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# FIRST WORD

## FREE LIBRARIES: Are they becoming extinct?

By Octavia E. Butler

Octavia E. Butler's latest novel, *Parable of the Sower*, will be available from Four Walls Eight Windows in November of this year.



On April 29, 1988, I stood on the corner of Fifth Street and Grand Avenue in downtown Los Angeles and watched black smoke pour from the windows of L.A.'s Central Library. The big library, which I loved, and in which I wrote my first novel, was a victim not only of arson, but of years—decades—of neglect, political bickering, and short-term thinking. Ironically by the time of the fire, the building's long-needed renovations had finally been scheduled. This year, those renovations made all the more urgent by the fire, will be complete—just in time for another, broader library crisis.

All over the country now, public libraries are in as much danger from shortsighted budget cuts, political expediency, and neglect as the old firetrap Central Library ever was from fire. The L.A. Library fire was a metaphor for what's happening to libraries in America. Some libraries have already been closed. Others have had to cut hours, staff, services and acquisitions.

This is not sensible! We Americans of the 1990s are sending our unskilled and semiskilled

jobs away to low-wage countries just as fast as we can. We're hoping that the long-term result of this will be to stimulate enough of an increase in trade to create new, better-paying jobs. Of course new workers will need more education to get those jobs, and displaced workers will need job-market information and retraining. But meanwhile, we're saving money by cutting school budgets, closing school libraries, raising university tuitions and fees, and dismantling or closing public libraries.

In my most recent book, my main character, who lives in a poorer, dumbar near-future time, writes, "Intelligence is ongoing, individual adaptability." And, "Civilization is . . . a means of combining the intelligence of many to achieve ongoing group adaptability." Just so. And in the present time of great change, public libraries, like public schools, are among the best tools of adaptation and civilization that our society has.

Public libraries in particular are the open universities of America. They're free, they're accessible to everyone, they may offer special services to shut-ins, to children, even to nonreaders. They offer worlds of possibilities to people who might otherwise be confined by their ignorance and poverty to continued ignorance and worsening poverty.

I'm a writer at least partly because I had access to public libraries. I'm black, female, the child of a shoeshine man who died young and a maid who was uneducated but who knew her way to the library. I'm also a product of librarians who read stories to groups of avid little kids and taught them how to look for books about mythology and horseres, dinosaurs and stars. At the library, I read books my mother

could never have afforded on topics that would never have occurred to her. I escaped from bad books that seemed intent on teaching me how dry and dull reading had to be. At school, I learned that reading was work. At the library, I learned that it was fun. And because the high school I attended had no creative writing classes of any kind, I got all my early information on the craft and business of writing from the library.

The trip that I made to the L.A. Library on the day of the fire was part of my effort to pay back a little of what I felt I owed to libraries in general. I had joined the Library Adult Reading Project and was on my way to meet with a student whom I had been tutoring. The student was an eleventh-grade dropout who could read a little but who couldn't write much more than his name and address. After the fire, he and I met at a branch library across the street from a high school. There, when the school day ended, kids poured into the library to do homework, read, gossip, make chaos, and in general, stay safe and out of trouble. Being in the middle of all this was, for me, like taking a trip backward in time to my own school years. But for a lot of kids now, going to the library after school won't be even a memory. To save money, branch libraries are being closed, being sacrificed the way some trees are supposed to sacrifice branches during a drought. In fact, we're creating an intellectual drought that can only be made worse by such sacrifice. We're doing ourselves lasting harm in exchange for the ephemeral good of quick budget cuts. It's time we stopped, considered the consequences of our self-destructive behavior, and made the necessary changes. **OO**

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**SCIENCE & TECHNOLOGY**

(AND PUNK, JAZZ, INTERCULTURAL, ETC.)

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# COMMUNICATIONS

## READERS' WRITES:

Prevention on a plate, altered states debatable,  
and regarding Quark

### Alternatives Redoomed

I'm a student at Bell High School in Nepean, Ontario. I chose Judith Hooper's "Unconventional Cancer Treatments" and "The Cancer War: Stories from the Front" by Linda Murray both from the February/March 1993 issue, as part of my biology class reading material. The contrast between these two articles is startling. I support Hooper's view that the American Cancer Society (ACS) should embrace natural preventive agents and potential cures more willingly, especially if they're proven safe. The ACS should not condemn these alternative remedies; it should be willing to explore all possible avenues.

Who knows? Shark-liver oil may prove to be invaluable. As we forge ahead with scientific research, we shouldn't lose sight of the fact that we have our roots in nature and should be more accepting of natural remedies. Having been bombarded with articles on the likes of immunology and genetic research, it's a pleasant change to come across an article that focuses on the simplistic natural aspects of cancer cures. Discovering an article such as Hooper's has sparked an interest in science magazines, which is unprecedented in my case.

Rajni Singhal

Kanata, Ontario, Canada

Linda Murray's "The Cancer War: Stories from the Front" gives lip service to cancer prevention and perpetuates the myth that cancer is inevitable. There are many things a person can do to greatly decrease the risk of cancer. The National Cancer Institute has noted that upwards of 80 percent of all cancers are due to identified factors. High-fat, low-fat, plant-based diets have been shown to reduce the risk of breast, prostate, and colon cancer. Fiber and many vitamins and minerals in plant foods have a demonstrated ability to inhibit cancer. Dietary fats and animal fats in particular, are promutagens, which help cancerous cells to grow very quickly. Cancer is not inevitable; it can be prevented. We have the power to stop can-

cer, and the secret to that power is what lies on our plates.

Natal D. Barnard, M.D., President  
Physicians Committee  
for Responsible Medicine  
Washington, DC

### Tuned Out, Tuned Off

If [Terence] McKenna [May 1993] doesn't accidentally overdose and live to old age, he'll probably someday find he has seriously damaged his nervous circuitry with repeated "tripping." At that time, he'll long for the "handicap" of simple linear and apical perceptions.

Maria Gray  
Vermilion, SD

I can't believe you'd waste paper on fluff such as the Terence McKenna interview. Let me get this straight: when on his hallucinogenic trips, McKenna believes he communicates with "self-transforming machine elves." Like self-dribbling jeweled basketballs. Right.

Doan G. Wessinger  
El Paso, TX

### It's Shimmerman

In your Deep Space Nine article [February/March 1993], author David Beachoff names several actors in the show; however there was a mistake. Beachoff says the part of Quark is played by Armin Shimmer. His name is Shimmerman.

Kem L. Raw  
Benndi, MN

David Beachoff replies: It is indeed Armin Shimmerman who plays Quark on Deep Space Nine, not Armin Shimmer. DG

Got something to say but no time to write? Call 1-800-457-4494, ext. 70103. Your comments will be recorded and may appear in an upcoming issue of OMNII. The cost for the call is 95 cents per minute. You must be 18 or older. Touch-tone phones only. Sponsored by Pure Entertainment, P.O. Box 168, Hollywood, California 90078.

# ARTIFICIAL INTELLIGENCE

## THE GETTING OF WISDOM

A Massachusetts company helps people make mistakes—painlessly

By Steve Nadis

**T**he Greek philosopher Zen of Elea is famous for the paradox he explored in a treatise challenging commonplace notions of space and time. Some 2,500 years later an American entrepreneur, Abraham of Cambridge, took another paradox and built a software company around it.

Marc Abraham's business revolves around wisdom and how to get it. To his way of thinking, a wise person is someone who exercises good judgment. Good judgment in turn comes from experience. The most valuable experience comes from mistakes, which are the result of bad judgment.

In an attempt to answer this paradox, Abraham has devised a series of computer-run "judgment exercises" which force people to think their way through artificial yet involving experiences that afford

them the luxury of making mistakes without blowing up cities or getting fired from their jobs.

Wisdom Simulators, the Massachusetts-based company Abraham founded in 1984, sells software programs that simulate real experiences from the business world. "Learning how to deal with these situations typically takes years," he says. "They're the kinds of things people often learn the hard way. We're trying to shorten the learning process—and even make it fun."

Wisdom customizes software for individual clients and it also sells two generic products for man-

agers. One of these, *Bite Your Tongue*, provides ten scenarios relating to job interviews. The other, *Hold Your Fire*, presents ten situations relating to conflict resolution and employee relations—substance abuse, sexual harassment, and even death threats.

Both interactive programs display on the computer screen a description of a thorny situation with which a hypothetical manager must contend. After asking users to select a course of action among five alternatives, the software describes what happens next, asking the pretend managers to pick a new response among five more options, and so on. At each stage, the choices become increasingly difficult. The program proceeds until the users have either successfully handled the matter or failed miserably. In the latter case, the computer recapitulates the scenario, suggesting alternative approaches.

At the end of the simulation, as in real life, people may be left without a clear cut answer. "The whole point is to start an argument," Abraham says. He and his staff designed the programs for groups so that people will discuss, argue, and eventually learn from each other.

It took about two years to produce each of the two simulation packages. Abraham met with hundreds of managers and executives at more than 60 corporations, universities, law firms, and government agencies. To each he posed just one question: "What drives you crazy?" He gathered their various responses, identifying the ones that seemed universal. He and his staff then fine-tuned the resulting software by trying it out on users.

A very lean operation, Wisdom Simulators boasts only one other full-time employee, sales director Michele Meagher. Yet the small

company has already compiled an impressive client list that includes NASA, the U.S. Navy, the General Accounting Office, Du Pont, Aetna Life and Casualty, Merrill Lynch, and Harvard University. To date, it's the only company designing software to help people make judgment calls, and its products have garnered generally enthusiastic reviews. "*Hold Your Fire* is an apt name," claims Rich March, editor of the New York-based computer magazine *VAR Business*. "There may be a temptation for someone new to management, like myself, to blow up in a frustrating situation, but this program helps you to avoid that."

"It's like fire-fighting drills on ships," comments John Adkins, a lawyer at the Boston firm of Bingham, Denz and Gould, who runs the simulations in workshops for clients and staff. "Once a fire breaks out, you're glad you've been through them."

Still, some observers question whether people can learn how to make better decisions from a computer. "People are awed by a machine," says Boston management consultant Kim Slack. "The computer automatically spits out five alternatives, and you think, 'Wow! I didn't even come up with two.' But the one you thought of might have been better than the choices appearing on the screen."

Abraham agrees, explaining that the issued options are supposed to encourage people to generate their own ideas. He contends that "the computer is a lot more powerful when you flip it upside down and use it to raise questions rather than answer them. We just want something that can ask the right questions. With the right questions coming out of the computer, the most important 'processing' will take place in people's minds." □

**Decisions, decisions: Wisdom Simulators produces software that helps**



**people learn how to exercise good judgment in various business situations.**

# WIHEELS

## AUTO SAFETY:

Driving grows less hazardous, if a little duller

By Jeffrey Zigmant

**T**he safest vehicle money can buy? About \$3.5 million will get you an M1A2 main-battle tank built by General Dynamics for the U.S. Army and other allied forces. Weighing 88 tons with a sophisticated armor package that includes depleted uranium, which is two-and-a-half times denser than steel, the vehicle will see you safely through most highway mishaps.

But even if your M1A2, traveling its 45-mile-per-hour top speed, survived a head-on with a tractor-trailer doing 60, its passengers probably wouldn't come out whole. In motor vehicles, perfect protection simply cannot be bought. No matter how well fortified an automobile, the surest way to escape injury is to avoid wrecks altogether.

"Avoidance benefits motorists about 100 times more often than protection measures," says Mick Scherba, chief data hilt coked as director of safety performances for General Motors, the world's largest maker and crash tester of automobiles. Toeing to this line, accident avoidance is emerging as the primary aim of future automotive safety technologies.

That's not to say that armor plating against impacts isn't getting attention, too. But every car design already incorporates a crush zone for front-end accidents—which manipulates engine mass, steel metal, and an undercarriage gear to absorb an impact's fury. It's probably impossible to build in the same measure of protection against side and even rear-end collisions. "When a car gets hit in the side at 30 or 35 miles per

hour, there's only so much you can do with the few inches of space between the door and the motorist," says David Viano, principal biomedical research scientist at GM Research Laboratories.

Happy then, the quickening advance of technology, especially electronic control, makes it easier to make cars that avoid accidents. For example, the computer brain of an antilock brake system (ABS) automatically modulates brake pressure so that a driver retains the steering control he'd lose if wheels locked into a skid during hard stops. A newer arrival, traction control, helps drivers accelerate more safely on slippery roads. The system on the new Lincoln Mark VII luxury cruiser uses its antilock braking's sensors and microprocessor to detect when one or both of the drive wheels are spinning too fast, automatically applying the brake to bring it back to speed. The traction-control system on the NSX and Legend Coupe LS from Acura actually senses

when a car begins a sideways slide, automatically cutting back engine power no matter how hard the driver tries to push it on.

More exotic avoidance features will soon arrive. GM's Cadillac division, Viano says, will offer night-vision systems that give early warning of obstacles. Similar, forward-looking radar may eventually wrest complete control of a vehicle to avoid collisions. "When the radar detects an obstacle," Viano says, "it may depower the car if you continue driving forward. If you keep coasting, halting on hitting the obstacle, the system may brake for you."

Such measures attack the gravest problem in traffic safety: driver behavior—and misbehavior. Viano cites accident studies showing that 45 percent of traffic deaths occur when a car's own driver commits an error, like missing a stop sign. About 21 percent result from overly aggressive driving, usually from failure to negotiate a curve. The remaining 34 percent of fatalities get classified as "unavoidable" because they're caused by a driver in an other car who may pass improperly or run a stoplight.

The statistics suggest an obvious remedy: Improve driving to reduce serious or deadly accidents. That's why technology is taking over with automatic avoidance systems that operate vehicles with more care and precision than human drivers.

But everything comes at a cost. The price for driver carelessness is control. No doubt, many motorists will gladly cede their driving responsibilities to sure-footed robot cars. But others mourn the loss. Why else do some people still purchase cars with manual transmissions, preferring the whump-kachunk of hand shifting to the breezy anonymity of automatic gears? **CC**

In the future age of accident-free, automated cars and automatic roadways, let's hope some forgetful highways will remain for us who still enjoy the adventure of driving.



## A BRAIN IS A TERRIBLE THING TO WASTE

Savings banks for neural tissue are open for deposits

By Nina L. Diamond

**M**ost people haven't noticed that this country is suffering from a severe brain shortage. "Sure I've noticed," you may chuckle, pointing a finger at Washington or the local government of your choice. But that's not the kind of brain shortage we're talking about. We mean gray matter, white matter, brain tissue—the stuff in your head that neuroscientists need to investigate a variety of diseases, disorders, and dilemmas.

During the Eighties, investigators learned more about the can-

ington's and Lou Gehrig's diseases, Down's syndrome, depression, AIDS, and a host of other diseases. They're also examining how the brain is affected by internal and external activities: genetics, stress, alcohol, drugs, chemicals, and other toxins. And of course, they're looking to understand the brain.

Individuals who've noted on their drivers licenses that they are organ donors have gifted everything but the brain, although most are not aware of that. The brain is endowed separately—directly to one of the three banks (Miami, Boston, Los Angeles) that accept all kinds of brains or to one of the handful that specialize in one particular disorder.

"One brain can provide enough tissue for 50 researchers," says neuroscientist Edward Bird, director of the Brain Tissue Resource Center at McLean Hospital of Harvard University, founded in 1975. "We receive ten percent more brains each year than the last, and we always have at least one thousand in our freezers. But the number of researchers and projects is skyrocketing, and the requests will outpace what we have at the moment."

So-called "normal" brains are just as much in demand as unhealthy ones. "We use them as controls to compare to the diseased or impaired brain," explains neuroscientist Wallace Tourtelotte, director of the National Neurological Research Specimen Bank at V. A. Wedderburn Hospital of UCLA, founded in 1951. "All banks have a shortage of normal brains." The L. A. bank has more than 2,000 brains; collects 150 on average each year from donors and has 1,000 pledged. "When the donor is dying, the next of kin calls to let us know. We've made arrangements for a place to have the brain removed, and we

got the donor's medical records, too," Tourtelotte explains.

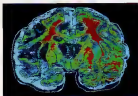
Although the banks are in dire need of tissue, not just any old brain will do. "The ideal situation is sudden natural death," says Mesh. "Someone brain dead on a respirator is a bad donor, because brain death alters cellular structure, chemistry, and electrical activity." The brain must be removed no later than 12 hours after death. Any later and deterioration will render it useless for research. Brains for donation are removed by pathologists and coroners. After removal, the entire brain is frozen and remains that way in the bank.

Donor awareness is greatest among older Americans. Mesh points out, and younger tissue is desperately needed. "We need baby-boomer brains," she says, adding that drug abuse studies in particular require neural tissue from the 30- to 50-year-old crowd.

Brains of all ages are affected by disease and disorder, and Bird notes that "there's always a shortage of young brains, particularly children's. While families don't like donating autopsies on children, they feel good knowing the tissue is going to a worthwhile cause." Increasing the public's awareness of the need for brain donors is paramount. "People think neuroscientists only work in labs with rats," Bird says.

"Tell the people this is different," Tourtelotte says. "You don't get an immediate return like donating your eyes and giving sight, but the brain tissue will help us understand, treat, and cure disease." The three general and disease-specific brain banks network with each other. "The most exciting aspect of the system," concludes Bird, "is how we can get so many scientists working on a disorder so quickly. All they have to do is call for tissue." **DD**

Much is demanded by researchers, postmortem brains will help reveal secrets of the living mind.



tral nervous system than in all prior human history. The Nurelles promise to be even more enlightening. "The brain is the last biological frontier," says neuroscientist Deborah Mash, director of the University of Miami Brain Endowment Bank. Founded in 1986, it's one of only three general brain banks in the nation. "We need to study the human brain post-mortem—diseased brains and healthy ones for comparison." The Miami bank has acquired nearly 200 brains in the last six years, and 600 are pledged.

Brain banks provide tissue to researchers looking for new treatments and cures for Parkinson's disease, schizophrenia, Alzheimer's disease, Tourette's syndrome, multiple sclerosis, Hunt-

# ELECTRONIC UNIVERSE

## LOST IN SPACE.

Hot on the trail of alien evils

By Gregg Keizer

**S**pace may be the final frontier, but it's still a place where gamers too often fear to tread. Seeds of Earth-bound computer games delve under the ground or fly in the atmosphere to hunt for dragons or race jets through frag airspace, but few take space even a bit seriously. When one does—whether with real science or science fiction—it's time to test of the plus-to-wrap-and-start-sticking-disks-into-the-PC's-drive.

A perfect example is *Where in Space Is Carmen Sandiego?* Yet another title in Briderbund's line of detective games for kids, this one moves the Carmen Sandiego series into the far reaches of the solar system. The premise, even the mechanics, are much the same as in classics such as *Where in the World Is Carmen Sandiego?* but the scenery and characters have changed.

Aiming for an older audience than did its predecessors, *Where in Space* is still a whodunit—where game of investigation, obtuse clues, and frequent travel. Kids play the part of a planet-hopping sleuth tracking down alien criminals who've stolen pieces of the solar system (a crater here, an asteroid there). Players interview witnesses, follow the alien criminal as it meanders around planets and moons (and even to Halley's Comet), obtain enough information to



name the alien in a warrant, and then arrest the thing and stem it into Jailhouse Rock.

To keep kids interested, *Where in Space* relies on detailed images of the planets and moons, animated constellations, digitized speech—in alien tongues, of course—and plenty of New Age-like background music.

The shennigans are fun for kids, of course, but parents will like the way this game slips in the science. A built-in database holds reams of information about the planets and their moons.

Grownups who want to get right to the action won't care much for Carmen, but they'll have a hoot with Ultrabots, a new game steeped in science fiction.

Set nearly four centuries in the future, *Electronic Arts' Ultrabots* plays to our xenophobic fears of alien invasion. Rather than rampaging, acid-chipping insectoids (though, the enemy comes in the shape of 18-meter-

tall robotic monsters armed with enough weaponry to eradicate humanity. We got rid of them once before—with a last ditch volley of ancient nukes—but now they're back. This time, though, we're running some robots of our own.

From the base camp's situation room you direct your mechanical charges, monitor the power network that's crucial to the machinal survival, and conduct repairs of damaged units. In a take-off from virtual reality's telepresence, you can jump into control of any robot at any time.

Made, radar screens, and visual- and thermal-imaging systems give you the view outside each ultrabot. Directing their battles doesn't take fast reflexes, but it does take fast thinking. You click on numerous onscreen games to make the robot speed up or slow down, turn, fire, or release a futuristic smoke screen. To simplify things, you can program any of your ultrabots with one of ten automatic settings.

Graphically, *Ultrabots* is part stunning, part static. The scenery and enemy 'bots you see on the screen are intricately drawn, and on a fairly fast PC, their animations fluid. What surrounds those moving pictures—the gauges and controls of the ultrabots' interior—are bland in comparison.

Needless to say, *Ultrabots* is all about combat. Until you've mastered the controls, the action washes over you like a Krakatau tidal wave; you'll be lucky to keep any of your machines alive for long. But, with practice, and an eye on tactical movement, you'll blast these Nissan factory refugees into oblivion. All that's missing from *Ultrabots* is a network or modem link so you can play long distance against others. When that happens, you'll be on your way to home-based virtual reality.

Who said scenarios is boring? **CC**



From science sleuthing to science fiction: Briderbund's *Where in Space Is Carmen Sandiego?* and Electronic Arts' *Ultrabots*.



## RETRACING THE FOOTSTEPS OF EVOLUTION: A rare missing link turns up in a museum drawer

By Kathleen McAuliffe

Discovery is a drawn: The mislabeled bones that Per E. Ahlberg (right), an Oxford University paleontologist, found in a museum drawer raise some fascinating questions about the course of evolution.

**M**ost fossil hunters chip away at rock or dig deep trenches in the ground. Oxford University paleontologist Per E. Ahlberg made a stunning discovery a less arduous way: He launched a dig through museum drawers, emerging from the unorthodox excavation with previously overlooked bones that represent a rare missing link in the transition of life from water to land.

The bones had gathered dust at the university's museum since about 1960, twenty years after the original collector retrieved them from a fossil-rich cliff in Scotland known as Scat Craig. The label on the drawers told generations of scholars that the skeletal parts belonged to ancient lobe-finned fish. But Ahlberg's well-trained eyes spotted something else: One of the jaw bones, he noticed, bore the distinct hallmarks of an early tetrapod—a four-legged creature that developed sometime after lobe-finned fish and before the first fully terrestrial vertebrates. His hunch was later confirmed when he pulled a tail-vertebra—a stem bone—from the collection. Since all the bones in those drawers had come from deposits laid down during the upper-Devonian period—some 367 million years ago—the fragments were probably almost 10 million years older than any known tetrapod, substantially pushing back the date when life in the water began its progression toward the shores.

It's still not clear whether the tetrapod parts recovered from the Scat Craig collection all came from the same animal. Regardless, the bones speak volumes about a critical juncture in natural history. The sheer size of the skeletal parts presented the first major surprise. Scholars had long assumed that early tetra-



pods had to be small, lightweight creatures to counter the crushing force of gravity on land. But Ahlberg's discovery tells a different story. The skull he turned up stretches nearly a foot and a half long, and he estimates the full body length of these animals to be about five feet.

Assuming all of the limb bones belonged to the same animal, Ahlberg's tetrapod had well-developed hind limbs and front limbs more like the fins of a fish. This chimera of traits suggests to Ahlberg that water-dwelling organisms must have originally developed legs for some purpose other than walking on land. His theory flies in the face of conventional doctrine, which maintains that vertebrate limbs first evolved to carry fish to a new source of water when their shallow pools began to dry up during the upper-Devonian period.

In fact, on climatic grounds alone, that hallowed notion now seems suspect. "It turns out that the Devonian period had monsoon weather not unlike parts of the Amazon," reports Jennifer

Clack, an authority on tetrapods at Cambridge University. "In all likelihood fish didn't get stranded in shallow pools but simply retreated with the water line during dry spells."

