

# OMNI

APRIL 1989



## CREATIVITY

THE SOURCE, THE SECRETS, THE EXERCISES

\$3.50



# OMNI<sup>®</sup>

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Photographer Ellen Schuster decided to have some fun with a mannequin she used in an advertising shoot. The Dallas artist experimented with the doll's head several times before creating the April cover, a homage, says Schuster, to photographer M. C. Escher.

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## FIRST WORD

By Kurt L. Schmoke

• It is time we brought our population of drug addicts into the public health system and out of the dark alleys, where organized crime controls the quality, quantity, and price of drugs. •

Last year the United States spent approximately \$70 billion on drug-related law enforcement, while drug criminals earned at least \$110 billion in profits. Meanwhile, drug-related crime, especially in our cities, simply got worse.

The harder we try to use criminal law to stamp out drug abuse, the greater the financial incentives become to deal drugs. Thus our drug policies aren't just failing, they're self-defeating.

Since 1974 the policy of the United States has been to treat the use of drugs in this country as a criminal offense. In 1986 August Volmer, a former president of the International Association of Chiefs of Police, said "Drug addiction is not a police problem. It has never been and never can be solved by policemen. Drug abuse is a medical problem, and if there is a solution it will be discovered by scientific and medical experts."

Our strategy of using criminal law to end drug abuse is a mistake. We need to revisit our approach, enlist new leaders, and begin again. Although the criminal justice system should still play a role in controlling drugs, our policies should focus on public health strategies.

As former state attorney for the city of Baltimore and a veteran of the war against drugs, I know that our strategy hasn't worked. Nevertheless, we can beat the traffickers and control our complex drug problem if we're willing to substitute common sense for myth, rhetoric, and blind persistence.

We must begin thinking about decriminalizing some drugs. We haven't made cigarettes illegal. Yet according to a report from the Department of Health and Human Services, cigarettes account for up to 350,000 deaths a year. Instead we have left it to the public health system to address the problems related to nicotine addiction, and fewer people are now smoking.

As for alcohol, we tried to make it illegal and learned a painful lesson: If the government doesn't regulate substances of abuse like alcohol, we bring a reign of terror down on our cities. It is time we learned the lesson of Prohibition and eliminated the only reason drug criminals stay in business—billions of dollars in profits. This could be done by bringing our population of addicts into the public health system and out of the dark alleys, where the price, quality and quantity of drugs are controlled by organized crime.

Providing drugs to addicts under medical auspices is a sensible policy. In the early 1930s the Shreveport Clinic in Shreveport, Louisiana, distributed narcotics to people who had become dependent on drugs. In an investigation of the clinic in 1921, Federal District Judge George Jack warned that he would oppose any steps toward a discontinuance of the clinic, because "it

had lessened crime in the city." The chief of police, the sheriff, and the United States marshal in Shreveport all agreed that the clinic helped reduce crime.

Other societies have successfully adopted public health approaches to controlling drug abuse. The Dutch government, for instance, has merged various programs related to the abuse of addictive substances under one branch of their health ministry. Under the ministry's direction, the Dutch have established an effective needle exchange program for intravenous drug users (used needles are exchanged for new ones), and drug treatment is available for those who want it. On the enforcement side, the Dutch have decriminalized the possession and sale of marijuana, while continuing to enforce laws against trafficking in cocaine and heroin. The purpose of the Dutch drug policy is to reduce the risks associated with drug use, such as blood-borne diseases like AIDS and hepatitis, for those addicts who won't or can't give up their addiction and to avoid placing an excessive burden on the criminal justice system. A decline in marijuana use has occurred since the Dutch decriminalization policy began.

Led by the Mersey Regional Drug Training and Information Centre in Liverpool, the British have also used health strategies to effectively confront drug abuse. The Mersey clinic offers a broad range of help to addicts, including a needle exchange program, prescriptions for buprenorphine and cocaine, and methadone and drug-free treatment such as counseling upon demand. It is believed that the availability of treatment has helped prevent the spread of HIV infection in the clinic's population.

To redefine our national drug policies, I recommend we eliminate criminal penalties for marijuana possession and redirect funding from law enforcement efforts to drug abuse prevention and education programs. We need to pass laws that permit health professionals to distribute methadone, heroin, and cocaine to addicts as a part of supervised maintenance or treatment programs. We need to establish an independent commission to study substances that are abused and based on their potential harm make recommendations on how they should be regulated. Finally, the war on drugs should be led by the surgeon general, not by the attorney general.

If all this were accomplished, we could look forward to a brighter future for the vast majority of people who live in our communities. Finding ways to confront and control the problems associated with drug abuse would provide the American people with a safer, stabler, more productive society. ☐

Kurt L. Schmoke is the mayor of Baltimore.

# CONTRIBUTORS

## OMNIBUS



DOODLES



DARWIN



MUELLER



GETTING CREATIVE



WHILE THE WORLD THINGS GROW



FINGERS KEEPERS

**T**here were no movies that year. No radios, no telephones, not even as much as the electric state of an incandescent bulb to piece a dark night. There were the ordinary events that marked the footsteps of time: school lessons, marriages, births—consequential only to those to whom the events happened. Yet within the lifetime of a boy born in 1847, the emblems of the modern age would be created.

The source of Thomas Alva Edison's ingenuity, the process by which conception became creation, is revisited in this month's interview, on page 82. Writer John Briggs talks to Reese Jenkins, science historian and Edison's archival, about how Edison invented the myriad gadgets and commodities we take for granted today. After poring over Edison's manuscripts and lab notebooks Jenkins believes he has discovered what made Edison an unparalleled inventor. He found practical applications for principles that already existed. "Actually," says Briggs, "creators give form to a hidden reality."

Scientists from Harvard to Stanford are also examining the creative process. In "On Creativity" (page 42), author Neal McAllister looks at what neuroscientists and physiologists know about the brain patterns of people in the midst of being creative. Psychologists are also testing artists and writers to see if there are common characteristics among them, a "creative personality" type

So how creative are you? Turn to page 112 ("Getting Creative: Birth of a Nation") and find out. University of California psychologist Frank Barron has designed a questionnaire so you can analyze yourself. Barron's a pro. He's been measuring creative types like Truman Capote and Norman Mailer for 40 years. But don't ask for their scores. They're held in the strictest confidence. (You can get the tests used in the Barron Creativity Workshop by writing to Applied Creativity, Box 2296, Aptos, CA 95003.)

To enhance your creative output, Barron has also developed exercises that teach you to think metaphorically, challenge your assumptions, and use "what if" thinking. You'll learn to develop your own original thoughts. And "learning" to be creative is the first step, Edison himself said. "Genius is one percent inspiration and ninety-nine percent perspiration." Just ask associate editor Kevin McKinney, who was inspired to suggest an issue on creativity. What you hold in your hand, however, is mostly the result of McKinney's hard work.

One manifestation of creative expression is doodles: those scratch marks made in the margins of notepaper (see "Breaking the Code of Doodles," page 64). By analyzing people's doodles, researchers have begun to unearth their deepest fears, desires, and needs. "I've always doodled elaborate shapes with webbing and cross-hatching,"

says freelance writer Joanna Torrey. "My doodles looked like a cross between a former president's webbed constructions and Son of Sam's interconnected triangles." Because these doodles are supposedly signs of sex, aggression, and anger, Torrey began to doodle with circles—signs of adjustment and health, the experts say. Well, she finally just gave up trying to draw according to someone else's standard.

We often find ourselves in Torrey's situation—forced to give up ideas, lifestyles, or even objects that don't satisfy us. Sometimes we find a replacement for what we've lost; other times we don't. And that's precisely the theme attacked by four fiction writers, including cartoonist Gahan Wilson. The stories, entitled "Finders Keepers" and commissioned by fiction editor Ellen Datlow, begin on page 48. Datlow edited the just-released *Blood Is Not Enough* (Morrow), an anthology of 17 vampire stories guaranteed to horrify.

Normally we don't think botanists could attend, much less horrify a soul. But in the eighteenth century Carolus Linnaeus harried his contemporaries in "Where the Wild Things Grow" (page 66), senior editor Jane Bowdell tells how Linnaeus, in graphic detail, classified plants according to the structure and number of the male and female sexual parts. The English were shocked. One peer went so far as to call his system a "loathsome harlotry." ☐



# MIND ODYSSEY

## FORUM

**P**roblem: Design and build a structure from bales wood and glue. It must stand between eight and eight and a half inches high weigh no more than 15 grams, and support closer to 1,000 pounds.

Solution: 1) Ignore the problem. 2) Consult an engineer. 3) Ask a kid to solve the problem.

Can you imagine loading dense bulky weights onto such a tiny, capstan-weave structure without it collapsing? This is just one of many projects given to schools each year as part of a program called *Odyssey of the Mind* (OM). Conceived in a New Jersey basement by Samuel McKissack, OM is run by his wife, Carole McKissack, a Gloucester State professor, started OM to stimulate children's creativity. "I've been in higher education for more than twenty years," he explains, "and we do practically zero for creative kids." *Odyssey of the Mind* is one man's attempt to bring fun to learning—where it belongs. The contest is open to students from kindergarten through college.

Some examples of the projects are writing and performing a new ending to *Moby-Dick* and one called *Humor* from Homer. McKissack admits it's a way of taking the kids into reading the classics. "When something stands for two thousand years," he says, "it's a pity when it's not studied anymore." Another example of kids' ingenuity: the McKissacks' invention that earned a high school team the world finals. Created for businessmen, this device beeps if your zipper is down. McKissack also cites a team that had a production line called *Teeth Are Us*, which churned out tiny cotton-lined boxes for the tooth fairy.

Celebrating its tenth anniversary this year, OM is now an international competition involving more than 350,000 kids. Schools become members by joining the OM Association, a nonprofit organization whose curriculum materials are sponsored by IBM.

McKissack is still involved with the OM program and is presently working on new problems for next year's contest.

Nina Guccione asked him about his thoughts on the creative process. An excerpt from the conversation follows.

**Omni:** Do you believe creativity is innate?

**McKissack:** Although heredity may have something to do with it, I definitely believe creativity can be learned.

**Omni:** Do you think our present school system fosters creativity?

**McKissack:** I don't think they've really made any sort of commitment in the teacher-education programs to do so. Almost everything we do in school seems to be "Give the right answer for this, the right answer for that." Our art and music rooms are every bit as important as our football fields.

**Omni:** Are standardized tests valid?

**McKissack:** What do the SATs measure? We place so much emphasis on them—on whether or not you go to college, on where you place in your high school. The SATs are measuring computational skills, some math and some verbal, and that's about the end of it. If someone has a more insightful answer, forget it.

We do very little for people who have

other kinds of talent, be it leadership, artistic talent, or theatrical abilities. If we're going to use tests, we should test kids for all their potentials.

**Omni:** Is creativity linked to IQ?

**McKissack:** Creativity is a different kind of intelligence. Creative intelligence is something you'd measure a different way than you would IQ. But IQ tests are inexpensive. You can test thousands of people at one time. They all take the same test and give it back to the Jersey outfit that tells them how smart they are.

**Omni:** Does IQ indicate anything?

**McKissack:** What's the IQ of the U.S. Congress; you'd wonder half the time. But the people who run the Congress have to be great leaders. You just don't get elected to a public office if you don't have something great going for you—some kind of charisma or ability to lead. A correlation between leadership skills and IQ just doesn't exist.

**Omni:** Of what importance is creativity in today's technical world?

**McKissack:** We have to look under the umbrella of creativity—at critical thinking, at formulating alternatives to problems. What kinds of problems will our kids face in the future? Youngsters born today may be alive in the century after next.

**Omni:** So what should creative education be leaning toward?

**McKissack:** I see problem solving as a more fundamental method of learning, more than just memorizing. It's not a one-answer world out there, but our educational system tends to be a one-answer system.

**Omni:** Any suggestions for where we should start?

**McKissack:** We need to rework creativity a little bit. We too often penalize that kind of thing. "Curiosity killed the cat." What does that mean to a little kid? Ask questions and it may kill you? We have to allow people to try flexible thinking—encourage self-expression. Sometimes we forget we're dealing with young kids who have feelings. The bottom line is that learning should be fun and should teach creative skills necessary for life in the future. **OM**



Can a world of learning be creative fun?

# SEA OF TROUBLE

## EARTH

By Ken Brower

**O**n Judgment Day the sea gives up its dead. In the summer of 1988 we reached some such juncture. A million bottom fish died in Raritan Bay, New Jersey, trapped in a dead zone of anoxic water. The seven hundred herring dolphins of the year washed up on Atlantic beaches, dead of mysterious causes. Medical waste began washing up on the sands from Long Island to northern New Jersey—bloody bandages, syringes, or vials of blood, some of which, when tested, were found to contain AIDS antibodies or hepatitis B. There was drug paraphernalia—crack vials, needles—as well as tampon applicators and sludge.

And America was not alone. In the North Sea 6,700 seals were found dead, killed by pneumonia and liver infections. Bowel health officials were forced to close many beaches along the Black and Baltic seas because of pollution. The Mediterranean was awash in untreated sewage.

The summer of 1988 was an omen to the global of the worst of household

horrors. The toilet of the ocean was finally backing up. An indelicate metaphor for Mother Ocean, perhaps, but that is how we have used our seas: carelessly, effluently, dumping our garbage, expecting, as a kind of right, that clear water will flow in again with each flush of the tide.

But prospects for the ocean are not entirely bleak. Planetary restoration, which promises to be the great environmental endeavor of the next few centuries, has begun in the seas. Urban estuaries are surprisingly resilient, and biologists have learned a good deal about how to recell them to life. Kelp forests have been replanted in Southern California with considerable success. Mangrove forests are being replanted in the tropics. The seas can be saved, but the community needs to act quickly for, on balance, prospects for the watery two thirds of this planet are grim.

In the Baltic Sea the seals are starving, their mouths and flippers so deformed they are unable to catch fish. Red Norwegian lobsters caught off the

coast of Denmark have turned black. Studies conducted in 1985 showed that large regions of bottom in the North and Baltic seas are anoxic and lifeless, killed by algae blooms. Nitrogen and phosphorus runoff from industry, sewage plants, and especially farms had stimulated the blooms. (Of the 400,000 tons of nitrogenous fertilizer spread on Danish soil each year, about 200,000 tons winds up in Danish waters.)

Anne Nelson, director of the Ocean Research Institute of Denmark's Ministry of the Environment, has said that the Baltic pool of "nitrogen heavy" water will take decades to dissipate, noting that it takes about 30 years for a total mixing of the Baltic. And mixed to whom? A resident of Britain or Norway might ask. The Baltic empties into the North Sea, then the Norwegian Sea, the Barents Sea, and the Arctic Ocean in one direction, into the Atlantic in the other. Just because nitrogen-heavy water has been flushed from your own waters does not mean it is gone.

The first marine pollutant to seep into world awareness was oil. Oil is twice deadly in the ocean. It first kills in the unrefined form in which it travels in tankers and then in the petroleum product called plastic.

Plastic is lightweight, strong, and durable—its virtue on land. Plastic floats and is nearly immortal—it sinks in water. Plastic can take upwards of five centuries to degrade, and much of it is destined to drift about on the surface, where most sea life goes on.

Seabirds get entangled in monofilament line and six-pack connectors of plastic. An estimated 50,000 northern fur seals have been killed in the Pribilof Islands of Alaska by entanglement in fragments of plastic nets and debris (a slaughter that, its magnitude known, caused the National Marine Fisheries Service (NMFS) to institute its Marine Entanglement Program). Baleen whales—humpbacks, blues, minke, humpbacks—regularly snag themselves in plastic fish nets. Even toothed whales are sometimes sunk by plastic, despite



From Staten Island to the Mediterranean Sea, medical waste and sewage waste ashore

# HOW POLITICS KILLED LANDSAT

## SPACE

By Brenda Forman

**P**ost-World War II, when you buy a satellite recon photo...top quality? Forget commercial U.S. shots. Instead, try something imported—just like for cars and electronics and who knows what's next. The best news is now. If you want to buy a first-rate satellite image of Washington, D.C., a year from now, you're probably going to have to go to the French—or even the Soviets, declares Mummy Fisher, publisher of the *Washington Herald-Sensing Letter*.

The world used to come to the United States for Landsat images because nobody else had a remote sensing system. But Landsat has fallen victim to shortsighted deficit reduction, bureaucratic infighting in Washington, and military opposition to a civilian remote sensing system. This culminated in a disastrous effort to "commercialize" the system by unloading it on the private sector. All this supposed process of (Landsat) commercialization has done, states Dr. Paul Maughan, a partner in Space Development Services, is

Washington-based consulting firm, "is put the French, the Soviets, and soon the Japanese in business."

Not only that, but the American government and military have done everything they could to prevent our own industry—which invented the whole technology of remote sensing in the first place—from keeping up with this growing foreign competition. For years the government prohibited U.S. companies from flying any satellite with better than ten meter resolution because the Defense Department didn't want anything up there that could come near the resolution of our spy satellites.

Then in 1986 the French company Spot Image started successfully marketing ten meter satellite imagery commercially—and the Soviets in 1987 started offering satellite photos with five-meter resolution. Only then did the U.S. government admit that the house had left the stable and rescind the ten-meter prohibition on our own terms.

But it looks like the change in policy is too little and too late. For Landsat is

still struggling with the military services' hostility to a civil remote sensing system. "No way can a civilian remote sensing program survive in this country without the acquiescence of the military," says Fred Henderson, president of the Geosat Committee, a group formed to try to defend the beleaguered U.S. remote sensing industry. "It may be great for the military to keep U.S. technology (for instance, radar) ten years behind the time, but other countries are going ahead and building advanced systems."

How did the Washington politicians respond to this imaging crisis? They replied over and over: "It's sad when you get to the point where Iowa farmers are buying imagery from the French" to monitor crop conditions, irrigation needs, and harvests, says Courtney Stodd, former director of the Transportation Department's Office of Commercial Space Transportation. When the late Malcolm Baldrige [secretary of commerce] was trying to get Congress to build the necessary subsidy into the Landsat Commercialization Act," recalls Stodd, David Stockman [then head of the Office of Management and Budget] followed him around the Hill asking why we should care if American farmers have to get data from the French. Why should the government help U.S. industry?"

When technology plays politics in Washington, technology loses. And the Landsat fiasco is a classic example of this point. NASA developed Landsat technology but cut it adrift late in the Carter administration. Then Landsat landed in the lap of NOAA (the National Oceanographic and Atmospheric Administration in the Department of Commerce), which didn't want it and hadn't gotten any extra money to run it either. Next the Reagan-Bush administration really put the knife into things. The system was to be handed off to the private sector in a supposed process of commercialization. The only way that could work, though, was if the government provided a sizable subsidy. The



On a clear day: Can the United States regain its lead in satellite photography?



# THE BONES FROM BRAZIL

## EXPLORATIONS

By Heather Pringle

**D**uring the summer of 1996 Brazilian scientists made a perplexing discovery in an arid, sun scorched highland not far from the equator. Burrowing into the floor of a limestone cave some 900 miles north of Rio de Janeiro, Museu Nacional archaeologist Maria Beltrão and her colleagues unearthed hundreds of broken bones of long-extinct animals along with a strikingly primitive-looking stone tool. Convinced that ancient hunters had once feasted in the cave, Beltrão approached Henry de Lumley, one of France's foremost authorities on Paleolithic humans for assistance in dating the site. Much to her astonishment, uranium-series tests placed the age of two bone samples between 200,000 and 350,000 years—hundreds of millennia before the most widely accepted dates for man's arrival in the New World.

The ancient bone bed, however, is only one of three Brazilian discoveries stirring up heated controversy over New World prehistory. Discoveries of rock paintings and a possible ancient astronomical observatory also are challenging traditional thinking about America's first people. As one archaeologist joked: "It's beginning to look like early man crossed over from Asia and ran all the way down to Brazil."

Until recently, archaeologists generally agreed that America's first immigrants wore bands of modern men—Homo sapiens experts—who crossed the Bering Strait from Asia sometime between 12,000 and 20,000 years ago. In the wake of recent South American reports, however, tantalizing new questions are being raised. Could Homo erectus—a robustly built, heavy-browed species of man who arrived in China 700,000 years ago and who hemmed the at least 400,000 years ago—or some other archaic humans have tackled the stormy Arctic route to the New World? If so, what became of these early migrants? Could they have given rise to a sophisticated culture?

Intingually all three Brazilian discov-

eries come from the same remote northeastern plateau guarded by thorny thickets of nettles and twisted trees known in the local native dialect as *caatinga* (literally, "white forest"). Although the area is now prone to drought and has long discouraged agriculture, humid conditions during the last ice Age gave rise to tropical rain forest and lush prairie inhabited by mastodons, horses, and giant ground sloths. Ancient climatic fluctuations, moreover, seem to have played an important role in conserving the region's rich archaeological records. At Toca da Esperança, as Beltrão has named her discovery, mineralized water dripped from the ceiling during times of great humidity. As the millennia passed, it then sealed the ancient bone bed beneath three feet of concrete-hard mud—protecting it like food in a mason jar. "The region preserves anything," Beltrão says. "That is the key. It is incredible."

So far, Beltrão's team has unearthed more than 220 pounds of fossilized bones representing nine extinct ice Age

species, primarily from the horse family. Some fragments appear to have been shaped by human hands into sharp drills and scrapers, and one such possible tool was recently dated to 200,000 years ago.

In addition, the researchers have uncovered several quartzite pebbles showing signs of human use. "The nearest source of quartzite is two miles away," Beltrão says. "Many geologists and geomorphologists examined the limestone cave and believe it is completely impossible for quartzite to arrive there without human intention. So man must have been there."

Beltrão and De Lumley are convinced the cave holds the earliest known records of man in the New World. Reporting the finding in the official bulletin of the French Academy of Sciences, they suggest that Homo erectus could have crossed the Bering Strait to the Americas several times. "If [woolly mammoths, bison, and other] fauna crossed the Bering Strait in both directions since the Pleistocene," Beltrão reasons, "why should man, a nomadic hunter, not have done the same?"

The Brazilian archaeologist is quick to concede, however, that American populations of Homo erectus could have remained very small. Excavators elsewhere in the New World have uncovered scant evidence of such early migrants. (Objects that may have been stone tools were found in California's Mojave Desert at a highly controversial site that has been uranium-series dated to 200,000 years.) It is entirely possible, wrote Beltrão and De Lumley in their official report, "that the descendants of the first inhabitants of the Americas became extinct."

Despite the authors' confidence in their findings, serious doubts are being raised. According to Canadian archaeologist Ruth Gruhn, Beltrão and her team have not yet published key pieces of proof required to substantiate their claims—photographs of the tools in situ and geological profiles of the site. Natural forces, it seems, could have



Out of Rio: Glimpse of Western civilization?

# MASS APPEAL

## STARS

By Steve Nadis

In 1967 Long Islander Raymond Davis went to South Dakota to dump 100,000 gallons of perchlorethylene (PCE)—the funny-smelling solvent used by dry cleaners—into a tank in an old gold mine. The reason? He planned to use the PCE to trap neutrinos—among the smallest and most elusive particles in the universe. Produced by fusion in stars and the Big Bang, these chargeless elementary particles have little or no mass. Thus they are able to travel at about the speed of light and can pass through an entire planet without hitting anything. This permits them, for instance, to travel from the center of the sun (where they are created) to Earth in about eight seconds. Furthermore, since the typical neutrino remains intact, so does the original information it contains about temperature, density, and the fuel-burning processes in the core that formed it.

Neutrinos' ability to pass untouched through matter also makes them quite difficult to catch—they rarely collide with detectors designed to capture them. Although Wolfgang Pauli first proposed their existence in 1931 and Los Alamos researchers Frederick Reines and Clyde Cowan first "saw" them in 1956, researchers have done very little by way of neutrino trapping. Davis, in fact, set the world's only neutrino observatory for almost 20 years.

The lonely field of neutrino hunting changed dramatically on February 23, 1987, when a wave of neutrinos lit up instruments in underground water tanks in Ohio and Japan. The source was a star that blew up in the Large Magellanic Cloud, 160,000 light-years from Earth, an event known as Supernova 1987A (light from the blast arrived three hours later). Researchers detected a total of 19 neutrino signals—8 at the Ohio IMB detector and 11 at the Japanese Kamiokande II. Observations gleaned from the neutrino shower confirmed prevailing models about supernovas. Since then, neutrino investigators around the world have been setting up elaborate traps in tunnels, mines, mountains

and seas. Other researchers are digging up metal ores to find traces of supernova neutrino collisions over the last 10 million years. Says Boston University physicist and IMB collaborator Lawrence Sulak, "The age of neutrino astronomy is upon us."

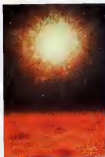
Researchers at IMB wait patiently for our galaxy's next supernova—an event that may be 10 to 15 years away—though funding will probably run out long before that happens. The Kamiokande group, meanwhile, is planning to expand their facility to enable it to capture ten times as many neutrinos.

Researchers are also developing new installations around the globe to capture the tiny particles. Four new solar neutrino labs are in the works in Italy's Gran Sasso Tunnel. Each is roughly the size of a football field. Another detector, using 60 tons of gallium instead of water or PCE, began operating in February 1998 in the Caucasus Mountains in the USSR. And investigators in Australia are now running the Sun lab, a water-filled detector. Even more

ambitious is the proposed Sudbury Neutrino Observatory (SNO) in Ontario, Canada. According to John Bahcall of Princeton's Institute for Advanced Study, SNO should be able to detect all three known types of neutrinos—electron, muon, and tau—as well as determine their source. These solar neutrino lab results could explain how the sun and similar stars "shine."

Three other installations are designed to find "high-energy" neutrinos, emanating from the hottest, most violent stars in our galaxy. MACRO, located in the Great Sasso Tunnel, began operations in 1988. GRAND, an underground detector proposed for Arkansas, would search for gamma rays and neutrinos. If funding goes through, DUMAND (10 years in the planning) will have detectors located three miles deep in the waters off Hawaii. High-energy neutrino labs could help unravel such mysteries as the nature of cosmic rays and the ways galaxies form.

There is a big cosmological question that the detection of these different types of neutrinos may help to answer: Do they contain the so-called missing mass of the universe? (Ninety percent of all matter has so far remained invisible to modern astronomical instruments.) Estimates based on Supernova 1987A indicate that electron neutrinos alone do not account for all the mass that researchers now believe must exist somewhere in the universe. However, muon, tau, or other not-yet-discovered neutrinos might account for this missing mass. The problem: Neutrinos from the Big Bang now have so little energy left that even the most advanced equipment conceivable might not be sensitive enough to detect them. "Anyone figuring out a way to detect Big Bang neutrinos could go straight to Stockholm [for a Nobel]," says University of Hawaii physicist John Learned. The situation is frustrating—almost comical. "Here we are," says Learned, "sitting in this incredible neutrino soup, which could comprise most of the universe's mass and we have no way to detect it." DO



Neutrino hunters stalk the Big Bang

# ACROSS THE GREAT DIVIDE

## BODY

By Mary S. Gluckman

**A**ccording to a National Institute of Mental Health (NIMH) study, one out of six Americans suffers from a neurological or mental disorder. At some point, the study said, one out of three Americans copes with chronic depression, anxiety, obsessive-compulsive disorder, phobias, schizophrenia, drug addiction, or another condition causing mental anguish. Alzheimer's disease afflicts an additional 2 million Americans, and it's projected that it will affect 4 million by the year 2000. Others succumb to diseases like epilepsy or multiple sclerosis. While drugs may check the symptoms of their ailments, the molecular basis remains unresolvable, as it does for enzyme deficiencies like Tay Sachs disease or Lesch-Nyhan syndrome.

All of these individuals, however, should benefit from work currently being conducted on the blood-brain barrier, the closely guarded moat that prevents the body's normal chemical fluctuations from wreaking havoc in the brain. Until recently, scientists thought the barrier impenetrable. They now understand that it functions more like the door policy at an exclusive nightclub: It selectively admits certain nutrients—like glucose—the brain needs to function properly while barring others—like neurotransmitters produced elsewhere in the body—that might create an electrical storm if introduced into the brain.

Scientists researching the barrier have begun developing strategies for transporting drugs and enzymes through it from the bloodstream. In the near future, doctors will be able to correct the chemical imbalances that cause most diseases in the brain, instead of simply medicating their symptoms as they do now. Breaking through the blood-brain barrier will also enable them to deliver medications, like the antiviral drug AZT for AIDS, to infections that hide behind the brain side of the barrier even after having been eliminated from the rest of the body. Solving the blood-brain barrier problem is to the neuropharmaceutical market what the trans-

fer was to electronics, says Dr. William Partridge, an endocrinology professor at the UCLA School of Medicine. It's medicine's next frontier.

Using molecular biology and electron microscopy, scientists have spent the last 30 years breaking the unique code of the cell structures that make up the barrier. Specialized cells called endothelial cells line all of the body's capillaries. An outer two-layer membrane covers each endothelial cell. We now know that astrocytes, extensions of brain cells, surround the brain's capillaries. These astrocytes secrete a chemical that causes the endothelial cells to roll over on themselves and zip shut. When this happens, the outer layers of adjoining cells merge in continuous tight junctions, making them impermeable to substances in the blood.

