to be joined with other cars to make a train; instead, individual cars can be dispatched—one every 20 seconds or so, if the traffic justifies that many. Since there are so many individual cars, they won't all have to stop at every station; the maglev designers plan to copy the skip-stop strategy that Amtrak's Metroliner currently uses between New York and Washington, DC. Maglev won't need "megalubs," whether sprawling airports or huge railroad terminals; the designers intend to have a stop at ev-

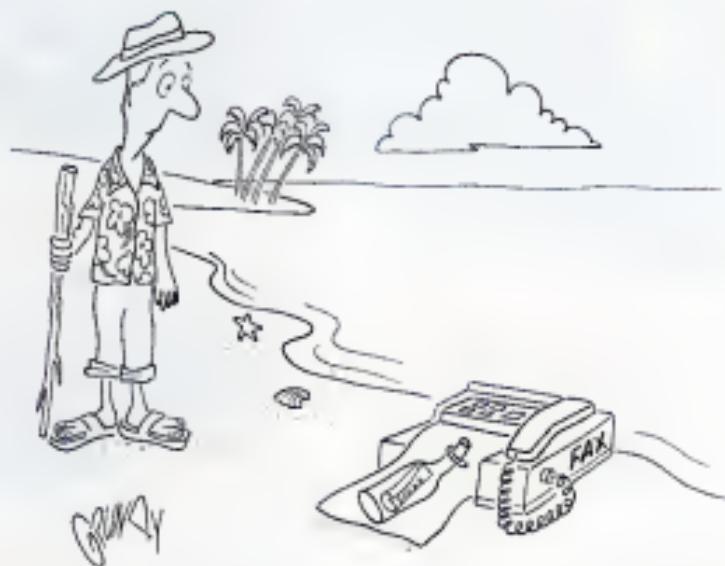
ery community and even every large shopping mall along the way.

None of this comes cheap. The maglev designers estimate construction costs of \$200 billion to put a 15,000-mile system of elevated guideways over the existing interstate highways. But that vast sum is after all only 1 percent of the money we will spend on transportation over the next 20 years anyway. And once in place, maglev can carry passengers (for about three cents a mile) or piggyback freight (for about seven cents per ton-mile) at 300 miles an hour almost anywhere in the United States, with excursions to a couple of Canadian cities as well. Maglev will always be faster than cars or conventional railroads, since there will be no need to get to and from an airport, no takeoff delays, and few delays caused by weather. It will generally be faster even than jet travel for journeys up to about a thousand miles—at half the energy cost of automobile driving and a quarter the energy cost of flying.

There's more than one way to skin a cat, and Battelle Memorial Institute's Edward S. Lipinsky attacks the carbon dioxide/global-warming problem from another angle entirely. He has an interesting idea for dealing with at least some fraction of the surplus carbon dioxide

that comes from the burning of fossil fuels. There have been many proposals for extracting the carbon dioxide from flue gases and disposing of it in some harmless way—for instance, pumping it down to the bottom of the sea. All of these disposal methods are expensive and difficult. Why throw it all away, Lipinsky asks. Why not use some of the stuff? It has many virtues. Like other bulk raw materials, it can be used as a feedstock to manufacture useful materials; it's currently available in pure form in large quantities, and it's cheap—about \$40 a ton. Unlike those materials, it's now going to waste and, in fact, needs to be disposed of.

The only thing wrong with carbon dioxide as a feedstock is that it's chemically highly unreactive—at least for us human beings and our factories. Plants, however, don't have any problem at all with the stuff. Through photosynthesis, they have no trouble breaking it down to make the chemicals they need. The world's trees, grasses, flowing plants, and algae manufacture billions of tons of organic chemicals from atmospheric carbon dioxide every year, in spite of the fact that the gas is only available to them in a decidedly impure state. It constitutes less than 4/100 of 1 percent of the atmosphere



from which they extract it. Now human chemical industries can start with 100 percent-pure carbon dioxide and apply advanced technologies, such as polymerization and redox reactions, to turn this unwanted waste product into useful complex organic molecules.

Six days of morning and afternoon panel sessions provide a lot of person hours of data transmission on subjects from the ethics of clinical trials, electronic networking, and the science of psychoanalysis to high-energy physics, supercomputer applications, and space research. Each of the two dozen tracks provided its own fascination. "Pesters of Life in Urban and Rural America" covered everything from interactions in the megalopolis to the future of rural America... with several sessions devoted to urban drugs, guns, and crime. David C. Lewis of Brown University, looking at the relationships among them broke drug-related violent crime into three categories: crime caused by drug use, crime caused by the need to buy drugs, and " turf" crime among competing drug sellers. Surprisingly, he found that in the first category, the only drug that produced a higher rate of violent crime was the legal one, alcohol. Since almost all violent crimes associated with narcotics resulted from trafficking in the drugs rather than taking them, Lewis asked, "Could the war on drugs be a diversion from the war on crime?"

In the sessions on biomolecular archaeology Thomas H. Loy of Australian National University, Margaret E. Newson of California State University, and Jerold M. Lowenstein of the University of California at San Francisco reported on the use of techniques borrowed from contemporary crime lab practices in studying blood samples from archaeological artifacts. Ancient humans sometimes mixed their own blood into the pigments for wall paintings; others

left blood traces on their stone tools. Now, as much as 100,000 years later scientists can use such tools as cross-over electrophoresis and antibody radioimmunoassay to analyze that ancient blood with results that help spell out the details of the story of human evolution.

In the area of medical technology Richard Wilangham of Harvard University, Karen B. Stiner of the University of Wisconsin, Eloy Rodriguez of the University of California at Irvine, and others described the new science of zoopharmacognosy, the study of nonhuman animals' ability to select medicinal plants to help cure their ills. In some pre-

On a typical day you might be confronted with a choice between listening to Marvin Minsky on artificial intelligence, Rosalind Bagdade on international cooperation in science, Amory Lovins on superefficient cars, and half-a-dozen others on half-a-dozen other great topics but since there was only one of you there was no way you could get to them all. If you wanted to hear Hans Mark describe the court of Henry the Navigator (perhaps the first think tank in history), you had to miss Paul R. Ehrlich on population and the debate on the age of the Sphinx (one side passionately dating it to the reign of Khafre on archaeological evidence, the other placing it several thousand years earlier on the basis of geology). To hear John Huizinga debunk cold fusion meant skipping Donald Jensen as he described the technique of cleaning up the oil spill from the Persian Gulf War. Listening to John Stakel (standing in for D. Eugene Redmond Jr.) on the use of fetal tissue in the treatment of Parkinson's disease was at the cost of failing to hear Thomas Shandek on telebots and teleoperation—and that's without even mentioning the six or eight other lectures scheduled for each time slot.

The writer Gordon Dickson once described his childhood dream of grown-up heaven. When he grew up, Dickson said what he wanted to achieve was to become a member of some wonderful scoundrels' club. It would be a place where he could drop in after an exciting session spent on the Greenland ice cap, and share experiences with some other club member just back from collecting butterflies along the Amazon or studying the volcanoes of Hawaii. Maybe Dickson's marvelous dream club doesn't really exist, but the annual meeting of the AAAB is close enough, close enough ☺

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tropical forests, wild apes and monkeys eat specific plant products with detectable medicinal properties when they're ill but not at other times, and their use of these plants closely resembles the traditional practices of nearby human native tribes.

But all these panel sessions weren't the end of it. Between the morning and afternoon sessions, the meeting schedule allowed a couple of hours for lunch. It was a good idea to eat fast, though, because at 1:15 every day came the hour-long star turns, the single-lecturer performances on specialized subjects.

# SARAH LEIBOWITZ

"In years to come, we may look at your genetic profile and say, 'With your genes, you have a likelihood of becoming obese,'" predicts a neuroscientist who discovered the brain's center of eating behavior

PHOTOGRAPH BY FRAN COLLIN

Ten, even five years ago people focused on massive crash diets artificially propped up by diet pills. That approach just has to fail. We can't control either our appetite or weight like that. We have to think in more specific terms: meal one, meal two, so much carbohydrate here, protein there. And unfortunately," sighs Sarah Leibowitz, associate professor of neuropharmacology at The Rockefeller University in New York City. "maybe even some fat."