So why did legs evolve? Both Ahlberg and Clack believe the hind limbs were designed to support the animals in shallow water. "The first tetrapods probably hung out in reed-choked riverbeds and used their legs to grasp chic weeds on the surface," Clack explains. "Suspended from their perches, they would be less inclined to create vibrations in the water that might alert prey." She points out that the Sergeant frog fish uses finger-like projections on its back fins for exactly that function today. In the view of the British researchers, tetrapods probably adjusted to a marginal existence on the fringes of swamps for at least 20 million years before embarking on the next major evolutionary step: crawling ashore with a fully developed four-legged gait.

These later tetrapods, of course, needed to breathe on land, but the researchers think they arrived well equipped. "Lobe-finned fish had primitive lungs for gulping air in oxygen-poor water," Ahlberg reports, "so by the time tetrapods appeared millions of years later, lungs were presumably standard equipment."

Ahlberg now wants to determine the true relationship between his tetrapod parts. To figure out which jaw and limbs go together, he needs to see how the bones came to rest in the ground. His most recent excavation at Scat Craig, however, bore no fruit. He and some colleagues from the Royal Museum of Scotland dug around in a likely fossil site—now a woman's garden—and turned up plenty of fish bits but no new tetrapods. **DD**

# ARTS

## DECONSTRUCTING MARK TANSEY

An artist combines words and pictures to often startling effect

By Judith Bell

**F**rom a distance, one wonders why such a massive table lacks a centerpiece. Step closer, and the polished wooden surface reveals much more than any decoration could. Artist Mark Tansey stands before the table he created and

Born again nomads/maximizing power vacuum.

The unexpected connections set up in these phrases have a liberating effect on Tansey, who first began to compile the lists of metaphors and ideas while working as an illustrator for the *New York Times Book Review*. "The wheel frees the mind," says Tansey. "It's a generator of content—a no-end game that gives me a feeling of play and relieves me of the anxiety of what to do next. The wheel is an emblem of my revitalization of pictorial content."

Tansey, 42, who studied at the Art Center College of Design in Los Angeles and Hunter College in New York, says his best edu-

at the edge of expectations, where one may notice that something is not quite right. That's where the picture really begins."

A case in point is *Triumph of the New York School*. Staged in the style of old battlefield scenes, the painting upon a circular look reveals American painters and critics dressed as soldiers, accepting the surrender of the School of Paris with Picasso looking on in a fur coat. What seemingly began as a history painting becomes a sly commentary on the machismo that underlay the celebration of Abstract Expressionism after World War II.

Nor are more recent critical movements exempt from Tansey's invidious explorations. Responding to the Deconstructionist philosophy which proposed that literary and philosophical texts are self-contradictory, Tansey's *Wheel of Content* creates its own logical text, demonstrating that the meaning of any text remains elusive. In some of his paintings, Tansey takes this concept literally, as with *Constructing the Grand Canyon*, where every surface of the enormous, craggy canyon is lined with random sentences. "What I did in these pictures that have text in them was question at what point the picture ceases to be textual and becomes pictorial."

Tansey's work is the subject of the book *Mark Tansey: Visions and Revisions* (Harry N. Abrams, 1992) by Arthur C. Danlo. His first retrospective opened in June 1993 at the L.A. County Museum of Art. It will then travel to the Milwaukee Art Museum in September, the Modern Art Museum in Fort Worth, Texas, in December, the Museum of Fine Arts, Boston, in May 1994, and in September 1994 will finally arrive at the Montreal Museum of Fine Arts in Quebec, Canada. **BB**



Mark Tansey explores the areas where text and illustration meet, often confounding our expectations with his results.



itled *The Wheel*. The wheel—three wheels actually—randomly matches subjects, verbs, and phrases culled from such diverse areas as fractal geometry, quantum physics, and politics. With a roulette spin of the wheels, its creator is faced with 180 terse remarks like

Short term investors/ensterning/ the masses  
Hermetian to traders/leveraging outchance,

ation came from working as an illustrator. "I would be given a book or a readout of a review, and I had to come up with an image. If I could make a metaphorical hookup between an image and an idea, there was everything to do. This connection seemed to be what had been asked from painting for so long.

"Most of my paintings can, at first reading, be viewed within a range of conventional plausibility. But there is usually a moment,

# STYLE

## THE FABRIC OF OUR LIVES? Polyester makes a comeback

By Peter Callahan

**A**s if comedians didn't have enough problems these days. Not only is Dan Quayle fading into oblivion, but new developments in a certain fabric—long a target of every two-bit laugh track, might make all their barbs obsolete. Yes, polyester is back, folks, and better than ever. The reason for the resuscitation of a fabric associated with the darkest days of fashion? Microfiber, a polyester thread that can mimic everything from velvet to suede, and even your tailor may not know the difference.

Manmade microfiber is offering something really exciting," says Samuel Winchester, a professor at North Carolina College of Textiles. Gone are the disadvantages of the old stuff, the sticky feel, the clamminess, the awkward way the garment draped the body. In fact, microfiber is fast becoming the fabric of choice for active and outdoors, like raincoats, and is making inroads into high fashion as well.

Invented by Du Pont and perfected by—surprise—surprise—

the Japanese, microfiber technology is opening up a whole new world to designers. The secret lies in its thinness. Microfiber is 15 times finer than parryhose, allowing for a whole range of uses without sacrificing any of the positive qualities (such as wash and wear) that first made polyester popular. "The technology has advanced to such a degree that it can be made to feel like any thing," says Larry Holtz, a spokesman for designer Donna Karon. While the old polyester may have scored in the wrinkle department, "that's because it was made like iron," says Holtz, "and it looked like it. But Microfiber breathes like a natural fiber."

If microfiber-based polyester does catch on with the public, it'll be an amazing comeback for what Du Pont dubbed a "miracle fabric" in the Forties and Fifties. "In the early Fifties, we weren't that far away from the hard times of the Thirties and the shortages of World War II," says Winchester, coeditor of the book *Fifty Years of Polyester*. "The mindset of the typical consumer was longevity and good wear performance, so it really had a rapid adoption."

Then, in the mid-Sixties, fiber producers aimed for the high end of the market—and the fashion world was never the same. Polyester produced "whatever the designer could imagine," Winchester says. "You could form the garment any way you wanted to. You had the drug culture diving a wild kind of coloration. All of that merged together in an explosion of leisure suits."

If leisure suits weren't enough to signal the demise of polyester, the fabric started turning up in discount stores across the country, in bell bottoms and double knits made on the cheap by mass mar-

ket producers. "The quality went way down," says Winchester. "All you had to do was brush up against something and fuzz would develop."

The Seventies' "back to nature" drove the final nail into polyester's coffin. "People started eating natural foods and getting away from chemical-based things," says Winchester.

But just when you thought it was safe to go back into the stores, microfiber appeared like a white knight to rescue these discredited from distress. The clothing industry hopes the public will soon realize what designers have already discovered: Polyester made with microfiber bears little resemblance to the material nightmares were made of.

"It's been a tough road adding ourselves of the image" people have of polyester, says Ellen Swaney of Hoechst Celanese, the nation's second largest producer of polyester. But she believes retailers and consumers are slowly coming around. "I just came back from Europe and I saw it all over the stores. It's finer and more luxurious."

Donna Karon's Holtz agrees that the perception of polyester as a fabric for the leech is bound to shift. "People buy a microfiber coat and don't realize it's polyester, and they probably would hesitate to buy it if they knew."

David Wolfe, a fashion forecaster with the Doneger Group, thinks the development of microfiber means more than just a rehabilitation for polyester. It signals a whole new course in the clothing industry. "Microfiber is the first generation of what we're going to see in the future," he predicts. There's going to be a lot of high-tech feel-fabrics. A decade from now we'll all have wardrobes made out of fabrics that don't even exist today. ☐



Microfiber makes polyester fashionably correct once again—in outdoors and high fashion.



# BOOKS

## A PEEK BEHIND THE CURTAIN

What do we mean when we talk about "science"?

By Robert K. J. Kilheffer

**T**he word science gets tossed around in the popular press and in daily conversation, and we all assume we know roughly what we mean when we use it. Asked to define it, we might mention reasoned problem solving, mumble something about the experimental method, maybe drop some other ill-defined term like "skepticism" or "theory." We could describe solemn researchers in white coats and sterile labs. We might even recall some names—Newton, Einstein, Hawking, Feynman.

But such fumbling about would go to show that "science"

knowledge at the heart of stories that appear to the modern eye, wholly mythological. He finds in tales of the goddess Venus (also called Ishtar, Inanna, Hoku-loa, and other names) reflections of the ancient astronomer's careful observations of the planet's apparent movement through the sky. Though the details of that motion can be hard to visualize through Aveni's text alone, he makes a persuasive argument that the basis of science is precise observation of the natural world and an attempt to relate its parts in some systematic way—and that the ancient Greek, Mayan, and Babylonian astronomer/astrologers were true, in their own cultural contexts, beginning the process that has led to our own attempts to plumb the secrets of the cosmos.

During the late classical and medieval periods, thinkers preferred to rely on the authority of ancient writers such as Aristotle and Euclid rather than modifying or correcting those antique theories with further observation of their own. In *New Worlds: Ancient Worlds* (Belknap/Harvard University Press, 1992), Anthony Grafton shows how the book-based learning was replaced by a renewed interest in the direct study of nature. Renaissance voyages to distant lands brought back firsthand information that contradicted the ancient writers, sowing the seeds of the scientific revolution. Profusely illustrated, Grafton's book (with sections by April Shelford and Nancy Struel) traces the reemergence of scientific inquiry and plots the courses it took into early modern times.

R. A. Buchanan picks up the story with *The Power of the Machine* (Viking, 1993), examining the applications of scientific research in the form of technology from roughly 1700 through the

present. Concentrating on the centuries of greatest change (the eighteenth and nineteenth), Buchanan offers an excellent survey of society's transformation by the forces of industrialization, and he refreshingly avoids a simplistic invention-by-invention chronology, emphasizing at every turn the diverse factors, such as economics and patent laws, that influenced the process.

Which comes us to our own time and to as intelligent an account of twentieth-century science as we could ask: Steven Weinberg's *Dreams of a Final Theory* (Pantheon, 1993). Focusing on physics as the most fundamental of the sciences, Weinberg followed the quest for the deepest underlying explanation, a theory that will unify the elements of quantum mechanics, gravitation, relativity, and more. Along the way, he gives a crash course in the nature of scientific inquiry, examining the meaning of its "explanations" and the aesthetic principle behind many of its theories. This may be the best popular science book of the year.

Finally, Arthur N. Strahler's *Understanding Science* (Prometheus, 1992) provides a more exhaustive and academic study of the subject, from basic concepts and vocabularies to the differences between science and pseudosciences such as astrology and creationism. Prometheus offers a couple of other titles of related interest: *The Struggle to Understand* by Herbert C. Corben (1991), a history of scientific discovery and thought, and Milton A. Rathman's *The Science Gap* (1992), a lively look at misconceptions about the methods and purposes of science.

Armed with these books, you can easily escape such common misconceptions. So read them—any good scientist would. **GG**



**A scientist of thought, entertaining books explores the nature of science, from the astrological myths of the ancient Babylonians to the megabudget microscale studies of modern physics.**



is a remarkably loose term, and it's wise to step back now and then to consider what it means. Luckily, a number of insightful writers have offered informative books which, especially when taken as a group, provide a meditation on the nature and practice of what we call science.

Anthony Aveni's *Conversing with the Planets* (Times Books, 1992) studies the astrological systems of various ancient civilizations to reveal a core of scientific

# POLITICAL SCIENCE

## HEALTH-CARE TRIAGE

You can heal some of the people all of the time, or . . . ?

By Tom Dwoletzky

**O**nce, when I was bottom feeding in the economic seas, I found myself in the emergency room of a public hospital with a health-insuranceless friend who had thrown his back out while pulling a motor from a pickup. As he was merely in excruciating pain but not bleeding, hallucinating, or in any other way deserving of prompt care, he took his place at the end of the list. This is called triage.

That was over a decade ago, but for the 37 million people with no health coverage this emergency-room scene could be yesterday—and today and tomorrow too. To address this deplorable situation the country is now pondering some form of universal health care. But we have a problem: With accolades to Abraham Lincoln, you can heal some of the people all of the time or all of the people some of the time.

The United States was founded on the myth of total equality, but reality is and always will be two-tiered. The haves have more than the have-nots in all things—including medical care. What then to do? First, acknowledge reality with plans such as the one in progress in Oregon that rations health care. (That's triage, or using limited resources where they stand the best chance of doing good.)

Next, we should turn our attention to creating a bill of health-care rights: a reasonable safety net to which everyone is entitled and guaranteed by law. Again this entails a form of triage. What should be covered and guaranteed? My list, somewhat arbitrary, perhaps, and open for modifica-

tion, includes family planning, prenatal and child-birth care, child care, preventive and emergency care for all adults, treatment for illnesses for which there are proven cures, humane but modest management of other diseases through the creation of small walk-in clinics, hospices, and halfway houses that substitute for more expensive hospitals.

Certainly I've left out many ailments and conditions, and to ad-

dress those we need additional tiers of insurance coverage that you can buy if you're able to. This kind of primary national insurance (bid out to insurance companies) could provide middle-level, middle-class-affordable additional coverage. And then there should also be a private, total-care package approximating the kind of treatment you get if you're rich. It should cost accordingly.

To pay for the safety net, we should examine the rationale behind treatment costs and the causes of health damage. The health care industry should respond to regulation akin to that applied to any other public utility. This doesn't mean arbitrary caps on prices and other anti-free-market devices per se, but it does recognize that the same regulation now practiced in health care (such as licenses and FDA approvals to operate) has already restricted market freedom. It

does mean the industry will have to show us—the public—why it needs a price increase. Why should an identical drug cost substantially more in the United States than in any other country? Regulation of goods and services, however, is not one-sided. One of the biggest costs is medical liability coverage. To bring health-care costs under control, we must bring liability costs under control as well. Some form of arbitration with caps on liability awards must accompany any medical-care price controls.

Another form of cost management is to create ways for providers and recipients to pay off their expenses by working in some type of public capacity. Doctors incur serious educational debts they can work off at clinics in areas where quality health care is in short supply. Patients could pay for some elective treatments by working in a hospital or other public capacity.

By adding this notion of responsibility to the health-care equation, we can ensure adequate minimum care for all. But to do this, we must stop pretending that everyone can get the very best, that life is not two-tiered. **DD**



address those we need additional tiers of insurance coverage that you can buy if you're able to. This kind of primary national insurance (bid out to insurance companies) could provide middle-level, middle-class-affordable additional coverage. And then there should also be a private, total-care package approximating the kind of treatment you get if you're rich. It should cost accordingly.

To pay for the safety net, we should examine the rationale be-

**Why should a drug approved for human patients cost more than the identical substance approved for veterinary use?**

# SOUNDS

## DIGITAL RADIO:

Linking the global airwaves

By Byron Poole

**D**riving across country can be therapeutic—until the tape selection grows stilted and you're left searching the radio dial for a semiaudible station. With the latest advancements in digital radio, however, you'll soon be able to pick up a station on the West Coast and listen to it all the way to Rhode Island—commercial-free.

This revolution in the way we listen to radio is taking three paths: cable lines (that send signals to state-of-the-art digital converter/receivers provided by your local cable company), satellite, and "In Band On Channel."

Pioneering the idea of satellites in digital radio broadcasting, DC-based CD Radio Inc. (who recently joined forces with the 4-billion-dollar aerospace company Loral) is anxious to hit national airwaves but is waiting for the go-ahead from the Federal Communications Commission (FCC). Once the company is licensed and the three-year process of building the satellite is complete, listeners will be able to pick up the signal no matter how far they are from a city.

Despite local broadcasters' attempts to slow the switch to digital radio, David Margolies, CD Radio Inc.'s CEO, believes the transformation can't be stopped. "If we had that situation in America, obviously we'd still be driving horses and buggies."

If you can't beat 'em, develop your own technology. Soon, local broadcasters will also go digital, thanks largely to USA Digital's development of a method for stations to transmit digitally within their already licensed spectrum in Band On Channel, or BOC, enables a station to send both its present signal and a digital one simultaneously without clogging up the airwaves. This is essential in the transition the listening pub-

lic will have to make from current radios to ones necessary to receive the digital signal.

If listeners' response to digital radio offered through the cable lines is any indication, we may never hear the warm hum of static again. Subscriptions for the two leaders in the cable radio field already exceed 20 million.

Digital Cable Radio (DCR) of Harrisburg, Pennsylvania, which formed a partnership in January with Time Warner Cable, the nation's second largest cable-tel-

ing doctor's offices, McDonalds, and the Tacoma Dome.

What better way to take broadcasting into the twenty-first century than by replacing the human DJ with a hand-held remote? DMX is the first company to introduce such a device. Called the DMX-DJ, the remote prints out information, such as record label and artist, in an LCD window.

DCR followed up with a universal remote that not only scrolls across song information, but allows users to control their VCRs,



The newest radio mutation—commercial-free, DJ-free, 24-hour-a-day programming—puts the power in the hands of the listener.

vision operator, will make 78 digital radio channels available to its subscribers within the next year. Tom Oliver, president of DCR's competition, Digital Music Express (DMX), based in Los Angeles, says that through fiber optics and advances in compression equipment, more channels can be squeezed into the spectrum bandwidth—which translates into an enormous amount of programming potential.

And selection is precisely what these companies plan to give you. DMX has taken the leap into commercial establishments with more than 3,000 businesses now subscribing, includ-

ing CD players, and cable boxes. By next year, it should provide sports fans the ultimate luxury—a sports ticker that runs across with all the current statistics. And within a few more years, the remote will have interactive capabilities with your TV set, allowing you to block out the screen and pull up lyrics to the song you're listening to or watch news wires or financial tickers.

Digital radio is on the take. The BBC intends to begin digital broadcasting by the mid 1990s, while the cable companies continue to spread over the entire globe with programmers already in Canada, Holland, and Australia. **DD**



# CONTINUUM

TO FAX OR NOT TO FAX:

Trying to answer the ultimate modern question. Plus, teaching sea lions to spy on whales, and making internal organs out of sponges

Imagine, if you will, a world without window screens. In this pre-1910 world, insects circulate freely through the house, so you might as well sit on your front porch on a summer evening talking to your neighbors. Then someone invents window screens. Later someone else invents air conditioning and, of course, television, and voilà—a drastic decline in porch sitting. As Americans withdraw into their separate homes to watch *Jeopardy!* with the air conditioner up high, neighbors become strangers and community becomes a dim memory.

This is the sort of technological fallout that Loka Institute of Amherst, Massachusetts would have you ponder (in Sanskrit, *loka* means "unity of the world, interconnectedness of society.") "When a panel of experts discusses the impact of different technologies on our lives," says Loka's executive director Richard Solve, "they address safety, health, or environmental consequences—not the large range of cultural effects and the ways that technologies help structure and restructure political relationships."

What effect do faxes have on a culture? How do cellular phones affect the quality of one's mental life? Do computer networks foster community or subvert it? Does cable television empower the citizenry?

"I'm concerned these questions won't be addressed until there's a wide diversity of laypeople who play a major role in decisions about technology," says Solve. At present the technological universe we inhabit is created by hundreds of corporate decisions made behind closed doors. By the time the public gets a peek at the latest wonders, vast sums have already been committed, and it's too late in the game to say no. You might argue that John Q. Public can cast his "vote" in the marketplace simply by deciding whether to buy a videogame set, a fax machine, or a cellular phone. But, says Solve, "you can't do anything about the collective consequences of other people's purchases. You can decide not to have a TV, but if all your neighbors have TV, you can't form a community by yourself. Suppose, on the other hand, you prohibited all broadcasts and video rentals



every Thursday evening from six to nine. It would be interesting to see the social consequences."

Once a technology is established, an irreversible social process may be set in motion that ends up cornering the consumer into buying a fax machine, for example—because if you don't have one, you're out of the system and you pay a penalty. Solve insists that the public must enter the technology/evolution process at the research-and-development phase, before billions of dollars have been spent. Yet Solve acknowledges that current corporate-trade-secret laws would bar this sort of public scrutiny.

Do not take Solve for a Luddite who yearns for the good old days when there was no television. "I'm not antitechnology," he insists, "but decisions about technology are too important to be left up to experts—scientists, engineers, CEOs—who lead very privileged lives."

Also, nowhere on Earth is there a fully evolved model of the sort of grass-roots technology renewal Solve envisions, though Europe can boast a few promising attempts. In Holland, "science shops," associated with universities, have sprung up to provide community groups with technological information—for example, whether the smoke released by the nearby factory is blighting their vegetables. Ten years ago in England, an even more ambitious scheme of "technology networks" was nipped in the bud by the Thatcher government. But the community most alert to the long-range cultural implications of technology is the Amish. "The Amish have tried out different things—calculators, computers, tractors. Liking the slower pace, many Amish communities decided not to use tractors, for example, for plowing fields, but they did adopt them as portable generators."

If the rest of us were to bring this degree of foresight to new technologies, Solve wonders, would we be so rash about such sexy newcomers as nanotechnology and virtual reality (both of which Solve believes are potentially alienating)? Would we decide that computer networks were authentic communities or a impoverished simulacrum?

—JUDITH HOOPER



## CONTINUUM

### SEA-LION TAMERS

At the Long Marine Laboratory in Santa Cruz, California, sea lions are being trained to complete tasks a little more complicated than balancing balls on their noses.

Researchers are teaching the animals to follow whales in the open sea and capture their secrets on videotape. University of California biologist Daniel Costa, a sea-lion expert, and James Harvey, a whale authority from San Jose State University, conceived the project, and the training is administered by graduate student Jennifer Zeigler, who has also worked with monkeys, birds, bears, dogs, and seals. "Almost all animals are trainable," she says. "It's just a question of knowing how to do it."

To begin the project, Zeigler got the sea lions accustomed to wearing a harness with a videocamera mounted to it. "It takes a while for them to get used to wearing anything," she says, "kind of like getting kids used to the idea of clothes." Then she instructed her pupils to swim parallel to humans. "It's the same behavior as teaching a dog to heel," Zeigler explains.

Currently, she's teaching them to swim parallel with just about anything—boats, whale models, and real-live

whales. The sea lions must assume the right position while tracking the whales, "or else the videocamera might get a twenty-minute film of the middle of a whale, which wouldn't be too illuminating," Zeigler says.

Costa and Harvey picked sea lions for the job because they swim faster than whales. Since they're a natural part of the marine environment, the researchers hope their presence won't disturb the whales' behavior. As to what mystifies the sea lions may uncover, Zeigler says, "We know so little about whales it's hard to know what to look for." When the study is completed a year or two from now, "we might have a better idea of what to study."

—Steve Nadis

THE SURFACE AREA OF THE PACIFIC OCEAN IS MORE THAN THREE TIMES THAT OF ASIA, THE LARGEST CONTINENT



Like rocks just off shore, like these, odor-removing Nardocite rocks, Forever help clean the air.

### ODOR-EATING ROCKS

What's hard as a rock but absorbs like a sponge? It may sound like a riddle, but it's Nardocite.

More accurately, a Houston company called Nardocite markets a rock of the same name—a clinopillite zeolite, or a mineral formed from the crystallization of volcanic ash—that can draw odors out of the atmosphere. The company's founder, Deen Philpot, stumbled into the business while experimenting with zeolite.

"One of the first things I observed was its affinity for ammonia," he says.

The rock removes odors by adsorption, a process in which molecules of foul-smelling gas lock onto its honeycombed surface. Adsorption itself is accomplished by the attraction of opposite electrostatic charges, which most people have experienced as static electricity. Zeolites are negatively charged,

attracting the positive side of polarized molecules.