When doctors first began to use antibiotics, they didn't understand why penicillin never circulated from the bloodstream into the brain, while chloramphenicol, another early antibiotic, did. Now we know that chloramphenicol

passes through the blood-brain barrier because it's lipid soluble. Lipids—substances that don't dissolve in water—are the primary components of endothelial cells' outer membranes. Thus substances that dissolve in fats—being lipid soluble—pass through easily while water-soluble compounds do not.

Most substances that get past the barrier reach only the cerebrospinal fluid (CSF), all four ounces of which are made in the brain and are reabsorbed by the bloodstream every six hours. Most drugs take several days to diffuse into brain tissue from the CSF, according to Partridge. Like water running from a faucet into an unplugged sink, drugs that pass into the CSF drain back into the bloodstream before they can do the patient any good.

In the last few years, neuroscience researchers have developed several approaches to getting substances past the barrier and into brain tissue. Partridge has taken a physiological tack that calls for exploiting the transport systems used by these substances that do routinely clear the barrier. Dr. Nicholas Bodor, a medicinal chemistry professor at the University of Florida School of Pharmacy, has devised a technique based on altering the molecular structure of therapeutic drugs. He binds fat-soluble molecules to water-soluble drugs in such a way that they not only sneak past the barrier but remain in the brain, diffusing into its tissue.

Partridge's strategy hinges on manipulating the transport mechanisms that water-soluble nutrients and enzymes depend on to cross the barrier into the brain. Carrier-mediated transport proteins present in the brain's capillaries pass molecules through the endothelial cells into the brain in milliseconds. Like firemen passing water vessels down a line in a bucket brigade, this system enables the brain to absorb energy sources like glucose and lactic acid, as well as amino acids like tryptophan, which it needs to make neurotransmitters. Receptor-mediated transport acts like a raft to ferry insulin and



Breaking the brain's natural barrier

CONTINUED ON PAGE 31



# CONTINUUM

## GENE RUSTLERS

**T**here's an apocryphal tale being passed among geneticists nowadays. It seems that a young molecular biologist had reached an impasse in her research program. In order to complete a critical experiment, she needed a certain laboratory-engineered bacterial gene. The only source of that gene was the laboratory of a well-established scientist with a reputation for being uncooperative. Nevertheless, the woman wrote him a letter asking for the strain of bacteria bearing the needed gene, explaining that it was critical for the future of her research and her career. A reply came quickly—a letter asking his outrage that she would even think that he might share one of his research accomplishments with the likes of her. At that point she smiled—and cut his letter into little squares, placing each square in a special solution that would screen for the bacteria with the engineered gene. A few days later one of the cultures contained bacteria; she had her gene. His hands had inadvertently placed micro-organisms from his lab on the letter.

Whether or not the story is true, it bears two important messages. The first is that the right genetic material, worth for weight, can be more valuable than precious metals and jewels, more valuable even than plutonium. The second is that genes come in tiny packages. All of the information necessary to build a whole organism resides within a single cell. Given the extraordinary value of certain genetic materials and their microscopic size, can that be far behind?

Gene piracy is not new. In the 1600's, for example, the Dutch ended Arabia's monopoly on coffee when they smuggled seeds out of the port of Mocha and planted them at their colony in Java. Thomas Jefferson is said to have enhanced America's rice crop by stealing an improved variety during a trip to Italy. Even cattle rustlers in the Wild West boosted the genetic value of their herds by stealing prize bulls. Today a "gene rustler" would require only a single gene or a cell from which to extract it. And because genetic manipulations are more exact—one could decide to change only one trait—the value of a single gene increases. Placing the engineered "ice-minus" gene in a common bacterium, for example, keeps frost from forming on plants and has the potential to prevent worldwide crop losses of more than \$1 billion annually.

Not surprisingly, safeguards to protect genetic inventions are beginning to appear. Genes can now be patented, and because each gene has its own unique sequence of different DNA subunits, the precise sequence can be registered. Some researchers and companies may take the additional step of attaching to their patented gene some sort of trademark, a few extra DNA subunits that would serve as a genetic brand. Such steps will discourage gene pirates who are planning to sell their booty, but it won't deter those who plan to use the goods themselves. If, for example, an engineered yeast cut the cost of making beer by 10 percent, an unscrupulous brewing company could engage in a single act of microtheft that would save it millions of dollars a year. Unless the owners of the patented yeast happened to notice the dramatic increase in the pirating company's profits, they would have no reason to suspect that their gene had been stolen.

The most effective measures for deterring gene piracy will be those that prevent it altogether. Ironically, these strategies may come from the industry's response to environmentalists who are working to prevent the spread of engineered genes in nature. Some biotechnologists have taken the warnings of the ecologists seriously and are coming up with clever solutions to contain their engineered organisms. For example, several research groups have developed what they call a suicide vector, a poison-pill gene tightly linked to the engineered gene. If the cell that contains the poison gene were to be taken out of a particular environment (its home), the poison gene would kill the cell.

In the future more subtle forms of control may appear. As the science of gene expression grows, we may be able to create genes that can turn themselves off after they have gone through a certain number of cell divisions or after the gene has produced a certain amount of the desired product. Those genes would have no environmental impact because they would soon deactivate themselves. In so doing, they would create a constant demand from the market. And at the same time they would foil gene pirates, who would see their stolen goods disappear before their very eyes. How satisfying, then, to see that the best interests of the environment are also the best interests of business. —NORMAN C. ELLSTRAND

# CONTINUUM

## BLEEDING AUGUSTINIANS

What cleanses the guts, dries up the brain, warms the marrow, produces a musical voice, curbs tears, and gives long life? The answer is a phlebotomy or healthy blood-letting. At least, those are the benefits listed in a fourteenth-century *vide mecum* or handbook for the "ordinary medical man." Generations of Europeans bared their arms to the sharp blades and hungry leeches of medieval doctors for the treatment of everything from gout to indigestion. But just what one might ask became of all that blood gone?

Archaeologists digging near Edinburgh, Scotland, have found an answer for at least one twelfth-century site. They have unearthed several blood dumps near the ruins of Soutra Hospice, a hospital run by Augustinian monks for nearly 300 years.



Medieval doctors are unrelenting phlebotomists: "blood dumps"

Taking samples from long-buried ditches and pits located by a geophysical survey, archaeologist Brian Molloy found pieces of an odd, purple-brown clay. Tests of the clay with hemoglobin-detection strips—normally used by doctors to test fecal samples for signs of internal bleeding—all proved positive for the presence of blood.

Molloy, who is investigating medieval medical practices at Soutra, believes the blood deposits could prove invaluable in locating infirmary wastes, rich in the salts and pollen of herbal medicines.

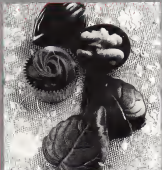
The Augustinians went in for bloodletting in a big way," says Molloy. Not only did they regularly phlebotomize the local populace, but each monk was routinely bled to the point of unconsciousness (minus three to four pints) as a sort of tonic. Molloy figures a stable community of 30 monks bled seven to 12 times a year over a period of 300 years must have yielded upwards of 189,000 pints of blood—a less-than-sanguine approach to life.—James Kilgore

*You know that if I wake somebody, I'd like to come back a buzzard. Nothing heats him or revives him or warms him or needs him. He is never bothered, and he can eat anything.*

—William Faulkner

*I find television very educating. Every time somebody turns on the set I go into the other room and read a book.*

—Groucho Marx



Chocolate-covered Kisses and plain ones: The difference is in the endorphins.

## WHY YOU CAN'T SAY NO TO A HERSHEY'S BAR

Every year Americans consume about ten pounds of chocolate per capita, a lusty appetite that scientists have been curious about for years. The latest theory comes from Charles F. Levinthal, a psychology professor at Hofstra University in Hempstead, New York, who believes there may be a connection between chocolate addiction and the body's endorphins.

Endorphins, opiate-like substances produced by the brain, are natural painkillers. "Endorphin levels have been linked to the way we regulate our levels of mood,

Levinthal told an audience at a recent scientific symposium on chocolate. "Low levels are tied to depression and high levels to mania." He cited a German experiment in which rats (among nature's biggest chocolate fans) were given the drug naloxone, which has been shown to block the effect of endorphins. The researchers found that the rats injected with naloxone showed far less desire for chocolate than they had before or than control rats that had not been given an injection. Although Levinthal believes the human craving for chocolate is more complicated, he suggests the endorphin connection merits more investigation.—George Nisbete



You won't see this solar car doing rush hour. It's designed for racing. But James Worden plans to market two consumer models, both powered by solar cells or another electrical source.

## WOULD YOU BUY A SOLAR CAR FROM THIS MAN?

By the time the graduated from MIT last year, classmates were calling James Worden "the Henry Ford of solar cars." And for good reason. The twenty-one-year-old had been building solar-powered cars since high school, using cells bought at Radio Shack. Today he's in the process of setting up a company to manufacture two of his models—an economy car that can travel up to 40 mph and may cost as little as \$4,000, and a deluxe version that can cruise along at 80 mph and will cost a hefty \$15,000 to \$20,000. Both

versions will be equipped to run on electrical power provided by either the solar cells or an outside electrical source, a feature that will make them useful in all kinds of weather.

Worden thinks the market for his solar cars, which will be less expensive to operate than conventional automobiles, should be as great as it is in Europe. There more than 200 solar cars have been registered, and the market is expanding quickly. In the meantime, Worden is busy publicizing solar cars through a series of races that will showcase their speed and practicality. "It's gonna be an automotive revolution," Worden says.

—George Nobbie

## TURTLE RESCUE

Endangered sea turtles will get a second chance at winning the race for survival. Coordinated efforts by conservationists and Congress have resulted in the passing of a Turtle Excluder Device (TED) law, which will require shrimp fishermen to use TED nets when fishing offshore, beginning May 1 of this year.

After much deliberation, the late season legislation was finally approved as part of the Endangered Species Act. "All branches of the federal government have now looked at the evidence on the drowning of sea turtles in shrimp nets, and all have agreed that shrimp fishermen must begin using TEDs

if sea turtles are to be saved from extinction," comments Marydele Donnelly, director of the Sea Turtle Rescue Fund at Washington's Center for Marine Conservation.

The nets are designed to allow 97 percent of captured sea turtles (which are air breathers) to swim free. The nets also provide an escape route for fish and other marine species. With TEDs, everyone wins. At a cost of only \$400 each, TEDs reward shrimpers with far more time-efficient, fuel-efficient, waste-free catches.

Previously shrimp trawls (the large standard nets) accounted for the "accidental" capture of about 46,000 sea turtles each year. So it's hardly surprising that the Center for Marine Conservation has hailed the new legislation as a "tremendous victory." Still, says Donnelly, much work remains for all of us in educating fishermen.

—Mindy Leal



Not dead! The endangered sea turtle gets a second chance.



## CONTINUUM



What has six legs, is ten feet tall and is 100 percent made of steel? Just this, an advanced testing robot.

### ROBOT WALKER

Like an Erector set dinosaur, the most advanced off-road vehicle ever constructed recently lumbered outdoors for its maiden foray. The lightweight aluminum "walker" shambled with four-foot steps over crevices and embankments in an Ohio farm field, no minor feat for a 7,200-pound robot ten feet tall and 17 feet long. The six-legged automation motors along at six miles an hour over terrain too rough for conventional vehicles such as jeeps and tanks.

"It's probably the most sophisticated attempt at a walking vehicle in history," says Kenneth T. Waldron, principal investigator and professor of mechanical engineering at Ohio State University in the work since 1980, the \$9 million robot, funded largely by the Department of Defense, is controlled by a human operator who sits inside the robot and directs the vehicle with a joystick. In rule, 16 angle-board computers receive information from sensors on the vehicle. This system guides the robot while

maintaining balance and stability. A scanning range finder acts as an optical radar. With infrared laser beams laying the path ahead, the vision system enables the onboard computers to detect obstacles.

The robot could eventually orient for military combat, rove around on Mars, or operate in a nuclear reactor. Waldron may also team up with MIT researchers to produce a second generation of robot walkers, with an eye toward unlocking the secrets of human locomotion.

—Robert Brody

### MICROWAVE BAKE-OFF

Like some gigantic microwave oven, the AT Research Institute in Chicago says it can literally cook toxic waste right out of the soil, heating it to temperatures as high as 350°F. In one test at an Air Force base near Madison, Wisconsin, they removed almost 99 percent of the jet fuel, chlorinated hydrocarbons, and waste oils that contaminated 30 tons of soil.

The process does not require costly soil removal. Instead, tubular electrodes are inserted to a depth of six feet in a containment area or laid across the top of the area. The soil heats up when the electrodes are excited by radio-frequency energy. "This process is similar to the heating accomplished within a microwave oven, although the frequencies are much lower," explains Jack Bridges, senior science adviser for the project. "During the cooking process, water and hazardous components in the soil are rapidly evaporated. The vapors are collected and condensed [passing through a bed of activated charcoal] for subsequent removal from the site."

Best of all, the system can clean up a polluted site for one third to one half the cost of current cleanups.

—George Nobbie

*Hardly is nothing but stored environment.*

—Luther Burbank

*Only a madman person is always at his best.*

—Somerset Maugham

## SEEDS OF OBSESSION

Victims of obsessive-compulsive disorder (OCD) are slaves to relentless thoughts and bizarre rituals. One obsessive-compulsive man, for example, feels an overpowering need to drive around several hours a day looking for a nonexistent body. An obsessive-compulsive girl is compelled to count to 50 between each word she speaks.

National Institute of Mental Health (NIMH) psychiatrist Judith Rapoport, who documents these cases in *The Boy Who Couldn't Stop Washing*, admits that these behaviors sound crazy. "But the more I talk to obsessive-compulsives, the more struck I am by how normal they are in other ways. There is mounting evidence that OCD is a biological rather than a psychological problem."

Specifically, she explains, the strange obsessions and compulsions that haunt about 2 percent of the U.S.

population appear to be caused by a biochemical imbalance in the basal ganglia, masses of nerves deep in the brain linked to involuntary movement. NIMH researchers recently compared CAT scans of the brains of ten male OCD patients with those of ten healthy subjects and found that the basal ganglia of the obsessive-compulsive men were significantly smaller than those of the controls.

This is a very preliminary study," emphasizes Rapoport, chief of the NIMH's child psychiatry division. "But it fits in with other data linking OCD with that part of the brain. For instance, twenty percent of OCD patients also suffer from tics or twitches, which are thought to be related to basal ganglia problems."

No one knows how these aberrations in the basal ganglia start or why they drive one person to wash his hands until they bleed and another to ritualistically pluck out all her eyebrow hairs. But Rapoport reports that recognizing OCD's physiological basis has already led to new help for sufferers. For instance, in clinical trials testing more than 1,000 people, the drug clomipramine—which enhances the action of the neurotransmitter serotonin—has reduced obsessive-compulsive symptoms by 40 percent. —Sherry Baker

"The only way to keep your health is to eat what you don't want, drink what you don't like, and do what you'd rather not."

—Mark Twain



Some last-minute improvements in the old-world idiosyncrasy can add charm to the surrounding area.

## ORGANIC SIDEWALKS

What do you add to concrete if you want to make it stronger? Well, if you're Innobest, a small but innovative company in Angoulême, France, you prep up your product with a healthy dose of dried animal blood.

Innobest buys beef blood from French slaughterhouses, dries it to a powder, then blends it with two varieties of cellulose cementing agents. When mixed with water, the blood protein molecules in the solution react to form crystalline shells as the

concrete hardens. These shell-coated bubbles make the concrete significantly lighter, and because the bubbles are distributed evenly throughout the concrete (in traditional concrete, air bubbles are randomly distributed), it is up to 40 percent stronger than other concretes. —Bill Lawren

"Man kind is a gregarious animal, and much more up in his mind than in his body. He may like to go alone for a walk, but he hates to stand alone in his opinions."

—George Santayana



Obsessed with winning your war? Try to lose hope.



# CONTINUUM

## DROUGHT REPELLENT FOR FRUITS

A chemist has come up with a remarkable way to protect fruits and vegetables from the ravages of drought: a biodegradable film coating that blocks the evaporation of fluid from the fruit trees or vegetable plants.

The chemist, Walter Polovina of Southern Research Enterprises in Fort Myers, Florida, believes his coating will be a boon to farmers because the substance allows the plant to exude only enough moisture to keep it from spoiling—an act that

protects the fruit tree or vegetable plant from drying up in hot, dry weather.

Polovina developed the coating, which is unnamed at this writing, through a number of experiments in which delicate adjustments were made to the chemical processes involved in evaporation. The nontoxic film can be applied using a hand-held sprayer or a field conveyor. Polovina says the substance should be available later this year. —George Nisbete

*By perseverance the snail reached the ark.*  
—Charles Haddon Spurgeon



A thin coating has been developed that keeps 20% less moisture from fruits and vegetables during dry weather.

## CROAKS OF DISTINCTION

Some people say a French accent turns them on. Others swoon over the sound of a Spanish one. Now researchers have discovered that at least one species of frog also shows preferences when it comes to accents.

Cricket frogs, a small species found throughout the country east of the Rockies, have long been known to exhibit variations in their calls. But psychologist Walter Wilczynski and zoologist Mike Ryan of the University of Texas at Austin recently found that cricket frogs

living only a few miles from one another have developed different "dialects" marked by variations in pitch, trill, and repetition rate. "We think the females use this to discriminate their own population," Wilczynski explains. They mate only with the male frogs in their group.

Studies of the calls of female cricket frogs have shown that adaptations have occurred that make the frogs sensitive to dialects. "For example, in groups tuned to lower frequencies, certain parts of these frogs' ears are larger to help them pick up the lower resonances," Wilczynski says.

Why would frogs that look identical to other frogs living only a few miles away develop different dialects in the first place? That remains a mystery, but we are currently trying to figure out if something in different habitats makes one mating call better than another for a particular environment.



By mating with the frog, you have to speak the right dialect.

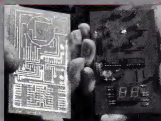
Wilczynski answers.

Whatever the cause of the frogs' varying accents, it could have long-range effects on their genetic makeup. "Because they are isolated from one another behaviorally, as mutations build up they will eventually become isolated genetically," Wilczynski says. "In fact, within thousands of years, frogs living only a few miles from other frogs with different accents could develop into distinct species."

The University of Texas researchers emphasize that they are less interested in how the frogs' dialects than in how the creatures tell the difference between various frog accents. "What's amazing is that these frogs are actually paying attention to them and changing their behavior because of what they hear." —Sherry Baker

*Never does nature say one thing and wisdom another.*

—Juvenal



A printed circuit made of ink (left) will make it possible to miniaturize everything from telephones to televisions.

## TIMER TECH

A portable telephone no thicker than a credit card—a television set that can fit on a bracelet. A remarkable new printed-circuit technology known as the *Printon Process* may soon make it possible to design miniature versions of many appliances.

Developed by Robert F. Conley, a former chemistry professor at Rutgers University, the *Printon Process* allows for almost unlimited miniaturization of circuit boards, using only 20 percent of the space required by present technology. Circuit boards, which can be found in almost every electronic appliance from hair dryers to VCRs, are instruction panels that tell machines what to do by conducting a flow of electrical current along pre-determined pathways. The current procedure for manufacturing electronic circuit boards uses highly toxic acids to conduct electricity

over copper-coated panels. With increased usage, the copper can become overheated, stopping the mes sage flow. This is the most common cause of a malfunction. Worse yet, the acids left over from the manufacturing process cause a major pollution problem for the industry. The *Printon Process* sidesteps both of these problems by using a patented new alloy ink that "prints" pathways on the boards. These heat-resistant panels get zapped with energy, curing the ink and making it conductive.

In the future, Conley explains, circuits will be printed on flexible material (even fabric, since our process doesn't use acid vats or cyanide). This means needles or vats will be printed directly with medical electronics. We devices that monitor blood pressure. The process will be limited only by the imagination of scientists. —Linda Yachtes

## DEATH BY VENDING MACHINE

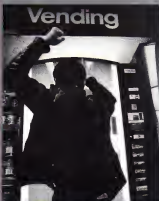
Add this to your list of unusual injuries. A study published in *JAMA, The Journal of the American Medical Association* by U.S. Army major Michael Q. Cosio, M.D., reveals that men who take their anger out on soda-can vending machines risk being seriously injured. Of the 15 cases Cosio studied, there were 3 fatalities and 12 patients who suffered such injuries as fractured ankles, pelvises, legs, and skulls, as well as crushed toes, dislocated knees, and

punctured bladders.

In each case the man started to shake the vending machine after it failed to work properly or when the machine was known to relinquish a free soda if shaken hard enough.

The men's histories were remarkably similar, Cosio says. They were rocking the machine by pushing on the front top of it. The machines, which weigh half a ton when loaded, are top heavy. Once the victims got one moving, few of them could control the rocking, and the machines fell with surprising speed.

—Bob Mangino



No shaking. The "Vending" machine (left) shows the temptation to shake it; the machine will not.

# CONTINUUM

## MOON BYTES

How do you design a lunar base? If you are a NASA planner you contact the Large Scale Programs Institute (LSPI), a nonprofit affiliate of the University of Texas and have it develop a computer simulation that takes into account the basic assumptions and variables that will come into play.

Stewart Nozette, a vice-president at LSPI, says that other institutions could do the work, but it would cost more. Belying the skimpy budget from the Johnson Space Center Office of Exploration Nozette has developed a simulation that runs on an IBM PC and uses a Lotus Symphony spreadsheet. The program can accommodate hundreds of variables—the task to be accomplished, the number of crew members needing support, how long they will stay on the moon, what their activities will consist of, and so on—and then determine such necessities as how much oxygen and food will be required. Calculations that would have taken weeks or months to perform by hand are now done in minutes.

Already NASA management and Lockheed Engineering are using the model to grapple with the demands of putting a base on the moon by the year 2010. "The more thinking though of the problem that you can do up front," Nozette says, "the better you will ultimately design your system."

Encouraged by the model the LSPI staff is expanding it by stitching together Sym-



Creating a lunar habitat... it's a lot easier to get it right here on Earth, but the first small steps are being taken now to do this using computer simulations to create lunar conditions.

phony with other programs for more complex calculations. Says Nozette, "My staff is developing a Mars mission simulation and ultimately we will merge them."

—Paul McCarthy

"Is our environment to be handed over to careless, unthinking development by those who think only of what it could yield to them today? There's a planner who needs your help."

—Giovanni De Bell

## ARTHRITIS CROSSES THE ATLANTIC

It's well known that the early European explorers contaminated the New World with a host of hitherto-unknown diseases, including smallpox and swine flu. Now a group of researchers has found evidence that the transatlantic disease trade

may in fact have been a two-way street. The scientists think that rheumatoid arthritis appeared first in the New World and was then transported to the Old.

Bruce Rothschild, a pathologist at the Athens Center of Northeastern Ohio, and Kenneth Turner and Michael DeLuca, anthropologists at the University of Alabama, base their claim on their examination of a half-dozen 35,000-year-old Native American skeletons found near the Tennessee River in northwestern Alabama. The bone tissue in the joints in these skeletons, Turner says, shows lesions that are "strikingly similar" to those found in rheumatoid arthritis. Turner and colleagues speculate that the disease originated in the Americas and was transported to Europe during the Age of Exploration, carried

by the explorers themselves or by the plants and animals they brought with them.

One interesting aspect of this argument is that rheumatoid arthritis is a disease in which some of an individual's antibodies "turn bad" and attack the host's own tissues. There is still extreme controversy over the causes of this and other autoimmune diseases. If in fact rheumatoid arthritis did spread from the New World to the Old, it would suggest that the disease is not caused simply by a genetic defect. "It's very difficult," says Turner, "to argue that a gene spread across the Atlantic." Rather, it indicates that an organic disease-causing agent like a virus or a bacterium might be implicated. This in turn could give scientists a new direction in seeking cures for the disease.—Bill Lawrence



ARTICLE

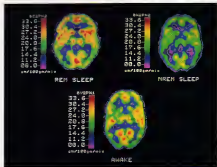
# ON CREATIVITY

BY NEIL McALEER

*Just what makes a great idea? And where does it come from? In pursuit of the muse, neuroscientists are looking beyond sweet inspiration to the machinery of the mind*

PAINTING BY STANISLAW FERNANDES

●No correlation between measured IQ and creativity exists. Intuition, more than rational thought, appears to be vital to the creative thinking process.●



Comedian Robin Williams wasn't laughing nor was he, in this late moment, making others laugh. This wasn't his vibrant comedy act with its famous improvisations; it was his legitimate stage debut. He was rehearsing his part in Samuel Beckett's classic drama *Waiting for Godot*, performed last fall in New York City. He knew it was risky but he had help from his four fellow cast members, who were going through their own creative labor pains. The Godot quartet had to put their faith in themselves and in one another and never let up. Just one fumbling of Beckett's words could throw everyone off and wreck the play. They were on the edge of an intense creative effort.

"It's hard to describe," Williams says. "There'll be moments when you get a spark, a gleam of light, and—boom! You're gone. It seems easy. But then it goes away, and it gets so incredibly hard. It's like having sex in a wind tunnel."

Creativity, like sex in a wind tunnel (in case you haven't tried it), is a passionate, exciting, and challenging effort to make just the right connection and the bulking chaos of everyday reality. And in re-

Artists often associate dreams and dream-like states with creativity. Is there a physiological connection? PET scan images of the brain are very similar during the dream and waking states (top left and below). During normal sleep (top right) the brain rests.

cent years the effort to understand humanity's imaginative quest has sprouted new wings. In fact, there haven't been such a surge of creativity research since the post-Sputnik years, during the late Fifties and early Sixties, when the American educational system was scrutinized, overhauled, and well funded by Congress. The reason for the renewed interest is the same today as it was 30 years ago: international competition.

Some scientists remain skeptical that we will ever fully understand the creative process. Nevertheless, many creativity researchers believe that a comprehensive psychology of creativity is within reach. And many hope to apply what we know about creativity to finding solutions to today's serious global problems. The idea that creativity spontaneously bubbles up from a magical well or gains a direct line to the Muses is just another myth among many about highly creative people and their work," says Harvard University psychologist David Perkins, codirector of Project Zero, a research project studying cognitive skills among scientists and artists. Momentary flashes of insight, often accompanied by images, make up only a small part of the creative continuum. At the heart of the process, personality and personal values shape an individual's intentional and sustained effort, often over a lifetime.

Creativity and genius have so often been considered bedfellows that creativity has been linked to intelligence. But intuition, much more than rational thought, appears to be vital to the creative thinking process. "You don't have to have a high IQ to be intuitive," says Frank Barron, a psychologist at the University of California at Santa Cruz who has measured and observed creativity for the last 40 years. "Intuition depends less on reasoning and verbal comprehension [the main measure of IQ] than it does on feelings and metaphor."

Scholastic skills do not predict whether a person can create something that will make a difference in society or even in his or her own life. Project Zero codirector Howard Gardner emphasizes. There are ample historical examples of creative individuals who had little interest in school or were poor students. Thomas Edison (see this month's interview with Reese Jenkins) was at the bottom of his class; neither William Butler Yeats nor George Bernard Shaw was a very good speller. Benjamin Franklin was poor at math.

Perkins contends there is no justification for assigning such abilities as math and music or general faculties like intuition and rationality to the left or right hemisphere of the brain. Research fails to conclusively pin down such specificity. "Yes, the right side of the brain is adept at spatial perception and pattern recognition; and yes, the left side plays a dominant role in speech, reading, writing and logic. The two hemispheres, however, interact and cooperate in a variety of complex ways not yet fully understood."

According to Stanford University neurologist Karl Pribram, the left side of the brain largely perceives verbal stimuli and the right side perceives visual stimuli. The frontal lobe is also more verbal on the left and more visual on the right, although not quite in the same way. "If there is an important, simple, anatomical way of dividing the brain in relation to creativity, it's front/back, not right/left," Pribram says.

The brain consists of three basic parts: the hindbrain, midbrain, and forebrain. The forebrain includes the limbic system at the center, the cerebral hemispheres, and their outer covering, called the cortex. Each cortex is divided into four lobes—frontal, temporal, parietal, and occipital. The frontal lobe is in the front of the brain right behind the forehead; keeps time and place ordered in our perception.

CONTINUED ON PAGE 38



#### FICTION

*Four games of lost and found by Gahan Wilson, Richard Christian Matheson, Michaelene Pendleton, and Pat Murphy*

## FINDERS KEEPERS

LEAVINGS By Gahan Wilson

I was not happy when I saw the looks on the faces of Officers Mancini and Parkhurst because I could see right off we had a couple of cops way out of their league and foundering, and enough chit-chat things had already happened to put Inspector Nolan in a bad mood, and here it was only eight-fifteen in the morning.

I drove more or less up to the curb—with a police car you don't have to be all that precise—and Nolan stepped out of the car. He blew on his big hands against the chilly dirty Eighty-sixth Street wind, crammed them into his pockets when that didn't work, and by then I was standing next to him and we were both looking down at the sobbing man.