What we eat, from breakfast until late at night, Leibowitz informs us, is powerfully driven by brain chemistry. Not just what but how much, how often, and even how fast we eat is largely the product of a grand biochemical conversation between certain neurochemicals and hormones that break down our meals into essential nutrients and regulate metabolism. This nonstop dialogue does not merely determine whether we feel hungry or sated. It actually turns on or off our desires for carbohydrate, protein, and fat at different times of the day or night.

People eat because it tastes good, because they know it's healthy or because someone gave them lots of it as a kid. Memories, pleasure, social conditioning all play a part in pushing us to eat as we do. But underlying all the experiential software is something more basic. To survive we must generate and maintain a level of energy adequate to our changing internal and external rhythmic requirements. The true goal of appetite and body-weight regulation, according to Leibowitz, is energy balance, or homeostasis. If this sounds a bit mechanistic, that's because it is. Yet the same chemicals that regulate appetite, metabolism, and weight also impact on our moods, levels of stress, physical energy and the quality of our sex lives. "Our emotional life and state of mind," says Leibowitz, "will be affected by every bite we eat."

Her mother was a concert pianist and accompanied her mother who was a leading contralto at the Met. Her grandfather was an obscure late-romantic composer, and her cousin was Samuel Barber, one of the greats of twentieth-century music. Born to such blue-blooded musical

### DISCOVERY MOST PROUD OF:

Disturbances in eating and weight correspond to disturbances in brain chemistry.

### FOOD PREFERENCES:

Loves: salads and vegetables  
Hates: anything with fat

### FAVORITE SPORTS:

Skating, swimming, basketball

### PIANO WORK MOST RECENTLY PERFORMED:

Schumann's Piano Concerto In A Minor

### RECENTLY READ:

*The Hunt for Red October*  
*Virus Hunting*  
*AIDS, Cancer and the Human Retrovirus*

### MOST PROUD OF, II:

"That my work has stood up over time, my research is solid, that I have a full, complete and unified picture from twenty years' work."



ancestry, Sarah Fryer naturally studied piano at Manhattan School of Music and elsewhere. When she traveled to Vienna to complete her musical education, she was "presumed prima." But suddenly, at age 20, she turned her back on the concert stage, returned to New York, married mathematician Martin Leibowitz, and in 1968 got her Ph.D. at New York University in behavioral neurology.

Bamboo into her parlor: at Rockefellar, Leibowitz accidentally discovered that Thorazine injected into the hypothalamus powerfully stimulates eating. Publishing her finding in *Science*, she shifted her research from learning and memory to how brain chemistry affects eating behavior. "Learning and memory was so broad, so diffuse," she says. "You spent a lot of time just arguing your case. Well, I just like to prove my case!"

During the next decade she did just that. Her exhaustive, five-year, mapping study of the entire brain paid off. Not only did she almost single-handedly lay the foundation for an entire new area of research, she did something every neuroscientist dreams of accomplishing: She proved that an area of the brain does something important that no one had ever ascribed to it. She showed that one hypothalamic region, the paraventricular nucleus (PVN), was the pivotal player in the brain's intricate network for appetite control. "The PVN," says Leibowitz, "seems unique in that chemical changes there almost always correspond to changes in eating behavior. The PVN is an integrator of behavior and biochemistry involving nutrient and taste preference, pleasure, and what have you." The PVN "may not be the center of the universe" but could well be the center of the eating universe.

Among many other things, Leibowitz's research has begun to unmask genetically based tendencies toward overeating and obesity. Her increasingly precise index of key biochemical indicators should enable us to predict eating and weight-control problems long before they occur, and so promises to revolutionize their treatment. Our present drugs may be only marginally effective

in controlling appetite and weight, but drugs of greater power and specificity she says will be synthesized. And they will help us to treat and control specific desires and cravings.

She did not perform on the piano in public for 25 years, but after the death of a pianist friend, Leibowitz left compelled to give a recital in her honor. Then she was asked to "perform at the center in Sweden where they give Nobel Prizes." Now, whenever some neuroscientists or feeding people get together, they seem to want Sarah Hyler Leibowitz to play. After she finished talking to interviewer Douglas Stein, she invited him to an impromptu minicliental in the Piano Room at Rockefeller. On the way, Stein asked, "What's it like to leap from the lab to the concert stage?" Leibowitz was quick to answer. "Like pulling it out of the hair. The more you perform the better you are. But for me, it's Boom, and all of a sudden there it is. I feel like a gymnast doing his act. My feet above the ground with no net. Gee, I could use a bit of glucose—you don't happen to have a piece of chocolate in your pocket?"

**Omni:** Why, in today's health-conscious society do we seem to have a greater problem with obesity than ever?

**Leibowitz:** Our energy needs are very different from those of the farmers, pioneers, and soldiers of a hundred years ago. If we were out there fighting and learning, there'd be little fat left. It would be burned off, and we wouldn't worry about weight. Our obsession with what to eat is only going to get worse because we will get more sedentary. From desk to desk, to elevator, to train or car, from home and back to the office, we hardly have to exert ourselves to survive. Yet foods are getting more and more palatable. Our society is notorious for overeating at night. That goes right to fat. We go home, eat, and then sleep right on eating in front of the TV. It would be nice if we could modify our marketplace and social makeup to have an earlier meal when we really need the energy and can burn it up, but that seems unlikely.

**Omni:** So Americans have reason to be concerned about our weight?

**Leibowitz:** You bet. A good 50 to 70 percent of women spend 30 percent of their waking hours worrying about how to diet. What waste of human energy! People pig out in fast-food restaurants on the strip or in three-star restaurants in the big city only to worry about it later. Especially teenagers. They are all absolutely preoccupied with their weight,

and now boys, even men, do not escape this preoccupation.

I've raised three college-age daughters and, fortunately, they're all worked out. But what are kids always talking about? "My ballet-dancer roommate is anorexic and runs her way through the day, and I have these classmates who are bulimic and constantly worry about food." Let me tell you, a large percentage of our young female population has problems.

As a teenager, when you start to see fat on your body, it's scary. And society is only going to get worse unless we revert to the Rubens ideal and just enjoy the fatter body. Fat chance! Who defined beautiful as thin? Yet this is unfortunately exactly the case. Some people have a thin background. I can eat twice what the next person does and not gain—but that's rare. On the street I see terrible, beautiful kids whose lives are ruined because of this preoccupation. I sure as hell would love to tone down all of this hyper concern.

**Omni:** When you started investigating how brain chemistry affects eating, biochemistry was virtually zero and theories were mainly psychological. What did leaping into a new area at the outset of your career feel like?

**Leibowitz:** One very rapidly forgets how one was alone. I had no one to direct me at Rockefeller. But I also relished following my own nose and creating something new. This was more exciting than following in someone else's footsteps. I felt the only way to get anywhere was to be absolutely precise, go straight in and try to pin down the specific brain regions where specific neurochemicals turned eating on and off. So how did I feel? Like I was digging in the dark.

I began in 1971. The studies progressed so slowly because I was committed to mapping the entire brain. Others might have mapped two or three sites in the hypothalamus, but I injected about 20 to 30 sites. At one point I was studying about 500 animals—brain scientists laughed every time I'd mention that. I had no preconceived ideas, so I went everywhere, and one site, the PVN, emerged as a primary regulator of eating and drinking behavior.

**Omni:** When you first presented this thesis, how did colleagues react?

**Leibowitz:** "What is it?" [She pantomimes shock and disbelief.] Then, it was gospel that the PVN did one thing only: synthesize and deliver oxytocin, which triggers milk letdown in lactating females. To say as I did, that a neurochemical like norepinephrine in the PVN strongly elicited feeding, was contrary to their thinking.