"Molecules heavy with odors are highly polarized," Philpot explains. "When they get near the surface of the rock, they just latch on."

Nardocite rocks have snipped more than 60 different kinds of stinks and stretches from places as diverse as hospitals, locker rooms, spice factories, and crack houses. For the last three years, they've kept under control the disturbing smell produced by the 6,000 animals gathered at Houston's annual Livestock Show and Rodeo. They've also proved a boon to chemically sensitive people, who put Nardocite in their homes to remove the strong odors that can emanate from new carpeting, pressure-treated lumber, and pesticides.

When the rock can adsorb no more odors, it can be recycled—sort of. If placed outdoors, it will release the odors it's captured, and then it can be reused. —Anne Naudon

Just when whales least expect it, they'll be on Sea Lion Cam's camera.





## PROSPER AND LIVE LONGER

Some scientists search for the secret to life extension in miracle drugs, exotic diets, and exercise routines, but epidemiologist R. G. Wilkinson has found that it lies mostly in your bottom line.

After analyzing data from 19 developed countries, Wilkinson, a senior research fellow at the University of Sussex in England, discovered that life expectancy is related to income distribution rather than economic growth. Once gross national product has passed \$5,000 a year, further increases in wealth make little difference to health. What does matter, however, is the way a country distributes its wealth. The



Is wealth distribution the key to Japanese longevity?

Japan is the most egalitarian of the developed countries," Wilkinson says, and its population lives longer than any other. Life spans in the United States and the United Kingdom, to the contrary, have deteriorated

## MAKING LIVERS OUT OF SPONGES

A team of doctors and engineers at Harvard Medical School and the Massachusetts Institute of Technology have come up with a technique that creates an artificial liver using a rather unlikely item: a sponge.

Patients with disorders such as metabolic disease or some forms of cirrhosis, which can lead to liver failure, have in the past had to rely on transplants of whole or parts of livers. But a shortage of donated organs inspired the Harvard-MIT team to look for something better—or, at least, less problematic. So they've come up with a technique in which they implant a biodegradable polyester sponge onto a membrane near the intestine that carries blood to the liver. Surrounding blood vessels soon grow into the sponge, and the doctors then inject it with healthy liver cells. If all goes well, these implanted

cells take over some of the liver's functions.

So far, surgeon Joseph Vacanti of Harvard has tested this artificial liver in rats and pigs. In rats with an enzyme deficiency that led to a disease similar to a form of human jaundice, the artificial liver corrected the deficiency. In such studies, the implanted cells survived for at least a year. In more recent tests with pigs, the implanted cells "took," and Vacanti's team is now determining if those cells are working as they should. If their work continues to go well, the researchers will contemplate human trials, using liver cells donated by patients' close relatives. Although he as yet has no firm timetable, "We'll begin human testing as soon as we possibly can," Vacanti says.

—Bill Laurien

"Never read a book through merely because you have started it."

—John Witherspoon

BECAUSE ONE-FIFTH OF ALL RUNNING WATER ON EARTH POURS OUT OF THE AMAZON RIVER AND INTO THE ATLANTIC OCEAN, FRESH WATER MAY BE FOUND AS FAR AS 100 MILES OUT TO SEA FROM THE MOUTH OF THE RIVER.

more income equality, the greater the life expectancy.

Many studies have shown, Wilkinson says, that the provision of health care actually has little to do with life expectancy. Ninety-five percent of the causes of death and "almost all measures of illness show higher rates in the lower classes," according to Wilkinson. And surprisingly, income redistribution seems to benefit the health of as much as 60 percent of the populations of most developed countries.

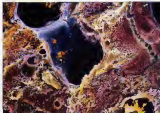
ed as income differences have widened.

So what role does medicine play? We put vast amounts of money into it, Wilkinson argues, and get very little return in life expectancy because medicine can do relatively little to cure heart disease, cancer, and stroke. "Medicine just provides a better quality of life," he says.

—Paul McCarthy

"A full cup must be carried carefully."

—English Proverb



When liver cells are damaged, doctors must perform a whole or partial liver transplant. A sponge could change that.



## CONTINUUM

### WHAT DO EARTHQUAKES AND UFOs HAVE IN COMMON?

Look! A strange light—is it a UFO from outer space? No, it's electricity from the earth.

John Derr, a geophysicist with the U.S. Geological Survey in Albuquerque, New Mexico, has determined that the phenomena glimpsed in many UFO sightings may actually be balls of electricity related to earthquakes. Derr and Michael Persinger, a professor at Laurentian University in Ontario, Canada, tapped into a database of UFO sightings compiled by the Center for UFO Studies and cross-correlated the sightings with reports of seismic activity. "When we started looking at it area by area, certain patterns began to emerge," he says.

For example, residents of New Mexico reported UFO sightings in 1951 and 1952 within 60 miles of the epicenters of three tremors measuring 4 to 5 on the Richter scale that occurred less than a year later.

"Earthquake lights" tend to be basketball-sized globes of glowing electricity generated by crushing rock or changes in ground-water flow related to underground pressure. They can appear

for months before and months after earthquakes.

"Sightings that can best be explained as earthquake lights are objects seen at ground level or objects in the sky that have a discontinuous path," Derr explains. "Our statistics suggest that eighty percent of such sightings could be geophysical in origin."

"There's been a lot of anecdotal information regarding electrical phenomena

### SKIN ACCOUNTS FOR 16 PERCENT OF YOUR BODY WEIGHT

and earthquakes, but I haven't seen anything that really documents it very well," says Jim Mori, a seismologist with the Geological Survey in Pasadena, California. "During the June 1992 earthquakes in Los Angeles, there was a lot of a strong of electrical transformers. Certainly those aren't earthquake lights, but in some situations, it may provide a good explanation of what people saw. However, in the 1989 San Francisco quake, some electromagnetic waves were recorded minutes before it started."—Don Vaughan

### FANNING THE FLAMES IN SPACE

Fire poses one of the most serious threats to a crew living in the confines of a space station or space station. That's why NASA researchers want to know as much as possible about how fire behaves in space, particularly on the planned Space Station Freedom.

Experiments on Skylab in 1974 found that fires in orbiting spacecraft spread only one-tenth to one-half as fast as they do on Earth. Under normal gravity, hot—and thus lighter—combustion gases flow upward, and fresh, oxygen-rich air is pulled in to replace them, fueling the fire. But in space, where there is no "up"—and no corresponding buoyant flows—the lighter gases don't rise, and fresh oxygen isn't drawn in as quickly.

Those experiments, however, were conducted in still air. Now drop-tower work at NASA Lewis Research Center in Cleveland, Ohio, suggests that when a 7- to 20-centimeter-per-second breeze—

about what Freedom's ventilation system would generate—wafts through the cabin, flames could spread as fast in near weightlessness as they do under normal gravity. Researchers expected that air movement in the cabin would supplement the influx of oxygen usually provided by buoyant flows, but the strength of the effect surprised them, according to NASA aerospace engineer Robert Friedman, who cautions that much more experimentation is needed.

The research findings could affect several aspects of Freedom's design, including the proposed carbon-dioxide fire-extinguishing system. The pipes leading from the supply tanks to the discharge outlets are normally filled with air. The initial rush of that air from the pipes before the carbon dioxide emerges, however, might briefly accelerate the blaze because of the air velocity's strong influence in low gravity.—Ted Scala

Electromagnetic activity preceded the 1989 San Francisco earthquake





## CONTINUUM



The people who make calamansi lemon won't like this. A vaccine for poison ivy may soon hit the market.

### TAKING THE ITCH OUT OF POISON IVY

Good news for the 67 million Americans susceptible to the blistering rash and painful itching of poison ivy.

Researchers from the University of Mississippi's Research Institute of Pharmaceutical Sciences have come up with a vaccine for the nasty stuff.

Melvin A. ElSohy, E. Sue Watson, and C. W. Waller began their quest some 20 years ago searching initially for an oral medication because, at the time, most pharmaceutical companies believed consumers wouldn't accept a poison-ivy vaccine that had to be injected in a doctor's office. The researchers never found an oral vaccine and eventually began experimenting with intramuscular injections to counteract the effects of urushiol, the oily chemical compounds secreted by the leaves of poison ivy, oak, and sumac plants.

ElSohy developed procedures to assay the different

molecular variations of urushiol, first isolating and then synthesizing them, a feat that enabled Watson to unravel the rash-producing properties of each molecule. The scientists created less toxic forms of urushiol-producing chemical variants that the body can convert into active compounds which lead to tolerance instead of a rash.

"One injection may either eliminate sensitivity or reduce it greatly for a full season," says ElSohy, adding that lab tests on guinea pigs produced no side effects. The institute is negotiating with a pharmaceutical company to license the product, but the vaccine may not get Food and Drug Administration approval for at least three years.—George Nabbie

"To the dog, every man is Napoleon, hence the popularity of dogs."

—Aldous Huxley

"Cops, like cats, will reveal themselves at night."

—Robert Brooks

### READING, WRITING, AND VIRTUAL REALITY

Students of West Denton High School in Newcastle upon Tyne, England, now can escape the classroom without leaving their seats. Their school is a test bed for Europe's first school-based virtual-reality project, enabling students to create virtual worlds on the computer screen.

In a VR program called *Dangerous Workplace*, for example, the screen becomes a factory floor. A library of computer images from the workshops of local engineering firm NEI Parsons furnishes the factory. Students design factories from scratch, with health and safety rules in mind. Then, using a trackball control, they explore the environment they've created, donning virtual goggles and joystick trunks.

Students experience the

excitement that comes with being able to control and explore the worlds they design," says Trevor Robertson, the teacher directing the project. "One of our sixth formers has just created a Renaissance city from a set of original drawings."

Through the VR project, the school can also provide a service to the community. Tyne and Wear Development, a local company, commissioned the students to create a model of a multimillion-dollar building project to be sited on the River Tyne. "The three-dimensional model was more powerful than a conventional model in helping us resolve concerns about how the public would perceive the riverside development," explains Philip Round, the company's public-relations officer. "It's certainly helped our planning."

—Susan Aldridge

Students at a high school in England use virtual reality to create and explore virtual environments.



**INSIGNIA COLLECTION IN SILVER AND GOLD**

Shown slightly smaller than actual size.

The data were obtained from the National Longitudinal Study of Adolescent Health, a national study of adolescents and young adults.

**The most prized emblems in the universe,  
accented in precious silver and gold.**



# SKY WATCHERS

ARTICLE BY SHARON McAULIFFE



TWELVE YEARS AGO, AMATEUR ASTRONOMERS WORLDWIDE CAREFULLY SEARCHED THE SKY FOR A ONCE-IN-A-LIFETIME CHANCE TO SEE COMET SWIFF-TUTTLE. THEY EXPECTED THIS MOUNTAIN OF DIRT AND ICE TO COME INTO VIEW FOR THE FIRST TIME IN MORE THAN A CENTURY, BUT DESPITE THEIR VIGILANT EFFORTS, NO ONE SPOTTED THE COMET

AFTER A WHILE, MOST PROFESSIONALS GAVE UP ALL HOPE OF SEEING THE COMET THIS TIME AROUND, MANY THOUGHT IT MUST HAVE SLIPPED BY UNDETECTED. AT THE HARVARD-SMITHSONIAN CENTER FOR ASTROPHYSICS IN CAMBRIDGE, MASSACHUSETTS, BRIAN MARSDEN, PH.D., CALCULATED THAT SWIFF-TUTTLE MIGHT STILL PASS BY AS LATE AS 1992.



PHOTOGRAPHS BY DAVID MICHAEL KENNEDY

But as time went on, he became discouraged. "I got rather dejected about it," Marsden says. "I was thinking, well, maybe it did already come and go. I was losing faith in it myself."

Then one night in late September, an amateur astronomer named Tsunehiko Kuchi packed up his gear and drove to a parking lot on Yatsugatake Mountain, some three hours outside of Tokyo. "From eight to twelve it was kind of foggy," says Kuchi who by day runs a small manufacturing business. "So I was having coffee in the car and taking naps. But when the fog lifted, I got wide awake and serious."

With a pair of high-powered Fujinon binoculars, Kuchi began sweeping the sky one section at a time. Like all practiced comet hunters, he has memorized the sky and can tell if something new appears. At a little past 3 a.m., Kuchi picked up an unusual object near the Big Dipper that looked like a smoky-colored blob. When finally it moved, he knew this was no comet impostor, but the real thing. "I felt so lucky, I

alerting them to any significant changes in the sky.

In the 1960s, amateurs watching occultations (eclipses) of stars helped NASA more precisely pinpoint the position of the moon in order to guide the space agency in landing spacecraft there. In 1990, an amateur in New Mexico was the first to pick up a small disturbance on Saturn that would eventually grow into an extraordinary storm three times the size of Earth. Amateur astronomers were also first to spot the last five dust storms on Mars. And in March, a Spanish amateur discovered a new supernova—the brightest stellar explosion to be seen in the Northern Hemisphere—beating out the professionals and at least one major observatory whose automatic system failed.

In a few specialties—most notably planetary and stellar astronomy—professionals and amateurs actually work closely together, almost in teams. If, for example, scientists want to monitor particular activity on a planet or study fluctuating stars, they'll contact large amateur groups to go out and collect thousands of observations. "I owe my Ph.D. to an



**COMET HUNTER**

**HOWARD**

**BREWINGTON**

**MOVED TO**

**NEW MEXICO TO**

**IMPROVE HIS**

**RECORD OF FINDS.**



couldn't believe it. I went home and woke up my wife and son." Later that morning, the National Observatory in Tokyo sent out a message in typical understated Japanese style: "This is maybe Swift-Tuttle." A few hours later, the probe confirmed it. After 130 years, Swift-Tuttle was back.

Kuchi is just one of thousands of amateurs who patrol the sky each night. These unpaid sky watchers discover one-third of all new comets as well as many asteroids, novae, and supernovae. On the basis of amateur reports, professionals quickly move into action; they stop giant research telescopes in places like Mt. Ika in Hawaii and Serni Tolelo in Chile and swing them around for a closer look.

There is so much going on in the sky at any given time that professional astronomers can't possibly cover the whole field, and amateurs are still able to make valuable contributions. While they can't tackle basic research questions about how the universe was formed or how its stars or galaxies actually work, they do make many of the first sightings in astronomy—especially in our solar system and galaxy—and act as kind of advance guards for professionals.

Amateur who would phone me at 4:30 in the morning to tell me what was happening with the star I was following with an x-ray satellite," reports France Cordova, chair of the astronomy and astrophysics department at Pennsylvania State University.

"Amateurs are practically at the level of professionals who do full-time research and teaching," says Peter Stockman, deputy director of the Hubble Space Telescope. "They often have ideas that aren't in vogue with professional astronomers but can be just as meaningful and important." In fact, amateurs are so valued that a few have been rewarded with research time on Hubble. Seventeen precious viewing hours were given over to amateurs last year in gratitude for their "decades of valuable assistance." Honored amateurs have already done sophisticated research, such as looking for frost formation on Io, one of Jupiter's moons.

#### **A Love Affair**

A love of the stars and the sky is the one thing amateurs all share in common. The word amateur actually comes from

the Latin *amator*, meaning lover. It may begin in childhood when someone looks up at a country sky and is suddenly bedazzled by thousands of stellar gems sprinkled across the heavens. The beauty of the sight creates a sense of wonder about the universe and often the desire for a first telescope. "I remember around the age of eight, saving up money to buy a small refractor," says Sam Storch, an avid amateur from North Merrick, New York, "then waiting with my tongue hanging out for the mailman to come."

Like many of the estimated 300,000 amateurs in the United States, Sam belongs to an observing club near his home. At the Astronomical Society of Long Island, members get together each week to discuss the best ways of building their own scopes, the tricks to observing deep-sky objects, and the dreaded disease called "aperture fever" (if you have a six-inch telescope, you always want an eight-inch; if you have an eight-inch, you want a nine-inch, and so on.) It's like a lodge meeting that crosses all social barriers, where an obstetrician, insurance salesperson, and garbage

#### The Comet Hunters

Comet hunting is the most competitive area in amateur astronomy because these are the only discoveries actually named after their finders. "I get upset every time there's a comet found and my name isn't on it!" says Howard Brownington, an accomplished amateur with four comets to his credit. In fact, shortly after losing a comet find to Kuchi Beck in 1980, Brownington left his home state of South Carolina—where he felt poor weather conditions were hurting his chances of being a world-class contender—and moved out to the clearer and darker skies of a remote little town called Cloudcroft, New Mexico.

Since that time, Brownington, who runs a small TV and VCR repair shop, has built a small observatory on top of a mountain peak 7,500 feet above sea level. Instead of having to drive 20 miles for good comet viewing, he now walks just 100 feet to use one of two telescopes specially designed for comet work. Brownington made his scopes—8-inch and 16-inch models—completely by himself, right down to hand-



**NOVA WATCHER**

**PETER**

**COLLINS CREDITS**

**MEMORIZING**

**THE SKY FOR HIS**

**FOUR NOVA**

**DISCOVERIES.**

collector all go out for coffee. Together they reminisce about the subtle color changes in a recent lunar eclipse and make plans to observe the following night when the temperature is expected to go below freezing.

And once a year, many amateurs make a pilgrimage to Vermont to attend Stellafane, a huge "star party" held every August. There, enthusiasts show off their largest homemade telescopes and spend the night searching for favorite sky objects such as M 51—a spiral galaxy connected by a bridge of stars to another galaxy. "Stellafane is like a Soles happening of astronomy and telescope nuts," says Storch. "It's an observing free-for-all, an equipment-building frenzy, a place to exchange ideas and meet new friends."

But for an amateur to actually make new discoveries in astronomy, there comes a point at which he or she must go beyond star parties and club meetings to focus on one kind of sky watching. "A casual amateur rarely does anything of significance," says Harvard-Smithsonian's Brian Marsden. "You have to go out night after night and sweep the sky, even when it's cloudy, to find anything."

And he added all kinds of specialized attachments to make his work easier, including a little heater that keeps the eyepiece from fogging if he breathes on it and filters specially tuned for the color of comets. The result: three new comet finds for Brownington in two years, including one named on previous returns to Earth and subsequently rechristened Comet Neatca-Brownington.

Just a little further west of Brownington in Tucson, Arizona, is David Levy, one of the world's most successful amateurs with 16 comets and one asteroid to his name. A popular astronomy writer by trade, he sleeps during the morning and comet hunts at night. Because comets are an elusive prey, hiding out behind passing clouds and showing themselves only on clear, moonless nights, the rhythm of Levy's month is set by the phases of the moon. "The moon acts as a referee," Levy says. "At full moon, there aren't any comets to be found because the sky is too bright. But as soon as it leaves the evening sky, there's an hour or so of dark sky that can be searched in hope of finding a comet." Two weeks later, when the declining moon dims, Levy is able to

hunt the morning sky. In the summer, that means being at the eyepiece by 2:30 a.m.; in winter, around 4:30 a.m.

Indeed finding comets takes incredible dedication. Levy put in exactly 917 hours and 28 minutes before his first discovery. "There was a period when I got interested in other parts of astronomy and didn't do too much," he reports, "but I always kept a little clock going to keep a statistical count on how long it took me." In total, 19 years would pass before Levy made his first discovery. And he had to stand up a girlfriend to do it. Over a romantic dinner together, the sky began to clear, and his date knew what was coming. "You're going to leave me here and hunt for comets, aren't you?" said Lanny Baker. And snapping to attention, I said, "No, no,

no. We're not going to do that. We'll finish dinner first, then I'll go home and hunt for comets!" Days later, a front-page article in the local paper contained one paragraph on Levy's comet find and two columns about the broken date.

Occasionally, an amateur does make a quick discovery. A 16-year-old high-school student from Texas decided to spend his summer vacation comet hunting back in 1968 and made a find his third night out. But others tell of putting in up to 3,000 hours before getting their first comets, and many meet with no success at all.

What keeps so many amateurs comet hunting then? Besides the glory of having your name go down in the record books and the adrenalin rush of a find, amateurs find com-

# HOW TO CREATE YOUR OWN OBSERVATORY

**A FIRST-CLASS BACKYARD ASTRONOMICAL OBSERVATORY CAN COST FROM AS LITTLE AS A FEW HUNDRED DOLLARS TO AS MUCH AS TENS OF THOUSANDS, DEPENDING**

on whether you prefer to buy your equipment or roll up your sleeves and build much of it yourself.

First, consider what you want to observe. Monitoring stars, photographing distant galaxies, or watching for changing features on the moon or planets all call for a permanently mounted telescope. If you prefer comet hunting, firing grazing lunar occultations (eclipses of stars by the mountains and valleys on the northern or southern edge of the moon), or hanging out with other amateur astronomers at star parties, you'll need a mobile observatory. Some amateurs manage both by building onto a trailer an observatory equipped with a large telescope.

## The Basics

If you don't know what you want to observe or if you want to do it all, begin with the cheapest and easiest "observatory"—a pair of good binoculars clamped rock-solid onto a sturdy camera tripod. For around \$100, you can buy a pair of high-quality binoculars; a telescope of comparable value is little more than a toy.

Binoculars are described by a pair of numbers, such as 7 x 35 or 8 x 50. The first number refers to the magnifying power; the second number is the diameter of the aperture in millimeters of each of the main lenses. Because objects in the

night sky are so dim, it's best to view them through binoculars at least 50mm across.

You can purchase a good new telescope for between \$400 and \$800. There are two basic types: reflectors, which use mirrors, and refractors, which use lenses. Reflectors require far more craftsmanship, so comparable aperture can be five to ten times more costly than for reflectors.

A telescope's size is specified by the aperture of its main mirror or lens and also by its focal ratio (the distance required for the main mirror or lens to bring the light to a focus, divided by the aperture). While two reflectors of the same aperture (most commonly six or eight inches) have the same light-gathering power, a telescope with a shorter focal ratio (say, f/6) is better for dim extended objects such as comets. One with a longer focal ratio (say, f/8 or f/10) however, is better suited to viewing bright, compact objects such as the moon and planets. Unlike binoculars, a telescope's magnification can be changed simply by changing the eyepiece. Maximum usable magnification is about 50 times for every inch of aperture.

Far more important than magnifying power is the quality of the telescope's optics and mount. To test them, first aim the telescope at a distant bright light. Through each of the

eyepieces, make sure you get a sharp, clear image without obvious fringes of color (unless binoculars, a telescope's images are upside down.) Next, while focusing on some distant object, give the telescope a sharp rap. If the image quickly settles, the mount is solid. If not, you can count on images shivering with every slight breeze. The best telescopes can be ordered through reputable optical firms.

For several hundred hours of careful labor, you can build your own 14- or 16-inch reflector. Many amateur clubs and planetariums offer telescope-making classes.

## The Observatory

Most amateurs don't really need an observatory building. The average reflector weighs 50 to 75 pounds and can be disassembled in two or three pieces for carrying from garage to backyard. But if you live in an ideal observing site—remote and dark, away from city lights and smog, where the nights are clear much of the year—you may eventually want a permanent observing installation with your equipment set up and ready for viewing.

Whatever you choose, check into local astronomy clubs, college astronomy departments, or planetariums for information and other resources.

Clear skies! —Trudy E. Bell



# A ONE-YEAR SKY GUIDE

**AUGUST 11-12, 1993:** Peak of the Perseid meteor shower, predawn, three to four hours before sunrise. Observe with the naked eye.

**AUGUST 19, 1993:** Saturn is in "opposition" (on the opposite side of the earth from the sun). At dusk, Saturn will be low in the east-southeast (ESE) sky. Look high in the south in the middle of the night. At dawn, Saturn will set in the WSW.

**SEPTEMBER 5, 1993:** Mars will lie within one degree of Jupiter, directly below it, low in the WSW sky at dusk, 45 to 60 minutes after sunset. The bright star, Spica, is at left.