He was an old, worn-out bum, hunkered up on a little bit of concrete located just inside the doorway of a failed shop where the two patrolmen had crammed him in order to keep civilians from stepping all over his body. He had a weird shriveled look, and you could smell the poor bastard from a yard off.

"All right, Sergeant Mancini," said Nolan. "we haven't got all day here, for Christ's sake. What's it all about?"

His voice had a real edge to it, so I suppose the old man's sobbing was getting to him the same as it was to me.

"I hate to bother you with this, Inspector," Mancini said, dry-mouthed and shooting occasional glances over at his partner for signs

of reassurance but not getting any. "Only this is the first time I know maybe all this crumbers is for real."

"It's cold, Mancini," said Nolan. "Get to the point."

Mancini bent down, then took hold of the sleeves of the old man's coat and flipped them one by one like raggedy flags, all the time looking back up at us over his shoulder. The old man winced each time Mancini touched him, then his sobbing broke off and he gave a soft, short little howl like a dog might make.

"Jesus!" I said.

Nolan gave me a quick look, then lowered down at Mancini. "All right," he said, "so this poor bastard hasn't got any arms."

"They end like night here," Mancini said, flipping his

PAINTING BY ROGER BERGENORFF

own shoulders and looking from Nolan to me as if he was afraid we might not understand what he was trying to say. "Smooth as a whistle. Like his skin was polished. No scars at all. Parkhurst and me, we looked. Didn't we, Parkhurst?"

Parkhurst glared into the street, not saying a word.

"Come on, Parkhurst. God damn it," Mancini shouted at him. "You got to back me up on this! It's like the poor old shit was born that way, right?"

"Maybe he was born that way, Mancini," said Nolan, after a pause. "Babies do get born without arms all the time these days. It's the price of progress. What's your fucking point?"

Mancini swallowed, then blurted it out. "That's just it, Inspector," he said,

talking in a rush. "We know goddamn well he wasn't born that way. Parkhurst and me, because just yesterday we damn near busted him for stealing a couple of pineapples off the Greeks' vegetable stand down the street there. He run near half a block with those pineapples before we got him, and he was using arms to hold the goddamn things, two of them, just like you and me got! Isn't that right, Parkhurst? God damn it?"

Parkhurst only screwed up his mouth a little tighter.

"This has got to be bullshit, Mancini," said Nolan.

"Ask my goddamn statue partner there if it's bullshit!"

Parkhurst still never looked at us, but I could see his lips move. Then they moved again and we could make his voice out. "Yeah, all right," he said. "Like Mancini says. He had arms."

Mancini heaved a big sigh of relief and then looked around, justified.

"All right?" he said. "There it is. The man had arms. They wasn't much, okay? Just like the rest of him. But he had arms. So it means that all those other stories those bums been telling us: maybe they're true."

Nolan was hunched down now, carefully patting the old man's greasy coat around his shoulders.

"Shit," he said. "There's not even any stumps!" The old man snarled and stared at him with his eyes all round and bulging like a scared little boy's.

"I'm not going to hurt you, old-time!" Nolan told him.

The old man studied the inspector a little longer, then he pulled in a deep, wivering breath to get some air and spoke. "They took it," he wheezed. I could see Nolan fight not to turn his face from the stink pouring out of the old man's mouth. "They took it, man!"

"See?" hissed Mancini. "It's the same stuff all these people been telling us, I swear to God! Only it's so crazy we haven't been passing it on, see?"

Nolan sighed.

"Who took your arms, old-time?"

The bum blinked and gaped around

with his bulged eyes as if he were trying to spot the answer somewhere on the sidewalk. "I dunno. I was asleep down there." He bobbed his head toward the nearby subway entrance. "Sleeping by the token booth where it's safe, you know? But it wasn't 'cause I woke up and mams was gone, and it never even hurt. It don't even hurt now, mister."

He blinked, and tears spurted out of him. "Oh, Jesus!" he wailed. "Oh, Mommy! Was I bad? Is that why they done it? Is that why they took it?"

"It's just like the other stuff we've been hearing," whispered Mancini, who then turned and snapped up at his partner, "Isn't it, Parkhurst? God damn it?"

"Yeah," Parkhurst answered him, after a pause. "Fuck."

"See?" cried Mancini in triumph, backed for a second time. "It's always the same kind of shit, Inspector, but who could believe it?"

Nolan stood, and I could see it was to

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•He was an  
old, worn-out bum, hunkered  
just inside the  
doorway of a failed shop where  
the two patrolman  
had crammed him in order to  
keep civilians from  
stepping all over his body •

---

get away from being that close to the crazy relief in Mancini's face.

"Who the hell could believe some bum telling him he's just missing some part of him, only there's no blood and no scars, for Christ's sake!" Mancini asked us, taking a little wider all the time. "Missing ears, goddamn noses—all that. Who's going to believe this sort of shit?"

Parkhurst cleared his throat, still looking away from us.

"One man came up to our car and told us he didn't have his stomach no more," he muttered. "Then he died."

"You think we're going to pass that on to those creeps on the next wagon?" Mancini asked us, standing. "Say, I tried that once when we picked up this old bag lady working her way right down the middle of Lexington Avenue in front of all the taxis and trucks, dropping her packages and whatever, and she's screaming they stole her eyes! I told them what she said and the son of a bitch really gave it to me, you know? She never had no eyes, asshole!" he tells me. "Fuck that! Who's going to ask for that?"

Nolan dusted his coat off carefully

even though it had never touched the sidewalk, then he turned to Parkhurst.

"You're backing this up, Parkhurst?"

Parkhurst finally looked over at us.

"Once we came across what we figured was his nut case trying to pay a busted guitar for quarters," he said. "He didn't have any fingers or thumbs. His hands was only a pair of flippers, like a seal. He told us yesterday he could have played us anything we wanted. Another guy didn't have no needs to his mouth at all. No teeth, no tongue, no nothing."

Nolan stared at him and sighed.

"Once you've got started you're kind of hard to stop, aren't you, Parkhurst?" he said.

"The worst one was this guy who wasn't missing anything at all, see? He had everything. Only the peeces didn't match up." Parkhurst said.

Nolan looked over at me, and I looked back at him, and we both moved in a little closer to Parkhurst, like we were warning him off from the street. Parkhurst didn't notice any of this, but Mancini did, and his eyes widened and he swallowed.

"Toll me about this one," Nolan said. "I really want to hear about this one."

Mancini had gotten all shifty. He took hold of Parkhurst's arm.

"Forget that one," he told his partner. "We was wrong about that one."

"Oh, yeah?" Parkhurst said, jerking his arm away, really angry with Mancini. "The hell we was! You wanted me to tell them that, so I'll tell them about it!"

He turned back to us.

"We saw him down to the far end of the uptown platform down there in the subway, right? The lower level, where the express trains stop. It was maybe around four in the morning. He was kind of waddling away from us, only he had to move at angles, first this way then that way on account of he was all loped."

"He's wrong about this," Mancini said, looking at us with a serious expression. "Look, I'll talk to him about this. I promise. I'll talk after it."

"You shut up," Parkhurst said to him, and then he turned to us again. "He wouldn't answer to me, this guy, so I took hold of his shoulders, see? And it was awful, I can't tell you why, except one of his shoulders was big, and the other was small, and it felt awful. When I got him turned around I saw he wasn't able to talk on account of his head didn't match his neck so the throat couldn't work right. He got enough air for breathing, see? But not enough for talking."

"Hey, fellows, just forget this," Mancini said. He looked at the inspector, then at me, then back at the inspector.

"I'll take care of it," he said, stepping in front of his partner trying to block him from us. "He's a little slow but he's okay. I'll talk to him. It'll be all right."

Nolan had written an address on a slip of paper. He handed it carefully to Mancini. "You two take the old man to





Tough sucker. He grunted and bore down. The blade punched through, air hissing from the can. Floyd sawed away until he could bend back the top of the can. Four pink things lying in pink jelly. Using the P-38's blade, he fished one out and shook it until the goo dropped off.

Didn't look like no sardine. A long, thin body ending in a limp tail. Four stubby legs with real long toes. Ringy line poking out where its ears oughta be. Closed eyes bulging out like a tadpole's. Funniest damnsardine he'd ever seen. Looked more like a mud puppy. Floyd sniffed at it. Smelled okay. He took a small bite of the tail. A little crunchy but not bad, sort of like the cheap sardines with big bones. He ate all of it except the head. Then he ate the other three. Wasn't much to 'em, so he ate another can, washing them down with wine. Not bad at all.

He sat staring at the last can, wondering if he should save it for tomorrow when a swim cap appeared in the can's top. With a faint wink, the top of the can hinged open. Floyd blinked at it.

A pink mud puppy climbed out of the can, swinging its short legs over the side. It stood up, balancing on two legs and its tail. Large, dark eyes wandered around and settled on Floyd. It held out one of its upper limbs, took a couple of steps forward, and jabbered at Floyd.

God damn, shit, fucking shit! Floyd barked it away and scribbled backward,

it crunched into the can and fell. It squeaked. Floyd's stomach turned.

The mud puppy pulled itself up and again reached out to Floyd.

Choking down sour bile, Floyd grabbed the Tokay bottle and mashed the little sucker. Mashed the can, too, until it was nothing but glutinous junk. Then he threw up.

God damn. World's gone to hell when they don't even make sure the damn things are dead before they can eat.

He topped the Tokay bottle. Empty. Hungry, sick, and cold, Floyd went to find another drink.

#### SCAVENGER By Pat Murphy

On a sunny afternoon in spring, just a month after her husband's death, the elderly Mrs. Morris found an extraterrestrial in her scotch bed. She did not recognize it right away, of course. That came later. The last of the snow had melted the week before. Mrs. Morris was taking a stroll, gently exercising her arthritic hip as her doctor had recommended. When she saw a shiny bit of metal sticking up from the muddy ground, she squinted at it, thinking it might be a gardening tool that she had carelessly left out last fall. Using her walking cane for support, she stooped, took hold of the metal, and pulled it from the mud.

It was an odd sort of thing, an irregu-

larly shaped, fist-sized lump from which three rods protruded. She turned it over in her hands, using one finger to knock away the bigger clumps of mud. Each rod was about the length of her index finger. Like her finger, the rods were hinged, so that they bent in two places. She flexed one of the rods, and mud fell away from the metal surface, which seemed remarkably smooth for something that had been out all winter.

The metal felt warm to the touch. Mrs. Morris never liked the feel of the thing, though she could not puzzle out what it was or who could have left it in her garden. She took it back to the house.

At the kitchen sink she washed the rest of the mud from the metal. The central lump had three more indentations—as if the thing had once had six metal fingers rather than just three.

When the phone rang she went to answer, carrying the scrap of metal to the living room and setting it on the coffee table. Mrs. Morris's daughter was calling to check on her mother, as she did each evening.

"So how are you feeling, Mother? Have you had dinner yet?"

Mrs. Morris was tempted to lie. Ever since her father's death, Sylvia had been trying to regulate her mother's life via long-distance phone calls from her Manhattan loft. "Not just yet, dear," Mrs. Morris said. "I have a lovely little casserole that one of the ladies from the church brought over. I'll be heating that up soon."

"I worry about you," Sylvia said. "I don't think you eat enough these days."

"I'm just fine, dear. Really I am."

"Have you looked at that brochure I sent you?"

The brochure, an advertisement for a New York State retirement community, lay on the coffee table beside the metal thing. Mrs. Morris had leafed through it, glancing at photos of bony condominiums, an impossibly blue pool, a complete medical facility. "Yes, dear," Mrs. Morris said mildly. "I really don't like the look of the place."

"I visited there last week," Sylvia went on, as if her mother had not said anything. "They have a wonderful swimming pool with an attached Jacuzzi, complete medical facilities, a centrally located clubhouse where you can get together with your friends."

"I don't have any friends there," Mrs. Morris interrupted.

"You'll make new friends," Sylvia said. An edge crept into her voice. "You just have to realize that you can't go on living alone forever, Mother. I worry about you."

"When I leave my home, I expect it will be for more than just a heated pool and a clubhouse," Mrs. Morris said, unable to listen to her daughter any longer. "I wish you could understand that."

"I understand," Sylvia said, and then persisted for the next half hour in arguing with Mrs. Morris and demonstrating ex-

CONTINUED ON PAGE 96





Today's botanists are in a race against time. The world's flowering plants are disappearing so rapidly that many will be lost to us even before they have been described. Although we must feel less than concerned for the doom of plants we have never had eyes on—hills and oak trees are not on the endangered list, after all—we will pay a hefty price. According to the Institute of Economic Botany at the New York Botanical Garden, nearly half of all prescription drugs now in use originated in plant life. Add to that the number of tropical plants that could one day be used as alternative food and energy sources and the price skyrockets. Michael J. Balick, acting director of the Institute of Economic Botany, for example, is studying the be-

## WHERE THE WILD THINGS GROW

PHOTOGRAPHS BY HEINZ TEUFEL

loneu palm that grows in Latin America. The palm yields not only a clean-burning charcoal but also an oil that can be used for cooking and fuel. How many other such plants lie in waiting is anybody's guess.

The loss of species goes beyond the material good they may give us. Scientists have longed for the day when every plant and animal species would be added to the tree of life, when a comprehensive list of all living things and their relationships to one another would yield a clear picture of life on Earth.

One of the first milestones in this scientific undertaking came in the eighteenth century, when Carlus Linnaeus revealed his classification system. He grouped organisms together on the basis of similar characteris-

PURPLE SAGE

fice and ordered them in progressively larger groups (species, genera, classes, orders, phyla, kingdoms).

At the top of his tree of life sat *Mano sapienter*. Fair enough, agreed his contemporaries. But they were less than thrilled when Linnaeus placed the lovely orangutan in the same genus as human beings.

Linnaeus's first love was botany, and his most thorough classifications were of angiosperms, the flowering plants. Those include not only plants with conspicuous flowers but also the majority of the large trees, as well as vegetables, grasses, rife, and grains. After scanning about 7,000 species of angiosperms, Linnaeus decided that the most accurate



IMPETUUS

system for classifying them would be based on the structure and number of their male (stamen) and female (pistil, now carpel) sexual parts. In particular, graphic terms, Linnaeus described how each variety of flowering plant displayed its sexual organs. He called stamens husbands, and carpels, wives or concubines. He wrote fondly about their many marriages and indiscretions. Of mungolds, for example, he wrote, "The beds of the named ones are in the middle, and those of the concubines are on the sides."

Linnaeus's system was so simple, and his descriptions so easy to grasp, that almost anyone could understand them. The graphic nature of his descrip-



HAPPY-POET FIRM



ROSE HYDR

bone, however, offended many scientists and laypeople. According to *The Hayday of Natural History* by Lynn Barber, a professor by the name of Johann Siegesbeck called Linnaeus's system "Katharsome history," stating that "God never would, in the vegetable kingdom, have allowed such odious vice as that several males should possess one wife in common, or that a bush husband should, in certain composite flowers, besides its legitimate partner, have near it illegitimate mistresses." Linnaeus didn't like this charge lying down. He retaliated by giving the name Siegesbeckia to an extremely ugly and particularly smelly weed.

Although Barber does not say how Siegesbeck responded to



CHRISTMAS PEPPER

the Linnaean-style revenge, she does quote another of Linnaeus's critics, the Reverend Samuel Goddough, who wrote: "To tell you that nothing could equal the gross puerility of Linnaeus's mind is perfectly needless. A literal translation of the first principles of Linnaean botany is enough to shock female modesty."

Despite this sort of impassioned criticism, Linnaeus's classification system prevailed, and though it has been revised by later scientists, it remains the foundation on which all living things are placed in "scientific" order. It is perhaps a sad commentary on our times that so many of those living things are now fighting for their lives.

Jane Botwick



#### ARTICLE

Those loops, lines, and dashes  
are harmless, the simple products of an idle mind.  
Or are they much, much more?

## BREAKING THE CODE OF Doodles

BY JOANNA TORREY

Most of us doodle. Like the man or woman who comes into the psychiatrist's office moaning, "I never dream!" the person who says he never doodles is probably unaware of his scribbling. Part of the reason we doodle is that it's safe. We can express our emotions through doodles in the margin, and no one will judge us. Doodles also spice up the tedium of a dull situation—those stacks of puckered cubes, after all, are certainly more dynamic than, say, the droning voice of a lovelorn, obsessive friend. Your favorite doodles may relax you; when the moment is fraught with uncertainty they can make you feel secure. What's more, in some situations drawing a lower of open-ended boxes or pages of scribbles actually helps you perform. The very act of doodling is analogous to the repetition of a mantra, which enables you to focus your concentration and marshal your will.

So why is it that despite their obvious usefulness, doodles have been labeled "fugitives of the unconscious" by one psychoanalyst? How much of ourselves do we really give away on the phone pad

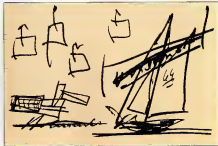
or in the margin of the board-meeting minutes? If doodles are simply harmless scribbles, then why is it standard procedure to destroy all scraps of paper left behind following sessions at the United Nations? Even more curious: why do we usually throw away our own doodles?

Perhaps, because they reveal more about us than we care to admit. Like dreams generated in the outback of the unconscious, doodles are filled with complex, highly individual symbols that reveal our hidden desires, fears, and needs. "In doodles as well as drawings, the conscious and unconscious must be unspooled," notes psychologist Robert C. Burns, director of the Seattle Institute of Human Development and author of *Actions, Styles and Symbols in Kinetic Family Drawings* and *Kinetic-House-Tree-Person Drawings* (Brunner/Mazel). "If we've been peeling potatoes all day, the potato may appear in our doodle. But if the potato is striking our mother-in-law the unconscious process is revealed."

New York Jungian analyst Gregg M. Furth, author of *The Secret World of*

PAINTING BY GOTTFRIED HELMWEIN

•We study Son of Sam's vacant, robotlike faces and John F. Kennedy's sailboats and try to find a place for ourselves safely in between. •



Drawings (Sigo Press) taps into this process directly when he asks clients to draw a picture of their childhood, a traumatic incident, a personal event, or a body image. He then studies the drawings to see what kind of unconscious material emerges. Often the drawings are closely related to the difficulties the client is encountering in his daily life. Indeed, Furth compares doodle analysis to dream analysis: A doodle is information from the unconscious, he says. "As unique as each person on Earth is, that's how unique his doodle will be." Analyzing your own doodles may be difficult, Furth adds, because the unconscious material they contain is, by definition, hidden.

Yet it is for this very reason that doodle psychology can provide us with such piercing views of our inner life. "Art has this long history predating even language, of expressing nonverbal information," says Betty Edwards, an art professor at California State University Long Beach, and author of *Drawing on the Right Side of the Brain* (Jeremy P. Tarcher) and *Drawing on the Inner Within* (Simon & Schuster). She believes that doodling reveals so much because the analytical left brain dismisses the task as meaningless, allowing uncensored material to come pouring out. In fact, Edwards has given her own doodle tests to technical and corporate groups, anticipating that



they would feel highly threatened, to her surprise, they were remarkably at ease. "It's a very strange process," she says. "The left brain immediately says, 'Oh, well, it's just scribbling,' and all the inhibitions disappear. Once you remove the requirement to do anything recognizable, they just plunge in. You can really dig very deep very quickly."

Doodles have been used to understand behavior since almost the dawn of modern psychology. Freud first declared that geometric shapes were sexually symbolic, and much of his dream work was based on the interpretation of symbols. Jung discovered that a mandala is

circular form, and the shapes he drew inside it had a centering effect.

Since these early explorations, standardized projective drawing tests have been successfully used to "map the unconscious" without getting tangled up in a patient's verbal defenses. A drawing or a doodle can be used to help determine whether a child is being abused or how an adult is coping with a parent's death.

Certified graphologists Lois Wasman and Patricia Siegel, both faculty members in the social sciences at the New School for Social Research in New York City, have analyzed even celebrity and criminal doodles (shown above) to see how the other half lives. For example, the vacant, robotlike face in the Son of Sam doodle combines with stiff, interconnecting forms to indicate a web of dependency, instability, and fear.

Contrast this with Ronald Reagan's doodles, which are playful, humanistic, and childlike. Also contrast it with John F. Kennedy's doodles, marked by a confident, expressive quality and an intuitive sense of organization. Indeed, even the casual observer can see that Kennedy's strokes are aggressive, with a strong sexual element apparent in the very movement of the lines.

What do doodles reveal about you? To find out, take the doodle quiz presented below. Adapted for *Omnis* by some of the foremost doodle experts in the country, this incisive test will help you release your right brain—and some of the thoughts, feelings, and personal characteristics you



## NOTHING ATTRACTS LIKE THE IMPORTED TASTE OF BOMBAY GIN.



CAJANDER SEEDS FROM MEXICO



ANGELICA ROOT FROM SICILY



JUNIPER BERRIES FROM ITALY



CASSIA BARK FROM INDIA



ALMONDS FROM INDIA



LEMON PEEL FROM SPAIN



GINGER ROOT FROM ITALY



LICORICE FROM INDIA

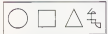


may have unconsciously concealed. We also hope you find the following exercises therapeutic. Gregg Ruth, who describes doodles as a "prayer to the inner self," says our personal drawings "help anxieties come out, so there's a healing process. Instead of teaching kids to read at age three, maybe we should let them scribble until they're eight!"

### DOODLE QUIZ

Before taking the doodle quiz, make sure you have two pieces of blank, standard-size typing paper and a ballpoint pen (or a pencil with an eraser). After you've completed each exercise, label the page with the appropriate exercise number.

**1. THE SHAPE OF THINGS TO COME** A. Number the geometric shapes below in order of preference.



B. Do you have a favorite doodle that you absently sketch as you are talking on the phone or daydreaming? If not, just start doodling and see what happens. Don't try to be creative, artistic, or clever; just "let it happen."

**2. FIELD STUDY** Fold a sheet of typing paper in half four times. Open it up and number the first row of boxes 1 through 4 and the second row 5 through 8. Copy the patterns onto your paper in the same positions as shown.



For example, place the dot from square 1 in the center of your first box. Then draw a picture or figure of your choice in each square, incorporating the dots, lines, half-circles, and other patterns you initially transferred into the eight squares.

**3. WOOD SWINGS** Take the paper you folded in the previous exercise, cut off the used half, and label each of the remaining eight boxes. On the top row from left, label the boxes with the following words: anger, joy, peacefulness, and depression. On the bottom row from left, label the boxes with these words: humor, energy, femininity, and stress. You may label the last box with any human trait, quality, condition, or emotion, from loneliness or anxiety to cozy love, or fear.

Express the emotions identified by these labels with marks or lines created with the point or side of the pencils lead. You may make wide or narrow marks, use heavy or light pressure, and draw with lines that are short or long. You may use one line or fill the whole box. Use an eraser if you wish. There is only one definite restriction: You must not draw any pictures or symbols at all. In other words, you may use no hand tools, erasing elastics, hearts, question marks, rainbows, or clutched fists. There is no right or wrong, no good or bad; just line and tone. The best way to work is to think back to the last time you felt the emotion. Imagine that emotion is flowing from deep inside your body to your fingertips and then into the pencil and onto the paper. It is important not to plan what the final drawings will look like. Most participants complete the set of drawings in about 15 to 20 minutes.

**4. BAD VIBES** Stop to consider your current situation, visualizing any area that presents a particular problem. It may be a personal or work-related problem involving only you or you and other people. Do not define the problem in terms of language—use it simply in terms of images—before you begin. Now take the sheet of paper, draw a boundary that will provide a frame for the problem within the context of the sheet and doodle the "im-

age" of your problem inside it. The purpose of this drawing is not to solve your problem but simply to put it in a new perspective. Do not censor what you draw but as in the previous exercise, make sure you use only lines and marks. Do not draw any recognizable objects or symbols. If you wish to characterize your problem in more than one picture, feel free to get extra paper and try again.)

**5. SELF-PORTRAIT** On the next sheet of paper, draw a picture of yourself doing something. You may draw yourself alone or with others in the context of family or work. Try to draw whole people, not cartoon characters or stick figures.

**6. THE HOME FRONT** Take the last sheet of paper and place it horizontally on the table before you. Draw a house, a tree and a whole person on this sheet of paper, and make sure that some sort of action is indicated within. Your person should be a whole person, not a cartoon character or a stick figure.

### UNDERSTANDING YOUR DOODLES: ANALYZING THE RESULTS

The information below will help you analyze the doodles you have produced. With sufficient scrutiny, you should know more about yourself and your unconscious tendencies than you did before.

Please remember, however, that analyzing your own doodles can be as impressive an art as analyzing your own dreams. Your creations may have many meanings and implications, depending upon your unique experience in life. Therefore, we suggest that you follow your intuition as well as our guidelines. If an interpretation feels intuitively wrong, it probably is. And realize you may not be able to glean the full meaning from every single doodle you have created on the test without some professional guidance.

Before you begin, we would like to point out some drawing characteristics that apply to all the questions in a general way. As you study your doodles, examine them for the stylistic features listed below as well as for more specific features described under each question heading.

- **Pressure tactics.** Unusually heavy pressure suggests the drawer may be extremely tense; such pressure may also indicate a forceful, ambitious, or aggressive individual with the tendency to act out these qualities. Unusually light pressure may be the sign of a hesitant, indecisive, timid, fearful, or insecure individual with low levels of energy but can also indicate flexibility or adaptability.
- **Stroke or line characteristics.** Consistent horizontal movement may suggest weakness, fearfulness, self-protection, or femininity. Vertical movement suggests

masculine assertiveness, determination, and possible hyperactivity. An emphasis on curved lines suggests a feminine or accepting personality. Extreme use of straight, rigid lines suggests rigid or aggressive tendencies. Continuous changes in direction of strokes suggest low security. Firm, unhesitant strokes suggest security, persistence, ambition, and consciousness. Interrupted strokes with vacillating direction suggest masculine shyness and dependence. Long strokes suggest controlled behavior; while short, discontinuous strokes suggest impulsive, excitable tendencies.

- **Size of drawings.** Consistent production of unusually large drawings suggests aggressive, expansive, grandiose tendencies, as well as general feelings of inadequacy. Production of unusually small drawings suggests feelings of inferiority, ineffectiveness, and inadequacy, as well as a weak ego structure and possible depressive tendencies.
- **Placement of drawings.** A tendency to center doodles on the page indicates a relatively normal and secure individual. (This is the most common placement.) On the other hand, placing your doodles in the absolute center of the page every time indicates insecurity and rigidity, especially in interpersonal relationships. Repeated placement high on the page suggests a high level of aspiration and

CONTINUED ON PAGE 128

FICTION

*Even looking for love  
in all the wrong places, you may  
find it there anyway*

# BABY STRANGE

BY TOM MADDOX

Fingerin' an elec-  
tric rosary that shot sparks between  
thumb and forefinger of his left hand,  
Noodles paced behind his counter. He  
said to me, "Well, you touch this one. I give  
you the vig every week till you say no."  
I said, "Noodles, telling that woman put  
you in this, you're a sly dick," and he was  
More than three months now he had been  
playing a shark on a loan that repre-  
sented a piece of his investment in a  
gaudy young woman named Louise, who

PAINTING BY DI-MACCIO





had lived with him for a little over a year but was now two months gone.

Louise had liked nights in the urban seige, easily shift for low-time Noodles now in her wake, twelve hundred dollars per week was ripped from his account on auto-collect with no hope of getting on top or folding because all he did was stay even with the vig—ten points a week on what he had borrowed—and that had begun to pinch ugly.

Women. Noodles said, "I'll put you in the shit." Then he looked at me with a punning, stoney stare, and I had to laugh.

"So they will, Noodles," I said. My two-year go-round with Camille had gone public domain near the start—lots of action in that one, screwdowns across dinner or drinks in some very nice venues with interested lookers-on. I'd gotten a tag out of it. Bad luck with women. It had been a long time since I could show any proof to the contrary. "But if a woman's involved, maybe I'm the wrong solo for this."

"I got no one else to go to," Noodles said. Around us loomed the stacked shelves, pigeonholes in pale green board stretching from floor to ceiling under old-fashioned fluorescents that didn't do a damned thing for the ambience. The clean-up spiders' little vacuum whine made a steady background as they worked their way through dusty piles of junkie. Click-click-click—a spider's fiber leg scoured across the counter between us.

"Noodles, you ever think you should throw all of this crap out and get into something that actually pays?" Weedy little bastard in his storefront, he was something out of another time, trying to run a fence in the twenty-first century. Tell me another, funnier one, because these days anything's signature can be read down to the molecular level for ID, so at street level, disposals get fenced, not much else—Noodles had nothing but soft appliances, computers, and other such tossaway.

I said, "Your collars dirty, and your root buds look like hell." Noodles grabbed his collar with his right hand, where the old white cotton shirt mottled and shiny with junkie dust was buttoned to the top. He wore stained suspenders of yellow pinstrip holding up dark slacks of some cheap synthetic. On his pale skull, white skin showed under sparse black hair—one of those thirty-minute Seals-a-Minute treatments was what he'd had.