Initially I focused mainly on norep-

## DIET FOR A HEALTHY BRAIN:

HOW AND WHEN BRAIN CHEMICALS  
AND HORMONES CONTROL YOUR APPETITE

FOOD GROUP	CHEMICALS	TIME OF DAY
CARBOHYDRATE	Desire for:  Turned on by norepinephrine, neuropeptide Y, cortisol (hormone); turned off by serotonin	Desire strongest:  On waking and early morning; desire decreases as the day goes on
PROTEIN	Desire for:  Turned on by serotonin, opiates; turned off by neuropeptide Y, norepinephrine, dopamine, and galanin	Desire strongest:  Alternates with carbohydrates in morning; rises gradually toward middle of day, peaks at dinner and evening
FAT	Desire for:  Turned on by galanin, opiates, isobuterenone (hormone), turned off by dopamine	Desire strongest:  Desire for fat increases during middle of the day and predominates in evening

# The N.E. THING PUZZLE

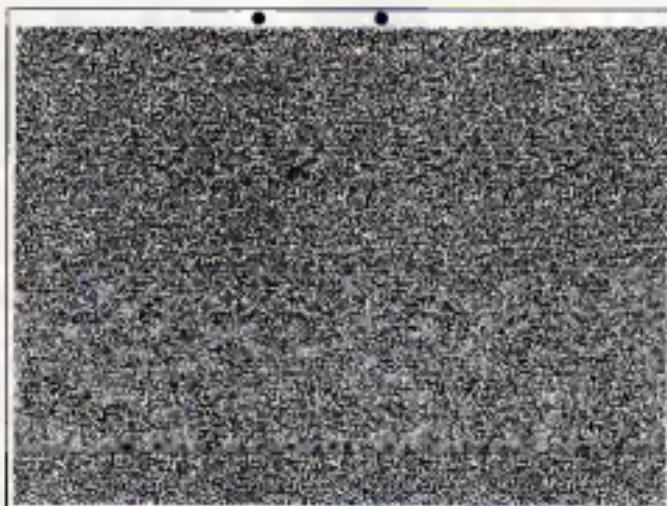
The STARE-E-O below contains seven letters which can be combined to form the name of a flying animal. We will randomly select ten winners from correct entries to receive a free STARE-E-O MAKER software package for either their Mac or PC computer! You must fill in and send us the coupon below for a reasonable facsimile to qualify!

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patient, the illusion is worth the wait!

If you cannot "see" the 3D image, but would like more information, send in the coupon without an answer. We'll send you our catalog, a complete explanation, and more samples!

This N.E. THING puzzle is harder than our last one, so be prepared to use your imagination, and some old fashioned orthogonal thinking. Don't ignore the dictionary or the puzzle will get your head spinning. Looking at STARE-E-Os is good exercise for your eyes but don't overdo it (go outside and get some sunshine or you'll turn into a side street). We hope you enjoy this puzzle. Copy it, share it with your friends, and — KEEP GAZING!



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norepinephrine [NE] and dopamine. In different areas of the hypothalamus, these neurotransmitters had opposing yet balancing actions on eating. NE and drugs stimulating its actions enhance eating and weight gain at one site, whereas at another, they suppress appetite and lead to weight loss—as do dopamine and drugs like amphetamine. Overall, NE and its agonists, such as clonidine, stimulate appetite, while dopamine and its agonists suppress hunger.

**Omn:** Chemicals in the hypothalamus were just a part of the appetite- and weight control picture.

**Leibowitz:** Oh, absolutely. If the hypothalamus is the controller or integrator, it can't just be involved in neural signals but also has to respond to changes in the blood reflecting the animal's nutritional and metabolic state. Hormones are indispensable to converting food into energy and tissue. So during the mid-Seventies, we started to remove different glands from hundreds of animals. This work told us that hormones are needed for neurochemicals to act normally in the brain. The adrenal steroid corticosterone [cortisol in humans] and norepinephrine, we saw, depend upon each other to promote eating. And of course, the number of brain chemicals found to turn appetite on and off and

to affect body weight proliferated. **Omn:** How did your discovery that specific transmitters regulate our desire for specific foods emerge?

**Leibowitz:** In the early Eighties, I began to notice that our animals seemed to eat more or less of different nutrients after neurochemical stimulation, and also at different times of the day or night. Norepinephrine, for instance, was most potent in its appetite stimulation right after the rat woke up. So I started putting a little carbohydrate here, some fat there in the mix to see if changes in what they ate would change their response to the neurochemicals—and vice versa. After struggling with various percentages of protein, fat, and carbohydrate, we finally said in 1985, "Okay, we're just gonna have to go with these pure nutrients and accept that they are not the most natural of diets." And each of these neurochemicals and hormones has proven to be highly specific in stimulating or suppressing appetite for one or more of the macronutrients.

**Omn:** You found what one prefers to eat turns out to be inseparable from the time of day one wants to eat it. So the rat wakes up.

**Leibowitz:** And he's going—as do you or I in the morning—for a blast of carbohydrate. You don't get up wanting to

stuff your stomach with a steak or huge bowl of ice cream. In the morning we are energy depleted because we haven't eaten for 10 or 12 hours. Blood sugar is low, insulin down, and stored carbohydrate—glycogen—utilized and the liver is pretty much gone. We prefer carbohydrate because it's converted most quickly to glucose, and that's what we need to get going. But soon there's a switch to protein, and then to mixtures of protein, carbohydrate, and fat—like we want for lunch.

After we've replenished our depleted carbohydrate reserves and begin to engage in more sustained activities, we need to fuel and rebuild our muscles and fill our fat cells. As the dinner hour approaches, one eats larger and larger protein and fat meals, with carbohydrate dramatically declining. In these later hours, we're looking to store rather than expend energy in anticipation of sleep. So fat, nature's most efficient way of hoarding up calories for future needs, becomes the food of choice.

**Omn:** How do changes in brain chemistry create and reinforce these patterns of food preference?

**Leibowitz:** Appetite for carbohydrate at breakfast is driven primarily by high levels of norepinephrine in the PVN together with circulating cortisol. Both chemicals rise while we sleep and peak shortly after we awake. The food deprivation of sleep is a kind of stress. Because cortisol's primary purpose is to aid in converting energy stored in tissues into glucose for immediate use, it makes good sense that the adrenal hormone and norepinephrine collaborate to make us go for carbohydrate early on.

**Omn:** What pushes us to switch over to eating protein?

**Leibowitz:** At first, mainly serotonin. Both serotonin and NE in the PVN rise simultaneously during sleep to counterbalance each other early in the eating cycle. While norepinephrine commands us to eat sooner, faster, to consume more food in total and more carbohydrate in particular, serotonin pushes us to switch over to protein, decreases overall meal size and eating rate, and ends the meal. Serotonin not only helps us lose weight by turning off appetite as a whole, but it also acts by increasing our energy expenditure. So early on there is a natural back-and-forth tussle between carbohydrate and protein eating.

**Omn:** Suppose we don't eat for a long time after waking up?

**Leibowitz:** Neuropeptide Y springs into action. NPY, which also works with cortisol, is truly the neurochemical of food deprivation. An animal or person whose energy reserves are especially depleted by fasting or starvation



Godzilla vs Rhode Island



# ANTIMATTER

**UFOs IN WASHINGTON:**  
The Fund for UFO Research is working for the cause  
on Capitol Hill

Every special-interest group seems to have a Political Action Committee (PAC) in Washington. So why should it be any different with UFOs? Well, it isn't. The Fund for UFO Research, a Maryland-based organization, has become an unofficial PAC. Although it doesn't contribute to political campaigns, the Fund does raise money for UFO research, conduct public education programs, and even contact congressmen.

The Fund was formed some 11 years ago by a group of UFO investigators and academics interested in raising grassroots donations for UFO research. Over the years, says Fred Whiting, who sits on the board of directors, the Fund has coughed up close to \$200,000 for 20 projects on a range of issues from crashed saucers to UFO abductees. These awards are Spartan by the standards of big science, with most researchers receiving only \$1,000 to \$2,000 a crack. Still, they are princely sums to investigators accustomed to reaching into their own pockets.

But recently, the Fund has taken a political turn. For the first time ever, it has endorsed a specific claim: An alien craft really did crash in the desert of Roswell, New Mexico, in 1947 says the Fund. What's more, says the group, parts of the crashed saucer were recovered by the United States Army and then passed off—falsely—as debris from a weather balloon.

To enhance the credibility of the claim, the Fund is currently funding research, videotaping witness



testimony, and even pushing for a Congressional investigation of the case. Toward that end, Fund investigators have interviewed some 200 civilian and military witnesses, concluding, among other things, that the Air Force has kept news of alien bodies under wraps for 45 years. Don Berliner, another member of the Fund's executive committee says, "You have to consider the possibility that this [what witnesses observed in the New Mexico desert back in 1947] was actually an extraterrestrial craft."

This could be proven during Congressional hearings, Whiting notes, because military witnesses, otherwise sworn to secrecy, could be subpoenaed. With promise of immunity from prosecution, he adds, these people might talk.