**OCTOBER 25, 1993:** Uranus passes 1.1 degrees south of Neptune at dusk, SSW. This is the last conjunction, or pairing, of these planets until the year 2105. Note: You'll need a telescope or binoculars to take in the view as well as a finder chart to locate the objects. Look near Sagittarius, above the eight-sided teapot.\*

**NOVEMBER 8, 1993:** Venus is a mere half degree from Jupiter—the brightest and closest planet pair of the year—at dawn, ESE.

**NOVEMBER 21, 1993:** Mercury can be found halfway between Venus and Jupiter, at dawn, ESE. Both planets are bright, which should make Mercury easier to spot through the horizontal haze.

**NOVEMBER 25-29, 1993:** Total lunar eclipse. Partial eclipse begins at 11:40 p.m. EST on November 28. Totality begins at 1:02 a.m. on November 29 with the darkest time (mid eclipse) at 1:26 a.m. Totality ends at 1:50 a.m., and the partial eclipse ends at 3:12 a.m.

**DECEMBER 13, 1993:** The best time to view the Geminid meteors—first in the predawn hours and again later at night.

**JANUARY 8, 1994:** Mercury, Venus, Mars, Uranus, and Neptune can be found within four degrees of the sun during daylight hours. Alas, sky watchers won't be able to see any of them.

**FEBRUARY 1, 1994:** Mercury is within 1.5 degrees of Saturn at dusk, very low, WSW.

**FEBRUARY 26, 1994:** Jupiter begins retrograde motion. The planet starts in the southern sky near the star Alpha Librae, at dawn. During the next four months, it will move about ten degrees west before moving east as the year continues.

**APRIL 12, 1994:** Venus passes very near the moon. In the Western United States, the closest approach occurs just before sunset, in the East, just after sunset.

**APRIL 25, 1994:** Venus sits just below the Pleiades. A last chance to view this pretty sky star cluster, at dusk, low in the WSW, if you've followed its progress. Binoculars are essential.

**APRIL 29, 1994:** Jupiter is at opposition—visible all night long. At dusk, you'll see it in the ESE, in the middle of the night, high in the southern sky, at dawn, low in the WSW.

**MAY 10, 1994:** Citizens along a track from Arizona and New Mexico to Maine can see an annular solar eclipse—a bright ring of sunlight surrounding the moon. The rest of the continental United States will have to settle for a partial eclipse,

which peaks in Southern California at 8:00 a.m. PDT. The annular eclipse hits Maine at 1:50 p.m. EDT. Caution: Do not look at the sun with the naked eye. "Pinhole" projection is the safest method of viewing.

**MAY 20-31, 1994:** Mercury is within ten degrees (lower right) of Venus at dusk, WSW. This is the best evening "aperition" of Mercury for the year.

**MAY 24-25, 1994:** Partial lunar eclipse. The moon enters Earth's shadow (umbra) at 10:37 p.m. EDT. The greatest eclipse (25 percent) occurs at 11:30 p.m. The moon leaves Earth's umbra at 12:23 a.m., May 25. Elsewhere in the United States, except the East, the eclipse takes place late at night, May 24. (Brightness precludes those in Hawaii and Alaska from viewing.)

**JULY 2, 1994:** Jupiter is 11 degrees east of Spica, at dusk, SSW. The planet, which had been moving toward Spica for the four previous months, ends its retrograde motion and begins heading east again.

**JULY 4, 1994:** Mars is within four degrees of the Pleiades, low in the ENE, at dawn. A quiet way to start Independence Day.

**AUGUST 11-12, 1994:** The Perseid meteor shower peaks in the predawn darkness several hours before sunrise.

**SKY-WATCHING RESOURCES:** Abrams Planatarium Sky Calendar (\$6 per year, Michigan State University, East Lansing, Michigan 48824); *Sky & Telescope's Guide to the Heavens and Sky-Gazers Almanac*; *Astronomical Calendar* by Guy Ottewill. —Steve Nadis



Sellal

etc. fascinating and beautiful objects. "It's not like looking at the Orion nebula or Andromeda galaxy which appear exactly the same night after night," Brewington says. "Comets can grow and lose tails as they move. Some break up and throw outbursts as they go across the sky. That's exciting."

#### Explosive Stars

The most challenging and difficult targets for sky hunters are novae and supernovas—erupting stars that are coveted prizes by both amateurs and professionals. Despite the magnitude of these cosmic events, they appear as only pinpoints of new light in the sky among the thousands and thousands of shining stars, and the view is often dimmed by surrounding dust and gas clouds. "You're really looking for a star among stars," says Steve O'Meara, an editor at *Sky & Telescopes*, an amateur astronomy magazine. "And that's far more difficult than finding a big, fuzzy blob like a comet."

Although today, most novae and supernovas are also detected photographically and electronically using expensive professional equipment, a few truly gifted amateurs do excel in visually spotting these stellar explosions. Robert Evans, a Protestant minister from New

South Wales, Australia, is considered the world's foremost supernova hunter, tallying up more than 30 discoveries since 1981. He has memorized the major details of many galaxies and scans the sky each night for any detectable changes. "He's extraordinarily good and can beat out the professionals with their fancy equipment," says Brian Marsden. "While they have to take notes, and go through their images, Evans has the images of how the galaxies should look in his brain. He does it all with the eye and the mind."

According to Peter Collins, America's most accomplished visual nova hunter with four finds to his credit, the key to memorizing all these stars is creating little constellations in your mind. "It's just like knowing the night sky by the bigger constellations like Virgo, but you're doing it with a pair of binoculars and the constellations are very small. You also have to make up your own names for figures because ones aren't given to you." Collins has tackled the Milky Way in this manner—a seemingly impossible task—by breaking it down into such images as a broom or a miniature version of the Big Dipper with one extra star attached.

Once a nova or supernova is sighted, professional astronomers seek out

the big telescopes with spectrographs on them to identify what kind of materials are being given off, the speed at which this matter travels, and how quickly the star will fade. They have only a few days to catch the event before maximum brightness occurs. By studying supernovas, in particular, scientists are trying to understand some of the most important processes going on in the universe. These massive explosions are thought to account for the formation of new stars, determine the shape of galaxies, and produce most of the different kinds of matter that exist. Some scientists believe the material generated by supernovas provided the seeds for new planets, stars, and all life that's found on our Earth.

#### Team Work

Many stellar astronomers work almost hand in hand with amateurs, relying on an 1,100-member group known as the American Association of Variable Star Observers (AAVSO). Headquartered in Cambridge, Massachusetts, its amateur members keep track of stars that vary in brightness over days, weeks, and years—very active sky objects considered essential to understanding how stars are born, evolve, and die.

When AAVSO puts out a special "alert notice," observers from around the world respond with thousands of observations. This data helps researchers schedule the best possible observing time on specialized satellite telescopes such as the new Extreme Ultraviolet Explorer. At biannual meetings, ones status is likely to be determined by such questions as, "How many estimates did you make last year?" and, "What's your grand total?" Real AAVSO troopers center their lives around outbursts of stars such as S B Cygni and T Pyeids and send in 2,000 or more observations each year.

In planetary astronomy, professionals and amateurs work even more closely together in a worldwide network called the Association of Lunar and Planetary Observers. With recent funding outbeats and only the occasional flyby of a spacecraft like Voyager, planetary astronomers depend almost totally on amateurs for the day-to-day monitoring of Mars, Saturn, and Jupiter.

In some cases, amateurs have even made startling discoveries. In the 1970s, a Harvard astronomer gave editor Steve O'Meara, who is also an avid amateur observer, a project to watch the rings of Saturn. Using a nine-inch refractor telescope, O'Meara, well known for his incredible eyesight, observed shadowy, fingerlike projectors moving across the ring. At the time, the



finding was dismissed because it seemed to defy the laws of physics. No one could explain how particles could cross a ring and still stay together. But four years later, when Voyager went by, pictures of these so-called "spokes" returned. No one knows what the spokes are or precisely how they work, but because they bear a resemblance to cars zooming around a racetrack, professionals dubbed the phenomenon "the Saturn 500." For O'Meara, the experience felt like "being a nineteenth-century astronomer who had the opportunity to jump into the twentieth century and see his findings vindicated."

#### Backyard High Tech

If professionals want to know what's happening on Saturn or Mars to plan a week's observing run somewhere, they're likely to place a call to Donald Parker, a Florida anesthesiologist whose wonderful pictures of planets have appeared in more than 15 professional journals. His studies of Martian climatic changes have proven helpful in examining Earth's climate. This accomplished observer is now breaking new ground with an electronic camera system popularly known as a CCD (charged coupled device), which turns out digital images that are stored and

processed on a personal computer.

Originally, Parker, 54, resisted leaving traditional astrophotography. "I was dragged kicking and screaming into electronic imaging. But the pictures are much better than anything I could ever hope to get with photography." Because exposure times on CCD systems are much shorter, Parker is able to capture incredible detail on planets—such as fading white spots on Saturn—that would have been completely blurred on traditional photographs.

In fact, due to the increasing accessibility of high-tech equipment—a CCD system costs only a few thousand dollars—amateurs now have the possibility of making real advances. Parker, for example, can now get images of Mars when it's still extremely small and distant—about four "arc seconds"—in the morning sky. "If you listen to the experts," he says, "they say this can't be done. And I say, 'We're doing it. We're pushing the edge of the envelope.'"

#### The Amateur Advantage

Prior to the twentieth century, no distinction existed between amateur and professional astronomers. Copernicus, who first put forward the theory that the sun is the center of the solar system, was a sixteenth-century Polish cleric. He cor-

rectly assumed the Church would be upset by his radical ideas and delayed publication until shortly before his death. William Herschel, the English astronomer who discovered thousands of stars, clusters, and nebulae—along with the planet Uranus—originally moved to England in the 1700s as a musician and only later discovered a penchant for telescope making and observing.

By the 1880s, astronomy had begun to evolve into a profession. Then E. E. Barnard, a poor photographer's assistant in desperate need of money, decided to try his hand at comet hunting. At that time, an American philanthropist awarded \$200 for every new comet discovery and Barnard, who used his winnings to meet his mortgage payments, is said to have literally built "a house of comets." He went on to become a distinguished professional astronomer.

Even in this century, Clyde Tombaugh began as an amateur, watching Saturn and Jupiter from his homemade telescope on a Kansas farm. On the basis of his drawings—little sketches the size of index cards—he was hired by Lowell Observatory in 1929. Within a year, Tombaugh would discover Pluto, the solar system's most distant planet.

Now specialized education and advanced degrees are usually a prerequisite for professional astronomy. But there are also more subtle divisions between the two categories, and few amateurs—even the top ones—have any desire to make the switch. Most amateurs love the freedom they have to observe what they want for as long as they want. Professionals, however, are limited to a few weeks a year on big telescopes and are always under pressure to "publish or perish."

Most important, modern professional astronomy has become divorced from actual star watching. "For decades," says Steve O'Meara, "the eyeball has been removed from any of the larger telescopes." Professionals sit in warm, lighted rooms far from their instruments waiting for data to roll in—usually in the form of numbers. Many spend virtually no time actually looking at the stars and barely know their way around the constellations.

But intensely knowing and watching the sky is precisely what attracts amateurs to astronomy. It is an ancient tradition that goes back to the early days of the Chinese Empire when the arrival of comets, novae, and eclipses were all first carefully recorded. "I never got tired of it," says nova hunter Peter Collins. "There are nights when you go out and see all kinds of marvels—a bright meteor, a satellite—things will happen. The sky just comes alive." ☐



ARTICLE BY A.J.S. RAYL

# NEW TECHNOLOGIES, ANCIENT CULTURES

THE FATE OF  
NATIVE  
AMERICAN TRIBES  
DEPENDS  
ON PRESERVING PAST  
TRADITIONS  
WITH FUTURE TOOLS

The mountain ranges that had long sheltered Tucson could never have sheltered it from this: everywhere, buildings were ablaze; people were fleeing, looting, and scrambling to escape. Arizona authorities called in the National Guard, but it was too little, too late. The water had run out. Panic had set in. Tucson was going up in smoke. And the apocalypse didn't stop there. It was spreading across the country. From the chaos, smoldering ashes, and polluted waterways, however, thousands of Native Americans—beckoned, they said, by a spirit force—emerged and headed for the United States-Mexican border 60 miles south of Tucson. There, they united to take control of their native lands.

This fictional scenario from Leslie Mannon Sikes's novel, *Almanac of the Dead*, was inspired by Mayan and Aztec Indian prophecies that foretell the "disappearance of all things European." But the real future of America's indigenous tribes remains to be seen. On the heels of the quinqucentenary of Columbus's encounter with the Americas, Native American tribes are, in fact, gathering their forces to stake a claim for their future.

In a movement of self-determination that ultimately may become their greatest stand in the 500-year war against genocide, tribes are battling to defend their sovereignty, sacred lands, and religious freedom; reclaim their cultures; and once again become

ILLUSTRATION BY CATHE BLECK



vibrant, healthy, self-sustaining communities. They are also offering up a peace pipe in the form of their traditional world views and environmental sciences for a planet many see careening toward destruction. Bolstered by a newfound image created by a growing sense of pride and the increasing public concern over the continual destruction of the environment—even Hollywood movies like *Dances with Wolves* and *Wings of the Tears*—Native Americans are now enjoying not just sympathy, but respect from people around the world. Tribes and tribal members, however, are discovering that their future has not just in seizing the moment, but also in the technology.

"There is a pan-Indian movement going on now in which a growing number of Indian people are uniting across tribal lines to work toward a common social and political good for all—and the links are the new communication technologies," says George Baldwin, sociology chairman at Henderson State University in Arkansas and an Ojibwa and Kew Indian who last year helped launch American Indian Telecommunications (AIT), the first nonprofit group dedicated to promoting the grass-roots Native American computing movement. "A lot of people like to romanticize, hold Indians to that image of weaving blankets for sale by the side of the road, and we're weaving all right, but it's gone beyond blankets to information."

Native American communities have long been isolated—from each other as well as from the rest of America. Computer and satellite technology, however, is changing that.

Witness: Hundreds of Native American students, educators, tribal representatives, attorneys, and scientists are now linking up via modern and mainframe networks, such as Internet (the public data network funded by the National Science Foundation), roaming cyberspace in virtual American Indian communities on the electronic frontier. "It's a whole new wave for Indian country," says AIT's Randy Ross. "And it's moving like wildfire." A half-dozen Native American-oriented list servers and news groups function as electronic powwows on everything from bingo to education and protection of sacred sites.

AIT, meanwhile, has launched a grass-roots computing movement with the Dakota BBS, a desktop bulletin-board system operating on a 486 machine, located in Rapid City, South Dakota. "Indian people at the grass-roots level need to have the opportunity of creating and exchanging information about and among themselves in a way that's appropriate for them and to form their own dynamic," says Ross, who set up the Dakota BBS with systems owner Anne Falls Group, including the Pine Ridge Reservation's Shannon Coun-

ty Schools and the Northern Plains Native American Chemical Dependency Association, use the service.

IndianNet, a computer network funded by the Administration for Native Americans (ANA) should go online this year. It will serve as a forum for the discussion on repatriation and house a tribal-profile database.

On many and more reservations, computer technology is recording and teaching native languages, tribal history, and traditional culture and knowledge as well as disseminating current events and information. "With computers we now have the capability for the first time to have really portable and low-cost technology to be able to enhance cultures," says Jim May, a member of the Katoowah tribe of the Cherokee and vice provost for information resources at California State University in Chico. "We can use camcorders to get oral histories and desktop publishing to disseminate information, and I can even print things out in Cherokee now on

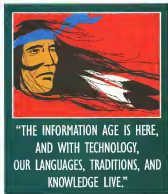
my Macintosh. It's going to result in an explosion of home-grown materials."

On the Huachuca Reservation in Peach Springs, Arizona, and on the Pine Ridge Reservation in Kyle, South Dakota, for example, students are learning their native language via HyperCard programs that allow them to check their pronunciations with the computer voice. Students and professors at Oglala Lakota College on Pine Ridge are creating CD-ROMs on everything from the Bigfoot Massacre in 1890 to the Wounded Knee Uprising in 1873. And in Window Rock, Arizona, the Navajo tribe is creating a CD-ROM on their traditional world view.


The American Indian Higher Education Consortium (AIHEC) and the Native American Public Broad-

casting Consortium (NAPBC) with a \$250,000 grant from the Commerce Department have joined forces to develop a video satellite network that will interconnect the 26 AIHEC colleges and BIA-operated schools to share courses. The network will also allow the tribal colleges to transmit courses via satellite to other universities around the country. "While education is the funding emphasis for the project now, we envision that it will grow into other areas, including intertribal communications, tribe-to-U.S. government communications, and news dissemination from courts, Congress, and various government agencies," says NAPBC Director, Frank Blythe.

The NAPBC is planning to launch the American Indian Radio on Satellite (AIROS) network, the first nationwide Native American radio network. AIROS would distribute programming and information to and from the 27 Native American-owned or controlled stations throughout the country, most of which offer a blend of programming, from tribal news and



# MURDERS FROM THE PAST

An electric saw buzzed through a lead container that had been sealed for 150 years. Slowly, the liner lid was removed, exposing the remains of Zachary Taylor, the twelfth president of the United States. Face to face with the former president, a blue-ribbon panel of investigators was surprised to see a thick mass of dark hair and a large cloth bow under the chin. Since the president's visit was meant to be brief, his heels went to work immediately. University of Florida forensic anthropologist Bill Maples methodically cut away the president's clothing, finding abundant body hair beneath the one-piece, pleated shroud. Then he took hair, nail, and tissue samples, hoping they would prove whether the president had succumbed to arsenic poisoning or died of natural causes.  Ghoulish? Perhaps to most. But to forensic sleuths like Maples, who focus on murders and other mysteries a century or more old, exhuming and examining the remains of celebrities from presidents to political



Back in time: To resolve some of the most gruesome and enigmatic murder mysteries of the past, physical anthropologists



gists like Bill Maples, top center, are digging up remains of both killers and victims as well as old murder weapons and more. Maples' colleagues, for instance, have exhumed the body of Dr. Carl Austin Weiss, top left, convicted, perhaps wrongfully, of assassinating the controversial U.S. senator Huey Long. Weiss's x-rayed





skull is depicted, bottom right. Experts also want to study the hatchet supposedly used by Lizzie Borden, next page, top right, to kill her father, whose skull is shown, top right, and her stepmother, whose skull

is depicted on the next page, bottom left. Bottom center on this page is another focus for forensic sleuthing: One Alfred Packer, convicted of a jury of his peers, he always maintained his innocence and was eventually paroled. Packer died in 1907, leaving unanswered the question of whether he truly was the



Juan Mountains. Though Packer was convicted by a jury of his peers, he always maintained his innocence and was eventually paroled. Packer died in 1907, leaving unanswered the question of whether he truly was the

assassin is business as usual.  In another case, for instance, Maples seeks to identify the remains of Francisco Pizarro, the Spanish conqueror of Peru. And his colleague James Starrs, a lawyer and forensic scientist at George Washington University in Washington, DC, has exhumed the remains of Dr. Carl Austin Weiss, the alleged assassin of the controversial U.S. senator from Louisiana, Huey Long. When held up to the scrutiny of modern science, Weiss's remains and other buried evidence may show whether the doctor was truly Long's assassin or was innocent, as his descendants have claimed.  It's possible to resolve such issues today, thanks to the extraordinary range and power of modern forensic techniques. Today's high-resolution microscopes, for instance, can analyze knife marks on bone, distinguishing between different knives or the marks left by animals. X-rays can probe beneath the surface of grave sites. Sophisticated chemical and nuclear technologies can detect trace amounts of incriminating poisons. And using computers, experts can superimpose old photo



vicious killer who ate his unwitting victims' remains. Shown above is a photo of the remains of the five victims shortly after



exhumation in 1989. Another historical figure currently the subject of investigation is Meriwether Lewis, of Lewis and Clark fame, at right, who died of two gunshot wounds. The

death was declared a suicide at the time but is now considered a murder. Also the topic of study was



former U.S. president Zachary Taylor, bottom right, who died suddenly, allegedly of gastroenteritis; despite this official cause of death, some experts have suggested arsenic poisoning instead. To unearth the truth, a team of forensic sleuths exhumed Taylor's remains in 1991, almost a century and a half after his

untimely death. It's interesting to note that detailed chemical and nuclear tests at the Louisville medical examiner's office and at the Oak Ridge National Laboratory in Tennessee yielded






no evidence of arsenic poisoning. But despite these results, say some experts, it's remotely possible that Taylor was poisoned with arsenic after all and that the evidence has simply leached from his body over the years.

leuthing crimes of the past, forensic anthropologists open up files on Lizzie Borden,

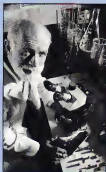
the Colorado Cannibal, Zachary Taylor, and Huey "Kingfish" Long, among others.

# MURDERS FROM THE PAST

of a victim or suspect on top of x-ray images of facial bones, determining whether or not the identities are a match.  In fact, whether it's determining the identity of an eighteenth-century criminal or investigating the fate of the princess Anastasia Romanov, forensic anthropologists have begun to rewrite the history of murder, mayhem, and sensational crime. For a look at some of the most fascinating investigations to date, open Omni's murder dossier, and read on. **Who Killed the Kingfish?** **VICTIM:** Huey Long, U.S. senator and former governor from Louisiana.  **DEATH NOTES:** The politically powerful Long was shot and killed while visiting the Louisiana State Capitol on September 8, 1935. The presumed assassin, a 29-year-old physician named Carl Weiss, was killed by Long's bodyguards in a hail of gunfire at the scene.  **MURDER MYSTERY:** Although the case against Weiss was considered open and shut at the time, questions began to emerge. First of all, officials were never able to establish a genuine motive. In addition, though police said Weiss's gun was found at the




Francisco Pizarro, top left, Spanish conqueror of Peru, stabbed to death by native Peruvians who despised his brutal reign. While the circumstances of Pizarro's death are not in question, experts have debated the legitimacy of the explorer's mummified remains, put on exhibit at the Cathedral of the Plaza de



Aramis in Lima. The mummy in question showed no evidence of a brutal attack, and when workers found



another batch of remains hidden behind a secret cathedral wall,

the identity of the true Pizarro was up for grabs. A bit of forensic sleuthing proved the mummy an imposter and the bones behind the hidden wall real.  This page, center, is George Washington University lawyer and forensic scientist James Starrs, who investigated the



The mystery solved, Peruvian officials put the true remains on display. "Fame is fleeting," observed investigator Bill

Maples, "even after death." This page, center, is George Washington University lawyer and forensic scientist James Starrs, who investigated the

scene, no one could prove he had carried the gun into the Capitol. Did Carl Weiss really kill Huey Long, or was he just a patsy, a fall guy set up by one of the many bitter political enemies Long had cultivated over the years?  **FORENSIC SLEUTHS:** James Starrs, forensic scientist, George Washington University, Washington, DC; Douglas Ubelaker, curator of anthropology, National Museum of Natural History, Smithsonian Institution, Washington, DC; Lucien Haag, freelance "criminalist" and weapons expert, Phoenix; Irvin Sother, state medical examiner, West Virginia; and Alphonse Pokis, toxicologist, Medical College of Virginia at Richmond.  **CLUES UNEARTHED:** Weiss's remains were exhumed on October 20, 1991, at the Rose Lawn Cemetery in Baton Rouge and transported first to the Lafayette, Louisiana, pathology lab for clearing, then to Ubelaker's lab at the National Museum of Natural History. To identify the remains as those of Weiss, Ubelaker used the technique of photographic imposition to match the skull with old photos of the suspect. To rule out the



murderer, Carl Weiss, whose dead body is shown at left on a Baton Rouge Capitol corridor floor, Forensic sleuths investigating the Colorado Canni-

bal have studied this sketch, above, created by artist John Randolph, the man said to have discovered the remains of the five unlucky victims brutally killed and then apparently filleted and eaten by Packer.