Sleazy little bastard, last of the small-time fences and here's better say that way. You lay your hand to something that is real property—a nice piece of industrial core or gram-valuable premises, say—you'd better be deeply connected, because somebody tags you with it, there's your very own molecular sign on it, and no saying you're sorry, whether you're talking to the lawman or the bad man.

Of course Noodles was not connected. As he said, all he had was me.

"Noodles, I'll try. Look, you know your shirks name? He shook his head no, which figured. Most steel loans get done electronic and blind. "Makes it a little harder." I said, "You hold on for two-three weeks, make the vig?"

"I'll gotta do it," he said.

Fifteen days later I waited in the rain in front of an auto-lac building—thirty-seven stories high, over stacked-out waterfront—lining the walker wolves as they scoured back and forth, oiled black bodies wet and gleaming, antennae bundles twitching, invisible wheels beneath them hissing and sliding over slick cement. A night like this, even Seattleers were indoors tending the moss between their toes or some such, but I breathed deep in it.

Finding Noodles' shirk didn't posed much weight. The access number Noodles

*When I  
caught a small pause in the  
patrol rhythms,  
I took a deep breath, a go  
breath, and fired  
a mini into the main doors.  
They blew inward  
in red and yellow flame.*

ties used had traced quick to a combine of Miami bankers looked on to old Seattle into dollars. Semple, with the principals about as far from street ops as they could get. When somebody comes around to pump quick virus into you, don't go to the dollar men when you're vomiting blood, because they've never heard of this interesting practice or of you.

Autolacs do for all kinds of black into that tucked in behind the ever-rolling machines. Especially they're popular with sharks, because nobody much cracks them. You do, you get your little mechs, the walker wolves, also, you get crosswax on hard bastards mean as the wolves but with longer memories and deep-set human needs for revenge.

This building housed the usual multi-lac setup, wired to conglom groups headquartered in Hong Kong Market, BA, Hokkaido, Dallas, New York, one or two here in Seattle. Tall blackness, thirty-seven stories of absolute nada but robotics and controls pumping out everything from throwaway camping bridges to red-dot laser sights for kiddie toys, and next year's Thanksgiving!

Christmas gift items are already in the lac programs. Piggybacked in among the robot manufacturing machines lay what I had come for, secure data storage hidden away from curious human eyes.

As the wolves prowled in front of me, dark bodies moaning in and out of the lights, I went to thinking it through, pumping red zoning, getting ready to do my dance. Rush and zen, rush and zen, that's my rhythm—jacking up, jacking down—getting tuned for what I knew was coming. Walk the wire and do your bit, and all things not being terminal, you can sort out the debts however they fall—dollars or blood—take your wounds to electrofix and get back on tour!

Fucking Noodles, fucking women.

When I caught a small pause in the patrol rhythms, I took a deep breath, a go breath, and fired a mini into the main doors, and they blew inward in red and yellow flame, then I ran through puddles as I had bursts of twenty into the walker wolves that came. As I went through the doorway, I unnaped my two hose magazines, each six foot long for two hundred rounds slack and empty, and let them fall. A wolf worked in the elevator and I dived it. It looked up tight so some kind of servo began to destruct made with a smell of burning plastic and hot metal. I snatched the little fucker by an antennae cluster dragged it out on free-rolling wheels, and heard it shriek and die as the doors closed. I hammered the ceiling light with my rifle butt and said, "Thirty-four floor!" I said it maybe half a dozen times, chanting it like a mantra as we rose the willful climber's voice replying with every beat, "Yes sir, thirty-four floor," until the two of us sounded like an idiot's chorus in the black.

But we were silent once destination—I had crushed its speaker to make sure. I pulled my goggles down as the doors slid back, then hurried cladders into dark space as I rolled, and the dazblers faded about the time I almost went down thirty-four quick stones but ended up dangling from the railing of the old iron catwalk.

My breath sounded much too loud in the echoing black, so I kept moving, though I was about prying myself from the scarp of it. (Ghast, I hate high places, though I've climbed them.) Just waiting, I was, as my hands walked across the grease-slick railing, for a wall to pull an auto-lac on me and burn. Nothing, nothing—so up on rubber soles and quiet as I could, running across the catwalk gridwork of iron and glass—

I gave the door a burst from the black bulb of a tremble-down to vibrate its lock mechanism out of existence, made a very quick step through past the front room's silent machinery—control stuff on this floor, no lubricating—and into the data stall itself, a closet full of tapeless boxes wired together with short thick knots of black fiberoptic, the whole mechanism calculating like a mad bastard as I stood

there. The taste of invisible power filled the air, kicked up by another flow nexus in the black economy, the one that makes the tax boys shiver with greed at the hugeness and nearness of it, but sends them home red-faced at night because for every dollar of it they grab, a billion more get sucked up easy into all the deft shuffles' plays.

Time to wipe Noodles' obligation. I slapped my v-t-box on the top box, it shattered and sent little worms crawling down to where the data lived, and I worked with my palm on its top for the vibration that would let me know it was done. About ten thousand records would be entered, old and new, dollars going into the cooler darkness. I didn't have sharp strike numbers, so I had to do saturation burn.

I waited in the dimness of watch lights with nothing to do but count my life's seconds as they passed. Then came the buzz across my wet palm, searing go now and I did, moving—

Something behind me that moved as I turned (not firing, not now I was too easy a fix in as deep as I was and easy meat if the wolves caught me).

It seemed large and formless, but in the uncertain light and shadow with the bulk of machines all around I might have seen anything at all, and I might have moved off but didn't want to leave what-  
ever it was behind me.

She stepped into a small patch of light

still almost entirely in shadow, and she said, "Take me with you."

No real description at this point, only quick flashes into my juzzed semium, which caught what it could and told me, Ah, beautiful! "Please," she said, "please!" Just like a woman, and I thought only of saying no. I was cutting short my lifetime by listening.

The man came through the door, tall and broad, a moving shadow. The only human security in the building—

I fell under the shock, was as it surged past where I'd been and crackled against a dark machine. The woman moved real quick, too—pushed by fear, I reckoned, she ran through the door before the man could put out his second wire.

He surprised me with a full stroke as I came up toward him off the floor, and I had to slip the blade thrust so it went straight to my heart, where the body armor took the point. I couldn't figure why we were dancing mortal because usually corporate security was a long talk before they dump the body. He was in killing mode though, so I kicked hard, gong for groin-and-pain—left knee, crotch, right knee, neck. He lay quiet but would be hurting soon and wouldn't be moving good for months, when those shattered joints would be rotting in plastic.

The monitor on his wrist showed the minute lines of wolves converging on this floor and the red dot of the elevator stalled

halfway down the pipe, both of which were live. A few minutes behind time, but I had that slack built in and now needed to move, stay to tempo. I clicked a titanium carabiner, covered in black fiber to make it invisible and muffle noise, across the catwalk railing, and I clamped shut. I unwrapped the rope coil from my chest and dropped it into darkness. The unwinding strand was double-mold glass wrapped with anticut and -burn gauze, spiderweb thin, light and strong.

Hands grabbed my shoulders as I lifted onto the railing, and I don't know why I didn't chop her down because I was waking the dorsal edge. She said, "I am dead, I stay," and I didn't have time to think much about that—she was already cradling herself on my back as we dropped into darkness.

The rappel harness did most of the work, its electronics giving off the smallest whine as its little brass signals triggered. I only had to hang loose and let it happen—bad work for an acrophobe. When we hit spalls and I put glue mounts onto the wall and clamped into them, triggered the rope fall, and worked to re-clamp carabiners and start the process again. Half a dozen heaves we fell down a black, invisible mountain.

Come fable one, we crashed through fiber pseudoboiling and landed in a corridor as we ran. I sub-voiced names and numbers off junction markers and got back an inner-ear voice telling me where to turn. At the end of the passageway I'd chosen two days before, I put a flat charge on the wall and stepped back around the corner.

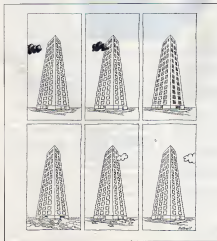
"Cover your ears," I said to her. There would be some blast pressure even though this was a small, smart charge. "Now breathe out." As she did, I hit it.

Visible through the two-meter hole in the wall, my cab waited outside. I started to tell her good-bye, good luck, when one of the wolves turned the corner and put out a rocket slug that trailed red smoke across the room, slammed into my left shoulder, and punched straight through my body armor. I was blown right through the hole in the wall.

She stepped through and stood over me where I lay stunned. I moaned toward the cab, and she put a strong hand under my shoulder and pulled me up. The cab's door popped open as we approached and I fell inside.

No robot voice asked for a destination when we got in the backseat, this was my dummy, my getaway. Windows turned black and we moved.

Fresh blood smearing bright scarlet between us, we climbed slow and ugly up twist stairs to the dried floor of the building five minutes from Pioneer Square, just outside the wino district, where I had prepared to go to ground. Rented triple blind, it was functional and cheap: living room, bedroom, kitchen,



and both rooms smell and peaked dirty cream over wallboard with its binding giving way so that a million small cracks showed through. When the door opened to my voice, I went through on hands and knees, blood dripping beneath me.

Once again she put strong hands on my shoulders but didn't seem to know what to do. "Leave me alone," I said. "Med-doc will do it." Yesterday I had brought in fresh plasma, antibiotics, and sterile water and filled up its emergency-care unit.

The white enameled cart rolled across to where I lay faceup, pecking back my armor to show smeared crimson, and she watched as I crawled onto the med-doc's lowered pallet.

The next day I woke the first few times to an anesthetized haze, saw her watching me, face calm, and drifted back to sleep. Finally I came around enough to check the med-doc's monitor, saw that my vital signs were low but solid, healing curve normal, ready for the boost. She walked quickly into my field of view, bent over, asked, "Can I get you anything?"

"No," I said. "Machine's doing me fine. Why you here?" She watched me steadily. "Why?" I asked. She said nothing, but I had other things to worry over.

Fistfuls burn like lover, puts small bugs up your spine and into your eyes, and pushes ugly chemical smudges into you through your veins. You go someplace

beyond, where memories jump all over you moored with dreams and other strangeness. Mostly you go on fire.

As I burned, the set near me on a long couch in ugly green plastic that stretched across the opposite wall. The pain came up the way it will, a hot tearing feeling across the wound as it drives against the healing. Nothing but hard knockout will cool it, and that's out of the question on fistfuls—the organism's got to go full-out—so you just do what you do, cry or scream or suffer in silence. Don't worry the med-doc's got you nerve-frozen on the table so you won't move around and break things up.

The first time it happened, she stood over me, and I watched through fire the way she looked calm and distant and gorgeous. The next time, she walked quickly across the room and bent over me, moved her lips above mine and over my face—careful, not touching me at all.

There comes a peak, when you feel someone turned up the gain on the whole thing, and pain's the label on the world. She touched me this time, unbuttoned the silk front of her dress and leaned over me and put her cool breasts against my face and I was crying with it all, with hurt and beauty.

"Yes, you can leave the core pellet," the med-doc said. "However, please move carefully. Though your wounds have

undergone primary reconstruction, your motor-sensory integration will be impaired." She walked in from the kitchen holding a white bowl of soup. "The machine told me to feed you," she said.

"Some dizziness and vertigo are to be expected," the med-doc said as I stumbled to the couch.

"I'm sorry if this isn't hot enough," she said. "The machine told me to make it this way." She sat and spooned lukewarm chicken soup into my mouth, and I was weak down inside and wanting to eat, but still watching her, wanting to know. What was she doing here?

The next day the med-doc said fast/heal was complete.

"Who are you?" I asked. She had walked into the room from the kitchen with a cup of coffee for me. "What were you doing in the suite?" I wanted to come at her sharp and hard, punch through any bullshit and find what was happening. "Why did you stay with me?"

She smiled and set the coffee on the scarred tabletop and sat next to me and didn't answer, didn't indicate in any way that she'd heard me. She said, "Your experience was very painful."

Games—let her try mine, to amuse up, why she'd been in the autopsy, to call or raise, why she'd hung with me since. "Who the fuck are you?" I said. She looked at me and said nothing.

And I was locked to her eyes, getting the bright spark off her, but then came hard memories, bitter and deep. Camille. And I was digging that this one's moves went too clever and had too much spin, like Camille's.

I went to the kitchen for another cup of coffee, ended up putting my cup into the sink and watching hot water splash into it—little shots ricocheted off enamel and stung my bare forearm.

When I returned, I found the living room empty. I walked into the hall and knocked on my bedroom door. There was no answer, so I opened it. A table lamp next to the bed made the room's only light, and she stood at the edge of it, nude in front of a small dresser mirror. When she turned to face me, she looked at me out of light blue eyes in the middle of huge, clear whites. Her thighs and buttocks formed tight curves. Her breasts looked small and high. Between her legs, dark hair formed a perfect triangle. Before I could say anything, she said, "I wished my clothes. They are hanging in your bathroom. Is that all right?"

She picked up my hairbrush from the dresser, held it out, and said, "Way?" I said nothing, just stood there, and she began pulling the brush through her hair with long, sensual strokes as she watched herself in the mirror. She turned her head and looked at me over her shoulder.

"I'd better go," I said. "Your problem, you don't want to say, that's fine, but you've got to go. I got problems, too. I



"All right, everybody! Who's for elective surgery?"

left before she said anything. Waking and staring through a long night, I slept across the couch in the living room.

She passed through the room and out the front door not long after dawn. That's right, woman, I thought. Go. But I was thinking it through, and I knew I wanted her to stay.

I lay there watching the sun trying to rise through gray clouds, what passed for morning in Seattle, until there came a knock at the door, almost a scorching nose, and I opened it, and she stood there, smiling. "I brought some cross-saints," she said. "And some cheese."

I've put hard words on women, you've got to know that, got down with them on the angry floor and scrapped like dogs . . . by the time I was ugly-sick with it and with them, so what happened next, maybe that was the only way she could have got to me.

I want to say we must have talked, we had to, though maybe not . . . one of the things she did, she shook loose all certainties for me, forever I think back, there the two of us passing back and forth from one small room to another, careful not to touch, silent in the gloomy narrow halls.

(I've put people down with my touch, you know, reached up and grabbed the heart till life cracked right out of them, but she brought me in, shot down and bloody, and now I had no meanness left when I looked at her.)

Not long after dark—cold Seattle night outside and rain dripping slow and steady across the windows—she took my hand and led me to the bedroom, where a rose stood on the bedside table, its long, cut stem in a drinking glass, tall-blossomed petals glowing like blood rubies in the light. Hands on my shoulders, she sat me on the end of the bed. She turned a circle in front of me, face in her hands, turned again as her hands slid down her body. She knelt in front of me as her dress made a pool of dark ink around her waist, below her neck and shoulders and breasts white and perfect, vein-ghosts blue under her skin.

She grabbed my wrists with those strong hands and pushed my arms to my sides. She flared her hands in front of my face, showing me blunt-out nails that turned pink as I watched, then went blood red. Her pale blue eyes shifted to dark blue that was almost black, and she smiled again and cupped her breasts in her hands (they were larger than before, their nipples darker) and dragged her nails down the sweep of her ribs, leaving gold tracks shimmering like fire across her skin—

With work happening now, I knew that, and thought maybe she had pulled me, out of blood for something darker than death, and thought again. So fuck it, maybe I'm ready—

When I started to move she said, "I will undress you." As she tugged on my clothes, she hissed between her teeth—not angry or frustrated but patient, maintaining speed.

She put silk and skin all over me, and I couldn't tell one sometimes from the other, then there was tongue and lips and nails and hair, all the while her image floated in front of me, above the bonestuck me—

We tucked giant like gods. That night, the next day, through light and dark, sleeping in small touches, then coming alive. Even when we sat, we sat naked on the old couch, eyeing and putting flesh on each other—

That's where we were when the door went banging in, and the shock wave slammed us against the wall. I could taste the blood in my mouth, feel it run from my nose—

Done up in strobebeats and ropes, faces under shimmer masks, two came through the door, minor-faced, anonymous. They

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*•The white  
enameled cart rolled across  
to where I lay  
faceup, peeling back my armor  
to show smeared  
crimson, and she watched as  
I crawled onto the  
med-doc's lowered pallet. •*

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carried lightweight soft strikers—black ribs that formed the skeleton of a pastel good for one magazine. They had to be figuring a quick shoot, then they could strip the masks and fade into concrete.

"Wakes a good thing to be alive," one said. "Cut them both savage. People hear about such shit."

"You or me?" the other said. "I'll do," the first one said. "You put shots in first, happen them pain."

I moved, and the cut man had been waiting for it and stepped back, long blade shining silver in his hand, and the stroker would knock me down for him, and she and I would suffer and die.

The subsonics slapped the air as the pistol went off, and the room turned red, light filling it up brighter and redder until we all disappeared into its brilliance.

It felt good to be back—stepping through the doorway, back home, the condo warm and alive to my return—in a well had a string of messages but nothing urgent.

Back?

In the middle of the rug, pale blue and

sand abstract, something shimmered, now it really came back, blood and death reaching out to give a bony shake—

She said hello out of the light and told it all to me, and I went to her, dowsing wand to water, and put her body under mine. More witch-work, because at the same time there was just me, standing there, staring at the shining light—

I heard the news. This was hello and good-bye, absolute.

"What happened?" I asked. "Those two men have gone," she said. I said, "You mean they're dead?"

"No, they've returned to what they do, who they are. They never saw us, never heard of you, were never there. A gift I can give, forgetfulness."

We went flesh to flesh as she told how it happened. Earth had called her, life flaring against the black wall of matter. She came down that night as she passed across the sky, and the autobus had sung to her, into pulse like song. She had been looked. She found data flow, not life. The other man in the building, the one I'd fought with, had been a thing of dull details, she said, not a man for her to go to. But she left my need and came to me.

She said the universe reaches out across the void, to itself, from itself, love to pain. She feels the wounded, she said, they give her form.

She told me true and she left me, so did I feel done down, deceived, betrayed by another woman? No, man. She gave perfectly—what I wanted, what I needed, too. She went away and though I laid down down by hard screw, something else was happening. I couldn't say what.

Noodles insisted on paying me the vig for a few weeks, but he was relieved when I told him I wouldn't take any more of his dollars. He had found a new girlfriend, so he needed what he had.

"She's terrific," he said, hitching up his pants and rubbing his new heir buds. "Does things just the way I like them. Got dinner ready every night—she likes it, too, no crummy autocooking. And she's terrific in the sack, even helps an old gaffer like me, you know what I mean?"

"Stay away from the sharks, Noodles," I said.

"Nothing like that, Mal. We've got a budget. We never spend more than I can afford."

On the street a few days ago, I saw Camille—she was walking on the other side, sleeping so graceful, the way she can, dancer's legs flowing out of dark silk—and I stopped and watched her like any stiff would, digging the beauty of her and amazed that a few times she had hooked it up to me. I looked at Camille without flaring into angry fire and said her name without tasting ashes, and I think maybe that's the final gift from my deep-oo lover, the last touch of her hand. ☐

*Trump told us how to make a deal, and Iacocca gave us the secret of corporate success, but this science historian is unlocking the key to the creative genius of Thomas Edison, the wizard of Menlo Park*

## INTERVIEW

# REESE JENKINS

**A**t one point late in his career, Thomas Alva Edison demanded that his employees punch a time clock. Edison punched one, too. The time cards indicate that during one week he worked 112 hours; another, 115 hours. Apparently, the schedule was not unusual. He napped on his lab table and sometimes under it until his wife—who thought the habit beneath his dignity bought him a cot.

Edison was a workaholic. He declared creativity to be 99

percent sweat. Perhaps so. But what about the other 1 percent? Exactly 100 years after Edison completed the first prototype of the kinesiograph, or movie camera, a college professor and team of historians are uncovering the creative life that went into such Edison inventions as the movie camera, the electric light, and the phonograph.

Reese Jenkins, professor of history at Rutgers University in New Brunswick, New Jersey, is the first director and editor of a decade-long ef-



PHOTOGRAPH BY BRIAN R. WOLFF

fort to review and publish from the three and a half million pages of documents that constitute Edison's papers. The hall outside Jenkins's office is lined with cases containing early light bulbs, telegraph equipment, and copies of sketches in Edison's hand. Like Edison, Jenkins, fifty, grew up in the Midwest and later settled in the East. His scholarly delivery is occasionally punctuated by a Midwestern "gosh" or "my goodness." He has delighted in examining documents having taken an interest in his wife, his aunts, after reading her letters.

As a graduate student at the University of Wisconsin, Jenkins came under the spell of scientific and technological documents while studying an annotated volume from Isaac Newton's library. The book was about alchemy. "The pages were filled with marginalia in Newton's handwriting," Jenkins recalls. "You could not miss that this was something held 'pored over.'" When Jenkins was pondering this book back in the 1960s, everybody thought of Newton as the paragon of the objective scientist, the pioneer of a modern science that had banished such superstitions as astrology and alchemy. So looking at Newton's reverential scribbles in a book of alchemy was "foundational shaking" for Jenkins. "It made me much more aware that science is not a strictly rational enterprise," he says.

In Edison's voluminous documents, Jenkins has witnessed the nonrational side of science. Wending his way through the lab notebooks, correspondence, patent materials, caveats (early statements to the Patent Office about inventions in progress), legal documents, internal memos and photos of models of Edison's many devices, Jenkins has arrived at a significant discovery about technological creativity. He has discovered that Edison moved from one invention to another by means of "intuitions," a deductive repatriation of forms, models, and solutions to design problems that he embedded in invention after invention. Jenkins also tracked Edison's thought processes by following the evolution of his sketches and working models. Photographs of these will appear soon in *The Papers of Thomas A. Edison: Volume One: The Making of an Inventor*.

For most of us, the name Thomas Edison is synonymous with our faith that the world becomes an increasingly better place through technological progress. Edison himself wrote in an article called "Machine and Progress" that "not through fever but through more complex machines will men find avenues that lead into lives of greater opportunity and happiness." The man directing the editing of Edison's papers has a different view.

Jenkins loves technology but is also a trenchant critic, skeptical of its vaunted benefits. One of the many reasons for this skepticism is the experience of Jenkins's father. The elder Jenkins was an indus-

trial engineer who did time and method studies to improve assembly-line productivity. He eventually left the profession because, says his son, he "bleh bleh bleh" out. He felt he was being pushed not just to make the industrial process more efficient but to dehumanize the entire activity. So I came to technology intrigued by the problem-solving dimensions but aware that it isn't a panacea."

There are only about 200 historians of technology in the United States in a field some 50 years old. Jenkins rose to prominence in the late Seventies for images and Enterprise. A history of the photographic industry, it is largely the story of camera whiz and Kodak founder George Eastman. Jenkins was moving toward a full-blown biography of Eastman when he was asked to take command of the Edison project.

Cosponsored by Rutgers, the National Park Service's Edison National Historic Site, the New Jersey Historical Commis-

**What drove Edison was technological play. He was trying to get nature to yield itself. The way he could tease things out of nature that nobody else could reflect that drive.**

sion, and the Smithsonian, the Edison Papers receives support from the National Science Foundation, the National Endowment for the Humanities, private foundations, and some 50 corporations, including sponsors in Europe and Japan. Eight full-time historians, archivists from the National Park Service, as well as history students from Rutgers work with Jenkins. Their goal is to publish a multi-volume edition of about 10 percent of Edison's papers and an annotated 15- to 20-volume back edition of the papers.

Edison loved problem solving. For Jenkins, the problem is, "What made Edison tick?" It's a conundrum that can be solved, he believes, only by exploring the original documents. "Intimacy happens when you handle these things written by a person," he admits. "You feel almost like a spy. You're inside the life and mind of someone and not necessarily by their permission. Of course, they don't have to know all that stuff second."

Interviewer John Briggs was writing a book on creative genius, *Fire in the Crucible*, when he met Jenkins in 1988. The interview was conducted in Jenkins's of-

fice at Rutgers, where a droning air conditioner, says Briggs, almost drowned out Jenkins's soft-spoken voice on the tape recorder—a further comment, perhaps, on our technological world.

**Ques:** What's the importance of the Edison project?

**Jenkins:** Edison is the most prolific and important inventor in United States history. He's in the pantheon of national heroes. If those crazy lists mean anything, worldwide on a list of two thousand of the most important people who ever lived, he's ranked in the top thirty. Despite this, what's been done on Edison is biographical puffery. The scholarship until recently has mostly derived from an obsequiously self-serving official autobiography by Edison and a secretary in 1910.

Our goal is to encourage real understanding, not only of Edison the man but of the role of technical creativity in society. Born in 1847, Edison was a key figure when the United States was emerging as an industrial and technological leader. Our focus on Edison comes at a time when we are very concerned about our leadership in that regard.

**Ques:** What's been most surprising about your study of Edison?

**Jenkins:** One thing we discovered is how central his drawings and sketches were to his thinking. They are often the first record we have of Edison—or his colleagues—idea for an invention. Those old notebooks are in many instances filled only with drawings in random order. When Edison and the research team came up with something that they thought was worth pursuing, they'd date, sign, and witness the drawing.

**Ques:** What have you learned from that?

**Jenkins:** Edison was a visual thinker. In his mind's eye he saw the instruments he was inventing. He took the component parts, played with them, and reoriented them in space. He used a distinctive repertoire of forms and solutions that he used again and again. One of his favorites was the drum, or cylinder. Cylinders were an important part of the design of whatever Edison worked on.

Cylinders were the omnipresent visual form present in the telegraph equipment of his day. They weren't invented by Edison, obviously, but he used them all over the place—some stationary and some rotating. As a press wire telegrapher, he was often in the newspaper offices in Cincinnati and Louisville and was familiar with the rotating cylinders of the press. He also knew Samuel Morse's telegraph which printed information on a flowing tape. That was abandoned by Edison's time in favor of receiving the code by sound, because it was faster. But Edison kept coming back to the idea of a rotating cylinder as a means of making things flow, whether it was strips of paper or tape or later, film.

A specific example: He was working

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BUCKLE UP FOR SAFETY

on an improved phonograph in the late 1880s, at the time when he was also working on the motion picture. He started his very typical process of visually playing with the cylinder—like the cylinder of the early phonograph. He played with it in different ways, seeing how it could be oriented. Some of the orienters seem to us really silly. He rotated it ninety degrees and ended up with a vertical cylinder. Psychologists could have a wonderful time with that. Anyway, he played with various designs using a vertical orientation. Ultimately he abandoned the idea because there were all sorts of mechanical problems. But in the kind of visual, spatial play he was able to suspend his critical powers. Initially Edison didn't worry about whether or not it was technically feasible.

In 1888 he wrote a letter, a kind of grant proposal to the federal government, in which he sketched his ideas for a facsimile telegraph, like today's fax machine. The sketch shows a rotating drum with a stylus, or needle, on it. The drum and stylus usually go together in his inventions.

**Q**wner: The facsimile telegraph he invented would print by sending electrical impulses over a line?

Jenkins: Yes. Also drawings and any kind of graphics. You had a stylus moving back and forth across a rotating drum with treated paper on it. There was a transmitter and receiver portion. On the transmitter part he used the perforated or chemically treated paper—creating an electrical code. The stylus moved back and forth across the paper and sketched it by making either dark or light strokes, depending on whether the circuit was or was not completed. The transmission and reception were synchronized.

Edison did not invent the facsimile, but he improved it. His great interest was that it might be good for sending messages in Japanese and Chinese, where the extensive alphabets, pictographs, made it very difficult to use coded messages. You also see the drum and stylus in his early conceptions of a printing press, which preceded his electric pen in the mid-1870's. When he got to the telephone, he put tape over drums to make a repeater, which allowed long-distance telephone transmission.

**Q**wner: What is the electric pen? The telephone repeater?

Jenkins: The electric pen was a needle-like device that "wrote" by rapidly oscillating. You held it in your hand, and it created perforations on specially prepared wax paper. The perforated paper became a template, by pressing ink through the perforations, it produced multiple copies. Edison's concept of it was the foundation for the mimeograph.

The reason for the telephone repeater was that in the 1870's electrical power from batteries was so low that the telephone signal would go only a short distance. Edison decided to record a signal

as it came in, convert it to an analog recording of a voice, then take the analog recording and retransmit it with renewed power. In designing this repeater, the analog recording eventually became his cylinder phonograph—which also used the drum and stylus.

**Q**wner: What was the most dramatic example of his use of the drum and stylus?

Jenkins: The motion picture viewer, the kinesiograph. Edison was developing an improved phonograph and using the drum-and-stylus idea. In the winter of 1888 he was visited in his West Orange [New Jersey] lab by Eadweard Muybridge, who'd made still photographs in sequence of animals and people in motion. The two men spent time together, and by October of that year Edison began to conceptualize how to transform still photos into a motion picture. The initial conception was based on analogy with the cylinder phonograph. He made that explicit in his caveat on the kinesiograph, saying, "I'm working on an instrument that does for the eye what the phonograph does for the ear." He went on to describe the parallel between his spiral of microimages and the spiral of grooves on the phonograph.