Surprisingly, technical journalist and UFO skeptic Philip J. Klass also welcomes hearings. "I contributed one hundred and fifty dollars to the fund," he says. His take on the videotaped depositions, a major piece of the Fund's evidence, however, is decidedly different. "I found them very unimpressive," says Klass.

To bolster its impact, however, the Fund keeps a number of other balls in the air. For instance, it's supporting a project to examine UFO reports dating back to World War II and is studying mysterious reports of helicopters in the United Kingdom. There's also a campaign to ensure ongoing media coverage of UFOs.—PAUL McCARTHY



# ANTIMATTER



## SEANCE FICTION

For those who believe in ghosts but have never seen one, the next best thing may be what professional magician and parapsychologist Loyd Auerbach, Director of San Francisco's Office of Paranormal Investigations, dubs "an entertaining evening of Seance Fiction." For a modest admission and the cost of dinner at a selected restaurant, guests are treated to a lighthearted effort to raise the dead. The hook? All of the restaurants in which the séances are performed are reputedly haunted.

"Our intention is to entertain people," Auerbach explains. "But we're hoping, since we are doing the séances in locations where paranormal phenomena have been reported, that additional things do happen. Of course, the audience

won't know what we've caused and what might potentially be caused paranormally by resident ghosts." —Keith Hamay

## YOGA WINES

In the first round of the war against the New Age, yoga classes were temporarily suspended in a small town in northeastern Georgia. Commissioners from Stevens County and the City of Toccoa voted seven to one to cancel the lessons, following protests from fundamentalist Christians who claimed yoga was a heathen activity akin to devil worship.

**IF YOGA HAS GOT YOU IN TROUBLE, THAT PERSON WOULD HAVE TO RENOUNCE IT FREQUENTLY AND BREAK HIS BONDAGE WITH SATAN. HE'D THEN NEED TO FILL THAT AREA WITH GOD'S SPIRIT.**

Toccoa Mayor Bill Harris was the lone dissenter. The lessons, he says, involve simple stretching and relaxation techniques. "It has nothing to do with religion or anything else. It just makes you feel good."

Harris later called for a public hearing, where the majority of participants came out in favor of yoga. Classes resumed a week later with one minor change: Students were to pay the instructor directly rather than paying the

recreation department.

Philip Lawrence, a Toccoa chiropractor who led the fight against yoga, considers that concession a victory for the separation of church and state. "Yoga has hidden behind a veil of innocence, but it's out of the bag now," he says. "God has exposed it for exactly what it is. They get you to meditate and leave your mind blank. When that happens, you had better look out! You open yourself up to demonic invasion and spirits."

Gerald E. McGraw, director of the School of Bible and Theology at Toccoa Falls College, agrees. Over the past 20

years, McGraw says, he has helped hundreds of people who have "come under strange influences" as a result of the occult.

"If yoga has gotten a person in trouble, that person would have to renounce it frequently and break his bondage with Satan. He'd then need to fill that area with God's spirit—hopefully the Lord Jesus Christ."

Since the Toccoa story broke, Lawrence has received phone calls from all over the world. A

woman in Wisconsin called to say her son was forced to play with a Ouija board in the ninth grade. "I told her to fight it." Another lady called from South Carolina complaining about "New Age" in the public schools. I told her how we were fighting it here."

So far it appears to be a losing battle. Publicity surrounding the class cancellation caused enrollment in the yoga course to double in size. Meanwhile, the protest has all but died down. Mayor Harris had a police car sit out in front during the first class, just to play it safe. He also asked a "couple of big old bruisers," to attend. "It's been very quiet," he says. "No sign of the Devil. I keep looking, but I don't see any horns. No one has grown a tail, either."

—Steve Nadis





## FRONTIER SCIENCE

Some people complain that fringe science never gets a fair shake. Well, at Temple University in Philadelphia, the Center for Frontier Science is trying to remedy that. Under Beverly Rubik, a Ph.D. biophysicist, the Center examines meditation, the potential dangers of electromagnetic fields, and more.

According to Rubik, the Center was created by "an enlightened group of Temple administrators" and is kept afloat by private donations and foundation grants. No research is done at the Center, nor are degrees conferred. Rather, Rubik and staff hold conferences, write articles, and publish a magazine.

Though frontier science encompasses many fields, the Center staff focuses on just four of them. The first area of inquiry is

"consciousness studies," says Rubik, including "meditation and the effect of prayer on health." The second area is electromagnetism, the relationship between electromagnetic fields and the body. Researchers in this field are asking whether power lines cause cancer or VDTs damage fetuses. The Center also studies "energy medicine," including acupuncture and homeopathy, and alternative energy devices, including a technique to extract power from a vacuum.

Sociologist Marcello Truzzi, head of Michigan's Center for Scientific Anomalies Research, heartily endorses the Temple program, which, he says, "helps to legitimize anomalous studies."

Not all far-out ideas are welcome, though. For example, the UFO phenomenon is not testable, says Rubik, so she won't touch it.—Paul McCarthy.

## REACH OUT AND TOUCH SOMEONE

Have you ever formed an image of someone you've talked to over the phone but have never seen? Steve MacDonald carries that notion one step beyond. MacDonald says he can look through another person's phone as if it were a video camera and accurately describe their surroundings. He can even peer into people's souls, he claims, and tell them what the future portends. This kind of talk can either get a person locked up in a nuthouse or put on TV talk shows. MacDonald has pursued the latter route.

The Chicago-based psychic pioneered his new technique, over-the-phone palmistry, in 1987. Since then, he has done about 5,000 readings. He asks his clients to rub the mouthpiece with both palms, one at a time, and tells them what he sees or hears, making predictions up to a year in advance.

MacDonald, at right, has followers throughout the country who call in at 25 bucks a pop. He told one woman that she'd soon be offered a free trip to Florida. A week later, she was given a plane ticket to visit friends in Boca Raton. Another woman phoned MacDonald during an appear-

ance on a Seattle TV show. He correctly guessed that she was planning to buy Oriental rugs and porcelain.

MacDonald also has his detractors. Robert Sheaffer, a writer for *Skeptical Inquirer* magazine, is, well, skeptical. He says that MacDonald employs a scattershot approach. "If a person tosses out twenty things, and one or two are close, you'll remember the ones that are close."

Sheaffer concedes, however, that MacDonald's phone readings are probably as good as traditional palm readings. "There's no scientific basis for the idea that the folds of the palm have anything to do with a person's life or character," he says. "It you can make it up when they're sitting next to you, you can make it up over the phone."—Steve Nadis



# The Artist

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I have a  
creative block  
and can't get  
started

Any suggestions?



It's his kind of  
talent that makes  
the rest of us  
look good.



# INTERVIEW

CONTINUED FROM PAGE 18

needs much more carbohydrate than norepinephrine can get him, so NPY, which is much more potent and long-acting than NE, will take over, driving the animal to larger carbohydrate meals. Toward this end, NPY also supersedes anything serotonin might be doing to switch appetite preference to protein food. In fact, we have recently discovered that animals who love carbohydrates have high levels of NPY in the PVN. Neuropeptide Y not only works with cortisol to give you quick energy, but since it also raises insulin levels, it helps drive that eaten carbohydrate into stored fat. In the lab, two or more NPY injections each day may cause an animal to overeat and get fat.

Omni: Under normal circumstances when pushes us to eat fat?

Leibowitz: The opiates that stimulate both fat and protein gradually rise through the day. People will go for a sandwich, cheeseburger, or maybe chef's salad, where protein and carbohydrate predominate—but where mayonnaise or latrach dressing is jazzing up the works. At the late-afternoon coffee break, people will eat pastry that mixes carbohydrate and fat. Toward dinner the drive for fat becomes stronger still because the peptide galanin, which stimulates appetite for fat—and nothing but fat—is on the rise.

Galanin and the opiates are countered by dopamine in the hypothalamus that suppresses both fat and protein intake. But dopamine seems to fight a losing battle in the later hours. I could show you these huge fat meals—just tremendous, of almost straight fat—that our animals consume purely as a result of a shot of galanin into the PVN. To make sure we eat fat during the second half of the day galanin not only suppresses citalopram, but also controls the powerful catalyst of early carbohydrate eating. We've recently found that animals who eat lots of fat and gain weight have high levels of galanin in the PVN. Galanin is one of nature's more emphatic ways of making sure eaten fat turns into stored fat. It works to decrease energy expenditure at times when activity level is naturally declining.

