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Far on the other side of the galaxy, the *U.S.S. Voyager* faces a bold task: to explore strange, new worlds—and find its way home. A look at the people making it possible. Cover art by Gary Hutzal, copyright Paramount Television. (Additional art credits, page 96)

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FIRST WORD

REMEMBERING THE PAST:

A new chapter in the old story of women and oppression

By Mark Pendergrast

Investigative journalist, accused father, and author, Pendergrast discusses the implications of recovered memory therapies for feminism.

In her 1972 landmark book, *Women and Madness*, Phyllis Chesler noted that "today, more women are seeking psychiatric help and being hospitalized than at any other time in history." Today, that is truer than ever. Chesler attributed this intensification of an old trend to the "help-seeking" nature of the learned female role, the oppression of women, and role-confusion in the modern age.

The female "career" as a psychiatric patient identified by Chesler has a long history, with women usually displaying the symptoms expected of them, ranging from depression to paranoia. Chesler tacitly acknowledges this history with the wry observation: "No longer are women sacrificed as voluntary or involuntary witches. They are, instead, taught to sacrifice themselves for newly named heroes."

One of these newly named diagnoses, amazingly popular since the publication of *Courage to Heal* by Ellen Bass in 1989, is that of Incest Survivor. Millions of women—and some men—have come to believe that all of their "symptoms" (depression, panic attacks, poor relationships, sexual dysfunction, bodily perils, nightmares, eating disorders, and other life problems) stem from long-forgotten sexual abuse. Only by recalling and reliving these repressed trauma memories can they be truly healed.

For centuries in Western cultures, women have often suffered from bizarre psychosomatic ailments asked and abetted by the "experts" of the era. Because of societal bias, females, considered the "weaker vessel," have

traditionally been expected to act out the role of the hysteric more often than males. Women, almost universally repressed, abused, and powerless to do much about it, have often conformed to the roles expected of them which at least allowed them sympathetic attention and an emotional outlet for their suppressed

and often justifiable rage. Little seems to have changed: The only thing that is relatively new about the Incest Survivor movement is its particularly awful slant—the virulent accusations against parents and other early caregivers, and the complete rewriting of the personal past.

I speak from experience. My own daughters cut off all contact with me after accusing me of unspecified sexual abuse. As a consequence, I spent over two years investigating recovered memory therapy (RMT). I cannot possibly summarize here all of the significant findings I detail in a 600-page book on the subject *Victims of Memory*. Suffice it to say, however, that there is no scientific evidence to support the concept of "massive repression"—the idea that human beings can or do completely forget years of abuse, only to recall it years later in therapy. On the contrary, there is a great deal of evidence which confirms that when a therapist suggests the possibility of repressed incest memories, confabulations (the psychologist's term for illusory memories) can easily result.

To question the validity of massive repression or the efficacy of RMT is not to deny the existence of real abuse. I am well aware of the horrors of real in-

cest—but no one forgets years of abuse. The real problem for incest victims is their inability to forget.

One of the tragic ironies of this movement is its supposed affiliation with feminism. I have interviewed scores of self-identified "survivors" who have recalled abuse memories. They are firmly convinced that, as they have been told repeatedly, "You have to get worse before you get better." They are thrown into a psychological hell in which they frequently lose their self-confidence, jobs, marriages, children, and sometimes their sanity—all in the name of "healing."

Though most therapists who help attract these "memories" truly believe that they are helping their patients, they do so by making women feel helpless, dependent, wounded, incomplete, and fundamentally flawed. Does that sound familiar? Women's lives are being harmed by a movement that feminists should abhor.

Back in 1972, Phyllis Chesler issued a prophetic warning about radical treatments that promise to help female patients in some special way. "People and social structures change slowly if at all," she wrote, adding that "most people simply obey new myths, as inevitably as they did old myths." Consequently, she was both excited and disturbed by the possibilities she saw in feminist psychotherapy. It could, she feared, simply turn into "authenticitarianism with a new party line."