**Q**wner: Do you have a sense where these forms first came to his attention?

Jenkins: Besides the rotary presses in newspaper plants, he saw the rotating cylinder forms in lathes in the machine shops where he worked as a boy. The early sketches of the phonograph look much like lathes. The stylus is the lathe tool, and the phonographic drum is the stock material turned on the lathe. Of course, other forms were involved. Edison's genius was the way he moved among them. Often they appeared in sketches, then later became transformed, even abandoned. For example, he was familiar with blowing paper tape, which he saw going all the time in the telegraph offices in the 1860's. One early invention was a stock ticker on which tape was used to record printed information. When he started work on the motion picture, he tried many different ways of putting images on a cylinder. Finally he abandoned these attempts. But what did he abandon them for? For tape—only we call it film! Celluloid roll film had just been developed by George Eastman. To use the film, Edison needed to keep it in register (on track), so he perforated it just as he knew the British scientist Charles Wheatstone had done many years before in his automatic telegraph.

**Q**wner: Have you discovered other insights into his creativity?

Jenkins: Gosh, yes. One of the most interesting relates to Edison's hearing impairment. His early years as a telegraph operator led, I think, to an unconscious technique he often made use of.

Telegraph operators were driven to be absolutely accurate. You can imagine that in stock quotations sent over the wire, if

• Could it be that  
the supersecret Stealth bomber is  
responsible for report  
after report of large wing-shaped UFOs? •

## ANTI-MATTER

It made its official debut in Palmdale, California, on November 22, 1988. A wing-shaped airplane with a black underside and no tail, this supersecret B-2 Stealth bomber was, so near, the Air Force said, that it had yet to fly.

Or had it? "Very definitely the Stealth has been seen here," says Dan Gordon, the news and sports director for radio station WYVE AM in Wytheville, Virginia. "I've got twenty-twenty vision, and I saw it fly over my car."

To make himself heard, Gordon has just written a book called *Don't Look Up* about the more than

3,000 reports of UFOs over this small town in the mountains of Virginia since October 1987. Most of the sightings have been of dark, wing-shaped craft resembling the Stealth bomber. Says Gordon: "Unless someone has two hundred million dollars to produce a similar craft, there's no way this flying wing could be anything else."

Gordon's claims would be easy to dismiss if Virginia were the only state in the nation plagued by wing-shaped UFOs. But similar reports have emerged elsewhere with surprising regularity. More than a decade ago, for instance, the Lumberton, North Carolina, area was swamped with reports of V-shaped craft. And in recent years similar objects were reported in the skies of central Ohio and Westchester County, New York.

Could any of these UFO reports be attributed to surreptitious test flights of the B-2? "The B-2 has not flown, period," says an exasperated Major Pat Mulvaney of Air Force public affairs. "I have dealt with that question time and time again.



As soon as we acknowledged the existence of the flying wing, even though it hadn't been rolled out of the hangar yet, we've had people say, 'Oh, I've seen that thing flying.' Absolutely no way."

The Air Force did, of course, fly such craft in 1946, when the then-secret XB-35 and its jet-powered counterpart, the YB-49, were tested in the skies over Southern California. These craft were the culmination of a decade of flying-wing development by the Northrop Corporation, the same company that is responsible for the B-2 bomber today.

UFO activist Peter Gentien, however, points out that the early Northrop flying wings were being tested just as the UFO era got under way. Keeping this in mind, Gentien, a New York attorney, has been trying to link the development of the XB-35 and other experimental craft to those first UFO reports of 40 years ago.

Central to Gentien's theory is the notion that at least one of the objects seen by Kenneth Arnold over Washington State on June 24, 1947, was a Northrop flying wing. According to Gentien, Arnold's original account refers to nine "bright objects" without "tails" that flared and tipped their wings. "Arnold's illustration of one of the craft even indicates that it was crescent-shaped."

"The clincher," says Gentien, "is a photograph taken in the late Forties showing nine of these flying wings on a runway in California. Arnold himself thought he saw something the government was testing. That was everybody's first thought." —PATRICK RUYGHE

## UFO UPDATE





## SIGHTINGS OF LAKE MONSTERS

Somewhere in a glacial lake, nestled among the green hills and storybook farms of Vermont's Northeast Kingdom, lurks a beast of unknown origin. Or at least so reads the testimony of some 150 lakeside residents who, since 1816, have claimed sightings of a monster with a huge, horse-shaped head and a serpentine neck napping the cold waters of Lake Memphremagog (abovv).

But in a sense, Memphre as the elusive creature has come to be called, was of-

ficially recognized on June 18, 1986, when the International Dracoology Society of Lake Memphremagog (dra-kon is Greek for "serpent") declared it a protected species. Based in the twin cities of Megog, Canada, and Newport, Vermont, the society next procured dual citizenship for Memphre, a first among the world's legendary serpents, which include such risibles as Champ of Lake Champlain and Scotland's Nessie. Last summer the Memphre mascot, in costume, made its debut at the Megog and Newport lake festival parades.

Keeping a dragon in resi-

dence has proved challenging to some locals, embarrassing to others, and is definitely popular with city officials on both sides of the border who see it as boosting tourism.

Documenting and finally proving the creature's existence is seen as a serious business, however, by Newport resident Barbara Melloy, who in August, 1983, saw "a horse's head with a long neck emerge from the lake."

Melloy contacted Megog historian Jacques Boesvert, who had written extensively on the lake's legends and traditions. Impressed with Melloy's enthusiasm, Boesvert

named her an official Memphremagog dracoologist. Though Boesvert himself has never seen the monster, he is convinced it exists. "I've never seen God," he says, "yet I believe in God."

But mere belief is not enough. To prove the existence of its lake-dwelling creature, the Dracoology Society is offering a \$1,000 reward for rights to the first authenticated, publishable photo of Memphre. Prospective dragon hunters need not be afraid, just lucky. Says Melloy, "It's a friendly dragon who's rather shy and has never been known to attack anyone." —Mindy Leal

## MEMPHREMOG: A DRAGON BY ANY OTHER NAME

A few years ago the Army asked the National Research Council (NRC) to assess aeropsychology and other avant-garde techniques for enhancing human perform-



since Last December the NRC announced its results. There are no easy ways to make better soldiers: the council declared, and there is no solid scientific evidence for the existence of psychic phenomena.

Now parapsychologists are claiming that the NRC committee was biased and blatantly tried to suppress evidence. Dean Radin, president of the Parapsychological Association, says that the two principal evaluations of parapsychological research for the committee, Ray Hyman and James Alcock, have both had a long-standing, public and active role in CSICOP (the Committee for the Scientific Investigation of Claims of the Paranormal), an organization known for its commitment against parapsychology. Radin also claims that committee chairman John Swets at one time asked Robert Rosenthal, a Harvard psychologist, to withdraw the parapsychological section of the paper he had prepared.

In that section Rosenthal had looked for procedural problems in a series of parapsychological experiments with positive results. But on the basis of his analysis, says Rosenthal, "the evidence was quite compelling that there was a phenomenon that needed explanation." In the end Rosenthal refused to withdraw the section of his background paper but did agree to respond to the committee's critique of it. While the committee's final report relied heavily on the work of those critical of parapsychology, says Radin,

it does not even mention Rosenthal's conclusions.

Swets, chief scientist at Bolt Beranek and Newman in Massachusetts, doesn't deny having asked Rosenthal to withdraw the parapsychology section of his paper but explains, "The reason was we hadn't asked him to write it in the first place."

"That's not true," replies Rosenthal. "I think they attempted to avoid controversy, but that's not in the proper academic spirit."

Swets denies all charges of bias. "I think our report treated the field rather well," he says. "I think in some respects it got off easy."

Says a frustrated Radin, "trying to play the normal science game in this particular field is impossible."

—Patrick Huyghe

"We must be greater than God, for we have to undo his injustice."

—Julius Renard

## ALTERNATE

Philip Klass, in his new book *UFO Abductions: A Dangerous Game*, makes quick work of abductions and the people who investigate them. Abductee Betty Hill had bad dreams, he says, while Whitley Streiber's incredible abduction experiences, reported in the book *Communion*, can be traced to temporal-lobe epilepsy. As for UFO investigator Budd Hopkins, the "father" of the field, Klass says he's "tendently credulous, tendently sloppy."

Klass (below) sees his book as "an alternative explanation to the lunatic idea that extraterrestrials are visiting the earth." He argues that abduction films and books have exposed the American public to the basic outlines of the abduction experience and contaminated any stories that an abductee might tell. And, he suggests, the hypnosis often

used to dredge up abduction memories can implant

"pseudomemories" that the abductees believe are real.

Hopkins disagrees. He claims Klass has never interviewed him or talked to the major abductees. "Wouldn't you call that shoddy journalism?" he says. He doesn't see hypnosis as an issue either. "We have dozens of cases where no hypnosis was involved."

What about Streiber's temporal-lobe epilepsy?

Streiber has had two EEGs, a CAT scan and an MRI (magnetic resonance imaging) as well as "a thorough exam of my nervous system and motor function," he says. Although a couple of dots were found on the MRI and temporal-lobe epilepsy has not been ruled out, Streiber says the spots are consistent with having needles pushed up his nose into his brain. "I will continue the testing," he says.

As for Klass, he admits that he has been metaphorically abducted. He wanted to retire from the UFO field some years ago, but then came the abductions. "It is sort of like being Sir Edmund Hillary and you have climbed Everest and someone suddenly says, 'Hey, we have discovered a higher mountain—you can just say you are tired of climbing mountains.'" —Paul McCarthy

"What we see of the world is the mind's invention and the mind though stained by it, becoming rivers, sun, mole-dung, flies—can shift instantly."

—Philip Whalen



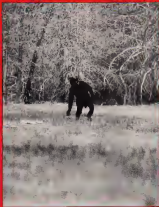
## Shadow of the Ape

In the Steven Spielberg production *Henry and the Hendersons*, a movie actor portrayed the ape-like beast known as Bigfoot. But according to Ernest Morrell, producer of a new video called *The Shadow of Bigfoot*, his movie stars the real thing—several Bigfoots captured on film by California tracker Ivan Max.

The 49-minute documentary (which sells for \$49.95 postage paid, through Amazing Horizons Incorporated, Box 61662, Sunnyvale, CA 94086) features a huge, hairy creature with a domed skull and male genitalia standing in a swampy area, dousing himself with water (photo at right). The beast also thrashes around in some bushes and then approaches an gloo where Max is hidden with his camera. Details of Bigfoot's face—including his eyelids and long white hair—are clearly seen.

Warren Cook, a professor of history and anthropology at Castleton State College in Vermont, believes the film is authentic. "The shower scene, where the Bigfoot is showering vigorously in water, is one of the strongest pieces of evidence—a man in a monkey suit couldn't make the water go out and up in all directions like that," says Cook, who served as the film's scientific adviser. "I was incredulous when I first saw the creature's pointed head. But now we know that *Australopithecus* makes head-tilt noises."

According to Cook, he and associates have discovered



a number of sites in New York and New England where the creatures go to breed. "We hope to eventually send a woman anthropologist to study Bigfoot in his natural habitat—in the same way Jane Goodall studied the wild chimpanzees."

But Rene Dahinden of Vancouver, British Columbia, who has been investigating Bigfoot reports since the Fifties, claims that in the *Shadow of Bigfoot* offers no proof that the creature is real.

"I don't know if Bigfoot exists, but the longer this kind of garbage is presented as evidence, the more skeptical I get," Sherry Besser

of *Psychiatry Today* writes.

George had it rough. He spent most of his waking hours washing his hands, checking to see if his doors were locked, or looking in his wallet for cash. At the tender age of eighteen, George was suffering from obsessive-compulsive disorder. Finally, frustrated by his inability to shake the condition, the young Canadian shot himself in the mouth.

Following the suicide attempt, George arrived at Shaughnessy Hospital in Vancouver, where psychiatrist Leslie Solyom pro-

nounced him cured. According to Solyom, though George's IQ and personality remained externally unchanged, the obsessive symptoms were gone.

"What happened was that George essentially gave himself a frontal lobotomy," says Solyom. "This is when you cut through the part of the brain in the left frontal lobe."

Because the bullet penetrated the left lobe of George's brain, he experienced some weakness in his right hand for a while, but now even that has disappeared. And though Solyom says George will never be the kind of person to let dirt build up in his environment, he is now a well-adjusted citizen who has resumed his studies and is functioning well in society.

This is proof that psychosurgery is not entirely dead, Solyom says. "Though I think we should emphasize that this is a unique case and that such action is not recommended, or we may have an epidemic of suicides on our hands." —Rick Basing

"They pulled you apart by the ears until they had split your luminosity and you were not an egg anymore."

—Carlos Castaneda

"The soul-substance is the seminal substance; genius is the genital in the head."

—Norman O. Brown

"'Synchronistic Acts'—the coming together, as if by design, of evidently unrelated phenomena or persons in order to form a clear pattern."

—Isidore Jones, author

# EARTH

CONTINUED FROM PAGE 20

warnings from the exquisite scow with which they are equipped. In Australia in 1987 a veterinarian tried in vain to save a sick baby killer whale. The whale was not yet weaned—she still had her milk teeth—yet in the autopsy the vet found plastic blocking her bowels: a plastic package of corn, a plastic bait bag, and some pieces of hairy plastic sheeting.

The war against plastic has begun. Alaska, California, Connecticut, Delaware, Maine, Massachusetts, New Jersey, New York, Oregon, and Vermont require that six-pack yokes be biodegradable. In Berkeley, California—my hometown—and in Suffolk County, New York, plastic fast-food containers have been banned. After 1991, by Italian law, nonbiodegradable plastic bags will be illegal. Chemical companies in the United Kingdom and Switzerland have invented "intelligent plastics" that degrade with the application of a reagent. The Japanese have been recycling nylon gill nets for more than a decade. (A fit punence: The nets of Japan's salmon fleet kill up to 750,000 seabirds and 5,000 Dall porpoises annually.) Hundreds of tons of Japanese gill nets have been processed into plastic pellets, then converted into products like whiskey bottles.

In October 1987 representatives from five Pacific Rim nations convened in Kona, Hawaii, for the Marine Debris Conference. Barry Fisher, a fisherman from Newport, Oregon, chaired the conference. Fisher had begun as a mercenary on the wrong side of the plastics war, then experienced a conversion. At the end of a streak of good fishing in the Bering Sea, he had taken a day off. On a beach in the Aleutian Islands, he had come upon carcasses entangled in the jotsam: dozens of seabirds, a sea lion, a fox.

"In the North Pacific, the fishing industry is the problem," says James Cox, director of the NMFS Marine Debris Program. On that beach, Captain Fisher realized that this was true. He had seen the enemy, and the enemy was him.

At the conference, Fisher and his conferees discussed high-tech solutions: biodegradable plastics, high-temperature on-deck incinerators for plastic. They discussed low-tech solutions: simply using less plastic and taking home what you do use. It is with the latter approach, Fisher believes, that the answer lies. If the North Pacific is to be depolluted, it will be by the decision of thousands of fishermen as to what they bring to sea, and what they bring home again.

In Newport, Oregon, Fisher's home port, a model program is under way. The Marine Refuse Deposal Project, funded by just \$87,000 from the NMFS, is work-

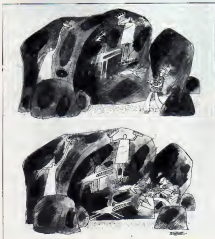
ing. The project's big blue dumpsters are filling with sections of sawd web, gill net, line, cargo straps, and Styrofoam packing. "It is not a question of confronting us like nuclear waste disposal, the cone layer, or even earthquakes," project director Fran Pacific told National Fisherman in June 1988. "This is such a stupid problem and its solution is so simple, we can actually do something about it."

Title II of Public Law 100-209 is called the Marine Plastic Pollution Control Act of 1987. It prohibits the disposal of plastics at sea by any vessel within U.S. waters, effective December 31, 1988. Annex V of the new law permits the Coast Guard to deny vessels entry to ports if the port terminals do not provide adequate garbage facilities. Under the law, the maximum penalty for willful dumping is \$50,000 and a five-year prison term. The difficulty, as always with crimes and misdemeanors on the seas, is enforcement.

Action has been taken to protect sea creatures as well. By the end of the Russian era in North America, the sea otter had been hunted to the verge of extinction. Government protection and rehabilitation have allowed the animal to reestablish itself on long stretches of the California and Alaska coasts. Among pinpoints, the northern elephant seal, hunted to near oblivion by the end of the last century, has multiplied from several dozen to today's 80,000 to 90,000.

In the effort to restore the ocean, as in other struggles for the environment, battles are won but never the war. The moment each small victory is achieved, the forces of reaction are at work against it. The sea otter had scarcely reestablished its toehold on the California coast, when abalone fishermen were complaining about the competition and demanding otter control. The ink was not dry yet on the antiplastic-packaging proposals in Berkeley and Suffolk County before Mobil Chemical Company was committing thousands of dollars to fight those sensible measures and the plastics industry was turning loose its big-lie specialists. "Berkeley is in this for symbolism and not really for substance," said plastic man Roger Barnsten. "I don't think the proposal is being driven by logic. It's being driven by the misconception that plastic is somehow a polluting material."

Perhaps our early skirmishes over plastic will escalate to a true war. Perhaps that war can serve as a model for wars on other insults to the marine environment—the chemical, radioactive, and human toxins that we persist in dumping, the overexploitation of the sea fisheries. Perhaps the summer of 1988—that season of sutures and syringes on New Jersey beaches, and the shock that garbage caused—will mark a turnaround in our regard for the ocean. □



This is the first in a three-part series on the state of the oceans.

# BODY

CONTINUED FROM PAGE 30

other polypeptides (chains of amino acids) across the barrier. After a molecule attaches to a special receptor on the blood side of an endothelial cell, a protective pocket called an endosome engulfs the molecule/receptor complex and forces it across the barrier. In minutes the endosome disengages the molecule and releases it into the brain.

In the Nineties, according to Partridge, the transport mechanisms described above will be exploited to deliver self-administered doses of drugs to the brain. Using the receptor-mediated system, Partridge has already succeeded in piggybacking peptides that don't normally cross the barrier to those that do. By the end of the century he says, many neurological diseases will be treated with nasal sprays composed of specially formulated peptides that, on their own, wouldn't cross the barrier. Because these substances would degrade quickly in the stomach if taken orally, all neuro-peptide-based drugs, Partridge says, will be marketed as nasal sprays. He anticipates the availability of a variety of such sprays, which doctors will prescribe to treat disorders from anxiety to leprosy. "Before the '90s are over," he says, "diabetics will take their daily insulin through the nose rather than by injection."

Pharmacologists will pattern many of the new medications on mood- and mind-influencing substances that are naturally present in the brain—like norepinephrine, which reduces anxiety, and endorphins, which help relieve pain. Drug companies will look at a receptor in the brain and design a drug that would either stimulate it or inhibit it," Partridge says. Because these drugs will be tailored to fit the underlying molecular biology of the disease being treated, they probably won't have any side effects.

While Partridge's approach provides an elegant means of circumventing the blood brain barrier, an Alachua, Florida drug company called Pharmalec is already implementing Bodor's more straightforward tactic. Licensed to Pharmalec in 1982, Bodor's system calls for linking water-soluble drugs to fat-soluble molecules called dihydropyridines in order to sneak them past the barrier. Once the compound gets into the CSF, an enzyme naturally present in the brain changes its electrostatic charge, preventing it from exiting back into the bloodstream. A second enzyme separates the drug from its carrier, freeing it to go to work and providing a sustained release that can last as long as 30 days.

Bodor conducted the first clinical trials of the system in 1987 with a hormone called estradiol, a form of estrogen used in birth control pills and certain medica-

tion of a routine therapeutic dose that reaches the brain is often too small to be effective, and too much of the drug can be toxic to a patient's system. Using dihydropyridines, Bodor can safely deliver estradiol directly to a patient's brain.

Last fall Pharmalec obtained a \$50,000 grant from the National Institutes of Health to combine carriers with two antiviral drugs to combat Lassa fever and other infections that attack the brain. In ten years, according to Bodor, drug companies will modify his technology to formulate oral medications for a wide variety of neurological diseases from Alzheimer's and Parkinson's to epilepsy.

Bodor is currently adapting his approach to get large concentrations of AZT into the brains of AIDS patients. Although not a cure, AZT effectively reduces the

amount of AIDS virus present in cells, prohibiting its growth and alleviating symptoms. AIDS, however, crosses the blood brain barrier early in the course of the disease. Because only minute amounts of AZT normally cross the barrier, the virus can flourish unchecked in the brain even as the rest of a patient's system responds to the drug. This spring Bodor will select the dihydropyridine molecule that performs best as an AZT ferry mechanism and begin toxicity studies. AZT treatment with this method may be available to AIDS patients as early as 1991, he says. □

The next Body column will focus on a third means of temporarily opening the barrier, a method scientists say has important implications for genetic engineering.



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## Why radar makes mistakes. How to protect yourself.

It's hard to believe, but traffic radar does not identify which vehicle is responsible for the speed displayed. It shows only a speed number. The radar operator must decide who to blame.

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### The best guess

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# FINDERS KEEPERS

CONTINUED FROM PAGE 54

actly how little she did understand.

When Mrs. Morris had hung up the phone, she heated a serving of tuna noodle casserole for dinner. Then she sat on the couch and turned the television to the local educational station to watch a National Geographic special on the Kalahari Desert. She and her husband had planned to travel in their retirement, but Roger had fallen sick. She did not begrudge the time she had spent nursing him, but now, admiring the unearthly landscape of the Kalahari, she could not help feeling a little sad.

Apparently she fell asleep while watching the television. She dreamed of the sound of metal scratching on wood. In her dream, light from the fast pattern on the television screen illuminated the room. Mrs. Morris blinked in the flickering light and watched the metal lump from the garden flex its fingers slowly. With her eyes half closed, she watched it pull itself across the table.

The metal fingers—or maybe she should call them legs—kept slipping on the table's smooth wood. She watched calmly and smiled at the thing's persistence. Though it moved only a fraction of an inch each time the legs flexed, it doggedly continued its efforts, stopping only when it reached the ballpoint pen that lay beside the telephone. It hesitated then. Its legs bent so that the central lump—its body she decided sleepily—was just above the pen. She heard a humming and then a rattling as the creature fussed with the pen. It seemed to be trying to maneuver the tip of the pen into one of the sockets on its body.

She yawned and closed her eyes again. Repeatedly her sleep was disturbed by progressive stages of the same dream. The creature, walking on its three original legs and a fourth leg constructed from the pen, pushed the brochure off the table and followed it to the floor, landing on the Oriental rug with a thump. She heard it walking across the kitchen floor, rattling in the trash, and scurrying across the kitchen shelves.

Curiously, the dream did not disturb her. She rather admired the creature's industry and persistence. From paper clips it made two legs that were much smaller than its other appendages. It scavenged tirelessly in drawers and cupboards, gathering an assortment of buttons, bottle caps, bits of twine, ember daisy thread, and jewelry. With these oddments it adorned its body, using its pinchers to position each bright bit just so. Watching it reminded her of a National Geographic special in which a decorator crab had covered its shell with seaweed and shells. It was a nice little crab, she thought as it dragged the retirement community brochure under the piano bench.

She woke in the morning, still from her night on the couch. Her aching hip ached with pain. On the television a game show host introduced the contestants. She blinked at the coffee table. Only the telephone remained on the smooth wooden expanse. She was not surprised to learn that the dream had not been a dream. She had suspected as much all along. She found the creature crouching by the magazine rack in a nest it had made by sliding the retirement brochure. She sat on the piano bench and studied the creature. "You've done me a favor," she said. "I didn't want that propaganda around here anyway."

The creature did not move. Two pearl buttons on its back looked like eyes. It appeared to be watching her intently.

"It's been a while since I had a pet," she said. "I had a poodle named Sparky when I was a child. But Roger—he was my husband—was allergic to animals; he, and we never had a dog." She watched

*“The creature, walking on its three original legs and a fourth leg made from a pen, pushed the brochure off the table and followed it to the floor, landing on the Oriental rug with a thump.”*

it for a moment, then put her hand down by the floor. The creature scolded from its nest, approaching cautiously. With its delicate pinchers it touched her hand.

Again she felt a strange warmth. She remembered the comforting heat when she first touched it. She stroked its back, soothed by the warmth it radiated.

"You're friendly enough," she said. "Do you eat anything? I wonder." When she went to the kitchen to prepare her own breakfast, the creature followed her. But it showed no interest in the saucer of milk or the slice of bread that she offered it. Instead it made off with three bits of cake from the trash.

When she considered her own breakfast, Mrs. Morris discovered that she wasn't really hungry. But she felt more enigmatic than she had in some time. She put some more birdseed in the feeder outside her kitchen window, tidied the kitchen, and busied herself with household chores that she had been neglecting recently. Now and then she heard the creature—or Sparky as she had taken to thinking of it—rummaging in closets and cupboards.

Late in the afternoon she went to see what Sparky had been up to. In the middle of the living room, it was building a metal framework from coat hangers. She sat on the couch, but it ignored her, continuing to work diligently. The framework formed a large oval shape that was maybe six feet long and two feet across. As she watched, Sparky neatly wove the wire of a coat hanger in with the others, pushing it over and under the crisscrossing wires of the framework.

When Sylvia called that evening, Mrs. Morris elected not to mention Sparky. Her daughter had grown up to be rather conventional in her thinking. Mrs. Morris suspected that she would not approve of Sparky, no matter how good the little creature made Mrs. Morris feel.

Sylvia talked incessantly of the retirement community. "You don't seem to understand, Mother," Sylvia said. "You just can't go on living alone forever."

"Perhaps I'll travel," Mrs. Morris said. "Last night I saw a National Geographic special about the Kalahari and..."

"Be serious, Mother," Sylvia interrupted. While Sylvia talked, Mrs. Morris watched Sparky add coat hangers to the framework. When Sylvia hung up at last, Mrs. Morris continued to sit and watch Sparky work. Such a resourceful creature, she thought, making use of leftovers and trash to make something new. She started to get hungry, but then Sparky came and sat in her lap for a time. After stroking Sparky's bottle-cap-covered body, her hunger faded.

She slept in the living room that night, lulled to sleep by Sparky rustling among her things and assembling them in a strange pattern. She dreamed of a place she had never been. She stared out into darkness, punctuated by brilliant points of light. It seemed to her that she did not see these lights with her eyes, but with some other sense. She had never seen such colors—a red that was somehow more than red, like red with a taste of honey and the tinkling of wind chimes, something like blue, but blue with citrus overtones and a faint smell of cinnamon. She tried to reach up to rub her eyes, but her hand was impossibly distant from her. She felt she could not say how empty space all around her. But the feeling did not frighten her. She felt warm and safe, her hip no longer ached, and she knew with a comforting certainty that she was going somewhere interesting.

When she woke, she blinked in the light. The pain in her hip had returned. As she came to herself, she realized Sparky was crouching on her chest, watching her with pearl button eyes.

She shifted her position on the couch, and Sparky scurried away, returning to its work. In the morning light Sparky's construction was glorious. Radial members filled the gaps in the framework, held in place by a lacework of copper wire. The silvery cans glittered in the light. Be-

tween the cans. Brightly colored buttons and bottle caps spanned cylindrical legs made of tin cans supported the oval body. As she watched, Sparky scrambled over the surface, tirelessly looping a strand of copper wire over a can.

"Why Sparky—it looks like you!" Mrs. Morris sat up on the couch. The construction did look like a larger version of Sparky. As Mrs. Morris studied it, she realized that the overall shape also resembled the lunar module in which the Apollo astronauts had landed on the moon. Sparky's construction had the same spindly legs as the lunar module, the same compact body.

With this realization, Mrs. Morris felt a sudden sense of loss: "You're going away," she murmured sadly. "I didn't realize you were making something that would take you away."

Sparky did not comment.

Mrs. Morris did not make breakfast. She wasn't hungry. She sat on the couch, watching Sparky work. She did not stop the creature when it began dismantling the television, taking wires and components into the landing module.

By evening the landing module looked complete. In the center of its oval back a hinged lid, like the lid of a pirate chest, stood open, poised to close. When she put her hand on the construction, Mrs. Morris could feel a faint trembling, as if something were humming inside. Sparky crouched beside the lid, waiting.

"I guess you're ready to go," she said. She opened the living room window. She had never been one to stand in the way of progress. But nothing happened. Sparky remained by the lid.

Mrs. Morris sat on the couch and waited. Still nothing happened, and she nodded off to sleep. A touch on her hand woke her. Sparky had climbed to the armpit of the couch. With two of its legs, it had taken hold of her finger. Gently it tugged on her hand, trying to move her toward the landing module.

"What do you want?" she asked, but it only tugged harder.

She picked up Sparky and went to look at the module. The hollow place inside it was just large enough to accommodate her body if she curled up on her side. Sparky had arranged some old sweaters inside. It looked soft and inviting. There were wires and odd-looking attachments where her head would rest.

Of course—it only made sense that the craft would need a pilot.