Omni: Is there a link between the body's thermostat and its "appetite?" Leibowitz: Temperature control is a hard-wired, indispensable-to-life thing. But our sense of how foods make us warm or cold is highly emotional. The functional link of the thermostat and the "appetite" is clear in the way our food preferences change between summer and

winter. People like the Eskimo consume much more fat, but don't necessarily get fat. To make one of their favorite desserts, they take walrus blubber, put it in a bowl, and knead it, knead it, and knead it some more. When it's a 100-percent fat, they throw on some berries to make it a little sweet, then hand scoop it into their mouths. Now that just grosses me out, but the point is, in that tremendous cold, they burn lots more fat to generate body heat.

Omni: You've seen that when animals can select what they eat, they show individual preferences similarly to people. Leibowitz: Our animals fall into three subgroups. About half choose carbohydrates and consume 35 to 60 percent of their daily calories in carbohydrates, a small group opt for protein, about 30 percent of the animals eat maybe 60 to 70 percent of their calories in straight fat. Those who eat fat consume the most calories and weigh the most.

Fat lovers consume a huge, overwhelming fat meal during the seventh hour of the eating cycle, a time when food consumption in the other two subgroups hits bottom. This seventh-hour fat meal fascinates me because the neurochemicals that control it may hold the key to what is really different about those who love fat and become obese. Galanin is obviously a major suspect, but maybe it's also low dopamine. For people, this is the later afternoon, when there's a lull, and activity in the workplace is dying down. Many researchers have focused on carbohydrate binges here, but this may be an oversimplification. The afternoon snack may mask a "pre-eating" for later fat urges. Perhaps it's a preliminary surge priming a person to consume larger amounts of fat late into the night.

Omni: Do chemical abnormalities you've found in these studies correlate with overeating or obesity?

Leibowitz: Yes. We know that overeating best corresponds to raised levels of specific norepinephrine receptors in the PVN. These animals also show raised levels of galanin and NPY. Now the Zucker rat, a genetically obese strain, also shows raised NE and NPY and enhanced expression of both the galanin and NPY genes after puberty. So both the overeater and the genetically obese rodents consume an excess of fat and turn an excess of eaten carbohydrate into extra body fat. And both allow abnormal levels of cortisol and another adrenal steroid, aldosterone. But are these neurochemical and hormonal changes the cause or the consequence of overeating and obesity?

To clarify this, we've started to work on newborn animals. The Zuckers



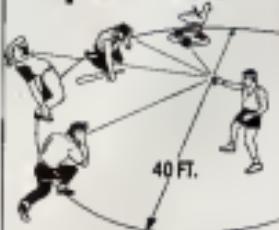
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show some neurochemical and hormonal changes, even at weaning, and they're already fat at puberty. We think this situation will hold for people. Those tending toward excess eating and obesity will show it early on, but the neurochemical and hormonal excesses and deficiencies will unfold in stages from early childhood to early adulthood.

In our studies with developing rats, we've found that patterns of nutrient preferences and weight gain are apparent at a very early age. Whether an animal has a strong preference for fat or carbohydrate in adulthood is apparent on the first day after weaning. Also weight gain during the first few days after birth predicts the body weight of the adult. It is interesting that animals that love to eat sweet solutions at an early age are more likely to gain weight and become fat later on.

**Ours:** Are girls and women more likely to gorge themselves with sweets and guys to indulge in orgies of meat stuffing? Lebowitz: Hey, some women just love a large steak! I myself can't stand it. But yes, in our studies with young animals, we've found that females love carbohydrate, possibly because of their greater adrenal activity and higher NPY levels. This is different from the males, who love protein to build muscles. Only after puberty do the animals begin to eat lots of fat.

Women are more vulnerable to carbohydrate abuse. Males go for the heavy mixes of protein and fat. Women are just set up to crave sweets, and that will lead to abuse. Late afternoon carbohydrate snacking and binging is much more common in women. Many seem to need carbohydrate on a regular basis throughout the day, but others skip breakfast and pay later. The circadian element is a big factor in eating problems. The Zucker rat can't go without eating because it has a flat circadian. It eats constantly day and night; it's just lost the natural rhythm.

**Ours:** Why are crash diets and pills so ineffective?

Lebowitz: This is a crippling trap people get sucked into. They feel, or are made to feel, horrible about how they look. They start dieting, vow to hold out as long as possible, and then when a craving becomes unbearable, resort to so-called appetite suppressant drugs. In the short term, food restriction is going to put you in a psychologically altered state. You're going to respond differently to almost everything. Skipping breakfast changes the pattern of neurochemical and hormonal interactions. The rhythm of alternating carbohydrate and protein meals is deranged at the outset. The longer you fast, the higher sub-

stances like galanin, NPY and cortisol will climb. So when you start eating again, it's tremendously difficult not to eat large meals of carbohydrate and fat.

Diet pills don't work because every meal and appetite for it is regulated differently, so you'd need different sets or combinations at different times of the cycle. What do people use? Either over-the-counter stuff, whose active ingredient, phenylpropanolamine, is basically fake amphetamine, or prescription drugs—things like antidepressants and serotonin agonists. All have one big problem. They target only monoamines—dopamine, norepinephrine and serotonin—and have little or no effect on the neuropeptides or steroids. Supermarket pseudo-speed aspects to mimic dopamine suppress protein and fat eating. But even if successful, it doesn't operate early in the day and doesn't suppress carbohydrate cravings.

Antidepressants that generally raise both norepinephrine and serotonin may actually lead to weight gain. Specific serotonin imitators work well on reducing carbohydrate meals but may have little dampening effect on the larger protein and fat meals. Serotonin drugs may initially reduce overall appetite somewhat, but the question is, are they effective in controlling body weight over a long time? Attempting to lose weight on these compounds is really a struggle.

**Ours:** What about blockers against galanin and NPY?

Lebowitz: Because the neuropeptides are so much more potent and long-acting and specifically target fat eating and deposit, drugs suppressing their synthesis or blocking their receptors hold great promise. Effective antagonists will definitely help people. Unfortunately, so far, we don't have any for galanin or NPY. Even if we did, there's the problem that peptides, as small proteins, would be digested in the gut before they ever reached the general circulation. Even if we gave them intravenously, they wouldn't reach their sites of action in the brain because peptides don't pass the blood-brain barrier. Drug companies are working fast and furiously to make drugs that are not peptides, but mimic them.

**Ours:** Have you felt an increased need to help people?

Lebowitz: I've always felt a need to help people. Yet I wrestle with that question daily. How should we use what I've learned? I went through years trying to learn about how the brain worked. My interest in where and how these neurochemicals act and interact—drove me to research for a long time the temptation to say "I want to solve obesity!" I felt out of place at "feeding" meetings, be-

where and how they act and interact—drove me I resisted for a long time the temptation to say, "I want to solve obesity." I left out of place at "feeding" meetings, because for me, feeding was a tool to understand the brain. That pure drive continues to be of paramount importance to me.

Now I've come around to trying to understand feeding and body weight regulation. Last fall, the National Association for the Study of Obesity and the Society for the Study of Ingestive Behavior merged. I was asked to speak about the brain mechanisms controlling fat intake and their relevance for appetite and weight gain in people. Each year I speak at more of these meetings, so, yes, I'm now a legitimate "feeding person." I clearly have to be more than a neuroscientist.

**Orvin:** Can your findings now be applied to people?

**Leibowitz:** Although present drugs are only marginally effective in controlling appetite and weight, drugs of greater specificity and power are on their way. They will enable us to target and treat specific desires and cravings. We now have the tools for defining the neurochemical profile for every meal in the day or night. Right now, we could begin to predict and possibly counter people's problems early on. We can predict height at two years of age, and with a few more tools and analysis of eating patterns in infancy, we may be able to predict adult eating behavior and weight gain. Say a person has a fat-intake problem. Can we restrain him with behavioral or drug techniques to restrict his fat intake? If we can get them early enough, we may be able to teach them not to enjoy fat quite so much so they won't just have to have it. If we can predict that we're going to love to eat this or that in the morning versus the evening, we can plan to eat somewhat differently. If we must have that fat, perhaps that should be earlier when we can burn it more and there's less galeana around to reduce our metabolism. These neurochemicals can be modified by what we eat so that they begin to work with, rather than against you. If we can set a strategy, a routine for months and years to come, then we can work with it. If suddenly we decide to change everything, such as with a crash diet, we're in for trouble. That's what dieting is for most people: NO EATING TOMORROW!