Photograph of the skull of victim George Noon, below, shows numerous hatchet marks. Finally,

experts trying to solve a royal murder mystery have compared photos of Anna Anderson Manahan, right, with depictions of her royal highness Anastasia Romanov, bottom right, said to have been killed with the rest of the Russian royal family during the Bolshevik revolution. To her dying day, Manahan claimed she was the real Anastasia, whose remains have never been identified.



Did Anastasia survive? To get to the truth, scientists are hoping to find and study more royal bones at the bottom of a firepit.





likelihood that Weiss committed the act as a result of a brain tumor or while under the influence of drugs, toxicologist Pokis examined the anatomy of the skull and analyzed the chemical content of tissue and bones. Examining the remains, he also discovered that Weiss had been shot a minimum of 23 times, with half the wounds inflicted on his back. Several bullet wounds were found in his arms, suggesting a defensive posture. Uebelker also found that Weiss had been shot from a "variety of angles," implying that his assailants came from many directions.

Then Haag, an expert in firearms and tool marks, stooped in to examine the contents of five squarered away by the police superintendent. Perhaps most telling was a .32-caliber bullet thought to have come from the scene of the crime. After testing the bullet at the laboratory in Phoenix, Haag concluded it did not come from Weiss's gun. Since Long's bodyguards carried only larger .38- and .45-caliber pistols, Haag notes, the mysterious bullet raises the question of a second, never-reported .32-caliber pistol somewhere on the scene. If's possible, he proposes, that Weiss's gun was simply a plant to protect the identity of the true killer, the one that got away. Anyone who knew that

Weiss carried a piece could have found one like it and committed the crime themselves, setting Weiss up for the fall, Haag says.

**CONCLUSION:** As a result of all the new evidence, the seemingly solid case against Weiss has been riddled with doubt.

#### Will the Real Pizarro Please Stand?

**VICTIM:** Francisco Pizarro, Spanish conqueror of Peru.

**DEATH NOTES:** Francisco Pizarro, displaced by native Peruvians because of his brutal reign, was stabbed to death by a crowd of angry subjects in 1541 at the age of 71 in full view of numerous witnesses. Pizarro subsequently led into history where he remained a topic for academicians and scholars for more than 350 years.

**QUESTION OF IDENTITY:** The circumstances of Pizarro's death are not in question, having been well documented at the time by the Spanish, who tortured witnesses to elicit the details. However, in the 1830s, Peruvian officials decided to put Pizarro's remains on exhibit as part of an upcoming celebration of Columbus's voyage. They asked officials at the Cathedral of the Plaza de Armas in Lima for Pizarro's body and were directed to a mummy, which they

put on view. Then, in 1878, workers in the cathedral uncovered a secret niche that had been walled over. On a shelf inside the niche was a lead box with a skull and an inscription identifying the contents as the head of Pizarro. Alongside the first box was another, this one containing the bones of several unidentified individuals. Who was the real Pizarro? The mummy that had been on display for nearly a century or the skull and bones found in the cathedral crypt?

**FORENSIC SLEUTHS:** Bill Maples, anthropologist, University of Florida, Gainesville, and Bob Benfer, anthropologist, University of Missouri, Columbia.

**CLUES UNearthED:** A preliminary investigation by one of Benfer's students showed that postcranial bones in the second box matched the skull in the first. The matching bones were then assembled with the skull. The challenge for Maples and Benfer, determining whether the newly discovered bones contained marks consistent with knif or sword wounds and then determining whether similar wounds appeared on the mummy. Using straightforward visual observation, the researchers determined that the skeleton had been stabbed multiple times, consistent with the reported demise of Pizarro. From the location of the wounds, Maples and Benfer concluded that Pizarro had been stabbed about the head and body and apparently had tried to shield himself with his arm, a reaction that is common in stabbing deaths. The mummy, on the other hand, exhibited no injuries whatsoever and could not have been Pizarro at all.

**CONCLUSION:** The remains of Pizarro had been hidden in the Cathedral crypt all along. The mystery solved, Peruvian officials exchanged the mummy with the bones, which are now on display instead. As for the mummy, it's on a piece of plywood down in the crypt. "Yams is feeding," Maples observes, even after death.

#### Search for Anastasia

**VICTIMS:** Czar of Russia, Nicholas II; his wife, Alexandra; their five children, Olga, Tatiana, Maria, Anastasia, and Alexei; the royal physician, and several royal servants.

**DEATH NOTES:** On July 17, 1918, during the Bolshevik Revolution, the Russian czar and his family along with the royal physician and some servants were awakened and taken to the basement of the house in which they stayed. There, they were greeted by a hail of bullets and then stabbed with bayonets. According to one account, their bodies were hacked to pieces and



soaked in acid. Two were burned.

**MURDER MYSTERY** In what may have been the ultimate game of Russian roulette, the assassins assigned to wipe out the royal family may have let two members slip through the cracks. According to rumors that have persisted ever since the fateful day the princeess Anastasia Romanov and her brother Alexis may have survived their grievous injuries and lived to tell the tale. One observer, for instance, recalled the czar's youngest daughter sitting up and screaming after the initial volley of bullets. And in the years that followed, a number of people have claimed to be Anastasia herself. Anna Anderson-Manahan, who died in Charlottesville, Virginia, in 1964 at the age of 82, was probably the most publicized claimant. For 60 years she tried to convince people she was Princess Anastasia and even filed a lawsuit in Germany for an \$85-million dowry supposedly held in trust. German bankers were vague about the existence of a trust fund, however, and she lost the case. Although a movie was made of her struggle, her claims were discounted, primarily because she could not speak Russian. Was Manahan or another claimant the true Anastasia Romanov? Did the youngest czar's princess survive?

**FORENSIC SLEUTHS** Bill Maples, Lowell Levine, codirector of the New York State Police Forensic Sciences Unit in Albany, Michael Baden, New York City pathologist, and Catherine Gaskes, microbiologist, New York State police

**CLUES UNEARTHED** In 1991, Russian authorities exhumed the remains of nine bodies thought to be the czar and those who perished with him. Also retrieved from the grave site were bullets and a broken acid jar. Soon after exhumation, American experts, including Maples and Levine, arrived at a lab in Yakutsk, a city some 800 miles east of Moscow. Their goal: to identify the bodies and determine the cause of death. The Americans quickly declared that historical accounts of the assassination were born out by the condition of the remains. Three of the skulls showed clear evidence of gunshot wounds, Maples says, and teeth and skulls showed evidence of etching and erosion by acid. There was even enough tissue on the remains of what was certainly the royal physician to hold the lower torso together. In fact, there was only one part of the story that could not be verified: the death of Anastasia. The skeleton of a 17-year-old female could not be found. Maples sees one last way to prove that Anna

Anna died. Locate a fingerprint containing the two bodies that were supposedly burned. According to historical accounts, the burned bodies belonged to Alexis, the czar's son, and a maid. But Maples says one of the burned bodies could turn out to be Anastasia. "If we found the bodies of two teenagers in a fire pit," he says, "I would feel confident that Anastasia did not survive."

**CONCLUSION:** DNA analysis conducted by British scientists confirmed the findings of forensic sleuths who went to Russia. After comparing blood samples taken from Prince Philip, a blood relative of the czar's wife, with tissue samples taken from the remains at Yakutsk, scientists were able to get a match. At the moment, the fate of Anastasia has been thrown into question. Russian investigators say Anastasia's remains were among those found. American experts are unsure. Recently, a lock of hair said to belong to Anna Anderson-Manahan has been produced and will soon be subjected to DNA analysis. Hopefully, say the experts, they will be able to tell whether her genes and those of Prince Philip match.

**Presidential Poison**  
**VICTIM** Zachary Taylor, twelfth president of the United States.

**DEATH NOTES:** On July 4, 1850, President Taylor dedicated the cornerstone for the Washington Monument. After walking home from the ceremony, he ate a bowl of cherries and drank a glass of cold milk. A short while later, he became violently ill with diarrhea, severe vomiting, and dehydration. Five days later he died.

**MURDER MYSTERY** At the time, Taylor's death was attributed to deadly gastroenteritis. But according to pundits the same symptoms are characteristic of arsenic poisoning, and they say Taylor may have been murdered by enemies willing to do him in. Historical novelist Clara Rising even has two prime suspects: then-Vice President Millard Fillmore and Kentucky senator Henry Clay. Taylor was opposed to the extension of slavery, Rising explains, and supported the admission of California as a free state, something that would have made free states more numerous than slave ones. After Taylor's death, however, Fillmore supported a compromise proposal by Clay in which California, a free state, was paired with New Mexico, a slave state; the balance of power was kept intact. Motive enough to assassinate a president? Rising and others say maybe so.

**FORENSIC SLEUTHS** Clara Rising, Louisville; Bill Maples, Dr. Richard Graefhouse, Jefferson County coroner,



*"I knew that you had many talents, Ferguson, but I didn't realize that levitation was one of them."*

Louisville, Dr. George Nichols, medical examiner, Commonwealth of Kentucky, Louisville, and Dr. William Hamilton, medical examiner, Gainesville, Florida.

**CLUES UNEARTHED:** Before exhuming Taylor on June 17, 1991, researchers checked with White House historical records to determine if the president had been embalmed. In the 1800s, embalming almost always involved the use of arsenic, and if he had been embalmed, it would have been impossible to tell whether Taylor had in fact been poisoned. According to Rising, records show that Taylor's wife would not allow him to be embalmed.

Coexistence of the coffin's lead liner caused by large quantities of seeping body fluids offers additional evidence that embalming did not occur. The researchers also sent tissue samples to the Louisville medical examiner's toxicology lab and to the Oak Ridge National Laboratory in Tennessee, where it was placed in a powerful research reactor and bombarded with neutrons. When bombarded with neutrons, different metals give off different levels of radiation; arsenic, of course, has its own telltale signature. When the results were in, both the chemical and nuclear tests revealed only "normal levels of arsenic" consistent with neither embalming nor

poisoning. The labs also checked for the presence of other heavy metals, including mercury and antimony, and found none.

**CONCLUSION:** The detailed tests found no evidence of arsenic poisoning. But despite the results, says Maples, it's remotely possible that Taylor was poisoned with arsenic after all and that the evidence has simply leached from his body over the years.

#### Colorado Cannibal

**VICTIMS:** Shannon Bell, Israel Swan, James Humphrey, George Noon, and Frank Miller, five prospectors seeking gold and silver in Colorado's San Juan Mountains.

**DEATH NOTE:** In the winter of 1874, the five victims hired one Alfred Packard to guide them through the mountains. But when Packard returned to town after six weeks, he said he had lost the others in a snow storm. There had, indeed, been a raging storm, but authorities were suspicious because of Packard's appearance. Despite his claims of hardship and a shortage of food, he was noticeably fat and more interested in drinking than eating. In addition, he seemed to have far more money than he'd had before the trip. When a traveling artist located the remains of the

missing men, he discovered evidence of foul play and even sketched the scene for Harper's Weekly. Finally authorities reported "marks of extreme violence" on the bodies of the victims and concluded that they had been murdered by a cannibal.

**FORENSIC SLEUTHS:** James Starns, Douglas Libbeyker, Walter Binkley, forensic anthropologist, University of Arizona, Tucson, tool-mark expert Lucien Haag, and archaeologist James Ayres, Tucson, Arizona.

**MURDER MYSTERY:** Before he could be charged with the murders, Packard escaped from authorities and remained at large for nine years. He was finally captured in 1883 and at his trial declared that four of the men had been murdered by Shannon Bell. He himself shot and then hacked Bell to death in self-defense, he claimed, after Bell attacked him. Packard was convicted and sentenced to death but won a new trial on a technicality. He was convicted a second time and sentenced to 40 years hard labor. At the turn of the century, however, a Denver newspaper columnist raised doubts about his guilt and succeeded in getting him paroled in 1901. He died in 1907. Was Packard innocent, or was he a vicious killer who

CONTINUED ON PAGE 32

## WHAT'S THAT?

It's the future.

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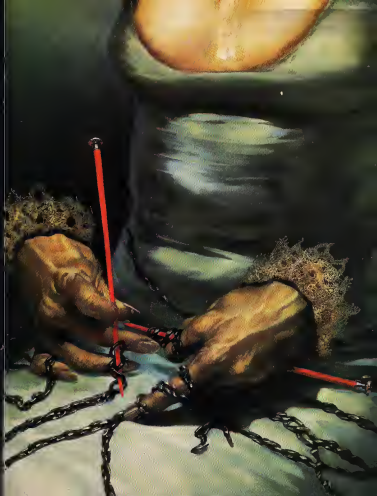
CORA IS A MORNING PERSON. Her sister, Janice, hardly feels conscious till late afternoon. Janice nibbles fruit and berries and complains of her stomach. Cora eats potatoes with butter and sour cream. She likes being fat. It makes her feel powerful and hides her wrinkles. Janice thinks being thin and willowy makes her look young, though she would admit that—and even though Cora spends more time outside doing the yard and farm work—Cora's skin does look smoother. Janice has a slight stutter. Normally she speaks rapidly and in a kind of shorthand so as not to take up anyone's precious time, but with her stutter, she can hold people's attention for a moment longer



## MRS. JONES

FICTION BY  
CAROL EMSHWILLER

PAINTING  
BY RICK BERRY



then she would otherwise dare. Cora, on the other hand, speaks slowly and if she had ever stuttered would have seen to it that she learned not to.

Cora bought a genuine kilim rug to offset, she said, the bad taste of the flowery chair covers Janice got for the couch and chairs. The rug and chairs look terrible in the same room, but Cora insists that her rug be there. Janice retaliated by pawing Mother's silver candlesticks. Cora had never liked them, but she made a fuss anyway and she let Janice's favorite silver spoon in the mayonnaise jar until, polish as she would, Janice could never get rid of the blackish look. Janice punched a hole in each of Father's rubber boots. Cora wears them anyway. She hasn't said a single word about it, but she hangs her wet socks up conspicuously in the kitchen.

They wish they'd gotten married and moved away from their parent's old farm house. They wish desperately that they'd had children, though they know nothing of children—or husbands for that matter. As girls they worked hard at domestic things: canning, baking bread and pies, sewing—waiting to be good wives to almost anybody, but nobody came to claim them.

Janice is the one who worries. She's worried right now because she saw a light out in the far corner of the orchard—a tiny flickering light. She can just barely make it out through the misty rain. Cora says, "Noneense." (She's angry because it's just the sort of thing Janice would notice first.) Cora laughs as Janice goes around checking and re-checking all the windows and doors to see that they're securely locked. When Janice has finished, and stands staring out at the rain, she has a change of heart. "Whoever's out there must be cold and wet. Maybe hungry."

"Noneense," Cora says again. "Besides, whoever's out there probably deserves it."

Later, as Cora watches the light from her bedroom window, she thinks whoever it is who's camping out down there is probably eating her apples and making a mess. Cora likes to sleep with the windows open a crack even in weather like this, and she prides herself on her courage, but, quietly, so that Janice, in the next room, won't hear, she eases her windows shut and locks them.

In the morning the rain has stopped though it's foggy. Cora goes out (with Father's walking stick, and wearing Father's boots and battered canvas hat) to the far end of the orchard. Something has certainly been there. It had pulled

down perfectly good, live, apple branches to make the nests. Cora doesn't like the way it ate apples, either, one or two bites out of lots of them. And then it looks as if it had made itself sick and threw up not far from the fire. Cora cleans everything so it looks like no one has been there. She doesn't want Janice to have the satisfaction of knowing anything about it.

That afternoon, when Cora has gone off to have their pickup truck greased, Janice goes out to take a look. She also takes Father's walking stick, but she wears Mother's floppy, pink hat. She can see where the fire's been by the black smudge, and she can tell somebody's been up in the tree. She notices things Cora hadn't: little claw marks on a branch, a couple of apples that had been bitten into and hanging on the tree near the nesting place. There's a tiny piece of leathery

---

Janice  
begins to like the little  
light. Thinks  
it looks inviting. Homey.  
She forgets  
that she found that funny  
piece of  
leather and the claw marks.

---

stuff stuck to one sharp twig. It's incredibly soft and downy and has a wet-dog smell. Janice takes it, thinking it might be an important clue. Also she wants to have something to show that she's been down there and seen more than Cora has.

Cora comes back while Janice is upstairs taking her nap. She sits down in the front room and reads an article in the *Reader's Digest* about how to help your husband communicate. When she hears Janice come down the stairs, Cora goes up for her nap. While Cora naps, Janice sets out grapes and a tangerine, and scrambles one egg. As she sets her early supper, she reads the same article Cora has just read. She feels sorry for Cora who seems to have nothing more exciting than the sort of thing to read (along with her one hundred great books) whereas Janice has been reading HOW FAMOUS COUPLES GET THE MOST OUT OF THEIR SEX LIVES. Just one of many such books that she keeps locked in her bedside cabinet. When she finishes eating, she cleans

up the kitchen so it looks as if she hadn't been there.

Cora comes down when Janice is in the front parlor (sliding doors shut) listening to music. She has it turned so low Cora can hardly make it out. Might be *Wavvadi*. It's as if Janice doesn't want Cora to hear it in case she might enjoy it. At least that's how Cora takes it. Cora opens a can of spaghetti. For dessert she takes a couple of apples from the "special" tree. She eats on the closed-in porch, watching the clouds. It looks as if it'll rain again tonight.

About eight-thirty they each look out their different windows and see that the flickering light is there again. Cora says, "Damn it to hell, so loud that Janice hears from two rooms away. At that moment Janice begins to like the little light. Thinks it looks inviting. Homey. She forgets that she found that funny piece of leather and those claw marks. Thinks most likely there's a young couple in love out there. Their parents disapprove and they have no place else to go but her orchard. Or perhaps it is a young person. Teenager, maybe, cold and wet. She has a hard time sleeping, worrying and wondering about whoever it is, though she's still glad she looked the house up light.

The next day begins almost exactly like the one before, with Cora going out to the orchard first and cleaning up—or trying to—all the signs of anything having been there, and with Janice coming out later to pick up the clues that are left. Janice finds that the same branch is scratched up even more than it was before, and this time Cora had left the vomit (full of bits of apple peel) behind the tree. Perhaps she hadn't noticed it. Apples—or at least so many apples aren't agreeing with the lovers. (In lots of the clues, Janice prefers to think that it's lovers.) She feels sorry about the all-night rain. There's no sign that they had a tent or shelter of any kind, poor things.

By the third night, though, the weather finally clears. Stars are out and a tiny moon. Cora and Janice stand in the front room, each at a different window looking out towards where the light had been. An old seventeenth-century record is on, Fritz Kramler playing a Bach Chaconne. Janice says, "You'd think especially since it's not raining."

Cora says, "Good morning," though she, too, feels a sense of regret. At least something unusual had been happening. "Don't forget," Cora says, "the state prison is only ninety miles away."

Little light or no little light, they both check the windows and doors and

than recheck the ones the other had already checked, or at least Cora rechecks all the ones Janice had seen to Janice sees her do it and Cora sees her nothing, so Cora says, "With what they're doing in genetic engineering, it could be anything at all out there. They make mistakes and peculiar things escape. You don't hear about it because it's classified. People disapprove so they don't let the news get out." Ever since she was six years old, Cora has been trying to scare her younger sister, though, as usual, she ends up scaring herself.

But then, just as they are about to give up and go off to bed, there's the light again. "Ah," Janice breathes out as though she had been holding her breath. "There it is, finally!"

"You've got a lot to learn," Cora says. She'd heard the relief in Janice's big sigh. "Anyway, I'm off to bed, and you'd better come soon, too, if you know what's good for you."

"I know what's good for me," Janice says. She would have stayed up too late just for spite, but now she has another, secret reason for doing it. She sits reading an article in *Cosmopolitan* about how to be more sexually attractive to your husband. Around midnight, when downstairs, she can hear Cora

snoring. Janice goes out to the kitchen. Moves around it like a little mouse. She's good at that. Gets out Mother's tea/coffee jar, takes big slices of rye bread from Cora's stash, takes a can of Cora's tuna/eh. (Janice knows she'll notice. Cora has them all counted up.) Takes butter and mayonnaise from Cora's side of the refrigerator. Makes three tuna/eh sandwiches. Places them on three of Mother's gold-trimmed plates along with some of her own celery, radishes and grapes. Then she sits down and eats one plateful herself. She hasn't let herself have a tuna/eh sandwich especially not one with mayonnaise and butter and rye bread, in quite some time.

It's only when Janice is halfway out in the orchard that she remembers what Cora said about the prison and thinks maybe there's some sort of escaped criminal out there—a rapist or a murderer, and here she is, wearing only her bathrobe and nightgown, in her slippers, and without even Father's walking stick. (Though the walking stick would probably just have been a handy thing for the criminal to attack her with.) She stops, puts the tray down, then moves forward. She's had a lot of practice creeping—creeping up on Cora ever since they were little. Used to

yell, "Boo," but now shouts out anything to make her jump. Or not even shouting. Creeping up and standing very close and suddenly whispering right by her ear can make Cora jump as much as a loud noise. Janice sneaks along slowly. Has to step over where whoever it is has already thrown up. Something is huddling in front of the fire wrapped in what at first seems to be an army blanket. Why it is a child. Poor thing. She'd know it all the time. But then the creature moves, scratches, makes a squeaky sound, and she sees it's other the largest bat, or the smallest little old man she's ever seen. She's wondering if this is what Cora meant by genetic engineering.

Then the creature stands up and Janice is shocked. He has such a large penis that Janice thinks back to the horse and bulls they used to have. It's a Pan type penis, more or less permanently erect and hooked up tight against his stomach, though Janice doesn't know this about a Pan's penis, and, anyway this is definitely not some sort of Pan.

The article in *Cosmopolitan* comes instantly to her mind, plus the other, sadder books that she has looked in her bedside cabinet. Isn't there, in all this, some way to permanently castrate Cora? Whether she ever finds out about it or not? Slowly Janice backs up, turns, goes right past her tray (the gleam of silverware helps her know where it is), goes to the house and down into the basement.

They'd always had dogs. Big ones. For safety. But Mr. Jones (called Jonesy) had only died a few months ago and Cora is still grieving, or so she keeps saying. Since the dog had become blind, diabetic, and incontinent in his last years, Janice is relieved that he's gone. Besides, she has her heart set on something small and more tractable, some sort of lamb, but now she's glad Jonesy was large and difficult to manage. His metal choke collar and chain leash are still in the cellar. She wraps them in a cloth bag to keep them from making any clanking noises and heads back out, picking up the tray of food on the way.

As she comes close to the fire, she begins to hum. This time she waits for him to know she's coming. The creature sits in the tree now and watches her with red glinting eyes. She puts the tray down and begins to talk softly as though she were trying to calm old Jonesy. She even calls his thing Mr. Jones. At first by mistake and then on purpose. He watches. Moves nothing but his eyes and big ears. His wings folded up along his arms and dangling, are army-dive drab like that piece she



found, but his body is a little lighter. She can tell that even in this moonlight.

Now that she's closer and less startled than before, she can see that there's something terribly wrong. One leathery wing is torn and twisted. Helpless. Or almost. Probably in pain Janice feels a rush of joy.

She breaks off a bit of sunfish sandwich and slowly, talking softly all the time, she holds it towards his little clawed hand. Equally slowly, he reaches out to take it. She keeps this up until almost all of one plateful is eaten. But suddenly the creature jumps out of the tree, turns around and throws up.

Janice knows a vulnerable moment when she sees one. As he leans back on his heels between spasms, she fastens the choke collar around his neck, and twists the other end of the chain leech around her wrist.