Mrs. Morris took off her shoes and stepped gingerly into the opening. Carefully she curled on her side in the fetal position, tucking her housedress neatly around her. Sparky curled up beside her, snuggling into the crook of her neck. The compartment was warm and comfortable. She pulled the lid closed. As it clicked into place, the craft's hidden engines hummed to life. "Let's go," she murmured to Sparky. And they went **OO**

## CREATIVITY

continued from page 41

and enables us to distinguish the future from the past; otherwise, we would experience only the present.

According to neuroscientist Candace Pert at the National Institute of Mental Health, science will eventually demonstrate that the frontal lobe is the section of the brain that is most important in creative thought. The density of opiate receptor sites is highest in the brain's frontal lobe, progressively decreasing toward the hindbrain. "There are about thirtyfold more receptor sites in the extreme front of the brain than in the parietal lobes," she says. Such front-to-back receptor densities, Pert believes, may reveal more about the physiological and biochemical aspects of creativity than studies of the left and right hemispheres will. The receptors may "filter incoming sensory information," she says. "You become plugged less into reality and more into an advanced consciousness. Such a filtering of reality may be conducive to creativity."

Pert points out that the release of endorphins, the brain's natural opiates, increases during exercise and other physical activity. This puts you into an "endorphinergic state," a kind of altered state, she says. "The fun of exercise is being blotted for days afterward." The effect, for at least some people, is a burst of creativity, a "creative high."

"I often find creative solutions popping into my head while I'm running," says Yale University professor of psychiatry Harvey Ruben, host of National Public Radio's *TalkNet*. "A few years ago, for example, I was working out ideas about competition in interpersonal relationships. During one of my morning runs, I suddenly realized there was a whole realm of competition that had never been considered in interpersonal competition, and the concept of autocomp—competition with yourself—came to me."

Creativity, Pert opines, comes from "the spiritual realm, the collective consciousness. And the mind is in a different realm than the molecules of the brain. The brain is a receiver, not a source."

Studying the brains of people during the creative process, University of Maine psychologist Colel Martindale has found that brain waves differ according to the degree of creative output. The university's professors recommended students to participate in the studies: the students then took preliminary creativity tests and placed in the creative or the control group based on the results of pretesting. Martindale then measured the brain wave patterns of the students while they performed creative tasks. The results, he says, indicate a physiological basis for differences in thought patterns during the creative process.

According to Martindale, tasks requir-

ing mental effort (an arithmetic problem or an IQ test, for example) increase activity in the cortex, with beta waves dominating. (In contrast, lower-frequency alpha waves characterize the resting state.) The creative and the less creative subjects had no brain wave differences in the resting state. But when Martindale asked the students to perform a creative task, he discovered that the creative students' cortical activity declined and alpha waves increased—just the opposite of what he observed in the control group.

Cortical arousal goes along with the focus of attention, Martindale says. "Once you make clear that you want creative people to perform creatively, their attention becomes unfocused. We're peering up the physiological index of that with the increased alpha waves." According to Martindale, this supports other research showing that the creative state of mind has a broad, unfocused sort of attention. By focusing your attention, you essentially defeat creative efforts.

Martindale has also tested the rate of subjects' habituation, measuring an individual's decreasing response to a repeated stimulus over time. The stimuli in the experiment were bursts of white noise, sound containing all the frequencies within the sound spectrum, presented through headphones at intervals of 25 to 50 seconds. The results show amazing and unexpected differences. The less creative subjects habituate quickly and don't respond after four or five tones. The creative subjects take two to three times longer to stop responding. "It's almost as if they have trouble changing whatever mental state they're in," Martindale says.

Artists, of course, have often associated creativity with dreams and dreaming or altered states. David Small, an American Book Award nominee for his first novel, *Almost Famous*, says he wakes up during the night, for example, and realizes that he's telling himself stories. "I accomplish my best work in the early morning or late evening times near sleep."

Monk Buchsbaum, professor of psychiatry and director of the Brain Imaging Center at the University of California, Irvine, has already scanned the brains of dreaming and nondreaming patients. It's not known how dream states are related to creativity. But it's only a matter of time before scientists use positron emission tomography (PET) to scan the brain during the creative process, to actually "see" what brain areas are most active and are using the most glucose for energy.

"During nonconscious sleep, the brain is resting, and the rate of metabolism and use of energy decrease," Buchsbaum says. "During dreaming, the rate of metabolism actually increases in the emotional and motivational areas of the brain's center—the limbic system—and it does so more on the left side of the brain than on the right. Also, the glucose levels increase in the left hemisphere during

dreaming." (Remember that the limbic system is in the forebrain.)

In a separate study Buchsbaum and Richard Haer imaged the brains of people taking the Ravens Progressive Matrices test, a series of very difficult visual puzzles that require logic, analysis, and other higher forms of thinking. The results showed that the better the test performance, the lower the brain metabolism, as measured by the brain's glucose level. This greater brain efficiency for the high performers might also be applied to creative people, Buchsbaum suggests. If the test puzzles are viewed as creative problems requiring creative solutions, then the lowered metabolism might be interpreted as corroborating the Martindale brain wave studies. Unfocused attention and diminished brain metabolism might allow creative ideas to emerge. Buchsbaum says, "Perhaps ideas are held back by active brain areas. An experiment designed for the PET scanner could prove whether very creative people use less brain energy than less creative people."

PET scans may even settle the long-standing debate about the link between creativity and mental illness. Images indicate that schizophrenics and manic-depressives have low glucose levels and less frontal-lobe activity than the average person. The frontal lobe, involved in the planning and organization of behavior, might be more active in creative people,

Buchsbaum suggests. By measuring the glucose metabolism of the frontal cortex in creatives and comparing the results with those from schizophrenics and manic-depressives, researchers can determine the similarity, if any, between creativity and some mental illnesses.

According to Marian Diamond, a neuroanatomist at the University of California at Berkeley, "It would be difficult to leave out any part of the brain in the interaction that brings about a true creative effort." Although Diamond has not discovered any neuroanatomical changes specific to the brains of creatives, she and her colleagues have observed a greater number of neuron-nourishing glial cells in the brains of rats with an enriched environment (large cages, playmates, objects to entertain themselves with) than in the brains of deprived rats.

Based on her study of rats, Diamond speculates that human brains may be similarly affected, although she has examined portions of only one creative brain—Einstein's—cell by cell. "His brain showed more glial cells than eleven other male brains," she says. "Other research has shown that active nerve cells have more supporting glial cells. And unlike the brains' neurons, glial cells divide." But there's no way to determine whether Einstein, like Diamond's rats, developed more glial cells as he struggled to break the boundaries of nineteenth-century

physics or whether he was just born with more than the rest of us.

If creative people are willing to be questers their brains, "then we can get a creative data bank and begin to get some answers," she says. "I've already got a musician in Santa Cruz who wants me to have his brain when he dies."

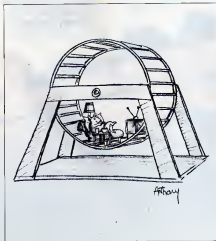
Scrutinized and probed for some four decades, the creative personality has slowly revealed a number of common traits that are shared, it turns out, by artists and scientists—indeed, by all creative people. From the abundant laboratory data, as well as biographical evidence, Harvard's Perkins has developed what he calls the "snowflake model of creativity." Analogous to the six sides of the snowflake, each with its own complex structure, Perkins' model consists of six related but distinct psychological traits of the creative person. Creative people may not possess all six, Perkins points out, but the more they have the more creative they tend to be.

The first among the six traits is a strong commitment to a personal aesthetic. "He drove to work order, simplicity, meaning, richness, or powerful expression from what is seemingly chaos," Martindale says. Einstein's life, like his work, is full of examples of his powerful drive toward simplicity. Someone, for example, once asked him why he used hand soap for shaving instead of using shaving cream. "Two soaps? That's too complicated," Einstein replied.

As part of their personal aesthetic, creators have a high tolerance for complexity (some researchers call it ambiguity), disorganization, and asymmetry. They often enjoy the challenge of cutting through chaos and struggling toward a resolution and synthesis. "In science very often the core challenge is to deal with a mass of ambiguities and forge a new identity," Perkins says.

The second psychological trait, the ability to excel in finding problems, was demonstrated in studies involving art students at the School of the Art Institute of Chicago in the Seventies. Through a battery of tests, University of Chicago researchers discovered that the students spent an unusual amount of time thinking about a problem and exploring all the options for solving it before they chose which solution to pursue.

Scientists value good questions because they lead to discoveries and creative solutions, to good answers. By asking the right question and finding the right problem, creators can define and "see" the boundaries of their fields that can be extended or broken. A student once asked Nobel laureate Linus Pauling, for example, how he found good ideas. Pauling replied that "you have a lot of ideas and throw away the bad ones." Such a winnowing out of ideas, however, depends on the ability to apply critical judgment to work that is often extremely per-





sional and emotionally charged.

Mental mobility, the third trait, allows creative people to find new perspectives on and approaches to problems. One example of such mental gymnastics is so-called Janusian thinking. Remember the Roman god Janus, who had two faces each looking in a different direction? Well, creative people have a strong tendency to think in terms of opposites and contradictions while they seek a new synthesis of ideas. They often think in analogies and metaphors and, as a matter of course, challenge assumptions. Pauling, for example, discovered the alpha helix (the most important way in which the polypeptide chains of proteins are folded) in large part because he questioned the assumption that all amino acids were not created equal. Pauling's idea, after years of frustrating work and dead ends, was that the amino acids are just one kind of unit, and whatever their structures, they are equivalent to one another. By questioning the prevailing assumption he verified the helical structure in about two hours with a slide rule, a pencil, and a piece of paper. And he did it while in bed recuperating from a cold—before his vitamin C days.

The fourth psychological trait is the willingness to take risks. University of Wisconsin psychologist Frank Farley has identified and studied risk takers and

clubbed them Type T personalities, for their thrill seeking (Mind, "The Big Thrill," April 1987). Creators as well as daredevils and criminals fit his criteria for Type T personalities, who, he says, constantly seek excitement and stimulation—physical thrills, mental thrills or a mix of both. Farley explains that Type Ts may need more stimulation than other people because they have a low ability to become mentally aroused. In other words, they're not as responsive to stimuli as other personality types. The mental risk takers are the creators in whatever discipline or activity they pursue.

Along with risk taking, moreover, come the acceptance of failure as part of the creative quest and the ability to learn from such failures. Many people believe that creative geniuses come up with ideas instantly, produce only masterpieces, never have any failures, and never take chances because they always know what they're doing. "Such myths inhibit people from being as creative as they could be," says psychologist Dean Simonson of the University of California at Davis. He argues that the odds of creative success depend on the number of attempts. The more you produce, the higher your chances of creating something really important. "Modesty tends to ignore the failures and praise the successes," Simonson says. "Picasso, for example, pro-

duced some 20,000 works of art, but much of it was mediocre."

By working at the edge of their competence, where the possibility of failure looms, mental risk takers are more likely to produce creative results. For some, taking risks in uncharted territory is exciting. Others may not relish the risk, but they accept it as part of the way to reach creative goals.

When I'm in the middle of fieldwork, there's a sense of terra incognita, of really being out on a frontier discovering absolutely untried ground," says anthropologist Robert McCormick Adams, secretary of the Smithsonian Institution. "You can also find terra incognita when you look into a microscope and other instrument-aided means of exploring the molecular or subatomic world or, for that matter, distant galaxies. Looking for new horizons is something that drives us. It's a particularly ingrained American trait because of the long influence of the frontier in the growth of the country."

The popular image of creative individuals often highlights their subjectivity, personal insight, and commitment. But without objectivity, the fifth psychological trait, creative people simply construct a private world that has no reality. Creative people not only scrutinize and judge their ideas or projects, they also seek criticism. "Contrary to the popular image the



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creative person is not a self-absorbed loner," says Perkins, who has studied professional and amateur poets. "The poets who sought feedback produced poetry that a panel of experts judged to be better than the poetry of those who didn't seek criticism." Objectivity, Perkins points out, involves more than luck or talent; it means putting aside your ego seeking advice from trusted colleagues and testing your ideas, as in scientific practice or marketplace settings.

The driving force behind creative efforts, however, is inner motivation, the such side of Perkins's snowflake model of creativity. Creators are involved in an enterprise for its own sake, not for school grades or paychecks. Their catalysts are the enjoyment, satisfaction, and challenge of the work itself. "There are lots of people who have great potential for creativity," says Brandeis University professor of psychology Teresa Amabile, who has conducted dozens of laboratory studies to verify the importance of intrinsic motivation in creativity. "Many may have had some early successes, but afterward they just dry up or are unable to produce, precisely because extrinsic constraints have taken over."

In Amabile's research, subjects ranging from preschool children to adults worked on creative tasks with or without specific extrinsic constraints. They were told, for example, that their work would or would not be evaluated. Amabile and her colleagues found ample evidence demonstrating that such factors as work evaluation, supervision, competition for prizes, and restricted choices in how to perform an activity undermine intrinsic motivation and inhibit creativity.

Words like love and passion frequently pop up when artists, scientists, and other creative people talk or write about their work. "Such commitment is what motivates the scientist to discover, the artist to paint, or the writer to write. The emotional states which lead to such achievements resembles that of a worshiper or the lover," Einstein wrote. Max Planck in 1918: "The daily struggle does not arise from a purpose or a program, but from an immediate need."

As we delve deeper into the mystique of creativity, learning more about its underlying nexus of biochemical, physiological, and psychological roots, we'll be able to increase creativity and instill more of it in more people. "We are, in a perfectly real sense, creating creative thinking even as we study it," Perkins says. And within the next 30 or 40 years, he believes, creative-thinking techniques will be used not just by artists, inventors, and scholars but by most of us.

The last step in that direction, University of California's Frank Barron suggests, is to think of creativity as the important human resource it really is. "It is a unique force in the universe," he says, "a gift of life to the human species." **DD**

## INTERVIEW

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an operator fouled up the numbers he could create a financial disaster. But there was a persistent technical problem with accuracy because the wires were not well insulated, and rain or electrical storms would disrupt as much as twenty percent of a message. As an operator, Edison was not transmitting but receiving, which was ironic because of his hearing deficiency. Nevertheless he got a reputation as an excellent receiver on the press wire. He was a whiz.

**Omni:** How did he do it?

**Jenkins:** As he later told the story, in Louisville he would carry the last press report to the newspaper office at three a.m. Listen to the editors discuss the politics of the day while they drank bourbon, then go home at five or six, carrying newspapers from all over the country. He'd sleep until about eleven, then spend the rest of the day reading. He came to know all the news, including the names of every member of Congress and who was on the congressional committees. He became so familiar with what was going on that when receiving the information on the wire, he could fill in the gaps created by storms, poor insulation on the wire, and his own faulty hearing. The experience of filling in the gaps helped him understand something really important about communication that he applied repeatedly to his inventions.

Once in a while it would backfire, though. There's a story that he was taking a message during one stormy night. He knew a certain person was to be elected chairman of a political convention. The wire was bad, and he could just get fragments of the message, but he wrote it up anyway. The next day his manager called him in because later messages indicated—as did he—that the meeting had been canceled. He supposedly lost his job because of that.

**Omni:** To what inventions did he apply filling in the gaps?

**Jenkins:** Edison's original phonograph was built in the 1870's; he had several episodes of the original machine made. Some people I've worked with have made Intel phonograph recordings with these episodes, and it's extremely difficult to understand what is being said on them. I've done this myself with classes and audiences. I play a recording from an Intel phonograph, and they can't understand it until I tell them what the words are. Then like magic, they suddenly hear it. Edison supposedly took the original phonograph to the office of Scientific American on December 7, 1877. The editors went out into the street and told their friends. Soon so many people were trying to crowd into the offices they had to lock the doors because they were afraid the floors might collapse under the weight.

People were amazed by this new invention. "You wonder why, since the sound is so hard to understand. But the people at the magazine were speaking into the phonograph, stepping back, and then listening to what they'd just said. They knew what was coming. In other words, they were filling in the gaps."

Many of Edison's inventions exploited the technique. For example, the electric pen copies were Pantolite-like, with the mind's eye blending the dots into continuous lines. In the motion picture, Edison applied the filling-in-the-gaps notion by stringing together sequences of still pictures with gaps between them. What was called persistence of vision fills in the gaps, creating the illusion of motion.

**Omni:** Do you think that the filling-in-the-gaps idea was a conscious invention strategy on Edison's part?

**Jenkins:** There was a level at which it was conscious. But it was largely a part of the subconscious critical faculties he brought to bear while working. He had certain fruitful ways of inventing communication tools because he realized he didn't have to convey the message in its full integrity. All he needed to do was get a critical amount of information across. Of course, he had to determine what the critical amount was.

**Omni:** The tactic indicates that Edison's strategies weren't only visual, like the drum and stylus.

**Jenkins:** No. In fact, there is another dimension of his repertoire—materials. Edison frequently used carbon, finding it to be a fascinating material. It's a very common substance that occurs with very uncommon frequency in his work. He used it for the filament in his electric light and to improve Bell's telephone transmitter. It suggests that inventors may have an attraction to certain materials as well as a repertoire of forms. And those mark their creative style.

**Omni:** Do you think these techniques are a general feature of how inventors and innovators work?

**Jenkins:** Yes, the visual language and spatial manipulation of forms, especially, go well beyond Edison. Some striking similarities exist between creativity in the visual arts and creativity in technology. The tendency has been to separate them, with the technical on one end and the artistic on the other. Edison's work confirms that there is much similarity between these two. Technology—just like sculpture, painting, or architecture—is based on design. Edison was thinking in visual and spatial terms: how parts will interact and move together.

**Omni:** Was Edison curious about his own creative process?

**Jenkins:** He personally saw the heart of his process as perseverance. He saw perseverance as his advantage over others. He may also have felt he had a special talent, but he didn't have much interest in it. He did occasionally copy some

sort of "poetic" thoughts. This is from a scrapbook of the early 1870's (Jenkins reads): "A yellow glass in hell/pierced stupidity. A phrenological doll. The somnolent dream of the grey-eyed Corsican/A brain so small that an animalcule went to view it with a compound microscope/The wrestling of shadowy square chunk of canon with two green eyes held by threads of gossamer which floats at midnight in bleak old rural graveyards. Three million miles beyond the limits of the universe where angels dare not go! There flies forever from nihil to nihil the foulest daemon of the cosmos."

Omniscient Edison, a romantic poet? So what's the greatest misconception people have about him?

Jenkins: Edison is known to every fourth-grader in the United States. There's a tendency to see him as an unlettered tinkering genius who did wonderful, miraculous things, reinforcing our tendency to see the creative process as magical. We detach him from his context, the historical era in which he worked, failing to recognize that his efforts were part of an ongoing tradition in technical work. Edison was very conversant with the work of others and in many instances had competitors whose work was superior to his.

Edison did not invent the motion picture alone, many were associated with it. Etienne Jules Marey, a French physiolo-

gist, did experiments to show animals in motion. He may have been responsible for suggesting the idea of celluloid film to Edison. Some now seek to give the exclusive credit—inappropriately, I think—to William Kennedy Laurie Dickson, one of Edison's associates. He worked in Edison's lab and was undoubtedly an important figure in making the motion picture a practical device.

Edison drew from people all over the world, but he was the conceptual leader. When you see the evolution of the kinesiograph through the drawings and patents he presented to the Patent Office, you see how his repertoire becomes an interpretive tool. Invention is a social process. Yet we heroize figures, casting invention in this culture's individualistic values. But in truth, Edison was usually working in a highly collaborative environment. He even institutionalized collaboration by developing an independent research laboratory.

Omniscient: So collaboration was vital to Edison's creative process?

Jenkins: Yes, but there's another level of collaboration. Somebody had to put up the money for all this. Edison had contracts with key figures in the telegraph industry—with Western Union, the dominant company, and with its subsidiaries like Gold and Stock Telegraph Company, and even made Edison sometimes found

himself under contract with competitors. That led to some awkward situations but didn't seem to faze Edison. These leaders in the telegraph industry were in a series, setting the larger agenda. They wanted to increase message density into their systems, for example—send two or more messages on the same line at the same time to save cost of construction.

Edison and other inventors were reacting to this agenda. Of course, they'd also give the entrepreneurs ideas of things advantageous to them. Both sides were changed by the collaboration. Edison became more cost conscious. And as the telegraph industry grew to respect Edison's technical capabilities, his opinions were more likely to be acted on. As an editor here, Paul Israel, noted, we see a progression within the telegraph industry during the 1870's. Companies start out buying new things patented by each inventor, then they try to capture the inventions. By the time Edison established his lab at Menlo Park, thirty miles southwest of Manhattan, in 1876, he had a very good contract with Western Union, which helped finance the lab. It was still Edison's lab, but they provided resources that allowed him to maintain his work.

Omniscient: He was playing many sides. Jenkins: Oh, indeed. He might not have done so well in the system that later evolved, where inventors became part of



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# The Artist

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Do you consider art  
a full-time job?



If I was as good  
at questioning  
I'd be  
another Barbara Walters



the industry and served mainly to protect the patents of the dominant companies. Inventions that really revolutionized an industry usually come from outside. Edison was able to get the best of both worlds—being an outsider and an insider at once.

Another important aspect of his creative process is that he worked on so many different products at once. Moving back and forth between projects permitted not only cross-fertilization but the ability to break out of the way had been looking at problems before. One of Edison's real strengths, paradoxically, comes from his ability to look on to a distinctive repertoire: work by analogy, and yet not get stuck in a groove.

An interesting example of that paradox involves Edison's tendency to use carbon. In the early 1870's, trying to improve oceanic telegraphy, he wanted to make a tabletop model of the Atlantic cable that would match in a small space the total electrical resistance of the ocean telegraph cable. He tried to use carbon connections to accomplish this. But the slightest bumping of the table, vibration, or noises from the lab machine shop, he found, changed the pressure of the connecting wires on the carbon connections and altered its resistance. Because he needed to maintain a constant resistance, he abandoned this approach.

A few years later he was working on an

improvement in the "speaking telegraph," or telephone. This time he wanted a material that would vary electrical resistance on the phone line, corresponding to the varying sound waves created by a speaker's voice. His solution was to use a thin metal plate that vibrated in response to the voice. This diaphragm pressed on a small carbon button that varied the current in the line. This major improvement in the telephone resulted from his remembering his previous failure that used carbon. For Edison, such failures simply enriched his repertoire.

**Qent:** How would you compare George Eastman's creative process to Edison's? **Jenkins:** Oh, boy, that's a tall order! Edison was unusual, compared to inventors like Eastman, McCormick, Fulton, or Morse. Eastman was more typical of the inventor who invented something, got it to the marketplace where it was highly successful, then got captured into the business and finally became the yoozon promoting that product.

By contrast, Edison was the perpetual inventor. He also carried the invention pathway into the marketplace—but then went back to the lab. He almost got captured with electric power, nearly closing down Menlo Park and going to New York City to work on power generation. But finally he turned his back on the lighting business and used his money to build the

West Orange lab, ten times the size of Menlo Park.

**Qent:** He was not, then, naive about realities of the "outside" world?

**Jenkins:** Edison thoroughly loved the problem-solving process in technology. But that wasn't enough, either. He also used the public attention. He had a background in journalism, was open to the press, and always made good copy. Of course, the publicity helped him to get resources, especially when he needed to borrow money from Wall Street. He could also use publicity to get other things he wanted.

In December 1880 the Edison Electrical Illuminating Company of New York was just established [today's Consolidated Edison]. Edison and company intentionally established their first illuminating plant near the Wall Street commercial establishments. To distribute the electricity, they had to tear up the streets and put in conduits. And to do that they had to deal with the city council.

Edison and his cohorts decided to show the aldermen the wizardry of electricity, so he invited a group of them to Menlo Park. When they got off the train in late afternoon, Edison and his associates gave them a tour of the power plant. By the time they arrived at the main lab, it was getting dark. Climbing the stairs to the second floor, some of the aldermen



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started grumbling. As soon as they got to the top, Edison clapped his hands, and someone threw a switch. The floor was instantly flooded with light. All around were waiters—prim and proper in black tie—and tables of food. They were being served by DeLeonzo's, the most famous restaurant in the country. All this was part of the elaborate lobbying effort Edison made at the time. We think of this sort of thing as modern.

But at a far deeper level, what really drove Edison was technological play—being in the lab and engaging in a contest with nature. He was trying to get nature to yield itself. He wanted to be clever enough to figure it out. His technological style, the way he could toss out things that nobody else could, reflects that drive. It was the real intellectual game for him. **Ques:** How did Edison view the rules of this game?

**Jenkins:** He wanted to invent whole new systems, not just make isolated innovations. As a telegraph operator and telegraph inventor, he spent fully a decade working on telegraphy. But you could make telegraph inventions without looking at the whole system—improvements on keys or something. That isn't the kind of thing Edison addressed. He was engaged in inventing new circuitry for automatic telegraphy, for facsimile telegraphy, for duplex and quaduplex [more than one message on a line] telegraphy, and

for the telephone. Each of those involved a transmitter and receiver in reciprocal relationship. Whatever happened here was going to affect something over there.

When Edison worked on electric lighting, he didn't just invent a lamp. He created a whole system of electric lighting, a new generator, a new principle of how to do practical lighting, serving a large number of customers. The games Edison most loved to play with nature involved the wholeness. Perhaps it has to do with Edison's intuitive sense that there is a whole. By inventing, perhaps he was seeking his own identity in that whole—where he could place other inventor's ideas into his larger vision and get something out of return nobody else could. **Ques:** What were some of his friendships with other inventors and scientists like?

**Jenkins:** Edison met Henry Ford in 1890 at a meeting of the Association of Electric Illuminating Companies in Brooklyn. Ford had been working for a few years at Detroit Edison and, on the side, on his internal-combustion machine. All the guys in the business wanted electrical cars, of course, and at the meeting they had a big session on them. Afterwards, at dinner, Ford was seated at Edison's table, and somebody started drawing Ford out about his engine. Edison was all ears. But since Edison was hard of hearing, someone suggested that Ford move over next to him. He began asking Ford penetra-

ing questions. Finally Edison slammed his fist on the table saying, in effect, "You've got it, now go for it." Ford had been pretty discouraged until then and later attributed that incident as a turning point in his motivation.

Edison and Ford developed a very close association over the years—Ford looked up to him as a father figure. Ford and Harvey Firestone would join Edison on touring camping trips. Those trips were famous. In 1929, for ten million dollars, Ford moved and restored the Menlo Park lab in Dearborn, Michigan, including two truckloads of New Jersey soil, to commemorate the fiftieth anniversary of Edison's invention of the incandescent light bulb. Edison came to the opening celebration, and Ford had him reenact the invention in the restored lab. Ford brought together celebrities from all over the country, including President Hoover. He even had a hookup with Einstein, who said a few words from Europe. But Edison had no business being there; he was in very bad health and collapsed toward the end of the event.

On the other hand, Edison sent a letter to Charles Darwin in the late 1870's. It's now in the British archives. This was during the time he was getting a lot of attention. He'd really made it, so to speak; he was part of the top crew. In the letter to Darwin he described running across an unusual insect at Menlo Park—there was a detailed description of the bug, including a particular odor it gave off. How his ego must have been deflated by the response we found in our archives: a mere postcard thanking him for his letter, signed by Darwin's son, saying that Darwin could not respond.

**Ques:** Did Edison think what he was doing was making life better for people?

**Jenkins:** Absolutely. In "Machine and Progress" Edison wrote, "It has been charged abroad and occasionally at home that we of the United States have become a machine-ridden people, that we are developing upon lines too completely mechanical. The very reverse is the truth. We are not mechanical enough. The machine has been the human bangle most effective means of escape from bondage. Too many people, [sic] even now remain bond-slaves to laborious hand processes."

**Ques:** The modern world views progress—in the form of technology—as its most important product. As an Edison historian, how do you view this idea?

**Jenkins:** Edison invented because he was playing his game with nature. He played with forms and created new inventions, but it may be far too simple to view what he created as "progress." To understand the relationship of technology to progress, it's useful to think about the concept of efficiency in technology.

We often think that the goal of technology is increased efficiency. Efficiency is progress. But what are the criteria for ef-



efficiency? Are the criteria constant, so that we get more efficient with every "advance" in technology? I don't think so. I'd argue that efficiency is redefined with each different time period and society. Progress is in the eye of the beholder. Progress is a product in one sense. It is changing tastes and cultural values. It's not advances in some absolute sense. **Orrin:** That idea may be hard to swallow. The notion that better technology leads to life being better is almost the cornerstone of American materialism.

**Jenkins:** I think that's a little bit like Edison's time, and he helped reinforce it. But it's an idea we should question. When Ford used the production line, I was the greatest thing since apple pie for efficiency. Then in the Sixties, questions arose about what production lines did to people. In the Seventies you heard about the Swedish model—getting groups together and giving them responsibility and autonomy—as maybe being more efficient. From period to period the standards of efficiency change, and so does the measure of progress.

**Orrin:** Why aren't we aware of this?

**Jenkins:** The engineering community usually doesn't question the criteria for efficiency. They just assume they know what these criteria are, that whatever they have learned in school is the measure of efficiency. That kind of unaware attitude tends to foster a view that technology is controlling us, rather than us controlling it.