**Orvin:** Is genetic analysis becoming a part of this?

**Leibowitz:** My lab is looking at gene expression for galanin, NPY and other chemicals at earlier and earlier ages. We are also examining how hormones

control the expression of these genes. Perhaps in years to come we'll be able to look at your genetic profile, analyze the relevant part of your chromosomes, and say, "Oh, because your genes are thus, you have a high likelihood of becoming obese." Then someone clinically inclined might say, "Okay, if you eat 2000 calories a day, you'll be X weight, maybe even X percentage of fat, at age 20. So here's the program I suggest you follow."

This kind of early intervention has frightening implications. Once we know what we're going to become, we'll certainly worry about it. Unless the strategy is carefully planned and supervised, there's potential for causing im-

mense suffering. Knowing what we're going to become long before we become it could wreck us down the road to a highly regimented existence.

Once we find a gene, we can spend years trying to define the physiology the gene is controlling. Also we may define a gene that encourages obesity, perhaps controls insulin or steroid secretion, fat deposition and energy metabolism. But another gene very likely determines the desire to eat fat. I believe this will be a multigene process; that there is no single gene for obesity. In the end, we will have to treat the whole person. And neuroscientists, biochemists, and geneticists will need to work closely together in this process. **DO**

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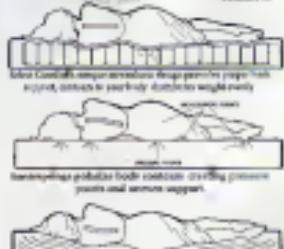
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lest strings, seductive in their rhythms, and am afraid to enter. Beside one, a man in a conservative blue suit wears a dagger slicing the abdomen of a young boy. Red dove and oil explode from the wound. Plants with teeth shatter the pavement, paper garbage grows wings and flaps off into the night sky. An old man scurries past, bleeding from a dozen cuts, clutching a television set to his chest. In a brightly lit restaurant seven skelets and their walled women begin dancing to a tune by Prince.

The street noise has reached a crescendo ("I'm not getting a response! Code Blue! Stat!"). Time to escape. I know, but I am still frightened of the doors. I did not plan to escape this way. My legs are cold, as if immersed in chill water, my thoughts are eddying, insubstantial, and I feel I am shrinking inside my skin. I buy a sword from a middle-aged man with a bushy Stalin mustache and a fancy uniform. The sword helps stem my fear, settles my dissociate feeling. I turn toward one of the doors and spot an Arab man in camo gear standing beside it. A soldier, a veteran. His eyes are blurred like dirty windows in rain. His deep wounds are invisible. As I approach, his eyes clear to imbedded glass and I see the shocks of combat staring in them, seductive rhythms that echo those I have glimpsed beyond the doorways. Like me he is no longer political. I know I can trust him and staring at him, I lose my fear, I yield up my last hopes, my fond memories—oh, the times I've had! Somewhere in the packed mosaic of states a bar mirror clouds with the smokes of my regret. This soldier and I have not even language in common but as new and brighter shocks singe the skin above my heart, sending me jumping like a fish stranded in that other world, we confide in one another, we share the holy knowledge of the fallen. This we say entering the door, still cautious, unsure, yet growing more secure on sipping the cool air of the courtyard into which we move. Its vast and defined as the temple at Karnak or the Valley of the Moon. . . . this is honor, we say, this is the black answer, the abyss, the undoing, but we also understand that this is resolution, this is peace, this is how all nightmares must end; how all good dreams begin in the season of the Hellfire missile. In the false spring of the American spirit, in the age of Saddam Hussein

—Lucius Shepard

#### THE PRESERVATION OF LINDY

My second wife, Manana, wanted to have a holographic preservation made of us but I told her, fine, we couldn't afford it and, second, I didn't believe in preservations.

I knew I should have mentioned the one of my daughter, Lindy, kept in the spare room. Finding me in it made her angry and jealous; there are some things that she doesn't understand.

I hadn't visited Lindy for a long time. The courtship and marriage to Manana had brushed the past aside. But the anniversary of Lindy's accident made me want to see her again.

Once a nursery and then my first wife's sewing room, crammed with Jake's and Lindy's childhood things, sparsely blankets, suitcases, an outdated encyclopedia, the room was nostalgic and quiet. I found the frame and, after moving a bookcase and a box of old

I have  
scratched and scratched  
in my mind  
to remember the real  
Lindy, but  
it all is overshadowed  
by the  
vividness of the portrait. ■

clothes, I managed to set it up.

Standing before the slatted door, I hesitated a long while. When this portrait had been made, no one had known that Lindy would only live another few months.

The perfection of Lindy's preservation stopped me from seeing or hearing my little girl any more. Either I had been a distant father or Lindy a perfect child, no tantrums, grazed knees or embarrassing events with boyfriends came to mind with any clarity. Like a persistent clanging bell, Lindy behind the door has drowned out all other memories of her. I have scratched and scratched in my mind to remember the real Lindy, but it all is overshadowed by the vividness of the portrait. It is all I have of her now.

Which was why I was philosophically against Space-Time-Sensory Preservation Portraits. They are too strong, too real. They wipe out the ephemeral and confused process of human memory by being too good.

I opened the door and stepped inside

Lindy sat at a plain table. A touch of sullenness tipped her mouth as she looked down at paper art prints on the tabletop. She was tidy, clean, her clothes soft and comfortable looking, her thick brown curls bursting out from a blue half-turban. Her face and nose were long, like her mother's, but her chin and hair and solid tall frame were from my family.

She didn't move at first but her eyes looked up from the table to me, the beholder of the preserved moment.

Lindy smiled. "Hello."

One could see a hint of the teasing, tart fun in Lindy's personality. She was nobody's fool but she liked to laugh. Then she shuffled the papers together and placed them on a square paperweight, which had been under her elbow. Her feet shifted on the tile floor with a soft scraping sound.

The preservation flickered like a badly cut film, as the loop started to run again. Again Lindy leaned forward, gaze on the table. I walked around the table to stand behind her. She looked towards the door. "Hello."

I saw the mole on the back of her neck, just visible when she sat up straight and tilted her head. I saw the indentations in her skin where her elbow had rested on the paperweight. On the floor behind her was her handbag, worn on the strap. Out of the pocket jutted a corner of the book that she had been reading that day. I couldn't read the title and, out of curiosity, wanted to pull it out of the bag but I knew that there was nothing really there to touch.

I circled back to her face. Her hands and lips appeared slightly chapped. It had been winter at the time of the preservation. Rain fell on the window the skies were gray and the roofs of neighboring houses wet. I heard water dripping from our eaves.

A flicker. Her eyes raised. "Hello," she said again.

As I stood there, a memory within a memory, the ring of lasers stared at me from the floor. I felt odd seeing them make the record—as if I had intruded and the next time I would be in the preservation, too.

I heard an unexpected noise and saw Manana, my wife, peering through the slatted door. I was immobilized by her look of wonderless fury. She stared first at Lindy, then came inside.

She turned to me. I was trying to think of an explanation when she put her face very close to mine, looking at me intently.

"Manana?" I said, uncomfortable in her scrutiny.

She screamed, suddenly, shortly and bit her knuckle as if to stop herself.



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Then she grasped both my hands.  
"Good God! It's really you, isn't it?"

I laughed, realizing that she had  
thought I was part of the preservation.  
Lindy was shuffling prints again as I  
swept my hand in introduction. "Mariana,  
meet my daughter, Lindy. Lindy  
this is your stepmother."

Flicker. A sudden look and then  
Lindy's eyes raised again. "Hello." Her  
gaze was just off Mariana's face.

"I thought you didn't believe in pres-  
ervations," Mariana said irritably.

"Well, I don't. This is why. This is all  
I can remember of my little girl. One  
memory that's all."

"I thought you said you couldn't afford  
them," she continued.

"No, we can't." I looked at my wife.  
She wasn't happy with me. Could I explain?  
You don't understand the power  
of these things. They have such a  
presence that they wipe out all natural  
memory. Like seeing yourself in the  
mirror every day—it's always a shock  
when you see a photo five years old  
and realize that you have aged. You  
just can't remember I can't remember  
anything about Lindy. Nothing that  
feels real anyway."