He only makes two attempts to escape: tries to flap himself into the air, but it's obviously painful for him, then he tries to run. His legs are bowed, his gait rocking and clumsy. After these two attempts at getting away, he seems to realize it's hopeless. Janice can see in his eyes that he's given up—too sick and tired to care. Probably happy to be captured and looked after at last.

She leads him back to the house and down into the basement. Her own quiet creeping makes him quiet, too. He seems to sense that he's to be a secret and that perhaps his life depends on it. It was hard for him to walk all the way across the orchard. He doesn't seem to be built for anything but flying.

There is an old coal room, not used since they got oil heat. Janice makes a nest for him there, first cleaning him to one of the pipes. She gets him blankets, water, an empty pail with lid. She makes him put on a pair of her underpants. She has to use a card around his waist to make them stay up. She wonders what she should leave him to eat that would stay down? Then brings him chamomile tea, dry toast, one very small potato. That's all. She doesn't want to be cleaning up a lot of vomit.

He is so tractable through all this that she loses all fear of him. Pale as he had as if he were old Janey. Smokes the wonderful softness of his wings. Thinks: If those were cut off, he'd look like a small old man with long, hard finger-nails. Mash-pot, not much more so than other people. And clothes can hide things. Without the dark wings, he'd look lighter. His body is that color that's always described as cork or tan. She would have preferred it if he'd been clearly a white person, but, who knows, maybe a little white in the cellar will make him paler.

After a last rubbing of his head behind his too-large ears, Janice padlocks the coal room and goes up to her bedroom, but she's too excited to sleep. She reads a chapter in *ARE YOU HAPPY WITH YOUR SEX LIFE?*, the one on "How to Turn Your Man into a Lusting Animal" ("The test of both sexes are exquisitely sensitive" and, "Let your eyes speak: but first make sure he's looking at you." "Surrender. When he thinks he's leading, your man feels strong in every way.") Janice thinks she will have to be the one to take the initiative, though she'll try to make him feel that he's the boss—even though he'll be wearing the choke collar.

For a change, Janice wakes up just as

easily as Cora does. Earlier, in fact, and she lies in bed making plans until it is late enough to get up. She gets a lot of good ideas. She comes downstairs whistling *Vivaldi*—off key as usual, but she's not doing it to make Cora angry this time. She really can whistle on key. Cora knows that Janice knows. Cora hates the way she whistles. Cora thinks that if Janice really tried, she could be just as in tune as Cora always is. Cora thinks Janice got up early just so she could spoil Cora's breakfast by sitting across from her and looking just like Mother used to look when she disapproved of Father's table manners. And Cora notices, even before she makes her omelet, that one of Janice's is missing, and that her tail of eye

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bread has gone down by several slices. She takes a quart of strawberries from Janice's side of the refrigerator and eats them all, not even bothering to wash them.

Janice doesn't say a word, or even do anything. She doesn't care, except that Jonsey might have wanted some. Janice is feeling magnanimous and powerful. She feels so good she even offers Cora some of her herb tea. Cora takes the offer as ironic, especially since she knows that Janice knows she never drinks herb tea. She retaliates by saying that since they're both up so early they should take advantage of it and go out to the beach to get more leekwater for the garden.

Janice knows that Cora decided this just to make her pay for the luresh and mayonnaise and such, but she still feels magnanimous—kindly to the whole world. She doesn't even say that they'd already done that twice in the spring, and that what they needed now were hay bales to put around the foundations of the house for the winter. All she says is, "No."

It is never been their way to shrink their duties no matter how angry they might be with each other. When it comes to work, they've always made a good team. But now Janice is adamant. She says she has something important to do. She's not ever said this before, nor has she ever had something important to do. Cora has always been the one who did important things. This time Cora can't persuade Janice to change her mind, nor can she persuade her that there's nothing important to be done—or nothing more important than leekwater.

Finally Cora gives up and goes off alone. She hadn't meant to go. She's never gone off to get leekwater by herself, but she goes anyway, hoping to make Janice feel guilty. Except Cora knows something is going on. She's not sure what, but she's going to be on her guard.

As soon as Janice hears the old pickup crunch away on the gravel drive, she goes down in the basement, bringing along Father's old straight razor (freshly sharpened), rubbing alcohol and band-aids. Also, to make it easier on him, a bottle of sherry.

Cora comes back, tired and sandy, around six-thirty. Her face is red and she has big, dried, sweat marks on her blue farmer's shirt, across her back and under the arms. She smiles belly. She's so tired she staggers as she climbs the porch steps. Even before she gets inside she knows odd things are still going on. There's the smells . . . of beef

stew or some such, onions, maybe a mince pie, and there, on the hall table, a glass of sherry is set out for her. Or seems to be for her. Or looks like sherry. Though the day was hot, these fall evenings are cool, and Janice has had a fire in the fireplace, and not badly done. Cora always knew Janice could do it properly if she really tried. Cora takes the sherry and sits on the footstool of Father's big chair. It's one of the ones Janice had covered in a flowery pattern—looks like pinkish-blue hyacinths. Cora turns away from it and looks at the fire. Thinks. All she has got to be because of something else. Or maybe it's going to be a practical joke. If she lets down her guard she'll be in for big trouble. But even if it's a joke, might as well take advantage of it for as long as she can. The sherry relaxes her. She'll go up and shower—if that is Janice has left her any hot water.

---

Mr. Jones  
is in pain. Janice is glad  
of it. She  
knows a wild thing—or  
even a not  
so wild thing—appreciates  
being  
nursed back to health. \*

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For several days, Mr. Jones is in pain. Janice is glad of it. She knows how a wild thing—or even a not so wild thing—appreciates being nursed back to health. She hopes Mr. Jones was too drunk to remember about the . . . removal . . . amputation . . . whatever you'd call it. (Funny, he only has four fingers on each hand. She'd not noticed that at first.)

As soon as he's better, she hopes to band him to her in a different way.

Cora is still suspicious, but doesn't know what to be suspicious about. The good food is going on and on. After supper Janice cleans up and doesn't ask Cora for help even though Janice has done all the cooking. And Janice disappears for hours at a time. Goes up to take her nap—or so she says, but Cora knows for a fact that she's not in her bedroom. After the dishes are cleaned up in the evenings, Janice sews or knits. It's not hard to see that she's knitting a child-sized sweater, sewing a child-sized pair of trousers. At the same time, she's working on a white

dress, lacy and low necked. Cora thinks much too low necked for some one Janice's age. But perhaps it's not for Janice. Maybe Janice has some news she's keeping from Cora. That would be just like her. Someone is getting married or coming for a visit. Or maybe both, someone getting married and a child is coming to visit.

Mr. Jones is getting better, eating soups, nuts and seeds and keeping everything down. Finally Janice is happy to see that his skin has faded some. He might pass for a grained, little Mexican, or maybe a fairly light India Indian. And he's beginning to understand some words. She's been talking to him a lot more or less as she used to talk to old Jonsey. He knows: good boy and bad boy and sit down, be quiet. She thinks he even has the concept of "I love you." She'd never said that to any other creature ever before, not even to the pony they'd had when they were little. She's been clung a lot of patting back rubbing, scratching under the chin and behind the ears. Though he's always wearing a pair of her underpants tied up around his waist, every now and then she notices his penis swelling up even larger than it already is, though she hasn't even tried the stroking of the exquisitely sensitive feet yet.

One night, after reading over again the chapter "How to Turn Your Man into a Lusting Animal" she puts on her flowery summer nightgown (even though the nights are colder than ever and they haven't started up the furnace yet). She puts on lipstick, eyeshadow, perfume, combs her hair out and lets it hang over her shoulders. (She's only graying a little bit at the temples. Thank God not like Cora, she's almost completely gray.) She goes down into the cellar with a glass of sherry for each of them. Not too much, though. She's read about alcohol and sex. She tells him she loves him several times, kisses him on the cheeks and then on the neck, just below the choke collar. Finally she kisses his lips. They are thin and closed tight. She can feel the teeth behind them. Then she rolls her nightgown up to her chin. She hopes he likes what he sees even though she's not young anymore. (If anything, he looks surprised.) But no sooner has she let herself down beside him, than it's over. She's even wondering, Did it really happen? Except, yes, there's a blood and it did hurt. But the isn't at all like the books said it would be or should be. She's read about premature ejaculation. That must be it. Maybe later, when he knows more words, they can go for sex therapy. But—oops—there he goes again, and just as fast



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# Gizmos

Article By Susan Skog • Illustration By Nenad Jakosevic and Sonja Lamut

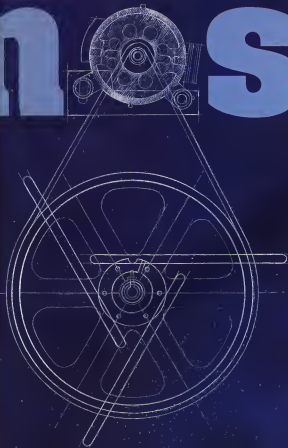
**F**rom vigilant valets to luscious all-night delis, Americans crave the dloying security of round-the-clock comforts—just in case we need them. On the domestic front, possibly the most ubiquitous example of our love affair with beck-and-call gratification is the hot water heater. Unlike valets who get intermittent curbside rests, water

heaters just sit there, forever cooking gallons of hot water—just in case someone decides to rinse a coffee cup.

What if, in a 1990s' altruistic swoon, Americans stopped squandering energy and water and embraced the best and the greenest of new home ecotechnologies? If concern for the environment isn't the ultimate clarion call,

maybe efficiency fever will spike when it sinks in that Japan fully intends to dominate the swelling \$200-billion ecotechnology market.

Notorious for their thriftiness and infatuation with high-tech gizmos, many Japanese know that going green is good for the environment—and more Japanese families know that a green household saves con-



*New technologies could be an enticing aphrodisiac for consumers looking for the latest home gadgets. Soon we'll hear of scrubbing-bubble washing machines, ozone laundries, insulating pop cozies for water heaters, CFC-free super-efficient refrigerators, fuzzy-logic heaters.*

siderable yen. Take water heaters. Many Japanese families use instantaneous or "tankless" gas water heaters that can hang on a wall and heat water when needed.

Then there's the combination toilet/bathroom sink, another common fixture in Japanese homes. The toilet/sink allows you to flush and then wash your hands with the water that comes out to fill the tank. (Some models have a flush lever that swings left for a half-tank flush and right for the full McCoy.)

Economic necessity and cultural predisposition have conditioned the Japanese to embrace efficient technologies, says design anthropologist Leonard Koren. "Americans work from a moral base. Saving the environment is good and moral. The Japanese work from a pragmatic perspective. Environmentally friendly action is often cost effective and intelligent. Different cultures, different rationalizations. I don't think the Japanese do it better, just differently," says Koren, who describes many culturally driven Japanese appliances and gadgets in his book, *283 Useful Ideas from Japan*.

As a result, efficient, environmentally friendly devices abound in the typical Japanese home. There are fuzzy-logic heaters that sense the presence of a person and the dimensions and temperature of a room and then warm the occupied space appropriately. Housewives covet their Zabu Zabu balls that supposedly save on laundry detergent because they intensify the swirling turbulence in washing machines. Energy-gobbling dishwashers are noticeably absent. A high-spin-speed clothes washer that literally whips clothes dry at 800 rpm is available. Also on the market is a fuzzy-logic clothes washer that senses the height and dirtiness of clothes and adjusts the hot water accordingly. Passionate about the purifying power of the sun, Japanese often hang their clothes outside to dry—saving more yen.

Japanese have been conditioned to embrace energy-saving environmental technologies if and only if they positively affect the pocketbook," explains Koren. "Japanese will go much further out of their way to save a little money than will their American counterparts."

But before prophets of doom wail that ecoplaceholders are betraying the face of TVs, VCRs, and other technologies Japan dominates, never underestimate America's ability to mastermind new green machines. It was Albert Einstein, after all, who patented early improvements on a gas-powered heat-pump system—one of the 1990s' hot new home-energy technologies

"We have a tremendous ability to innovate in this country," says Peter Miller, a senior scientist with the Natural Resources Defense Council (NRDC).

"We have a tremendous research infrastructure that's hopefully being revitalized in the years ahead. I see no reason why we wouldn't be able to make tremendous strides in innovation," Miller recently spearheaded a California-based study that evaluated about 125 emerging energy-efficient technologies likely to be commercialized between now and the year 2002. These green technologies are listed in a new report, "Emerging Technologies to Improve Energy Efficiency in the Residential and Commercial Sectors." The study was conducted by the American Council for an Energy-Efficient Economy in Washington, D.C., and the Davis Energy Group and E-Source in Colorado.

The report could be an enticing aph-

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Once  
you've ozonated or  
dipped  
your jeans, you'll soon  
be able  
to zap them in your  
new  
microwave clothes dryer. ☺

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rodize for consumers lusting for the latest in home fixtures. "Americans are great shoppers. We love to hear about new products," Miller says. Well, soon we'll hear more about low-water dishwashers, insulating pop cozies for water heaters, scrubbing-bubble washing machines, Golden Carrot refrigerators, and—ozonated laundering.

If you think the Japanese combo toilet/sink is a clever way to conserve water, check out a new commercial laundering system. It needs no detergent, operates in cold water and recycles most of the water. Instead, the system, patented by a Florida firm called Tri-Clean, saturates wash water with ozone, an oxidant used to disinfect drinking and swimming-pool water. Water from the washer is recovered, filtered, replenished with ozone, and reused for another washing. A prototype of the ozone commercial laundering system is serving the Jacksonville, Florida, Maxwell Hotel \$1,800 a month on water and energy. Another system, in the St. Luke County correctional facility in Florida,

saves \$30,000 a year and 2.5 million gallons of water.

One of the most promising green technologies, however, will tackle ordinary household laundry. Get ready for—big breath—the horizontal-axis, top-loading, high-spin-speed clothes washer. Stabber Industries, an Ohio washing-machine remanufacturing firm, will begin production of such a green machine this year. It will cut hot-water use more than 50 percent because the wash tub is only partially tilted, and with each rotation, clothes are submerged or tumbled in the water. Frigidare also will push its newly revamped horizontal-axis model under an environmental-marketing umbrella.

Commercialization of horizontal-axis clothes washers may expand rapidly in the next three to five years because they not only save energy, they use a lot less water," says John Morrill, business manager for the American Council for an Energy-Efficient Economy (ACEEE) in Washington, D.C. "If our country continues to have its environmental consciousness raised, the concept of using less and saving more will appeal to people," Morrill contends.

Once you've ozonated or dipped your jeans, you'll soon be able to zap them in your new microwave clothes dryer. Don't freak; the dryer compensates for zippers, snaps, and rivets. The microwave model, in addition to saving energy, reduces wear on clothes and reduces drying time by 25 percent. The Electric Power Research Institute and several manufacturers have been working on the microwave clothes dryer since 1990 and are gunning for a commercial model by 1994.

Meanwhile, over in the kitchen, ultrasonic dishwashers will gently bombard grimy dish grease with—this will rock your socks—sound waves. Instead of being sprayed, dishes are immersed in a tank of water and bombarded with high-frequency sound waves that create tiny vapor bubbles to dislodge caked-on grime. The upshot: a 20- to 50-percent drop in hot-water use. Southern California Edison is installing two prototypes (at the University of California Santa Barbara, and another state facility yet to be identified) of the ultrasonic dishwasher manufactured by a California firm, Ultrasonic Products.

Another hot, on-the-horizon technology is a plotless instantaneous gas water heater—to satisfy our penchant for instantaneous hot water in an environmentally friendly manner. If you don't live in a cold climate, high-efficiency gas storage water heaters are still your bairn bet. "But if we heaters can sell an on-demand water heater without an auto-

## INTERVIEW

Chief of surgery Steven A. Rosenberg peered intently at two x-rays the resident had stopped on the viewing screen. The original, taken after surgeries and chemotherapy had failed to halt the spread of Mr. Jensen's colon cancer, showed his lungs filled with tumors. The x-ray taken a few hours ago showed Jensen's cancer almost vanished.

It was 1985 and the first time Rosenberg had seen tumors shrink in a human as a result of immunotherapy. "I was reluctant to believe it," he recalls, "so we ordered a series of tomograms, longitudinal slices through the lungs showing precisely the amount of tumor. The next morning, I was ready for another disappointment, but when I got on the view box, sure enough, most of the tumors were gone." Rosenberg rushed up to see Jensen and his wife. "Good news, it looks like your cancer is going away!" Barely croaking a smile, James Jensen nodded. "Yeah, I knew

**WITH WEAPONS OF HIS OWN DEVISING, HE IS REVOLUTIONIZING THE WAR AGAINST CANCER.**



# STEVEN A. ROSENBERG

PHOTOGRAPHS BY PETER LIEPKE



# RECENTLY WRITTEN:

*The Transformed Cell* (Putnam's, 1992)

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"I was never my intention to practice the medicine of today"

# ON FAILURE:

"You need the courage to seem foolish and to fail. I hope to never fail again, though I do on a daily basis. What's critical is that you not fear failure. Failure must be something that focuses and energizes rather than defeats. Then you can make progress."

# TREATMENT-RELATED FATALITIES:

None, in the last 450 patients

# ON SUPERSTITION:

"Anyone you try to do something different to introduce a technology that may benefit humanity it strikes fear in the hearts of people who don't fully understand it. That's a lot of people."

## "IF WE RESHAPE OUR GENETIC MAKEUP TO COMBAT DISEASE, IT COULD AFFECT MEDICINE IN THE NEXT MILLENNIUM MORE THAN ANY DEVELOPMENT THUS FAR IN HUMAN HISTORY."

this was going to work." For the stunned scientist, it was an unforgettable moment. "Every patient we treated knew it was going to work. Only this time it actually had!"

Eight years after Jensen's spectacular recovery, Rosenberg and his staff at the National Cancer Institute (NCI), Bethesda, Maryland, treat four to five patients a week out of thousands of cancer victims who have failed all other previous cancer therapies and are considered "terminal." Medical centers around the world also administer variations of Rosenberg's branch—adoptive immunotherapy—mobilizing immune-system cells and hormones to search out and destroy a patient's cancer.

Rosenberg's appointment as chief of surgery in 1974, one month shy of his thirty-fourth birthday, came with it an unwritten mandate: Give us the next cancer therapy. Standard therapies were advancing in millimeters, Rosenberg recalls. "People were finally ready to admit that we had to have new approaches and were struggling to figure out what they might be. One thing I did on walking into my office was took on the wall this quote of John Hunter, the great eighteenth-century surgeon: 'Surgery is like an armed savage who attempts to get by force that which a civilized man would get by stratagem.'"

The stratagem Rosenberg devised utilized the immune system's rejection of foreign tissues. "My initial plan was to identify T cells that would specifically recognize cancer, then try to evolve enough of them in the patient to cause the cancer to go away." For three years, Rosenberg hunted that elusive T cell to no avail. But a year after the discovery of interleukin 2 (IL-2), a molecule made by some T cells that induces them to rapidly proliferate, he realized IL-2 could recast the shape of his research. "In a few minutes in 1977," he evolved the plan for what he spent the next 16 years doing.

He began taking tumor killers from dish to mice and, finally, to people. Along the way, he made another discovery: The cell-killing race of tiny tumors was not a classic T cell. Rosenberg christened the unknown warrior a LAK (lymphokine-activated killer) cell. After a decade of grueling stop-and-go lab work and 76 consecutive patient deaths, Rosenberg got his first suc-

cesses with Jensen and others. His therapy in the mid Eighties consisted of removing white blood cells from a patient, multiplying them in IL-2 for a few days, and then reuniting billions of new LAK cells to the patient's bloodstream, followed by massive infusions of IL-2 to activate them.

But only 10 percent of his patients responded completely to this regimen. Now more than ever, Rosenberg wanted the powerfully specific killer he'd postulated in 1974. Modifying his research procedures once again, he found that killer inside the tumor itself. He called it TIL, tumor-infiltrating lymphocyte. Later, he was astonished when after a lecture in Israel someone asked, "Did you know that TIL is the Hebrew word for missile?"

Although TIL killed nearly 100 times more potently than LAK cells, only in melanoma patients did his success rate approach 50 percent. Rosenberg decided the way to improve the guidance system and weather of his missile was gene therapy. In 1988, he says, "we were no longer limited to the cells nature provides. By inserting genes into cells, we could give them properties no cell had seen in the course of evolution." Genetically modifying TIL to make them react more vigorously against cancers is a way of "educating" them. "Right now our lymphocytes are only in kindergarten," he laughs, "and we need to make them Ph.D.'s."

Rosenberg is using these smarter TILs as a tool to pinpoint tumor antigens shared by people with the same type of cancer. Cloning genes that encode for shared antigens paves the way for development not only of cures for individual cases of cancer, but for vaccines, mass immunizations, elimination of entire categories of cancer. "We're not there yet," he admits, "but at least for melanoma, we're hot on the trail. It may be possible for other cancers."

Exiting his office, Rosenberg, 53, shows the compact, honed movements of an athlete. As he clasps a resident's hand, pauses to brief a lab technician, his warmth and ease of command are unmistakable. The man who cares for patients who are dying—or die that day—appears relaxed even if he is inwardly driven. But superstar clinician and researcher Rosenberg knows he can scarcely afford com-



# ANTIMATTER

## SAUCER SCOUTS:

UFO caravans cross the former stomping grounds of the notorious U2

Stories about a secret flying-saucer base at the Nellis Air Force Range located 130 miles north of Las Vegas, Nevada, first began circulating within the UFO community in 1987. And by 1989, wild tales of discs over the same site the Air Force had used to test the U2 were commonplace indeed.

One interested individual was 45-year-old Santa Monica, California, businessman Gary Schultz. In fact, Schultz was so intrigued that he ended up launching a camping group devoted to observing and tracking the mystery craft.

It all began for Schultz on January 8, 1990, when he joined a caravan of UFO buffs headed for Nevada to watch the night skies. Nothing happened—except that Schultz met Jeffrey Spivey, 31, a Mojave Desert

ranger from known airplanes and helicopters to distant, strangely moving points of light. "They seem to be keeping their distance for the moment," says Schultz, who adds that "they often seem almost indifferent to our presence."

The same is not so, however, for locals around Nellis, who have come to view the saucer tours as happenings in and of themselves. There's the Little ALÉ INN, a diner in nearby Rachel, Nevada, for instance, that caters to the saucer seekers brought by Schultz. Owners Joe and Pat Travis experienced their own strange—and unexplained—encounter five years ago. "This bright beam of light shot right through our back door one night, lighting up the whole door jamb," recalls Joe Travis. "Then it just dis-



appear mechanic who described an "amazing close encounter" that had occurred just three months before. Spivey and his roommate were stoking in a pickup truck, the mechanic claimed, "when a light shot over the Groom Mountains and into the valley. Its silhouette revealed a thirty-foot-diameter disc."

Spivey's story inspired Schultz to return the following month when, says Schultz, he and his wife saw "six alien craft suspects." Finally, by May of 1990, Schultz was so inspired, he decided to launch Secret Saucer Base Expeditions, featuring a regular tour to the Nellis field of lights. For a modest additional fee, he'll drive individual saucer seekers to the best observation locales in the Bureau of Land Management area that borders the Nellis range.

According to Schultz, recent sightings have

appeared. I turned and said, "You're welcome here."

As for speculations about the true meaning of the Nellis lights, they run the gamut. Schultz and others say the saucers are extraterrestrial craft now piloted by humans—"what I call Human Piloted Alien Craft, or HPACs," says Schultz. Meanwhile, Mark Rodeghier, director of the Center for UFO Studies in Chicago, says, "It's pretty well known that they develop secret aircraft and weaponry with black-project funds at Nellis, and probably the sightings are from those."