In the environmental case, engineers assumed that the most efficient way to produce chemicals was to maximize the tons or barrels of sulfuric acid or anything they could pass through the output door. Now we're beginning to see other considerations involving what are now called externalities—for example, pollution.

People used to think that scientific knowledge was progressing. Now at least some believe that science isn't moving toward some ultimate knowledge to truth with a capital T. But technology is the last bastion of Western belief in progress. Some people questioned progress in science, but few have raised this question with regard to technology. I question whether any technology at any point in history is capable of representing ultimately superior knowledge. The technology of any era is very much a reflection of the society, resources, and culture of that era.

**Orrin:** Right now there's concern that the United States is losing its technological edge. What's your perspective on this?

**Jenkins:** I hope we don't just throw money at the problem. We might catch up with the Japanese and, without realizing it, lose something of our culture that's more valuable in the long run. We need to be conscious of the goals and values that have become embedded in our technologies.

We can read technologies. The disappearance of the front porch occurred

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as communities fragmented and TV became our communicator. And most obvious is our commitment to material/technical progress. We have a belief that each generation will start materially where their parents left off. Now we're seeing a generation emerging where that's not going to be the case. The connection between the economic and the technological is strong. Our ideas about what the appropriate goals are and what the meaning of life is have been cast largely in economic and technological terms. New technologies, such as the computer, become an end in themselves, confirming our belief in progress.

When we imagine the future, we tend to see it as the efficient city, the New Jerusalem. We think technology will bring our salvation. Our immediate goals are to have a VCR, a microwave oven, CD player or a digital whatever. We all say we don't have the time to do what we really want to do, but what in fact are our agendas filled with? They're largely filled with the pursuits by which we can gain more technological gadgets. We measure our success in terms of new technology.

**Orrin:** Would everything collapse if we changed our values and stopped producing and buying all this stuff?

**Jenkins:** I'm not a prognosticator. But I think if we became more thoughtful about the implications of new technology, that would in itself represent a new form of

progress. Let me put it in personal terms.

Thank nothing in my daily working with the kind of time and method studies my father did. Some very positive things came from them in terms of productivity. But there was a fine line between enhancing productivity for the same amount of effort and increasing it at the physical and psychological sacrifice of the worker. When you're developing technology, it's very important to find that fine line. If we did this, I don't think we'd bring research labs to a screeching halt or put engineers out of business. We would have a better society.

**Orrin:** Are you saying, then, that we should develop only technology that is integrated with the whole?

**Jenkins:** We should try to be aware where innovations may lead socially. Such forecasting would be a guess, but we should do it. There's so much momentum that comes from the assumption that anything new is automatically better, it's very difficult to slow it so we can be thoughtful about the implications. Many built-in interests and incentives exist for pushing ahead, sometimes very appropriately. But there is that fine line.

**Orrin:** Obviously materialist technology is self-perpetuating. Until the Europeans came to this continent, Native Americans didn't need guns. With bows and arrows they could get all the food they wanted. But the white man wanted furs, and the







## GETTING CREATIVE BIRTH OF A NOTION

"The ditchdigger, the dentist, and the artist go about their work in much the same way," author John Updike has said. "Any activity becomes creativity when the door comes about doing it right or better. The artistic impulse is a mix, in varying proportions, of childhood fantasizing brought on by not necessarily unhappy periods of solitude, a certain hard wish to perpetuate and prosaize the self, a craftmanly affection for the materials and process, a perhaps-supersensituous receptivity to moods of wonder, and a not-often-enough-mentioned ability within the macrocosm of the art, to organize, predict, and perceive."

Some researchers believe creativity is confined to the Einsteins, Curries, Mozarts, and Picasos who appear at rare moments in history. But others accept the idea that all of us possess creative ability.

For two decades Frank Barron, who had asss like Truman Capote, Norman Mailer, and Jessamine West sit down to take IQ, personality, and other tests, has been teaching students how to maximize their creativity. "You can teach people to think metaphorically, to challenge assumptions, and to use suppositions" what if "thinking," he says. "Students make up their own problems and work on them after practicing on problems that I give them."

To encourage and develop creativity traditional Western wisdom tells us, young people should be in school settings that allow them to explore freely. Harvard's Project Zero coordinator Howard Gardner, however, has found otherwise. "In China we found five- and six-year-olds drawing in the most wonderful way, copying basic schemata like

cherry blossoms and chickens," Gardner says. "We had them draw things they had never seen before and in styles they had never seen. We learned that it really doesn't matter whether you begin with a skill orientation or an exploration orientation, as long as you have both."

Project Zero coordinator David Perkins also tested part of Project Intelligence, a one-year course on cognitive skills for seventh graders in Venezuela. His unit of the course emphasized the analysis and creation of designs. At the end of the course, students and a control group who had not attended the creativity classes were asked to design a table for a small crowded apartment. Those who took the course outperformed the control group on several measures, including more detailed designs and twice as many solution ideas. The control group students' products included, for example, tables with folding legs or a single column.

The creative students' tables, on the other hand, had not only folding legs but folding tops, other designs were triangle-shaped to fit into a corner.

"You don't have to be a champion to get into the game, but even champions need to exercise," Barron says. "There is good evidence that by cultivating our own creativity, by exercising it, with a coach or by ourselves, we can put our creativity to better use." The exercises on the following pages, developed by Barron, will help you stimulate and enhance your creativity. And your responses to our questionnaire will help scientists learn more about the creative personality.—Neil McAlister



PHOTOGRAPHS BY MICHEL TCHEREVKOFF

# GETTING CREATIVE

## BIRTH OF A NOTION

### TOOLS OF INVENTION

To teach creativity, I combine thinking ability with dreamwork, reverse, automatic writing and painting, visual and auditory pattern recognition, and pattern creation. The choice of exercises here is based on theory and research that has identified such clear-cut mental faculties as adaptive flexibility, fluency of association, originality, the ability to integrate complexity, and a sensitivity to problems. These abilities are part of the method I have developed in creativity workshops at the University of California and elsewhere during the last two decades. Once you've practiced these exercises, you can make up your own problems, situations, or unlikely but possible events. The exercises can also be played as a game with others. Exercises that require much guided instruction and incubation are not included here.

Some words of caution: Feedback is important and may be especially valuable if you try to combine the image-equivalent exercises ("equivalents") with the situational-thinking problems ("hyperreality"). Remember that the aptitudes you're exercising are specific factors in the creative process. The creative act itself has a quality of wholeness: calling upon deep sources of motivation, experience, and style. The whole self creates!—Frank Barron



### PREVIEW

Before you begin the exercises, let's see how well you're already able to recognize an original idea:

Each of the situations below is followed by four responses. Two are common, the other two are uncommon and display original thinking. All are actual responses that were given in earlier studies. Which ones would you consider uncommon?

1. If all the major countries began constructing bomb shelters, guaranteeing the survival of at least 5

percent of the population there would be:

- a) the rise of a new aristocracy
- b) domestic strife
- c) a fight over who gets to use them
- d) a class action suit initiated by the remaining 95 percent

2. If one superpower developed an impenetrable defense against intercontinental ballistic missiles:

- a) The other superpower would stage an immediate ground and sea invasion
- b) There would be an accelerated effort by the others to catch up

THE CREATIVE ACT HAS A QUALITY OF WHOLENESS THAT CALLS ON MOTIVATION, EXPERIENCE, AND PERSONAL STYLE. IT'S THE ENTIRE SELF THAT CREATES.

- c) The whole world would organize against it
- d) Spies would proliferate and moles would come out of hiding

In the following series, you're given a simple image followed by two common and two uncommon equivalent images. Which ones do you think are uncommon responses? (Again, these examples are actual responses that were given in earlier studies.)

- 3. The sound of a lagoon
  - a) the bellow of a beast
  - b) a lonely visitor in a strange city
  - c) the despair of a great unseen animal
  - d) a cow mooring
- 4. A floating feather
  - a) a parachute
  - b) a gentle gesture
  - c) a whispered word
  - d) a falling snowflake



## Q & A

"Creativity seems to occur when there is an unforced balance between will and will-lessness," says author Joyce Carol Oates. "From what sources the riches of creativity come, how and why they are structured as they are, in such infinite variety, is one of our most profound mysteries."

This questionnaire, developed by Frank Barron, can be useful to you as a means of analyzing yourself. Think about yourself and your own values as you become aware of your own creative potential and the conditions favorable for its expression. You may also come up with other questions and answers; it's a sort of "self-and-situation" search. At the same time, you'll contribute to scientific knowledge. Your responses can help research

psychologists to discover important patterns in the creative mind.

**I.** What adjectives would you use to describe yourself? Circle one response to each pair of words in the following list.

outgoing/reserved  
conventional/unconventional  
conscious/impulsive  
emotional/analytical  
tasteful/flamboyant  
ambitious/content  
intuitive/factual  
natural/dramatic  
argumentative/peaceful  
prudent/risk-taking  
active/passive  
spontaneous/inhibited  
deceptive/delaying  
stable/changeable  
artistic/practical  
informal/formal  
egotistic/considerate  
energetic/easygoing  
rebellious/compliant  
methodical/clever  
enthusiastic/doubtful

**II.** Some situations may bring out your creativity; others may not or may even stifle creativity. Call to mind those specific circumstances that showed you at your creative best. Circle the number of each situation or activity in the following list that applies to you and your creative experiences.

1. giving a party
2. preparing a written report that analyzed a problem
3. giving a speech
4. organizing a group to accomplish a particular goal
5. establishing habits of value to you
6. making a phenomenally good guess about what was going to happen (or had happened)
7. understanding another person and establishing a feeling of rapport
8. winning a contest (or earning an award)
9. on the job

10. setting up a successful routine
11. at home with family
12. personal relations
13. handling your money, investments, or financial planning
14. reacting to emergencies, disasters, or calamities
15. planning for the future
16. other: specify \_\_\_\_\_

**III.** Certain traits have been found to generally go along with creativity. Respond to the following statements according to whether you agree or disagree. (After each number, write Y if you agree, N if you disagree.)

1. \_\_\_The unfinished and the imperfect often have greater appeal for me than the completed and the polished.
2. \_\_\_I would enjoy the experience of living and working in a foreign country.
3. \_\_\_Many of my friends would probably be considered unconventional by other people.
4. \_\_\_I enjoy discarding the old and accepting the new.
5. \_\_\_When someone says something against certain groups or nationalities, I always speak up against such talk, even though it makes me unpopular.
6. \_\_\_Perfect balance is the essence of all good composition.
7. \_\_\_Straightforward reasoning appeals to me more than metaphors and analogies.
8. \_\_\_I much prefer symmetry to asymmetry.

# GETTING CREATIVE

## BIRTH OF A NOTION

9. \_\_\_ When people have problems or worries, it is best for them not to think about them and to keep busy with more cheerful things.

10. \_\_\_ An invention that takes jobs away from people should be suppressed until new work can be found for those put out of work.

11. \_\_\_ Some of my friends think that my ideas are impractical, if not a bit wild.

12. \_\_\_ I must admit that I would find it hard to have close friends whose manners or appearance made them somewhat repulsive.

13. \_\_\_ People should not probe too deeply into their own or other people's feelings and should take things as they are.

14. \_\_\_ I prefer team games to activities that pit one individual against another.

15. \_\_\_ I could cut my moonings—leave my home, family, and friends—without suffering great regrets.

16. \_\_\_ I believe you should ignore other people's faults and make an effort to get along with almost everyone.

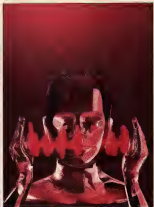
17. \_\_\_ The best theory is the one that has the best practical applications.

18. \_\_\_ I like to fool around with new ideas, even if they turn out to be a total waste of time.

19. \_\_\_ I would rather have a few intense relationships than a great many casual friendships.

20. \_\_\_ Pollution has gone too far to reverse its direction and effects.

21. \_\_\_ We should plan now to make nuclear energy



the main source of energy in the twenty-first century.

22. \_\_\_ The United States should strike first, if a nuclear war seems imminent.

23. \_\_\_ I would push "the button" if necessary.

24. \_\_\_ One of the things I value most is creativity in myself and others.

25. \_\_\_ I get most of my world news from television.

26. \_\_\_ We should spend a lot less money on armaments if we want a strong economy.

27. \_\_\_ I would be interested in transforming possible solutions to the nuclear arms race with a group of equally interested people.

28. \_\_\_ I favor a nuclear freeze now.

29. \_\_\_ I would vote to give up my American citizenship if a world citizenship under a global government were feasible.

30. \_\_\_ I think a nuclear exchange could very easily be accidentally precipitated.

31. \_\_\_ The policy of "deterrence" through the balance of terror is one of the best solutions for world peace in the foreseeable future.

IV. Information about your creative self. Place a check mark before those responses that best apply

1. I consider myself  
a) \_\_\_ creative  
b) \_\_\_ not very creative  
c) \_\_\_ potentially creative

2. I am inhibited in expressing my own creativity by

a) \_\_\_ something within myself  
b) \_\_\_ factors in my life situation such as \_\_\_\_\_  
c) \_\_\_ both of the above

3. As a child, I was considered creative by

a) \_\_\_ father  
b) \_\_\_ mother  
c) \_\_\_ teachers  
d) \_\_\_ friends  
e) \_\_\_ myself  
f) \_\_\_ no one  
g) other \_\_\_\_\_

Female \_\_\_ Male \_\_\_ Age \_\_\_  
Highest level of education completed

\_\_\_ elementary school  
\_\_\_ high school  
\_\_\_ college  
\_\_\_ graduate

\_\_\_ postgraduate  
Ethnic or cultural background

black \_\_\_ white \_\_\_  
Hispanic \_\_\_ Asian \_\_\_  
Native American \_\_\_

other \_\_\_\_\_

City of residence \_\_\_\_\_

Occupation \_\_\_\_\_

Income \_\_\_\_\_

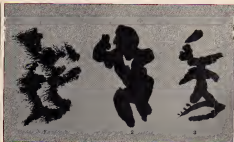
\_\_\_ less than \$10,000

\_\_\_ \$10,000 to \$24,999

\_\_\_ \$25,000 to \$49,999

\_\_\_ \$50,000 or more

Mail your completed questionnaire to Creativity, c/o Omni, 1965 Broadway, New York, NY 10023-5665. We'll report the results in a future issue—and you'll find out how your responses compare with those of other Omni readers. **OO**



## GETTING CREATIVE

CONTINUED FROM PAGE 114

5. Sitting alone in a dark room

- a) a person in a crowd
- b) the sound of a violin with no strings
- c) insomnia
- d) patience

Answers: 1) a and d, 2) a and c, 3) b and c, 4) b and c, 5) b and d

## MISSING LINKS

Give the first word that comes to mind when you read each of the following table

lake \_\_\_\_\_  
pet \_\_\_\_\_  
ang \_\_\_\_\_  
ball \_\_\_\_\_

Common responses to each of the above words are cheer, water, cat, queen, bat. Uncommon responses: bear, mountain, kangaroo, Kong, dance

Your responses may already be a bit uncommon, but try to make them more so. Run through them a few more times, speeding up your responses if you wish.

## EQUALIZERS

Picture the following images. For each, think of a scene that is different but equivalent.

- wind-blown leaves
- a train entering a tunnel
- a candle burning low
- tall trees in a field
- empty bookshelves

Here are a few common image equivalents for each of the above:

- wood chips carried downstream by a current
- a snake entering a hole
- the end of a lifetime
- skyscrapers
- a deserted room

Uncommon image equivalents:

- a civilian population fleeing before invading forces

- a nail being driven into a plank
- a smile ending in sadness
- a council of elders
- a ghost town

Now take a look at your own responses. They may already be unusual. But repeat the exercise, stretching your imagination even further.

## STROKES OF GENIUS

Patterns can occur in visual displays, in written or spoken words, in musical phrases, in olfactory sensations, and, of course, kinesthetically. The key to recognizing and changing patterns lies in looking at them again and again. People often see patterns in the inkblots above. What patterns do you recognize? Search your mind for uncommon patterns. Keep looking! That's often the secret to

TO RECOGNIZE OR CHANGE PATTERNS, YOU MUST LOOK AT THEM AGAIN AND AGAIN. WHAT DO YOU SEE IN THE INKBLOTS AT LEFT? KEEP LOOKING.

creativity. Here are some common and uncommon responses for each inkblot.

1. Common responses:

smudges, dark clouds

Uncommon responses: iron filings, a small boy and his mother hurrying along on a dark, windy day

2. Common responses: an ape, a modern painting of a gorilla

Uncommon responses: a balloon looking at itself in a mirror, Rodin's *Thinker* shouting "Eureka!"

3. Common responses: a voodoo dancer, a cactus

Uncommon responses: a person wearing a sombrero, a word written in Chinese

Try other patterns: other inkblots. Make your own inkblots by folding a piece of paper into equal parts. Open it and place a small blob of ink in the center. Fold the paper again and press the creases so that the ink spreads. Open it. What images do you see?

# GETTING CREATIVE

## BIRTH OF A NOTION



### CONFOUNDING CONFIGURATIONS

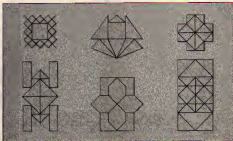
Carefully study the three simple geometric figures above. Each is concealed in at least two of the six complex figures in the larger group. Can you find them? Trace out the simple pattern within the complex one.

It's a form of elegance (or at least neatness!) to account for all the complexities in a pattern with a simple but complete explanation. For further practice, go back to the inkblots and try to make your responses more complicated—yet simple.

### MINCING WORDS

Word patterns, of course, are common. One writer has spoken of the delight he finds in "taking words out and putting words in."

What about words that are present in other words?



Sentences that have been jumbled? Or the letters of words that have been scrambled?

Take the word generation for example. Using only the letters in that word, what other words can you make? There are many common responses, like *nate*, *pane*, and *net*. But try less common responses, such as *naples* and *cation*, or even *onager* and *argentine*.

Here are a few groups of words. Rearrange them in an orderly fashion.

1. common course patterns  
Word are of (this, you've seen this one before.)

2. universe the doesn't dose  
God with play (You've probably seen this one, too.)

3. prefer phenomenal not  
unless unrelenting display  
complex simple mark To  
to a couple creativity is of a  
an it with drive a first order

4. more can of creativity use  
make The of no if we good  
more the we about or the all

Now try this jumbled haiku, a three-line Japanese poem with the last words of the first and third lines rhyming. The first word of each line is capitalized.

came name! with Lord even  
year's The first Mayors  
And end The unkissed

Rearrange these letters into a single word:  
adbscolemnansmehshetram  
(Of course, it's *establishmentarianism*!)  
Using only the letters in that large word, how many smaller words can you find?

### DISPARATE CHARACTERS

One of the greatest rewards in the exercise of creativity is taking disparate elements and putting them

into a pattern of your own. Below is a word group of 25 words. Make up a story using all of them. You might try using as few other words as possible.

chandelier, cool, wizened,  
poliborn, blazing, negale,  
heterosexual, shapely,  
magician, blatant, nuclear,  
grotesque, freedom, quirk,  
academic, mushrooms,  
skewered, optimism,  
psychedelic, and speed,  
quark, swift, praise, galaxy

Choose your own 25 words at random—from your head or a dictionary or have several people come up with the words. Then compose a story using all the selected words.

### HYPERSENSITIVITY

This exercise will help you increase sensitivity to problems and come up with original solutions.

The following events haven't occurred but could if they did, what might the results be?

1. Earth's ozone layer is virtually destroyed
2. One country develops an impenetrable defense against intercontinental ballistic missiles
3. A terrorist group gains possession of a dozen ready-to-go nuclear bombs
4. The choice of having a boy or a girl baby can be made safely, viably, and legally by every mother
5. Mapping of the entire human gene pool (the Genome Project) has been completed, and the next generation will have "designer genes"
6. Medical scientists can cure certain disorders by making genetic changes in a patient's cells
7. Cryonics, preserving a corpse in liquid nitrogen and reviving it at a later time, is technically possible
8. The average human life span is 150 years
9. Time travel is achieved

## ASSUME NOTHING

It is reasonable to assume that the sun will rise tomorrow, that people will fall in love, that there will be a next generation. But some assumptions lock us into a view of the world that isn't necessarily so. If we challenge the assumptions, some things in our world may change. Challenging the assumptions, however, can be very serious business, as Galileo discovered. Often it takes



courage as well as wit.

Do cities have to be the way they are? Do schools? Why do we sort students according to grade? Why don't we let parents go to school with their children? Why have schools at all?

Some people might think these are unreasonable questions, but if you're going to challenge assumptions, you must let yourself be unreasonable.

Try challenging some assumptions to improve cities and schools. Choose three assumptions about each. What changes might be made for each of the six assumptions?

## POSTSCRIPT

In the first exercise, you tested your ability to recognize originality. Now let's see if you are better at spotting an original thought.

Using the same problems as in the first exercise, which of the following responses are uncommon?

1. a) a global resurrection of ex-Senator Proxmire's Golden Fleece Award
- b) more people on tranquilizers
- c) a boom in the construction industry
- d) a mass exodus of people going underground

**WE MIGHT BE ABLE TO CHANGE SOME THINGS BY CHALLENGING BASIC ASSUMPTIONS. BUT AS GALILEO SAW, CREATIVITY TAKES COURAGE.**

2. a) its leaders would start bossing the others around
- b) it would have the "upper hand"
- c) No one would believe it has been done
- d) There would be an appeal to the United Nations to take over

3. a) a belch
- b) the tearing of cloth
- c) a drunken snore in an empty room
- d) a lost child's cry

4. a) a person's life dancing in time
- b) a leaf in a stream
- c) a falling snowflake
- d) an unseen smile

5. a) lying in a grave
- b) a book written in an unknown language
- c) contemplation
- d) one letter in a mailbox

Answers: 1) a and c, 2) b and c, 3) b and d, 4) a and d, 5) b and d

# DOODLES

CONTINUED FROM PAGE 69

sometimes an unrealistic level of optimism. Doodles low on the page suggest feelings of insecurity, inadequacy and depression. Repeated placement at the edge or bottom of the page suggests the need for support, fear of independent action, and the tendency to avoid new experiences.

Guidelines for interpretation of individual doodles now follow below.

**1. THE SHAPE OF THINGS TO COME** Test number 1, developed by San Francisco graphologist Ann Mahony, is designed to show you the difference between your conscious attitudes and unconscious tendencies, which may often be suppressed. A frequent expert witness in both federal and superior court and author of the book *Handwriting and Personality* (Henry Holt), Mahony says that "when you look at the shapes in part A of the question, you have an immediate surface response. The doodle you create in part B is more important because it represents your underlying choices. If there is a seeming discrepancy between the shapes you are drawn to in part A and the predominant shape that emerges in part B, it's because they represent the

difference between conscious and unconscious impulses."

To help you understand your answers, we first present the meaning of each symbol, as established by Mahony. The circle is the love symbol, representative of affection, approval, camaraderie and playfulness in life. The square represents security indicative of a logical, practical approach and the desire to build a strong, secure foundation. The triangle symbolizes sex and aggression, characterizing those who value achievement over emotional involvement and have a restless desire to move on. Finally the squiggle signifies imagination, those who gravitate toward it value individuality and reject routine. They are often fascinated by foreign cultures, philosophy, poetry and music and tend to value others not for social influence but for inner worth.

You may see how you stand on both the conscious and unconscious levels simply by comparing your answers in parts A and B. For some hints about conducting your own self-analysis, let's see how Mahony analyzes the individual who created the picture in Figure 1 (below). "This person," Mahony says, "has created three dimensions in his doodle. Thus he is someone who wants to see right through an object, so that all its characteristics are clear. See how his cubism turns into triangles; it's very unusual for people

to create a triangular formation in three-D. This shows an investigative, exploratory mind with an aggressive spirit. On the surface he may seem controlled, but his mind is constantly dividing and subdividing the world just like his art. Perhaps most interesting is that he put the circle in second place in part A of the test, yet in his doodle the circle gets a very token, childlike treatment. Is there a contradiction here? Not necessarily. Love and affection are important to this individual, but these values are simply overpowered by the urge to be aggressive and to succeed. As the squares in the doodle indicate, security is important to this individual. He will seek that security, however, not from a love relationship but from being number one on the job.

Here are some questions to ask yourself as you analyze your own doodle. Did your answers on part A correspond to the doodle you produced in part B, or did the two parts clearly diverge? Examining your response to question 1, do you think there are parts of yourself of which you are not consciously aware? If so, what are they?

**2. FIELD STUDY** Exercise 2 is based on the Wartegg drawing test, a system of personality analysis used widely in Europe to reveal unconscious experiences otherwise expressed only in dreams and handwriting. It was translated into Eng-

## THE KEY TO YOUR DOODLES





ish from German and adapted for Omni by New York graphologist Hilda Halpern, a personnel consultant and expert court witness. Halpern's comments are drawn from her own studies as well as from interpretations suggested by psychologists around the world. She provides a rundown, below, of the eight boxes, or fields, and the starting symbols within.

- **Field 1:** The dot in the center represents the ego and often pertains to one's emotional reaction to the environment. The test taker's work in this square may indicate a general approach to problems. For instance, if straight lines radiate from the dot, the doodler shows enough confidence and versatility to approach problems directly through a number of different solutions. If the dot is surrounded by a maze of lines, the doodler may be particularly self-protective or trapped in a particular situation or mind-set, literally unable to move.

- **Field 2:** The wavy line in the upper left-hand corner represents movement. Depending upon how you interact with it, you may demonstrate a tendency to move freely through your environment or a need to exist in a clear cut, structured terrain.

- **Field 3:** The three vertical, mounting strokes indicate ambition and enthusiasm. If the doodler enhances or accents this symbol, he tends to be driven and goal-oriented. He obscures this symbol, he lacks the qualities above.

- **Field 4:** The dark square in the right-hand corner represents a resistance or problem to be overcome. The image you draw around it often indicates an active or passive style of dealing with problems.

- **Field 5:** Two unconnected diagonal lines appear in the left-hand corner of this box. The two opposing lines make test takers to advance into the space, the way they advance reveals much about who they are. Crossed lines—including renderings of hammers and swords—indicate aggressiveness or hostility. Totally unconnected lines indicate indecisiveness, lack of willpower or repression.

- **Field 6:** Two separate lines: vertical and horizontal, represent unity, either past or present, with the emotions and the environment. They also represent relationships between parents, siblings, and husband and wife. Balanced strokes signal a balanced environment, while unbalanced strokes indicate unstable factors in the test taker's world.

- **Field 7:** The dotted half circle in the right-hand corner leaves a wide field for expression of delicacy, affection and sensitivity. In Field 7, the test taker reveals the absence or presence of those characteristics.

- **Field 8:** The convex curve represents a protective shield. The way in which test takers seek protection—among other humans, in natural forces, in silence, or in material things—will be revealed by their work within this square.

In order to interpret a doodle, says Hal-

pern, you must ask yourself two questions: What was drawn, and how was it drawn? As in the interpretation of handwriting, Halpern notes, "the individual works with space, form, movement, and pressure. Angles, curves, and originality are all important elements. For instance, if a doodler prefers soft curves over angles, one can see soft, female elements in the personality. Use of straight lines expresses firmness, goal orientation and self-confidence. Just as in handwriting, the angle represents contradiction, resistance, and tension. If used frequently in drawings, it points to aggressiveness and stubbornness. Combined with a firm stroke, it indicates wishty and willpower. The concave curve is interpreted as adaptability, obligingness, softness, sociability, receptivity. The convex curve shows conservatism and protectiveness of self and others and a lack of openness. The circle or oval indicates sensitivity and lack of initiative or activity."

*“This doodle shows an exploratory mind with an investigative spirit. On the surface the doodler may seem controlled, but he is constantly dividing and subdividing the world, as he does his art.”*

A repetition of these basic stroke combinations reinforces the psychological significance of each drawing.

To show you how these drawings may be interpreted, Halpern discusses the field study of a twenty-eight-year-old woman, whose doodles are shown in Figure 2 (page 120).

"My overall impression," says Halpern, "is that her drawings take up considerable space, indicating a desire for attention and importance." Here's a breakdown, field by field:

- **Field 1:** with an expanding spiral surrounding the dot, indicates an inflated ego and exaggerated self involvement.

- **Field 2:** consists of a juvenile face turned to the left, the left is often considered a symbol of the past. The black eye indicates fear of looking at what happened back then. (The woman's father committed suicide when she was ten years old.) Since the left side of the field also often signifies the self, the woman's attention is quite obviously focused on herself. This is confirmed by the exaggerated size of the drawing.

- **Field 3:** This playful, almost random

drawing works against the pattern of the mounting "ambition" lines. This individual seemingly lacks direction, the need for encouragement is clear.

- **Field 4:** Here our doodler has created a checkerboard. By reproducing the corner square, which indicates a problem, she is saying that she sees trouble everywhere. Notice that some of her squares are dark and others are light. This indicates that she is aware of some problems, while others are repressed. The checkerboard pattern also indicates the woman is playing games.