"That's silly. It's like not believing in  
photographs or anything not written down."

Mariana watched as I collapsed the  
door, lasers and viewing milieu into  
something barely larger than a good  
world atlas—all containing Lindy, her  
prints, her table, the gray rain on the  
window and the neighborhood beyond. As  
I slid it on the top of a wardrobe, I  
thought, goodbye for now, Lindy sweet  
heart.

"You wouldn't want to be reduced to  
just this, would you?" I asked her.

Mariana just gave me a sharp look  
it wasn't the last I heard of her wishes.

One morning, several months later, I  
opened an envelope and told Mariana  
the news. We had a refund from the tax  
office, a free and handsome windfall. It  
wasn't often that there was good news  
about money.

Immediately she said, "We can afford  
a double preservation portrait then."

I had forgotten the entire issue but  
from her promptness it was obviously  
uppermost in her thoughts.

"I thought I told you that I don't believe  
in them."

"But you have one of your daughter's."

"Experience is the reason I don't believe  
in them."

"Why don't you throw it away?" she  
challenged. "Or let Jake have it?"

Jake, my son, lived in a different  
place every six months. He would lose  
Lindy within a year. I opened my

mouth to say so but Mariana, the im-  
pending storm now fully developed with-  
in her, threw her napkin on the table  
angrily.

"You don't care about having any-  
thing to remember me by," she said.  
"You never photograph me; you never  
have kept any notes or cards that I  
gave you; you don't even look at me any-  
more!"

"Mariana! Not true!" I said. "I don't  
want anything but you to remember. I  
want to see your face every day not  
some unreal thing. Just this morning I  
was watching you sleep and thinking  
how lucky I am. I was remembering the  
day that you came to dinner and we sat  
on the floor, listening to—"

"Words words!" she said, weeping  
and sounding completely forlorn and  
wounded. "Just go and spend your mon-  
ey on whatever you like!" She ran out  
of the room.

Had I really neglected her so badly?  
I was devastated to discover that she  
was so hurt by what now seemed to be  
my pat quirk.

It took all the tax money plus a bit  
of savings to do a single portrait of  
Mariana.

I asked for something simple and  
everyday.

In her preservation, Mariana stood at  
the window in our front room and  
pulled the heavy curtains open, her  
arms outstretched, her back slightly  
arched. Mature, yet like—beautiful, el-  
egant, casual. The sun came in on her  
face, diffused by the lace curtains. She  
turned her head and smiled at me lovingly,  
pleased to be asked at last.

It used to remind me of how she  
looked when she first came to visit me  
months before we were married. It was  
a beautiful memory before it faded.

I believe in preservation portraits again.

Lindy was a special case. She  
didn't outline her preservation and her  
loss was such a shock.

But Mariana lives on and on, I see  
her face every day in various moods,  
aging and growing a little sour and  
impudent.

I am happy that we preserved my  
bride Mariana. She doesn't know how  
the memory sustains me.

—Leigh Kennedy

### THE DESERT OF TIME

"As time machines go—" she sniffed,  
allowing the first fragment of an expres-  
sion not pure misery to show through  
the tears, the sobs, the hysterics she  
had ground him down with for what  
seemed hours and hours now—"it's

very—how do you say?—user friendly."

Although, back in Utah, he had friends in the Computer Science Department who used things like "user friendly," it wasn't a term he was prone to say at all.

The expression was on the left side of her mouth and over her right eyebrow. Where she sat on the iron-frame day bed, looking down at her hands that had gotten red from twisting and wringing at one other, it was already breaking up on her face. Though it was not quite a smile, in the hot air seaching from the sandy wastes outside into the whitewashed room that held them in its silence, he tried to grasp it, hold to it, wondering desperately (as he did each time she seemed, for a moment, somehow closer to what he could recognize as logic and ordinary sense) how he might bring it into a smile and then on into flowing and liquid laughter. She could laugh so beautifully. But now it was so long since he'd seen it. "What you're trying to tell me is that I'm not a very lucky tourist on a fluke vacation from a wife, two kids, and a graduate teaching assistantship in the Painting Department at the University of Utah, and you're not from that kibbutz you keep telling me isn't in Israel. But rather—now let me get this straight—you're a time traveler from a different planet who—"

But the tears and the noise of her crying smashed out again at him and she huddled back on the day bed (even in an inexpensive guest house forty kilometers outside Munnakosh, he had hoped for better beds), with a violence that made something in his chest knot to pain that made a kind of echo pulse low in his throat to a rhythm that was not his heart. When it had begun, he'd really thought it was some sort of joke, which is why he'd even bothered to go into it. But now, so much later, she was still sitting there, sobbing—and he was still standing there, lost in the ugly vacuity of her crying and, yes, craziness. A beautiful, black-haired girl, he thought, an ardent like himself intelligent, fun—and a live-day affair that, he was sure they were both sure would have no repercussions once she took off to Zimbabwe and later that same afternoon he caught the bus to take him to the ferry that would get them across to Sicily to meet up with Nancy—only now, it seemed, she was crazy!

This woman with the perfect English and the charming accent was starkly, rivetingly institutionalizable, complete with little green bean and lime machines and flying saucers.

Then his legs began to shake. So he sat down, a little harder than he intended,

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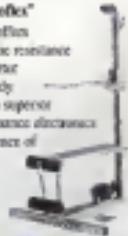


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ed, on the rug by the low tea-table with the tarnished brass tray.

She was saying (between the hiccups that had repeatedly come and gone throughout her upset), 'A whole different dimensional matrix,' or something like it. And then 'You fool—you fool—'

"I thought" he countered again (he'd said it many, many times—already, you'd like it—that you'd be pleased. Really. I didn't know it would upset you). He was sweating. The neck of his light weight cotton shirt was soaked and the cloth clung, too, to the smell of his back—through the single sentence he'd repeated in each of the letters and postcards he'd written that week had explained how, because of the dry heat here, you hardly perspired at all.

He looked at her some more, because under the onslaught of her tears, after he'd grown used to feeling helpless, that was all there was to do. Her black hair, fluffy around the little cap she always wore, he'd thought quite lovely. It was still...lovely. He knew she didn't pluck her fine eyebrows—because, back at home, Nancy did. (Whatever little problems there'd been with Nancy stalled three years now on her master's thesis, not to mention the kids, there'd never been anything like this.) It was supposed to have been so easy. He really wanted to get back; it seemed absolutely forever since he'd seen her. But he was not with Nancy now. He was here with... (He took a breath.) Her rather long face was—yes. Intelligent was the word. Not beautiful. Intelligent. Only, now it was puffed and teary from what he gathered, checking the ludicrously ornate quartz clock the guest house manager had hung on the back wall, was about ten minutes into the next hour of darkness.

But again she was a little quieter. He thought I can only try once more. Darling, he said. He'd started calling her darling because it sounded kind of three, and he was really into now and stuff, and it had become habit the easiest thing to repeat. I'm an artist. You showed me those pictures you said you'd made—and I thought you were an artist too. An artist likes to have his—or her—pictures seen by people. You said you would like to be famous and known throughout the world—you said it would be fun. You had two sets. You said I could look through one. Well, I have this friend who works at one of those sick fancy American magazines in New York—with all the advertising? That beautiful self-portrait you did, of you looking at the picture—I just thought I'd take it and send it to her.

She might want to see that one. They pay quite well, and everyone can use a little money . . . ? It's just the kind of thing they'd like. Really. But that's all. Look, if she writes you that she wants to use it, you can always say no. Or that someone else has already bought it. Or that it was a mistake. Or—

A whole different dimensional matrix... she was repeating, shaking her head.

Look," he said suddenly "this business about time machines and the pictures being part of it—you look at the one or that one say the right magic word—and suddenly that's where you are—and that's wonderfully imaginative, darling. But it's also crazy. That's—just not how time machines work! They have—dials and levers and things. Strange chairs made outta cabinets that you have to climb into. Test tubes I think. And bus bases. Time machines."