As for Nellis, "The Air Force comment is that we have no comment about anything that goes on at the ranges," emphasizes Tech Sergeant J. C. Marcom. Schultz, however, is optimistic that thanks to his constant observations, the mystery of the lights will be revealed.—A. J. S. RAY



# ANTIMATTER

## THE UP SIDE OF ABDUCTION

For the past 30 years, UFOlogists have characterized the alien-abduction phenomenon as terrifying and cruel. How else, after all, would you classify an experience involving bizarre medical exams, forced sex with six-eyed E.T.'s, mind control, and more? Well, according to California psychologist Richard Boylan, the ugliness of abduction has been exaggerated. In fact, he claims, alien abduction is relatively benign. Boylan argues, for example, that most abductees experience posttraumatic stress disorder, or PTSD, only when the abduction has stirred memories of other traumas such as childhood sexual abuse.

But UFOlogist Barbara Becker doesn't agree. Most people simply do not consent to abduction, she points out, "and abductees may be physically injured and psychologically abused. How can you call that benign?"

Boylan, for his part, responds that "there's no Earthly precedent for alien abduction, so informed consent is impossible. What's more, any harm is unintentional, much like the pain inflicted by the dentist. On the other hand,

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"I'VE NEVER MET AN ABDUCTEE WHO HAD SEX WITH AN ALIEN," SAYS BOYLAN. BESIDES, IT WOULD BE IMPOSSIBLE



aliens help abductees focus on spiritual, environmental, and humanitarian concerns."

In fact, insists Boylan, negative reports from abductees are encouraged by the expectations of researchers themselves. "These UFO investigations come from the severe-trauma school of research," he notes, adding that his own persuasion might be classified "the expanded-consciousness school. Among the 67 abductees I have worked with, 61 percent felt positive about the experience while 37 percent were ambivalent. Only 2 percent said they wished it had never happened."

Still, Becker isn't convinced. "Benign?" she responds. "If humans did what the aliens allegedly do, they would be arrested." —Paul McCarthy

## RETURN OF THE MUMMY

Naset-Amun, an Egyptian priest who served in the Temple of Amun at Karnak 3,000 years ago, recently "spoke" to the living through medical high tech. According to Manchester University Egyptologist Rosalee David, author



of *The Mummy's Tale* (St. Martin's Press) and head of the Manchester Egyptian Mummy Research Project, Naset-Amun died in his forties or early fifties with his mouth open and tongue sticking out. An insect bite on his tongue, scientists theorize, caused him to choke to death.

X rays proved he suffered from arthritis in his hip and a painful, degenerative cervical disc. CAT scans showed optic-nerve damage, possibly the side effect of treatment for worm infestation of the scrotum, as documented by electron microscopy. The priest also had chronic gum disease and teeth badly damaged by grime-contaminated bread. Finally, microscopic examination of blood vessels revealed he had atherosclerosis of the leg, probably the result of eating the fatty food presented to the statue of his god.

The Manchester team,

including an Egyptologist, dentist, radiologist, hematologist, and an artist, even set out to determine what Natsel-Amun looked like. They reconstructed his skull with the guidance of CAT scans, and a forensic artist created a bust of the ancient priest. According to David, the portrait of a bald man with mostly African features "is close enough for an old friend to recognize."

—Sherry Baker

necklace contains a pinch of soil from the Transylvania birthplace of Vlad V, the fifteenth-century blood-thirsty prince who inspired Bram Stoker's horror classic, *Dracula*.

Entrepreneur Joseph Klamt, who produces the jewelry with partner Dan Filipov, says it took several years to convince the mayor of Transylvania to permit removal of soil from the original *Dracula*'s modest castle. Finally,

COUNT DRACULA PENDANTS, AVAILABLE BY MAIL ORDER, CONTAIN SOIL FROM THE REAL COUNT'S BIRTHPLACE AND HOLD THE FAMILY DRAGON SYMBOL INSIDE TWO ROUND GLASS CRYSTALS FRAMED BY QUARTER-SIZED SILVER OR GOLD.



#### VAMPIRE LOVERS' JEWELRY

To ward off vampires, you might wear garlic around your neck, but if you'd rather attract the creatures, try a Count Dracula pendant. Marketed by D&J International Trading Company in Salt Lake City, Utah, each

Filipov, a native of Romania, used family connections to cut through red tape and haul away some 84 pounds of dirt.

The new jewelry line, sold via mail order, has been expanded to include earrings, rings, bracelets, and tie tacks. Prices range from \$13.95 for silver earrings to \$139.95 for a 14-karat-gold pendant. A portion of the profits go to Romanian child-relief programs, Klamt explains, adding that using *Dracula* to do some good shouldn't be surprising. "He helped stop the Turkish invasion of Europe. In Romania, he's a hero."

—Sherry Baker



#### BARBIE SERIAL KILLER

So, far, no one has witnessed the mysterious slasher mutilate his victims—who are all female, all wearing party dresses, and all flaunting Barbie-doll perfect figures. In fact, they are Barbies. Since June of 1992, 24 of the dolls have turned up in three large chain stores in the Sandusky, Ohio, area with breasts and groins slashed. According to Perkins Township detective Timothy McClung, who is investigating the case, police are taking the crimes seriously. "We don't want to find a dead body six months from now," he says, "with a Barbie doll lying next to it."

As part of the investigation, notes McClung, the FBI's Cleveland office is running a psychological

profile of the Barbie slasher. "And we've heard from psychiatrists who have worked with Jeffrey Dahmer/Charles Manson-type killers who have said we're probably looking for a white male, age 16 to 30, with a serious sexual dysfunction who could manifest violence toward women." No arrests have yet been made, McClung says, but he has chased down leads on suspects around the nation—including one man who had five Barbies sitting in the back seat of his car.

"What worried us," McClung notes, "was calls from other police departments saying they had had murders involving references to Barbies. One murderer in New York state was caught when he mailed cut-up Barbie dolls covered with fake blood."

—Sherry Baker



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## CULTURES

CONTINUED FROM PAGE 40

native music to the latest R.E.M. hit.

Radio is a powerful medium for us not only because of our oral tradition and the fact that we don't have our own television stations, but also because it reaches into surrounding communities and helps alleviate the stereotypes and racism toward Native Americans by communicating our side of the issues," says Alex Looking Elk, who has received funding to start up a new station on the Standing Rock Reservation in Little Eagle, South Dakota. Through AIRDS, Native American programs could also be downlinked to other public-broadcasting stations throughout the country, serving to more effectively assimilate Native American viewpoints into the American melting pot.

From here on out, says Baldwin, everything will depend on information access and innovative uses of the new communications technologies. "The information Age is here, and with these technologies, our languages, traditions, and knowledge live."

Indeed, technology may give Native Americans the power they need to preserve their independence in the face of predominant Western culture. Since the arrival of European explorers, diseases, war, racism, and poverty have ravaged the Native American population. An estimated 20 million American Indians perished in the worst racial holocaust in all of history. But, however precariously tribes hold onto their sovereignty, and the U.S. government reluctantly acknowledged them as legal "dependent sovereign nations" within the nation and assumed a federal trust responsibility for them. Native Americans are the only group specifically identified as distinct political entities in the U.S. Constitution—a document whose essential principles were adopted from the Iroquois League of Nations. Even so, American Indians were stereotyped and treated like "savages": their lands plundered.

With Manifest Destiny and Western expansion in the 1830s, settlers and the U.S. military killed Native American men, women, and children in bloody frontier battles and imprisoned survivors on reservations, changing their lifestyles forever and threatening their cultures with extinction. But, the vanishing Americans didn't vanish; their culture went underground until the mid-Seventies when the civil-rights movement finally touched their plight. The passage of the Indian Self-Determination and Education Assistance Act, PL 93-635, in 1975, gave tribes—which have rights similar

to states—more independence to take control of their nations. "Things are slowly getting better," says Michael Anderson, director of the National Congress for American Indians (NCAI).

Today, tribes are slowly finding ways to improve their economies with investments in communications, environmental, and gambling technologies. More money brings better educational and health-care systems, which is crucial to a people whose average lifespan is now 45 years and who has higher rates of unemployment, suicide, high-school dropouts, and alcoholism than any other group. The Mills Lane band of the Ojibwe tribe, for instance, has reduced unemployment from 80 percent to zero through its state-of-the-art casinos, building schools and a medical center with the profits. And the Passamaquoddy tribe invested a \$40-million land-claim case award toward a new pollution-control system, called a recovery scrubber, which combats acid rain.

Despite these shining examples, however, Self-Determination has also stirred animosity from numerous anti-Native American groups who continue to call for an abrogation of treaties usually over land and resource issues. While the government has honored some portions of the 370 treaties signed with tribes, in one way or another it has broken every treaty. Many tribes are still battling for control of lands, natural resources, and rights that are inherent on the paper of those century-old documents. "Those documents are in the words of the U.S. government, the supreme law of the land, but that hasn't meant much to them," says Paula Stam-Robideau, assistant director of the Southern California Indian Center. "The bows and arrows are gone. Our battles are now being fought on paper, in the courts, and in Congress."

The Black Hills case is a classic example. For the Sioux, the Black Hills are sacred: the "Heart of Everything That Is." For the government, it offers gold and other minerals as well as great space for recreation. After decades in the judicial system, the Supreme Court in 1980 finally ruled that the U.S. government illegally took the Black Hills in 1876 and 1877. The court, however, did not return any portion of the land. Rather, it added interest to the money the government "paid" for it. The money sits untouched in a bank account. The Sioux don't want it; they want the land and are now working to reclaim some of it through congressional legislation.

The government's desire for control of Indian land and resources has also resulted in a cycle of criminal prosecu-

tion of Indians that seems to occur every five to eight years," says Los Angeles attorney Jack L. Schwartz. "Beyond the Black Hills case, such highly publicized incidents as Wounded Knee in 1873, violence in Black Mesa, Arizona, over uranium and coal mining, the Salmon Scam in Portland in which Indians were rounded up and arrested over fishing rights, and the Mohawk uprising in Montreal over a planned golf course on Indian land represent only a handful of the battles American Indians have waged over their land and resources—and those battles will continue," says Schwartz, who worked on the defense counsel of the Wounded Knee and Salmon Scam cases.

As well, despite the new Self-Determination policy and the First Amendment—the Supreme Court in two rulings in the mid Eighties all but quashed the American Indian Religious Freedom Act (AIRFA) by ruling that governments no longer had to show a "compelling interest" to interfere with Native American religious practices or sacred lands. In Northwest Indian Cemetery Protective Association vs. The Lyng, for example, the court granted the U.S. Forest Service the right to destroy an ancient sacred site located on public land. This issue of American Indian religious freedom has attracted considerable public support, which, considering that it's one of the principles America was founded upon, is not surprising. The Senate Select Committee on Indian Affairs is expected to introduce an AIRFA amendment to shore up those rights.

Hundreds of cases that involve land claims, protection of sacred sites, and religious freedom currently are winding through the system, generating huge paper trails. Moreover, the fundamental issue of governance will become a huge legal issue in the future, according to Sam Deloria, director of the American Indian Law Center in Albuquerque. "Just how much can tribes adapt technologically to the world around them before they lose their political base by having somebody say 'Hey, you don't ride horses anymore, and you don't live in tepees. You work on computers—you're not Indian anymore!'"

Technology will help Native Americans unite to confront the legal issues. The Iowa Chapter of the Native American Law Student Association and the University of Iowa College of Law initiated the Iowa Indian Defense Network last year as a free BBS dedicated to the exchange of data on American Indian Law and Indian Affairs. For the first time, tribal attorneys involved in complex cases and Native American legal policy can begin to access, cross-refer-

ence, and transfer ideas, opinions, and briefs with others who handle similar cases, without leaving their offices and at a fraction of the expense such tasks would normally cost.

In light of all the ills that have plagued their people, numerous tribal governments as well as urban Native American leaders are looking back to traditional ways and realizing their relevance to contemporary society and the future of the planet. On Pine Ridge, for example, some seek to reestablish some of the old Lakota ways to the tribal government. "We are now preparing for a period of renaissance," says Elgin Bad Wind, president of Oglala Lakota College, where the revitalization effort has begun. "The symptoms—poverty, alcoholism, greed—are the same symptoms of the ills of larger Western society. But the symptoms are not the problem, the system is," adds OLC vice president Robert Gray Eagle. "We really have to come to grips with who we are as a people, how we're living and where we're going."

While every tribe has its own language and customs, certain values unify all tribes, such as belief in the earth as a living spirit, the harmony of creation and sharing, and the physical and spiritual inner balance of oneself. American Indians and non-Indians alike are now viewing these values as critical to everyone's survival. "There used to be a saying in the 1800s: 'Forget the blanket and learn the White man's ways,'" says John Castillo, an Apache. "Now our elders are saying, 'Go and learn in the White man's world, but do not forget your Indian ways.'"

Some American Indians believe the renaissance of indigenous ways extends beyond tribal country and to the earth as a whole. "There's an ecological bomb that's gone off on this planet, and we must dedicate ourselves to investigating just how to balance economy and environment," says Art Zimaga, of Oglala Lakota College. "We got an A in space, but here on Earth, the place we live, we're flunking. It's time to begin sharing everything we know and learn to turn this catastrophe around," Castillo sums it up. "Either we give respect to Mother Earth or give up the planet—it's a choiceless choice."

Such blending of traditional world views and high tech may prove to be the best medicine for today's Native American ills. "It all comes down to communication," says Ait's Ross. The goal now is information empowerment. "We don't want to see Indians or tribal governments in the future becoming technoparasites to the new information robber barons." □

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# MURDERS

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side the remains of his victims?

**CLUES UNEARTHED:** After the remains of the five prospectors were exhumed in July 1959, they were taken to the University of Arizona, where Walter Birby is curator of physical anthropology. According to Birby, the remains were in good condition: the result of soil with especially low levels of acid at the grave site. None of the bodies had been dismembered, he noted, but all had hatchet-like marks on the skull and had been defleshed. After the skeletons were assembled, Lucien Haag was called in to identify the marks found on the bones. Haag used a microscope to study the tool patterns and then made silicone rubber casts to preserve the marks for additional study.

According to investigators, the number, type, and location of implement marks leave no mystery as to how the prospectors died and what happened to them after death. "These individuals were all murdered," said Birby. "All of them exhibited evidence of sheep implement marks on their bones, which is consistent with defleshing. One individual had 14 hatchet marks on his skull." Some of the marks are clearly defensive, indicating some of the victims had held up their arms to ward off the blows of an ax or hatchet. Others received blows on the head, indicating they may have been sleeping when attacked. Many of the bones also showed very fine knife marks. Haag adds, an indication that these victims had, like steak, been filleted.

What about Packer's claim that Bell shot the others, causing him to shoot Bell in self-defense? Not likely, say the investigators. One individual probably committed all the murders, they explained, because the injuries were consistent from one cranium to the next. What's more, the researchers found only one bullet wound amongst all the victims—and that individual had been shot years before his death.

**CONCLUSION:** Packer's story did not hold up to scientific scrutiny. The jury that convicted him was right and his defenders were wrong. Alford Packer was, indeed, "the Colorado Carnival."

## On the Dock:

Thanks to modern technology, the skeletal remains of historical figures have the potential to rewrite history by answering questions unanswerable at the time of death. Several cases still under study could settle the cages of historians and law-enforcement officials.

**Lizzie Borden:** After an inept police investigation and a sensational murder trial in 1892, Lizzie Borden was found not guilty of hacking her father and 200-pound stepmother to death with an ax at their home in Fall River, Massachusetts. Despite her acquittal, Lizzie remained guilty in the eyes of the popular press and some historians. Enter forensic investigator James Starrs, who is convinced Lizzie Borden may have been innocent. Starrs wants permission from Borden family members to exhume the skulls of Lizzie's parents. If Lizzie is innocent, it can be proven scientifically, he says, "by comparing available physical evidence, such as the famous 'hoodoo hatchet,' with scientific analysis of the remains."

**Marion Lewis:** Also on Starrs' list of unsolved mysteries is the death of Marion Lewis (of Lewis and Clark fame). Lewis died in 1809 at an

James Starrs  
hopes to exhume the  
skulls of  
Lizzie Borden's parents  
to compare  
with physical evidence  
such as the  
famous hoodoo hatchet.

inn on the Natchez Trace southwest of Nashville, Tennessee. Governor of the Louisiana Territory at the time, he was on his way to Washington, DC, to meet with officials when he died of two gunshot wounds, one to the side and the other to the head. The death has long been labeled a suicide, but Starrs states that "the scientific evidence that he committed suicide is entirely deficient." Lewis may have been murdered, says Starrs. With the permission of Lewis's descendants, he hopes to exhume the remains and find out.

**John Wilkes Booth:** Abraham Lincoln was assassinated in April 1865 by John Wilkes Booth, who 12 days later was gunned down by soldiers in a barn—right? Wrong, according to Hugh Berryman, director of the Region 4 Forensic Center in Memphis. Nathaniel Orlowek, a religious educator at Beth Shalom Congregation in Potomac, Maryland, and Arthur Chitty, historian at the University of the South. They believe Booth may have escaped capture and lived another 35 years using the name

John St. Helen before confessing his identity and committing suicide in Find, Oklahoma. After his death, St. Helen's body was embalmed. But when the government showed no interest in investigating the claims, the lawyer to whom St. Helen confessed stored the mummy in his basement for 29 years. Eventually, the mummified body was sold to a carnival and then slipped out of sight. If the mummy can be recovered, says Berryman, it would be possible, using modern forensic technology, to make comparisons with known photographs of Booth. Meanwhile, Orlowek is attempting to exhume the body thought to belong to Booth and determine whether it is truly his.

**Wild Bill Longley:** On October 11, 1878, a notorious Texas outlaw named Wild Bill Longley was convicted of murder and hanged under the watchful eye of the local sheriff. His body was then buried in a cemetery near Giddings. Or was it? Family legend has it that he escaped the hangman's noose and relocated in Iberville Parish, Louisiana, where he adopted the sheriff's last name of Brown and lived a long life as a respected member of the community. According to family legend, in fact, Longley made a deal with the sheriff to fake the hanging using a harness to break his fall. Before burial, he escaped while the coffin was weighted with stones. The sheriff was subsequently killed in a gunfight with police in Chicago, and a man calling himself John Calhoun Brown began a new life in Louisiana. He fathered ten children, ran a successful timber business, and died around 1933.

These claims by the families of both the "original" Longley and the Brown descendants in Louisiana prompted Dr. Douglas Owsley, a forensic anthropologist at the Smithsonian Institution, to organize an investigative team. The first step was using a computer to compare photographs of the two men. "I was taken aback by the correspondence of the face," he says. "They were very similar." Betting on the "probability" that Longley and Brown were one and the same, Owsley worked with geologist Brooks Elwood of the University of Texas and Pat Mercado-Allinger of the Texas Historical Commission to exhumate 25 graves at the cemetery where the outlaw's coffin, filled with stones, was said to lie. The outlaw's marker had been moved at least twice in more than a century, so it's no surprise that none of the 25 coffins turned out to be his. But the team will do some more historical research and then return to the cemetery, hoping to find a coffin full of stones. **DB**

# MRS. JONES

CONTINUED FROM PAGE 64

as before. After that he falls asleep. She not only didn't get any real foreplay but no afterplay either. She's wondering: Where's the romance in all this?

Well, at least she's a real woman now. She hasn't missed all of life. She may have missed a lot, but no one can say she's missed all, which is more than Cora can say about herself. Janice thinks she is and probably permanently—at least she hopes so—one up on Cora. She has joined the human race in a way Cora probably never will, poor thing. Janice will be kind.

Janice hardly ever drives. She has always left that to Cora. She knows how but she's out of practice. Now she has several errands to do. She wants a nice pin-striped suit, though she wonders if they come in boys' sizes—a suit like her father never would have worn. She wants a good suitcase. Not one from the five and ten. Shiny shoes big enough for rough claws, though she's out those claws as short as she could, using old Janey's nail clippers. Since Mr. Jones looks sort of Mexican, she'll get him a south-of-the-border Panama-type hat and dark glasses.

It only takes a couple of days for Janice to get her errands done and then a couple more to get the guest room ready: aired out, curtains washed, bed made. (Good: it's a double bed.) She whistles all the time and doesn't even remember that it always bothers Cora.

Cora watches the preparation of the guest room, but refuses to give Janice the satisfaction of asking her any questions. It's easy to see that Janice wonders why Cora isn't asking. Once Janice started to tell her something but then turned red to her collar bone and shut up fast.

Janice has continued making good supper of Cora's favorite foods. Cora is still waiting for the practical joke to come to its finale, but even—especially if it doesn't and she knows something's up. She hasn't let down her guard and she's snoped around—over in the basement, but not in the coal room. She didn't notice the padlock on the door. But in the attic she did find a large—very large piece of stiff leather, shed blood along its edges. So brittle she couldn't unfold it to see what it was. It gave her the shivers. Planned her to see it, though she couldn't say why. Perhaps it was the two berries or claws that were attached to each corner. She'd thought of throw-

ing the dead-looking thing out in the garbage, but after she saw those claws that were part of it, she couldn't bring herself to touch it again.

Everything is ready, but Janice knows Janey needs a little more experience and training. She wants to pretend to go down and pick him up at the airport in Detroit. Cora, if she hears about it, will never let Janice go there by herself. But Cora mustn't be there. For lots of reasons, not the least of which that Janice wants the trip to be like a honeymoon. They could sneak out in the middle of the night and they could take two or three or even more days getting down there, and two or three or more days coming back. Maybe a couple of days enjoying Detroit. Janey could learn a lot.

Janice has never dared to even think of going on a trip like this before, but with Jones she wouldn't be alone. She sees herself, dressed in her best sitting across from him (he'll be wearing his pin-striped suit) in restaurants, going to motels—movies, even. She'd look right doing these things. Like all the other couples. They'd hold hands in the movies. They'd stroll in the evenings after their long drive. Can he stroll? She'll get him a walking stick in

Detroit. Better than Father's Silver hand-died. He may be a cripple, but he'll look like a gentleman. And the better he looks the more jealous Cora will be.

And it started out to be a wonderful honeymoon. Janice kept the choke collar on under Janey's necktie and shirt, running the chain down inside her left sleeve so that when she held his hand she could also hold the chain just to make sure. She also found a way to hold the back of his shirt so she could give a little pull on it, but she seldom had to use any of those techniques. And how could he try to escape? hobbling as he does? Unless he learns to drive the pickup? But Janice wouldn't be a bit surprised if he could learn to drive it. Even before they get to Detroit. Janey is dressing himself, uses the night lock in fancy restaurants, can eat a lobster just as neatly as anyone can.

Janice keeps a running conversation going, just as if they were communicating. She keeps saying "Don't you think so, dear?" hoping nobody will notice that he doesn't nod. Except she's sure that lots of husbands are like that. Even Father often didn't answer. Mother, lost in his own thoughts all the time. But Mr. Jones doesn't look lost in his thoughts. And he doesn't look as if he

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# The Artist

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No sphere  
in academia  
is more exhilarating —  
stimulating,  
or refreshing

I envy  
your  
work!



# GIZMOS

CONTINUED FROM PAGE 56

matic pilot light, that will be a very strong contender," Miller says. A pilotless gas water heater—a version of a French instantaneous water heater—has been approved by the American Gas Association and is expected to be available in late 1993. For a 67-gallon daily hot-water draw, the heater manufactured by Controlled Energy in Vermont, who already makes a high-efficiency tankless gas water heater, should cut annual water-heating costs 32 percent compared to a traditional storage gas water heater.

One of the most highly awaited efficient products is the Golden Carrot refrigerator, so named because a 25-utility consortium, known as the Super-Efficient Refrigerator Program (SERP), is dangling a \$30-million carrot in front of manufacturers to create the next generation of refrigerators. Frigidaire and Whirlpool are partnering for the finish line in the chlorofluorocarbon-free super-efficient refrigerator race.