- **Field 5:** The uncrossed lines of the seesaw image in this field reveal an indecisive individual subject to mood swings. Again, the doodler is playing a child's game. The seeming lack of forward motion in the seesaw indicates that the doodler's energy may be blocked.

- **Field 6:** The tic-tac-toe game in this box indicates that the doodler considers her home environment a large playground. The huge game board, filling the entire field, indicates that the woman yearns to be the center of attention.

- **Field 7:** Here our doodler has created a small flock of birds within a larger flock. This indicates that she seeks affection and protection in a clan of close friends.

- **Field 8:** Here we see a rendering of nature, including a rainbow and clouds. The doodler tends to seek peace and security in nature. But the image of clouds partially obscuring the rainbow suggests this doodler is a dreamer who lacks drive.

Here are some questions to ask yourself as you look at your own doodles. Given what you know about the initial symbols in Fields 1 through 8, what do your pictures tell you about yourself? Do you draw recognizable forms or abstract symbols? Are your lines dark, indicating determination, or light, indicating uncertainty? Or do you put the accent on one corner only, thus disturbing the balance of the picture and indicating anxiety about moving forward? Do your pictures face left, indicating a look toward the past and/or a tendency to be self-involved? Or do they tend toward the right, indicating that you are future oriented and/or other-directed? Though the questions above may be suggestive, Halpern warns that for a truly valid interpretation of the Wartegg test, you must consult a trained professional. Results would be strengthened if used in conjunction with handwriting analysis, adds Halpern, since both are different forms of graphic expression. Getting the full meaning from a drawing, Halpern says, "is a skill that can take years to develop."

**3. MOOD SWINGS.** Adapted for Omni by Betty Edwards, best known for her book *Drawing on the Right Side of the Brain*, this test reveals a host of subconscious thoughts and emotions. It works, Edwards explains, by bypassing language, a left brain activity and going directly to the visual perception center or right brain.

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EF

The language of the right brain, Edwards says, communicates through line, shape, light, shadow and space, making subconscious thought visible.

While no two individuals ever produce drawings that are exactly alike, there are often broad similarities. For instance, Edwards found that a majority of people interpret anger with dark, heavy jagged lines that almost overwhelm the formal and joy with light, curving, circular forms that tend to rise. Depression is often an image placed low in its allocated space, indicating "lowness." Human energy or power is often an exploding image or rising triangular forms, while femininity is portrayed in the form of curves. Drawings of illness generally show one form superimposed on another, different form. You might have a better grasp of your own drawings after studying Edwards's interpretation of Figures 3A and 3B, shown on page 120. In Figure 3A, for instance, notice that the image for joy resembles the image for power, to this individual, joy is energizing. Oddly enough, this artist's rendering of fear-like energy and joy is an exploding form. It seems that for this individual, any strong emotion reverberates within. Also note that the artist in Figure 3A does not seem particularly overwhelmed by illness or depression, illness, in fact, is portrayed as nothing more than an annoying, temporary blip. Contrast this with the image for depression in Figure 3B. Depicted as a black hole in the center of the page, depression is obviously the center of this individual's life. For the individual in Figure 3B, illness, too, is a serious matter, as indicated by the dark, serious lines. The images of joy, peacefulness, and femininity indicate a certain superficial bubbly quality, but even these communicate a certain underlying darkness, as though this individual is hiding depression and fear.

Here are some questions to ask yourself as you analyze your own doodles. Which doodles seem similar to one another? What does that tell you about yourself? Which emotions seem most intense? Do your drawings seem to give some emotions more precedence than you yourself do? How do your doodles differ from the ones most commonly produced by others? What have you learned about yourself as a result of this doodle test?

4. **BAD WRFS.** Also developed by Edwards, this test is designed to give you a better grasp of the problems in your life. To understand your doodle, take the finished drawing and hold it at arm's length. Now look at it. In front of you is a message from the visual-perceptual part of your mind. The next step is to capture its meaning in words. Study your drawing and allow its message in words—either silently to yourself, in writing, or out loud. Next, memorize your drawing and hold the drawing and the words in your mind at once. Close your eyes and try to call

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up the image in your mind's eye. If you can't look at your drawing and your words and try again.

Here is Edwards's reading of two sample problems. In Figure 4B (page 120), entitled *The Broken Relationship*, the dark area on the right represents an obstacle that may have prevented the relationship from moving forward. The central diagonal of triangular forms and the opposing area of squares indicate two very different groups of people—perhaps family, say, and friends—involved in the relationship. The forms floating between the dark, barrier-like edge and the center area represent the flow of events. And the exploding, bubble-like form to the left represents the artist—now escaping turmoil to experience a sense of renewed energy and power.

At first glance, Edwards notes, the drawing is happy and confident, with strong, clear, vigorous lines and an upward-springing flower form that suggests a sense of joy. When the drawing is studied upside down, however, its sharp and piercing character is revealed. What is joyful and confident now reveals itself as somewhat aggressive and contentious," Edwards says, "perhaps revealing the drawer's contribution to the breaking of the relationship."

In the vocabulary of drawing, Edwards says, the *Unlabeled Problem* shown in Figure 4A (page 120) recalls images often used to depict depression. Here the doodler—represented by the horizontal line—is placed as low as possible in the format and occupies minimal space. All the "other"—represented by the vertical lines—are active and moving, but they do not interact with the doodler, whose symbol is passive and still. Indeed, the doodler remains isolated and somehow lowly, like a worm. Confirming this interpretation, on the back of his drawing the doodler wrote, "The problem is that I feel lonely and alienated. I feel as though I don't fit in."

The doodler himself then turned his drawing upside down and had this to say: "When I turn my drawing upside down it seems as if everyone is drawing toward me, and I am the one that is keeping myself isolated. I wonder if I do that?" He later decided that perhaps he did.

Here are some questions to ask as you analyze your "backview" doodle. What is your intuitive response to each of the drawings you have produced? Which element in the doodle represents you? What people, things, or ideas do the other elements represent? Do any of the images in the doodle remind you of any of the mood drawings you produced in the previous exercise? If so, what does that similarity mean? What is your doodle telling you about your problem? How has the doodle changed your perception of your problem? When you turn your doodle upside down, what new aspects of your problem are revealed?

Once you have looked at every angle, Edwards suggests putting the doodle aside and letting it incubate. She compares the process to putting all available information into a letter, dropping it in the mailbox, and waiting for a response.

**5. SELF-PORTRAIT.** The self-portrait test widely used by psychologists in the United States and abroad, has recently been adopted by psychologist Robert C. Burns of the Seattle Institute of Human Development. Burns has added to the notion of the self-portrait a second layer, one in which action and interaction are expressed. As you study your self-portrait, be on the lookout for stylistic features described at the beginning of this analysis section. Also be sure to look for any of the specific facial, body and clothing characteristics described below. Be especially sure to look at drawing size, shape, and placement, as well as at the emphasis or omission of body parts.

*•The triangle symbolizes aggression, characterizing those who value achievement over emotional involvement and seem to have a restless, even relentless, desire to move on.*

Also be sure to study the context of your self-portrait. Note what you are doing in the picture and with whom and where you are doing it. Indeed, you may have drawn yourself in the context of your family or your business, a different self will emerge in a business context than in a family one. Usually a drawing of the self at home tends to be very imitative, assembling a kindergarten drawing, while the one at work will be more mature. "You can go home and cry and yell," says Burns. "You can't do that at work and your drawing will almost certainly reflect that." Below, Burns summarizes the meaning of some other typical elements that may be found in your self-portrait.

• **Head.** Unusually large heads suggest high intellectual aspirations or dissatisfaction with one's intelligence. Unusually small heads suggest feelings of intellectual or social inadequacy.

• **Eyes.** Unusually large eyes suggest a suspicious nature; they may also reveal anxiety and hypersensitivity to social opinion. Unusually small or closed eyes suggest self-absorption or introspective tendencies.

• **Ears and nose.** Large ears suggest sensitivity to criticism. An emphasis on the nose suggests sexual criticisms. Emphasized nostrils indicate aggressive tendencies.

• **Mouth.** Emphases on the mouth suggests primitive, oral tendencies—or a possible speech problem. Omitting the mouth suggests either depression or a reluctance to communicate.

• **Arms.** Arms reflect an individual's contact with his environment. Stiff arms suggest a rigid, compulsive, inhibited personality while limp arms at sides suggest ineffectiveness. Faint, flimsy, shrunken arms suggest physical or psychological weakness. Long, strong arms suggest ambition and strong interaction with the world. Very short arms suggest lack of ambition and feelings of inadequacy.

• **Legs and feet.** Very long legs suggest a strong need for autonomy. Elongated feet show strong security needs. Omission of feet suggests instability or lack of roots. Runaways, for instance, often draw people without feet.

Burns has analyzed for Ooni the particularly haunting self-portrait shown in Figure 5 (page 120). According to Burns, the self-portrait of a high-level corporate executive, age thirty-two, is a dehumanizing drawing that shows a person who doesn't tend to see other people. A product of our impersonal, computer-based society, his blank-eyed stare shows his indifference to the people around him. "It is easy not to watch others suffer if we have no eyes," notes Burns.

Here are some questions to ask yourself as you analyze your own self-portrait. If there are other people in the scene, who's on top (dominant), and who's on the bottom (dominated)? In our culture many children are on top, indicating a child-dominated family. Are any family members or the self omitted? Are members together or separated? Is there underlining at the bottom of the drawing, indicating an unstable family? Are particular family members underlined or encapsulated, indicating they may be unwanted? What are you yourself doing in the drawing? Are you sleeping, crying, or reading, indicating powerlessness? Or are you walking or climbing, indicating self-power and strength?

**6. THE HOME FRONT.** The doodle you created in response to Exercise 6 is best known as a *family-house tree* person (K-H-T-P) drawing. Drawings of houses, trees, and people have long been used by psychologists to penetrate the core of a client's personality. In an innovative approach to this sort of analysis, Burns regularly has his own clients draw a tree, a house and a person together in a single action-filled scene. Says Burns, "The interaction between the house, the tree, and the person reflects a visual metaphor. If you put the whole drawing into action, you can see what's happening in your life."

In simplified form, the tree in the K-H-T-P drawing symbolizes life energy. Your zest for life is represented by the thickness of the trunk and branches.

For example, people in retirement homes start to draw narrower and narrower trees as their enthusiasm diminishes. When the tree dominates the drawing, the doodle demonstrates tremendous energy and a positive approach to life. The person in the K-H-T-P drawing is the director of the "play" if you have someone other than yourself in the drawing—a child, say, or a spouse—then he or she is the driving force in your life. If you draw yourself, it indicates that you're in control of your own life. The house symbolizes the physical setting for the drama you've drawn. Depending upon its appearance, it may be your current home, your childhood home, the poorhouse, or even the house of detention. If the person is inside the house, it means that you want to be protected. If the house is extremely elaborate or if it dominates the picture, it may demonstrate your emphasis on material success.

One way to interpret the meaning of your K-H-T-P drawing is to examine the order in which you drew the house, the tree, and the person. If you drew the tree first, life energy and growth are of primary importance to you. Drawing the house first indicates an emphasis on nurturing, security, and success, or alternatively, a sense of doom for those things.

Below, Burns summarizes the meaning of typical elements found in K-H-T-P drawings. He starts with the possible characteristics of the tree:

- Tree blown and bent toward house. This is characteristic of those yearning for the security and safety of home. The image is associated with regression and sometimes with a fixation on the past.
- Branches flowing downward. This is usually drawn by those with unresolved problems. Weeping willow trees are often associated with such characteristics as depression and past fixations.
- Branches flowing upward. If the tree is well attached to the earth, it is associated with upward-moving persons "getting on" with their lives.
- Branches reaching outward. The sheltering tree is usually drawn by nurturing people, protectors of others.
- Profusion of branches and foliage on house side of tree. This suggests the person is putting an excess amount of energy into one aspect of life, neglecting balanced growth.
- Profusion of branches and foliage on side away from house. These doodlers tend to put energy into their own growth, rejecting or slighting family or other domestic values.

Here's a rundown on the meaning of some house characteristics:

- Chimney. Emphasis on the chimney suggests overconcern with psychological warmth of home, it may also reflect

concern about such things as masculinity, power, and creativity.

- Door. Absence of a door suggests psychological inaccessibility. A very large door allows social accessibility. A very small door suggests shyness. And a side door suggests escape.

- Roof. Significant cross-hatching shows a strong conscience and accompanying guilt. An emphatic or elaborate roof suggests concern over control of fantasy life.

- Steps and walkways. Drawn in a regular fashion, these suggest a desire for social interaction. Steps leading to a blank wall suggest conflicts with accessibility. Well-drawn walkways suggest control and social tact, while long walkways or steps suggest guarded accessibility.

- Windows. Absence of windows suggests withdrawal, while many windows suggest openness and a desire for contact with the environment. Curtains suggest concern for beauty and reserved accessibility. Very small windows suggest shyness and perhaps psychological inaccessibility.

To understand the meaning of features in the person part of the drawing, refer to the analysis for Exercise 5 ("SELF-PORTRAIT," page 124).

Burns also suggests you study your drawing for general characteristics such as pressure, stroke style, size of drawing, and placement on the page, as summarized on page 89.

To see how Burns applies some of these guidelines to interpretation of an actual K-H-T-P drawing, look at Figure 6 on page 120. The figure was drawn by "Tony," age twenty-nine. Burns has chosen to attribute it *Man Reared upon the Past*. "Tony draws himself looking at the house in the distance, with the tree leaning toward the house," Burns explains. "Tony has a great deal of nostalgia about the past. He says the house reminds him of the one he grew up in, three thousand miles from his present home. He thinks of the past often and wishes he were back in the old home. The self is curled up on the nurturing hill, looking at the house. Tony's energies are moving toward the past rather than focused on the present or toward an upward-balanced future."

What about you? What story does your picture tell? Whom and what do you see? Is the house a place to hide from a world perceived as hostile? Is the house broken, empty, or deenergized? Does it show signs of family life? Does the person appear aggressive or hostile? Is the person blank or vacant or downcast? Is the person seductive? Shy? Is part of the body hidden or omitted? Is it a person you would like to be? Is the tree alive or dead? Is it threatening or hostile? Does the tree seem protective? Nurturing? Happy? Sad? Is the person interacting with the tree or the house? If so, is the interaction positive? Do you see any personal symbols that give your picture a meaning only you can understand? **DO**

## SPACE

CONTINUATION FROM PAGE 81

market for remote sensing data, although growing steadily, is still too thin to support a profit-making business if that business has to price its images to recoup all its capital investment and operating costs, including launches. Proponents of Landsat lobbied hard, pointing out the unfair nature of international competition. All foreign systems enjoy major governmental support. The Office of Management and Budget (OMB) grudgingly agreed to include a subsidy in the upcoming 1985 federal budget request for the winner of the commercialization competition then in progress. Then as soon as the private-sector Earth Observing Satellite (Eosat) consortium had won the commercialization bid in late 1984, the OMB reneged on its promise and axed the subsidy funds from its budget request. Landsat has been sinking ever since. Landsat funding ran out this past March. Optimists are hoping that Congress will appropriate supplemental funds, but nobody inside the Beltway is laying any bets. Just recently NOAA started taking queries (and without invoking Eosat!) to the French about a possible Spot-Landsat joint venture in the mid-Nineties. But it's hard to see how you can join forces if Landsat has died in the interim.

And ironically, just as Landsat is on its last legs—and under the best of circumstances is going to confront at least a two-year gap in its data stream until a follow-on satellite can be built to replace the two old ones now dying in orbit—the intelligence community is discovering that hey, these Landsat multispectral data are hot stuff! Put it together with the data they get from their own "deep black" birds and you get some really important insights into subsurface structures—caves, hardened bunkers, and the like. Maybe our defense and intelligence communities will look more kindly upon a civil system when they find themselves forced to buy from the French or the Japanese. Or the Soviets. If anyone will sell it to them.

### SPACEWEEK UPDATE

A coalition of volunteers from the scientific, academic, and business communities, is planning Spaceweek, a nationwide celebration of the anniversary of two great steps for mankind—the first landing of a man on the moon in 1969 and the first unmanned landing on Mars in 1976. "You can help by bringing your community into the celebration and by involving more people in preparing for their future," says Spaceweek's volunteer president, Dennis Stone. Spaceweek is slated for July 15 to 24. Its events will focus public attention on the major issues of space exploration. For more information, contact Spaceweek, Box 58172, Houston, TX 77258. **DO**

# STAR TECH

## ACCESSING THE FUTURE

### POCKET PALS

This winter's Consumer Electronics Show, attended by more than 80,000 retailers, celebrated the move from laptop to palm-size. Behind this trend toward portable products for work and play is increasingly more powerful micro-chip technology.



### LABEL ME

If you're looking for a sign, try the P-Touch II hand-held lettering system (above). It prints labels in four colors, five sizes, and four styles. Price: \$329.50. Contact: Brother International, Piscataway, NJ, (800) 384-4387.



### TALK IS CHIP

Load the Voice Explorer (left) with its special vocabulary software, and it takes spoken English, translates it into a foreign language, then speaks the foreign phrase aloud. The Explorer already speaks Spanish and will soon learn French, Italian, and Japanese. Price: \$3,000; language cartridges, \$300 each. Contact: Advanced Products & Technologies, Redmond, WA, (800) 782-7663.

### GOT YA!

The Zap Shot (below) is a pocket-size electronic still camera that even tiny floppy disks instead of film. For

viewing pictures, just connect the camera to a television via serial or video jacks. Price: \$1,000. Contact: Canon, Lake Success, NY, (516) 488-6700.





### F/X-RATED

With its built-in editing system, the RCA Pro Wander video camcorder, model CC330 (above), expands the repertoire of the home videographer. The onboard editing features let you add narration, make cuts, and even perform animation. Price: \$1,699. Contact: Thomson/RCA Consumer Electronics, Indianapolis, (800) 336-1900.

### DAT'S MUSIC

Digital audiotape recorders are here. The Nakamichi 1000 (below) includes recording, processing, and remote control. Price: \$10,000. Contact: Nakamichi, Torrance, CA, (313) 838-8150.



### ROAD COPIER

The MC80 (above) is more than just a three-page copier that can instantly duplicate originals up to three and seven-eighths by six and one-half inches. Connect it to its

IM-F facsimile interface (not shown) and you can turn it into a tiny fax machine able to send images over telephone lines. Price: \$480; \$480 for the interface, too. Contact: Eltek, Fairfield, NJ, (800) 235-1899.

# GAMES

By Scott Morris

In the spirit of April Fools' Day, I'm presenting several challenges that should first be tried in private, since some of them will put you in awkward positions (literally). Unfortunately, April Fools' falls on a Saturday this year, so you'll have to put your friends on the spot rather than your co-workers. These connoisseurs require few props other than your own body.

The first illusion—discovered by magician Jerry Andrus—is similar to the "floating sausage" stunt. For this classic trick, hold your forefingers together a few inches in front of your eyes and focus on the far side of the room. When you separate the tips, you will see a disembodied finger with a nail on each end floating in space (illustration no. 1).

In Andrus's variation, you hold a pen or pencil in your fingers (no. 2a), place your hands in a prayer position a few inches in front of your eyes, and focus on a point in the distance. When the pencil is horizontal, it appears fairly normal, although the two halves are joined through the middle of your hands.

Now tilt your hands so that the pencil is at an angle. You will see it "shear," as in illustration no. 2b.

The psychologist Andrus and I talked with had never heard of this illusion. The effect, like the floating sausage, is caused by the brain trying to interpret the blurred, partially overlapping images taken in from the two eyes.

## DO AS I DO

Using only the hands, hence a stunt that's guaranteed to baffle. There's a well-known trick of asking someone to cross his or her outstretched arms, turn the palms toward each other, clasp the hands, and bring them back up in front of the face. Then point to a finger and ask the person to wiggle it. He or she usually finds this difficult and will inadvertently wiggle the corresponding finger on the other hand.

In this version clasp your hands the same way, bring your forefingers up (still crossed), and press the nail of each forefinger against your nose, as shown (no. 3a-c). Next separate your hands, raise your elbows, and leave your fingertips touching either side of your nose, as in illustration no. 3d. It looks easy, but get your hands to try it. Their wrists will get in the way of each other, so they won't be able to separate their hands. You can repeat this stunt over and over, and most people still won't figure out how you did it.

The trick relies on the fact that we have developed asymmetrical habits. There are two ways to fold your arms—right arm on top or left arm on top—and two ways to interlock your fingers—right thumb on top or left thumb on top. Every one has a preferred, "natural" way of doing this, and the preference isn't related to whether a person is right- or left-handed.

The stunt's secret is in



the first step. The way you cross your wrists in the beginning determines which hand clasp will feel most natural. If you cross arms with the left wrist on top, you will clasp hands with the left thumb on top, and vice versa. So when you initially bring your hands together, clasp them the "wrong" way—whichever feels most unnatural. Then in the last step, your wrists will unlock so you can comfortably raise your elbows.

## ILLUSORY STRENGTH

Here are some more body bafflers that will give the impression that you are superstrong. First, hold

your arms out in front of you, bend your arms so that the elbows point outward at shoulder level, then bring the tips of your index fingers together. Challenge someone to stand directly in front of you, grasp your wrists, and try to pull your fingers apart. (No jerking allowed.) Even a much stronger person will find it virtually impossible. The biceps muscles you use to hold your hands together are much stronger than the triceps muscles your friend must use to separate your fingers (no. 4).

After demonstrating your strength, ask your friend to place his two clasped



fits together in front of himself, one on top of the other, and try to hold them together. With just your forefingers, strike both fists horizontally and in opposite directions, as shown (no. 5). His fists will come apart easily. That's because muscles work in only one direction at a time. The muscles your friend uses to press his fists against each other are useless in resisting a simultaneous side-to-side force.

Of course, if your friend should counterchallenge, just remember the old trick of putting your thumb from your bottom fist inside your top fist!

#### DECEPTIVE WEAKNESS

Several body challenges exploit muscle weaknesses or deficiencies. Lay a wooden match across the end of your middle finger and place your index and ring fingers above the match, as shown (no. 6). Do you think you can break the match by finger power alone? Try it.

Place your hands together as in no. 7, with the middle fingers bent down and touching knuckle to knuckle. The other fingers and thumb touch their corresponding partners on the other hand. You can easily separate your

thumbs, forefingers and little fingers by several inches. But try to separate your ring fingers. They just won't come apart without the other fingers losing contact. Place someone's hands in this position with a coin between the ring fingers, and challenge him or her to release the coin without separating any of the other fingers.

Breathing through your nose and mouth is easy—most of the time. Newborn infants, however, can breathe in a certain situation that adults can't. What is it? (Answer: A.)

There's a place in all rooms where you can stand comfortably and yet be unable to lift your right leg. (No one can touch or restrain you in any way.) Where and how are you standing? (Answer: B.)

In a similar challenge, where in the room can a person be standing comfortably and unencumbered, yet be unable to jump or bend over without moving from the original spot? (Answer: C.)

Here's a maddening stunt to try at a bar or restaurant. Dip a dime in your drink and stick it to your forehead. Then make the dime fall off by wrinkling your brow. Repeat the performance, adding, "Isn't it amazing how I can do that?" Your friend probably won't be impressed, so dip the coin again and press it on his forehead. He'll start wrinkling and grimacing, but the dime won't fall. Encourage him with, "Come, you almost got

it!" but still nothing will happen. Finally, pluck the dime from his forehead and stick it on your own. Winkle your brow once and drop the coin into your hand. Why does this trick work for you and not for your friend? (Answer: D.)

#### ANSWERS

A) Swallowing. A baby can swallow and breathe at the same time, which is handy for uninterrupted sucking. We lose this ability at about six months.

B) Stand with your left side against a wall, touching it with your left shoulder and foot. As soon as you try to raise your right foot, your body's center of gravity shifts away from your left, and you will lose your balance and fall over.

C) Stand with your back to the wall and your heels, hips, and shoulders touching it. You won't be able to jump or bend over.

D) Cheat, of course. Press the dime to your hand's forehead, but when you withdraw your hand also withdraw the dime. Then watch and encourage him as if the dime were still there. Finally, reach up (with the dime hidden in your hand) and pretend to wipe the coin off his forehead and into your hand. What he felt on his brow was a patch of the cold water that the dime was soaked in. Because you've prevented him from seeing his reflection or from touching his forehead, he'll have a difficult time believing that he doesn't have a stubborn dime stuck to his face. **Q**





# LAST WORD

By Bob Mangino

• *Fluffy the rabbit's blood boils when he thinks of how petting zoos turn animals into bulimics. "People cram us full of cheap food all day, and we just gorge and purge, gorge and purge."*

The animals had it perfectly planned: Strike without warning. It was the boy's own fault—hanging around their pen without zoo personnel present. One minute they were a brood of cute baby ducklings, and the next, an angry yellow mob pecking and chopping in his face, their pupils dilated, veins bulging on their foreheads—venting their rage. In the other petting pens, animals cheered wildly, vicariously sharing the victory.

This lightning tale and the ones that follow were told to me by Fluffy, a four-year-old male rabbit. Some call him a macho man, some a savior, but zoologists classify Fluffy as a hard-luck case, a snail rabbit from a broken home. He's been bounced out of four petting zoos because he's too tough. As Fluffy explains, "I never attack without provocation, but after a long day of brats sticking lollipop to my fur and tinkling up my pen with their loaded diapers, I go berserk." With rage, Fluffy recalls last summer, "I suffered a sprained neck thanks to some little heckle-faced creeps heavy-handed petting," he says. But it's not just the physical abuse. Fluffy's blood boils when he thinks of how petting zoos turn animals into bulimics. "When people cram us full of that cheap food all day, we just gorge and purge, gorge and purge," complains Fluffy. "It makes me proud that the animals are fighting back. I want people to realize that we are wild animals, capable of the same savagery as a mother grizzly. We nibble on dry for food, but when you get in our way, we'll go for the jugular."

During our interview on the outskirts of Cleveland, he told me tales that made my hair curl—three of us keepers so threatened by attacks that they were afraid to report them. "I won't talk," the manager of Fluffy's zoo told me. "After all, I have to go back there tomorrow. How would you like to have incoming doves swoop at your eyes or chipmunks try to bury your nuts?" More and more animals are asserting themselves: the facts bear Fluffy out.

At the Caswell Game Farm last summer, Maillie, a red Rongoroo, stuffed three toddlers into her pouch. This was not an act of aggression from the 300-pound animal, but an act of parental instinct, at least that's what the authorities reported. Maillie confided that she was just plain fed of nasty brats snatching her pouch.

In his book *Ultimates: The Silent Killers*, Ramon Vargas documents cases of aggressive bulimics, powerful enough to slay at close range. He also warns that felines are excellent mimics of Suri-Sha, the ancient Incan mortal art. Vargas further proposes that the mass killing near Lake Nyos in Cameroon was not due to gases omitted from the lake but more likely "gases purposely emitted from the wild reedbuck, a close relative of the llama." Vargas is now

a zoo consultant on llama diets.

Everyone knows the danger of bending over in an enclosure with Billy goats, but did you know that rabbits are known to take uncult carrots and hurl them like spears at children's heads? Studies also reveal that rabbits prefer abusing children who wear eyeglasses.

Shetland ponies, long a favorite at county fairs, are notorious for pinning children to the fence with their soft snuzzles. One young boy, who prefers to remain anonymous, told stories of being forced to pose for photographs with a filly noding on his shoulders. Doctors say he will be swaybacked for life.

In Georgia's Inland Sea Zoo, children had been disappearing for years. Officials finally discovered that one of the Galapagos tortoises was lowering its shell over tots who had tripped on the gravel paths. Tortoises are renowned for "dropping shell" on unsuspecting toes, but this is the first reported case of hunting and gathering. Underground animal sources have established that years of being riden in circles exhausts giant tortoises, leaving them with incurable hemorrhoids. According to Lester Varnish, assistant zookeeper, "They stand on lippy-logs over a kid, then drop. Tortoises are too heavy for us to move, so we figure we'll wait and see if any parents come to the office." As no one has ever inquired about a lost child, zookeepers have never officially reported the incidents.

Even Manikoba's famed Beaverland has been beset by trouble. Tired of constant criticism and jeers that their construction talents are merely mimed, beavers have been kidnapping children and hiding them in their complicated lodges. Zoo officials thought nothing of this until they realized parents were actually paying sinners to obtain copies of supposed "lodge maps"—beaver blueprints to their underground tunnels. Before being punished, the beavers escaped, leaving behind a prospectus for condominiums in a mangrove swamp outside Miami.

"I think you got the point, Mac," growled Fluffy, as he pushed me down a hill. Polishing a set of bunny-ears, lucky brass knuckles on his fur, he cautioned me, "We don't want your stinker handouts, we just want some respect. We've tried it, squealing kids pulling our tails and drooling on our fur." He swears to continue leading what he calls the "freedom fighters" until humans respond to their demands for courtesy. Laughing maniacally, Fluffy yelled a final, derisive warning, "If we have to struggle in polar bears dyed like cuddly pandas and naked Tasmanian devils to pull it off, so be it." ☐

Bob Mangino retired from reporting and is now running a successful animal experiment laboratory.