•Then,  
because it really was  
crazy  
what she was saying,  
he stood  
up suddenly, turned,  
thinking: I  
can't take this any more.

are very old fashioned, you know—

But she was leaning forward, clapping her hands (again and again) in a desperately imploring manner. "I mean I going to Zimbabwe, when I leave here," she cried, almost like someone not crying. "I was going to Delft Seven-Eighth Century Delft—but that doesn't matter. How many times have I told you that. I'm not an artist—I'm just very interested in the art of the very strange, odd and bizarre, bizarre, bizarre boozie word. Oh, please try to understand. The two sets—those from one set get me there. I look at it, say the—your right magic words, that's what it would seem like to you. And I leave. Then the second set allows me to leave. Some different words this time. Time machines aren't old fashioned. They employ a very delicate, very sophisticated technology. But it's the reproduction. If the pictures are ever reproduced, all the energy costs—

Only here because it really was crazy what she was saying, he stood up suddenly, turned, and walked into the

next room, thinking: I can't take this anymore, I can't take this. I can't, the words coursing through his mind again and again and again. In was not the first time he'd found himself having to flee her logic or her tears.

But—in the other room—she kept on, trying to explain, once again, her voice low (because she didn't want the hysteresis to overtake her once more, really, she didn't)—the energy is dissipated. That self-portrait was me learning here. It's ever reproduced, in hundreds, in thousands of copies, even in the future, as long as it's in the same time line, then the releasing energy is cut by hundreds, by thousands of percent, and I—and you and everything around me—get trapped in the bit of time I was visiting between the two pictures, don't you see, just going around and around, never able to leave it, going through the same time, just before the picture, again and all over again. And we never get out! Oh, I know it sounds impossible. But it is true. It is. Oh, how many hundreds and thousands and millions of times do I have to tell you it's true?—at which point the full terror of it is lost on her, again.

And—again—she cried and shook and howled and huddled like some mad desert creature caught in the impinged iron jaws of a trap from a wholly alien northern clime and culture.

And again in the front room, he took a breath in his soaking shirt, sat down at the desk (again), and wrote his seven billion letter explaining that in the dry heat here you did not sweat. And his twenty-eight billion post card. Then—again—he went back in to talk to her. —Samuel Delaney

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## muscle

CONTINUED FROM PAGE 46

dragons and that her attacking immune cells were knights bearing lances.

Although it doesn't always work, the use of guided imagery can help even the most desperate of patients nurture a fighting spirit and a will to live. As Stephenne Simonson puts it, "There's no such thing as a false hope. In the absence of certainty, hope is simply a stance you take toward an unknown outcome." For anyone with a life-threatening disease, this is an essential and potentially life-saving truth.

You don't have to resort to hypnotism to begin to use your brain as a weapon in the battle against aging. Programmed relaxation techniques like meditation, which are actually similar in many ways to self-hypnotism, may do the trick in and of themselves. When the psychologists Charles Alexander of the Maharishi International University in Fairfield, Iowa, and Ellen Langer of Harvard University taught Transcendental meditation (TM) to a group of octogenarians in eight Boston-area nursing homes, 100 percent of those who practiced TM for 20 minutes a day were still alive three years later, while 38 percent of their peers who did not meditate had passed on. This is reminiscent of legends of Himalayan yogis using similar techniques to live more than a hundred years. "Of course, these stories have to be taken with a grain of salt," Alexan clarifies, "but meditation does seem to extend life."

Alexander is one of a growing body of scientists who believes that we can muster the power of our brains to stay healthy, to heal ourselves when we're sick, and—quite possibly, even to extend our life expectancy. I'm definitely in their camp; in fact, I think that the guided-imaging techniques of the Simontons and the hypnotic approach of Carter are just the beginning. I'm convinced that within the next ten to twenty years we'll gain such a thorough understanding of the mind-body link—and develop such powerful techniques for strengthening and exploring that link—that spontaneous "miracle cures" will become more and more frequent, and many of us will actually be able to use our minds to effect what amounts to the ultimate cure: to add length to our lives. **DO**

## HOW TO GET LONGEVITY

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# GAMES

## ODD ENDS:

Readers' puzzles and something new about the penny and the queen of spades

By Scott Morris

This month we present some reader contributions and other new puzzles  
(Answers at right.)

1. MAP-AMERICA GAME Our column on wordplay last May inspired Kelly P. Ronayne of Alexandria, Virginia, to create the puzzle at right, a poem he calls "An Inlandized State." Can you decode it?

2. NAME GAMES: The same column led Roy Maltby of Calgary, Alberta, Canada, to note that the words "nights" and "things" have the same letters but have no phonemes in common. All six letters have different pronunciations in the two words. When I related Maltby's puzzle to Will Shortz, the editor of Games magazine, it reminded him of a puzzle of his own. The clue is "Amy training camp for Hitler youth." The answer is two words that rhyme but share no letters in common. What is the answer?

Dloyd King wrote from Oxon, England, to submit several original puzzle ideas. Here are three of his most challenging.

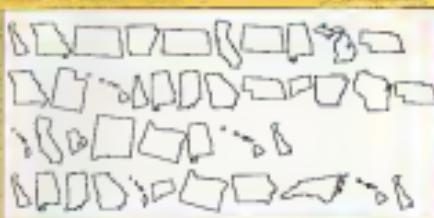
3. MBIT: Which is the odd one out?  
A. TOR  
B. SHOP  
C. RATE  
D. DIRECTOR  
E. SIGN  
F. ANTIC

4. COMPLETE THE SERIES

2 9 17 9

Choose from these

1 2 3 4 5



5. WHAT: What is the next word in this sequence:  
REDDEN, SEAM, BLEIN,  
HATRED, DENSE, AMBLE?  
6. ODD: Marc Glass of Jeffersonville, Pennsylvania, asks which of the following numbers is most different from the others:

- 1) ONE
- 2) THIRTEEN
- 3) THIRTY-ONE

7. BREAD BREAK: After devouring the German translation of *Omni Games*, Tim Schumacher of Wittenau, Germany, wrote to offer this deceptively simple problem: Three men hiking in the desert decide to have lunch together. One man has five loaves of bread. The second one has three loaves. The third man has eight cans, but no bread. He proposes they divide the eight loaves into three equal parts, and he'll give the eight cans to the other men in exchange. How many cans will the first man get, and how many will the second man get?

8. HORSE AROUND: Mel Stover of Winnipeg recently

showed us this new tabletop puzzle (below left). He arranged five toothpicks to create a horse pointing toward the left. Can you move just one toothpick to a new position and leave the horse oriented in another direction?

9. PENNY ANTE: Spin a new U.S. penny on a flat glass tabletop. When it comes to a stop, will it more likely be heads or tails? The odds aren't 50-50.

10. YOUR CARD SIR: Magician Stan Cohen of Washington, D.C., has seen something new in the cards. On six decks made by the U.S. Playing Card Company, the queen of spades appears to be holding a card with six spades on it. This leads to the following trick: Cohen removes a card from a deck and puts it face-down on the table. He offers another deck (stacked) and you pick a card—the 6 of spades. "My prediction is on the face-down card," he says. You turn it over and it's the queen of spades—holding the 6 of spades.

### ANSWERS

1. Substitute the postal codes of the pictured states and territories and get this

short poem  
DE MO IN DARK  
S CA NO AL MINE  
MO LITH IN H AL IN G A  
NE CTAR WINE  
VI CAR IN M DR AL HI DE  
DE AL IN B A  
VI CTOR IA N C HI DE

Ronayne's riddle for the puzzle form is itself a string of postal abbreviations:  
MA P A ME RI CA GA ME

2. Nazi ROTC

3. Put letters in the spaces to make six words: ACTOR, BISHOP, CURATE, DIRECTOR, ENGIN, ERATIC. Obviously, ERATIC is the odd one out because all the others are occupations.

4. 2. To complete the series, read it in a mirror.

## S E T I E S

5. WHAT is the next word in the sequence? The first 17 letters (from the "R" of REDDEN to the "T" of HATRED) are repeated in the same order.

6. The number 2 (if it's the only even number).

7. The first man gets seven cans and the second man one. Every loaf of bread is divided into three pieces, totaling 24 pieces. Each man gets eight pieces of bread to eat. At the beginning, the first man has five loaves (15 pieces), and the second one has three loaves (nine pieces). The first man eats eight of his 15 pieces himself and gives seven to the third man. The second man, eating eight of his nine pieces, gives only one piece away. That's why the first man gets seven of the eight cans.

(Answers 8 and 9 will be given next month.) **DO**