A typical 15-year-old refrigerator devours about 1,700 kilowatt-hours of electricity a year. Frigidaire and Whirlpool will unveil prototypes expected to feature a fivefold increase in insulation efficiency and better compressors, gaskets, and control systems. The Golden Carrot refrigerator may use only 350 to 525 kilowatt-hours each year and could save consumers \$500 over the refrigerator's lifetime.

When can you expect the old model on the dolly? SERP will pick the final super-efficient refrigerator manufacturer in July, and the Golden Carrot refrigerator could hit the market next year. "This is the start of what we're hoping is a new era in the utility industry, working to move markets en masse," says conservation analyst Jeff Hama of the Northwest Power Planning Council in Portland. Since 1983, the Council has ramped up energy efficiency in the Northwest through new standards for commercial and residential construction and other programs.

But even if utilities and appliance manufacturers begin to sway in unison to a greener beat, savvy consumers may not join the dance. "We're not very risky consumers. Efficiency by itself is not a reason to take that risk on a new product," says the Power Council's Hama. "If you can say, 'This is a more efficient appliance, and by the way, it offers through-the-door water and ice service and it costs you less money to run,' the consumer then says, 'I'd really like to have all those features, and gosh, it's

efficient, too. I'll buy it!'"

Efficient products also had better be glitch-free, cautions NRDC's Miller. Consumers still remember inescapable wind turbines and other energy-conservation debacles of the past. "Americans aren't terribly patient with technological glitches," Miller says. "We're concerned about the reaction if some of the energy-efficient products come out with glitches." Companies must make sure their products work well.

This aversion to flawed merchandise is why, as semiconductors and such continue to stream past U.S. shores, many of Japan's green gadgets likely will never see the light of suburbia. Case in point: supercomputerized multi-compartment refrigerators. All the leading Japanese appliance manufacturers produce such smart refrigerators that ponder to Japan's love affair with high tech. Each section of the refrigerator has a different temperature and humidity level so homeowners can adjust the temperature to keep their fish, tofu, vegetables, and beer at separate, optimal temperatures. Nice concept, if only the microinventions always worked and the beer remained cold.

Nor will consumers pine for products that require lifestyle sacrifices, Miller adds. That's why another typical Japanese fixture—bathub covers that keep the tub water toasty for subsequent bathers—likely won't be trendy numbers here. I don't think Americans are particularly frugal, but that's different from a willingness to invade and try different products and new technologies," Miller says. "People love hearing about new exciting technologies and advances, but not if it means covering your bathtub or turning down the temperature and wearing a thermal Afghan."

So gear up for super-efficient personal computers, fuzzy-logic clothes washers, and heat-pump clothes dryers. At the same time, new federal appliance standards push manufacturers to create efficient machines, utilities will stoke the ecotechnology revolution with new Golden Carrot programs.

And, like their Japanese counterparts, American manufacturers are bent on winning the ecotechnology race. "American manufacturers aren't sitting around," says ACEEE's Morril. "There's a lot of exciting stuff going on. This type of civilian technology provides a venue for a sort of renaissance in American manufacturing." Time to redefine that harvest-gold ratio for a fridge with a hot new ultrasonic, fuzzy-logic, high-speed-spin, solar-powered, oxidized number? You can think about it while you pop an insulating cozy on your hot-water heater. **DO**

# INTERVIEW

CONTINUED FROM PAGE 70

petitive egomaniacs. What I do is humbling. Discovering things first, being acclaimed for it, nurturing one's ego—those seem trivial when confronted with people in a desperately tragic situation who are impotent to help. Almost anyone who confronts the threat of human violence I do on a daily basis would be able to keep his priorities in order. Those priorities do not involve extraneous posturing, only fighting the disease as an enemy."

Dr. Rosenberg, you make it sound like war. "Is there any doubt?" he whispers. "It is." —Douglas Stein

**Q**uest: Just how big a problem is cancer in America? [phone rings]

**Rosenberg:** I have patients I care for so I have to answer that [on phone] "Hi, Alice. Yes, I will. I'll do it. I'll get it. . . . Yuh, make a decision. Bye." [end conversation] Sorry, I can never afford to ignore a call from a patient—or my wife. Okay, someone dies of cancer in the United States every minute. How many minutes in a year? Okay [using a calculator] that's 525,000 minutes. Pretty close, because in 1991, of the 1.1 million people who contract cancer each year, 515,000 died. Each month almost 50,000 people are about to die so at any time, millions of people are desperate for something. One out of every four people now alive in the United States will develop an invasive cancer. One out of six will die. The magnitude of the problem is staggering.

**Q**uest: When you were just five or six, you already had a clear vision of what your life had to become. How is that?

**Rosenberg:** From the time I stopped wanting to be a cowboy, I wanted to be a doctor and do research. I did well in school without working, and people were always crowing about how high my IQ was. I wanted to find things that no one else knew. I always had this desire—no, an obsession—with doing something that would relieve suffering.

**Q**uest: Where does that come from when you're a small child?

**Rosenberg:** World War II had just ended, and when I was between five and eight years old, the horrors of the Holocaust became apparent. My parents' families were caught in it, most dying in concentration camps, so it was something I heard about. These were not just vague stories of people dying, but horribly graphic tales of fathers being taken out of houses in the night and found shot in the woods. My father's father and brother died before my father's

eyes when their house was bombed. His mother died in his arms at the side of a road when she was refused entrance to a hospital because she was Jewish. Ours was a lower middle-class family, and my childhood in the Bronx was safe. But at a very impressionable age, I heard many stories of horrors I didn't personally encounter.

**Q:** Did you feel some guilt, perhaps about being "inspired"?

**Rosenberg:** I sense in myself not guilt but sadness that people are responsible for such a substantial amount of misery others have to bear. Each person can play a part in preventing that from happening by doing good. But parts of life, like cancer, over which we have no control, wreak great unhappiness. And I wanted to tackle one of these major problems. When I was late just now it was because I had to tell a 19-year-old boy and his mother that his treatment has failed. The cancer in his liver is growing. He and his family are innocent, yet they are in the midst of this terrible tragedy. If you're going to solve problems of human tragedy, you have to engage them. They become your enemy!

**Q:** What is the most difficult part? **Rosenberg:** To somehow leave all this. When my patients are suffering extremes of pain and distress and are counting on me and my team as their last hope, how do I justify leaving the hospital to go home and play catch with my daughter? Yes, there is guilt in taking time to do almost anything other than what I do here. Every day I confront the inadequacies and failures of today's cancer treatments. So I'm here to develop treatments that can be available tomorrow. You ask about guilt—well, we all deal with guilt when we decide what to do with our lives.

**Q:** Why was immunotherapy such a bold strategy to pursue in 1974?

**Rosenberg:** There wasn't a single example of immunotherapy working. Virtually no information even suggested that an immune response to cancer in the human existed, despite the fact that over the years, thousands of patients had undergone various immunotherapy regimens. Cancer, by definition, begins to grow and then keeps growing. Either there is no immune response against these cells, or the response is insufficient. And then we had no ways to measure immune reactions to tumors in people. But I'd seen two patients who'd impressed me. There was Mr. Danglelo, who apparently cured himself of widely metastasized stomach cancer through possibly a violent immune reaction brought on by streptococcus bacteria 11 years before I saw him. A second patient received a transplanted kid-

ney containing cancer that spread through his body. When immunosuppressive drugs were stopped, his body rejected the cancer, and it disappeared.

Thousands of studies described what had been tried in animals. There was an overwhelming amount of information about things that not only had not worked, but worse, things people claimed worked but had not been proven to work. Nobody had taken an animal that already had a growing tumor and made it disappear by immunologic manipulation. And that's what we needed. I concluded the part of the immune system responsible for rejecting foreign tissue in organs revolved around specific T lymphocyte reactions. We began by trying to immunize animals against their own tumors and then use their own T cells. We put a lot of effort into it, but it didn't work.

**Q:** In 1976, when interleukin 2 (IL-

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She stopped breathing and was within minutes of dying. We resuscitated her. We pushed her to the brink. But she got better and went home in about a week. ●

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2) came along, you didn't see its potential. When did you "see the light"?

**Rosenberg:** Many molecules produced by lymphocytes generate immune effects. IL-2 was not the first "cytokine" to be described, but it was unique in that it enabled immunologists to rapidly grow lymphocytes into large enough numbers to study in experiments. Only when our experiments suggested that T cells expanded with IL-2 would return all their immunologic powers did the path to this approach become evident.

The basic hypothesis was that one could remove T cells from a patient, greatly expand their numbers in culture while maintaining their anticancer activity, and return them to patients. But would T cells growing in IL-2 maintain their immunologic activity against foreign tissue? If they lost it, as they started to multiply, forget it. Look for a new approach. But we found they maintained their reactivity in a test tube. So would these cultured cells still maintain it when injected back into a live animal? When the answer to that was yes, I

knew the approach was valid, the tools were up to the challenge.

**Q:** Most scientists doing the pioneering work would have stuck to the lab, but the moment you got anything the least bit promising, you immediately took it to patients. Why did you put yourself through such a "decade of death"? **Rosenberg:** I have understanding how things work in the lab, seeking truth for its own sake. But that's not what I do. So as soon as we had even a tiny opening in that window, I wanted to bring it to patients. If I didn't think each new treatment had some chance, I wouldn't have done it. There was no way I'd subject these people to a treatment I thought could not help them. There was always a flicker to believe it might work and a crushing disappointment when it didn't. When everything we'd tried through 1984 failed, a gnawing fear that it would never work in people began to grow in me. Mysterious differences between mice and people could prove insurmountable. As patient after patient—every one a separate human drama—died, it was difficult to sustain the determination to keep pushing on. At any stage, one could say in retrospect, "Hey, I could've stopped here." But I wouldn't have stopped.

**Q:** Of your early successes, was Linda Granger the most dramatic?

**Rosenberg:** She was the first. We'd treated 76 patients in a row over ten years who'd failed all other treatments. We had raised their hopes with experimental treatments only to dash them when these, too, failed. All had died. We'd treated some with LAK cells alone, others with IL-2 alone. But immune cells grown outside the body were dependent on IL-2 for survival, and they died quickly after we returned them to people unless we also gave IL-2. Our animal models told us we needed both. But NIH (National Institutes of Health) review groups, the FDA, and other agencies demanded we prove each could be given safely before we combined them. These agencies severely limited the quantities of LAK cells and IL-2 we could give our patients. We failed time and again. Only after we'd shown we could give each safely were we allowed to combine them.

Linda Granger was 29, with melanoma throughout her body. She'd received multiple surgical excisions of her cancer, but it kept coming back. She failed all traditional treatments, plus experimental regimens involving interferon. Her doctors finally told her nothing more could be done, suggested she take a vacation, go to Europe, and try to enjoy the six or so months she had left. But one doctor who knew of our



work in animals said, "Why don't you talk to Steve Rosenberg?"

When I explained what we were doing and that we'd never had a successful treatment, she understood and agreed to it. We brought her into the hospital, gave her LAK cells and IL-2—large amounts—and we kept going. I was prepared to be extremely vigorous! She got into trouble, and we battled her out. kept pushing. The treatment lasted about 18 days until we gave her one dose too many of IL-2. She stopped breathing and was within minutes of dying. We resuscitated her. We pushed her to the brink, but she got better and went home in a week. When she left the hospital, none of her tumors had changed. When she came back for the first follow-up, they still hadn't changed. But a month later, we saw that all her tumors had died or shrunk dramatically. Linda Granger has never had a tumor grow back. Today, nine years later, she is disease free and executive officer of one of the world's largest naval bases.

**Q**uest: After your success with LAK cells, how did you improve immunotherapy?  
**Rosenberg:** We weren't looking for the LAK cell, and it diverted our attention from the kind of immune cell we'd sought. At the beginning, one of my hypotheses was that we'd find the cells we wanted inside the tumor itself. If the body is baffling cancer, the logical place to look for those cells is at the battle site. In 1985, we finally managed to isolate the killer, the TIL—tumor-infiltrating lymphocytes—have the ability to target a single antigen on the surface of a cancer cell. TIL can also track the cancer cell throughout the body by means of that antigenic marker.

**Q**uest: Why are TIL 100 times more powerful than LAK cells?

**Rosenberg:** The most striking feature of the immune system is its ability to recognize tiny variations in cell-surface molecules, antigens. It's that exquisite specificity we sought to exploit, because the difference between the surface antigen of a cancer and a normal cell is tiny. The immune cell can only recognize the foreign antigen when it is attached to part of the normal antigen molecules of that person. This "MHC restriction," as it's called, lends enormous specificity to the immune system.

In rejecting a cancer, we're reacting against a small part of a protein molecule attached to our normal antigens. This response also protects us against viruses and many other foreign invaders. LAK cells don't detect that single antigenic difference, but rather seem to recognize substances on cancer, virally infected cells, and normal cells in cul-

ture. LAK cells may be part of a primitive immunosurveillance mechanism we still have against transformed or damaged cells. They're broadly reactive and relatively weak. TIL, on the other hand, recognize a single antigen through surface receptors that bind to them and keep the TIL anchored there. Then a TIL kills directly by destroying the cancer cell's membrane or secretes hormones, including IL-2 that attract other immune cells to the site to do battle. Securing those hormones is more important in mobilizing the immune response than the killing activity per se. The hormones we've measured so far are gamma interferon, tumor necrosis factor (TNF), and granulocyte macrophage colony stimulating factor. Undoubtedly there are many others.

**Q**uest: Why did you increasingly focus your therapy on two cancers?

**Rosenberg:** When we began, we took on all comers. Of our original success, the first two with melanoma responded, as did the first three with kidney cancer. Because we now had a crack in that stone face to wedge open, we used these two as model systems to improve the treatment. IL-2 and LAK cell treatment in some patients with advanced melanoma and kidney cancer caused regressions, and about 10 percent of the time complete elimination of the cancer. Half of those with complete regression haven't had tumors return in the length of the follow-up, now over seven years. Then we found TIL, and our response rate in melanoma doubled to about 40 percent. Still, the treatment left many patients without response, and some responses are temporary. We need to improve the treatment and decrease its side effects.

After we saw antitumor responses in people given TIL, we began trying to answer questions about them. One was where TIL went after we injected them by labeling TIL with indium-111, a radioactive isotope, we learned that they seemed to traffic to and accumulate in the tumor. That opened an exciting possibility, and by 1989, we could genetically change TIL into vehicles for producing molecules to destroy the cancer at the tumor site. We collaborated with other NIH scientists to insert a gene into ten patients with life expectancies of 30 days or less. The first gene was simply a marker to help us identify TIL distribution and survival in the body. They survived in one patient over six months, and we found them in tumor deposits out to 64 days.

One of the first five was a 26-year-old Florida woman with a young child. She had 24 separate deposits of melanoma throughout her body—under her

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sen, in both tonsils, both lungs, and a very large tumor on the soft palate interfering with her swallowing. If we didn't realize this lesson, it could obstruct her airway. But I didn't want to, since radiation can suppress the immune response. We grew her TIL in IL-2. Instead our so-called "NEO" gene, and gave her back those TIL, plus IL-2. She underwent a regression of all her subcutaneous tumors, all tumors inside her mouth, all her lung diseases. Over three years later, she is disease free. It obviously wasn't the marker gene that was responsible—that just shows how effective TIL therapy can be for patients with advanced cancer. I just wish it would happen more often.

**Omri:** Might gene therapy help us to understand cancer?  
**Rosenberg:** Who is the enemy? In a way, cancer is a perversion of the life process. There's a famous tumor of a giant oboe bear with a typical osteosarcoma that's 175 million years old. On occasion, it's been around almost as long as life. Cancer is characterized by two properties that differentiate it from virtually all other cells. One, it exhibits uncontrolled growth. The second property, it is the one that makes it lethal in most cases, is it's the only cell that can de-

tach from its site of origin, travel elsewhere, then grow at that site.  
Oncogenes are in part responsible for causing cancer. But we don't yet understand how they change the cell's biochemistry, so we can't now design ways to interfere with these changes. We do know that when the cell becomes malignant, it changes its surface. The immune system is so exquisitely sensitive as to recognize a single amino acid change among the hundreds that make up any protein in the cell's surface, so now we have a device for potentially recognizing and eliminating that abnormal, different cell. This is the basis for immunotherapy, and why we can effectively use it even though we understand very little about the biochemistry and molecular nature of the cancer process.

**Omri:** What strategies do tumors develop to escape recognition?  
**Rosenberg:** They have quite a repertoire. Some cancer cells may not have any surface antigens. Or their antigens are somehow masked, covered by other molecules that prevent their recognition—"cryptic antigens" we call them. Every cancer cell may have different or multiple antigens, and it can also form its own and express others. It may secrete molecules that activate the im-

mune system's suppressor cells, thus turning it off. The cancer cell seems to have evolved genetic mechanisms for overcoming immune responses. That may be the best argument for using genetic approaches to combat it. If we can harness the entire genome of the plant to develop new treatments, maybe we can overcome the "genetic edge" the cancer cell has evolved.  
**Omri:** What are your plans for immunotherapy and gene therapy?  
**Rosenberg:** After we successfully inserted the marker gene, we got permission to insert the gene for TNF, tumor necrosis factor, a molecule that interferes with tumor blood supply. In the mouse, a single injection will cause large tumors to disappear within days. But TNF has no impact in people, because we cannot tolerate enough of it. Mice tolerate 40 times more. Putting the TNF gene into TIL treats the problem of metastatic cancer head-on—where you don't know just where these cancer cells are, and there are too many places where they are. TIL patrol the entire body, and wherever tumor cells are, TIL shoot and neutralize and act. So the tumor site itself achieves high enough concentration of TNF to treat against the cancer cells without exposing the entire body to TNF. These gene-en-

hanced cells home in on the tumor and deliver the TNF warhead to destroy it.  
Currently, we are working to genetically alter the tumor so that we can immunize patients against their own tumor. That far, we have nine patients in the TIL-TNF study and five in the adenovirus protocol. We're also trying to genetically insert into TIL the receptor for IL-2. The TIL would then be sensitive to much lower concentrations of IL-2, enabling them to survive and grow in the body with lower IL-2-related side effects. We've shown that TIL can detect unique antigens on some breast and colon cancers and non-Hodgkin's lymphoma. We've begun to use gene-modified TIL to treat a very small number of women with breast cancer—a high priority. These therapies are so complex that while we have 10 to 20 people referred to us a day, we might hope to give gene therapy to 50 within the next few years.  
**Omri:** Can evaluating the status of the immune system early in life tell us what may befall a person later on?  
**Rosenberg:** That question assumes that an immune defect leads to the development of cancer. That isn't necessarily true. Perhaps cancers develop without any relationship to immune function. When it comes to overall measure-

ments of the immune system, there's no difference in performance between the normal person and the person with cancer. People who are totally immunosuppressed with drugs or born without an immune system have a slightly higher incidence of lymphomas. But they don't have a higher incidence of the common cancers—colon, breast and lung. Cancer could be caused by agents having nothing to do with the immune system, and then, secondarily, immune reactivity against it is somehow subverted.  
**Omri:** How has the controversy surrounding gene therapy affected you?  
**Rosenberg:** One evening I got home, and there on the evening news the announcer was saying that scientists at NIH had received permission to introduce genes into people for the first time. Then, flashing upon the screen, was a picture of Adolf Hitler giving a speech to roaring throngs in front of the Reichstag. The commentator now says it was the Nazis who first tried to create the master race by influencing genes. Then off goes the picture of Hitler, and on comes my picture! The commentator says NIH scientists are trying to engineer cancer genes. Can you imagine how I felt seeing that sequence? I was glad my parents had moved to Israel so they weren't exposed to it.

Confusion and hysteria surround gene manipulation. The genes we introduce into cells cannot be transmitted to offspring. But we're not anywhere near smart enough to predict the impact of those genes on human functions other than the ones we're trying to influence. To introduce genes that can get into the germline and be transmitted is an incredibly perilous undertaking, one that must be done with ultimate care. I'd be horrified if anyone tried to use gene manipulation to introduce frivolous human characteristics. But that's very different from using this powerful tool to try to improve medicine's ability to treat innocent people suffering from this terrible disease.  
**Omri:** Why do you live the way you do?  
**Rosenberg:** In the 19 years I've been at NIH, there may have been ten days I've been in town and not come to work. I do what I know to do, my work and my life with my family. Everything I do is laser-guided toward how I can use this information. I also love astronomy and find it peaceful to look through my lovely telescope, just observing and thinking about the universe, because there is no way I can use that information to do something, no way I can impact on that galaxy whatsoever. For once, I am not obligated to intervene. **DO**

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# GAMES

## COUNTERS AND CARDS

A problem with no solution and an infallible card trick

By Scott Morn

5	$\frac{1}{16}$	$\frac{1}{32}$			
4	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{32}$		
3	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{32}$	
2	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{32}$
1	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$
	A	B	C	D	E

In the April 1993 issue, I presented an intriguing solitaire game that used a square grid and a bunch of counters. To start, you place a counter on the bottom left square. Each move thereafter consists of removing a counter and laying two new ones: one on the square immediately above and another on the square immediately to the right. Only one counter can occupy a square at a time.

The first move vacates the corner square and fills the first two diagonal squares. Three more moves empty the three corner squares and fill five squares (above, right). How many moves will it take to empty the lower left six squares?

Surprisingly, the answer is infinite. It can't be done! The counters always move

to the right and up, so you think that eventually the corner squares will be empty, but your intuition proves wrong. That's why I called this the Counter Intuitive Puzzle—and offered \$5,000 of my own money (not GMN's) to anyone who solved it in a finite number of moves.

I knew beforehand that this puzzle had no finite solution because I had seen an elegant proof discovered by N. Konstantinov of Moscow. He weighted each square of the grid. Vacating a square splits its weight between the two cells above and to the right. No matter how many counters are added to the board, the weight of covered squares always equals 1.

The entire board weighs 4. If allowed to progress to

5					
4					
3	○	○			
2		○	○		
1			○		
	A	B	C	D	E

**The difficult part of this puzzle is trying to empty the lower left six squares (above). The proof devised by N. Konstantinov calls for weighting each square of the grid (left).**

infinity, column A totals 2, column B totals 1, column C totals  $\frac{1}{2}$ , column D totals  $\frac{1}{4}$ , column E totals  $\frac{1}{8}$ , and so on. The puzzle requires that you leave the six corner squares empty—a total weight of  $\frac{29}{8}$ . But consider that other squares must be left empty, too, because the up-and-to-the-right movement of the game ensures that there will never be more than one counter on the bottom row or the far left column of the board. The best choice is to leave counters on squares A4 and D1, for a total weight of  $\frac{1}{8} + \frac{1}{8} = \frac{1}{4}$ .

Now the six empty corner squares ( $\frac{29}{8}$ ) plus the empty edge squares ( $\frac{1}{8} + \frac{1}{8} = \frac{1}{4}$ ) have a total weight of 3. The entire board weighs 4, so before the required six squares can be

vacated, every square on the infinite board must have a counter on it. Thus, the puzzle has no finite solution.

In fact, the game rules are simpler than they need to be: You can even allow counters to pile up on a square, so long as they're all on different squares by the end. It's still impossible.

Now try this new card trick invented by Los Angeles magician Jim Steemeyer. Put any nine playing cards in a stack, face down, and look at the third card. Now spell the name of that card, dealing a card face down into a stack on the table for each letter. For example, if the third card is the ten of spades, deal the top card to the table and say "T." Put the second card on top of that and say "E," and then put the third card on top of that and say "N." Then, reform the deck by placing the remaining cards in your hand on top of the stack on the table and picking up nine cards up again. Spell the second word, "OF," the same way, and reform the pack. Then spell the final word, SPADES, and again reform the pack.

Finally, spell the name of your favorite science magazine, using this method, and reform the pack. Then look at the top card. If you have followed the directions—and have good taste in magazines—it's the same card you spelled. Amazingly, this trick works with any card, regardless of how many letters are required to spell out the card's name. **GG**