Unfortunately, with the advent of RMT, that is just what has happened. With women's mental health on the line, let us hope that a new brand of feminist therapist will blow the whistle on this disastrous social phenomenon. **DD**

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READERS' WRITES:

A better beta version, unearthing more facts, and -
splendor in the gas

No Deposit, No Return

Regarding the sperm bank note [Anti-matter, October 1994], may I suggest the following Purdue campus scene? One (to a student) "I'm doing a story on college education and would like a little information on social life. I see you have a large Greek Beta on your shirt. Do you belong to a fraternity?" Student: "No, actually I don't. This represents my association with the local sperm bank. I'm a Master Beta."

Fritz Khan
Los Angeles, CA

Reality Check

I enjoyed the article on lucid dreaming [September 1994]. Regarding the anecdotal reports of people losing the ability to discriminate between dreams and reality, I would speculate that individuals with this problem already have an existing psychological disorder.

David Porter
Scotts, NY

Striking a Balance

Hats off to Omni and writer Margaret Wertheim for the excellent treatment of "Science and Religion" [October 1994]. Your fitting choice of scholars enabled you to dispel the idea that these areas of concern are in total and permanent isolation from one another. Student fundamentalists, whether of the theistic or atheistic stripe, whether zealous in the name of religion or science, have long resisted constructive interaction. It's time now for authentic scientists and theologians to engage in candid conversation and to see what each can learn from the other.

Howard J. Van Til
Grand Rapids, MI

I agree with John Polkinghorne's idea that we as a society need the insights of both science and religion [First Word, October 1994], but don't believe organized Christianity makes any attempt to be compatible with science. Christianity assumes a great deal. This is where the idea of Occam's razor could be applied. The best theory is the one which assumes the least. True science assumes nothing and observes everything. We need to cast off

the arrogant assumption that we could comprehend with any accuracy 'why' God created all this. We are burning out our brains arguing over something which we cannot possibly know in this lifetime. There is unlimited beauty and fulfillment in scientifically observing the infinite 'hows' of our cosmos.

Christian Crawford
Ceresbad, CA

Mounds of Evidence

Jeffrey Heck's article [Diggs, October 1994] was interesting, particularly the arguments and statements of curator Brad Lopper and author Stephen Wilkins who doubted the authenticity of the Newark Holy Stones. Perhaps speculation about authenticity should be withheld until the readily available evidence in the mounds has been fully examined. If the mounds contain additional similar stones which can be dated based on surrounding material proof of a Jewish presence in early America may be incontrovertible.

Roger G. Jenkins
Phoenix, AZ

The Gas is Always Greener . . .

I'd like to see another article on the use of helium-3 [Continuum, September 1994]. I once read an article on the theory that our planets are slowly moving toward our sun, the idea being that life hops from the inner planets to the outer ones as they approach "living position." Perhaps helium-3 changes into something necessary in the earth to come. Whether true or not, one does wonder if it is wise to deplete resources on Uranus which may be needed right where they are a long time from now.

Carol Tellingner
Mt. Shasta, CA926

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FUNDS

SECURITIES ARBITRATION.

The people's court for Wall Street.

By Linda Marsa

Making money in the stock market can be chancier than handicapping naps at the track, especially if you suspect the race is rigged. But unhappy investors who've been duped by scumious brokers don't have to suffer in silence. Now there's a way to fight back—and recoup their losses—without getting mired in costly litigation that can drag on for years.

Securities arbitration, a process geared toward a quick and cheap resolution of investors' claims, has become a sort of peoples' court for small investors, a way for the Davids of the financial world to slug it out with Wall Street Goliaths on a relatively level playing field. Since a 1987 Supreme Court ruling, in fact, investors who sign predispute arbitration agreements are now required to take their brokerage bewails to the organizations that handle securities arbitrations, including the New York, American, and Pacific Stock Exchanges, or the National Association of Securities Dealers (NASD), which hears about 85 percent of these cases.

Initially, small investors were doubtful they'd get a fair shake from forums controlled and funded by self-regulatory organizations for Wall Street's heavy hitters. But quite the opposite is true. A survey by Congress's General Accounting Office (GAO) discovered investors won more than half the time, and awards averaged about 60 percent of the amount claimed, in 30 percent of cases; arbitrators awarded investors what they claimed and more in punitive damages.

These numbers stack up even more favorably when you consider that perhaps half of the suits are frivolous. "Many of those sour-grapes investors are just suing their broker because they lost money, not because the bro-

ker did something wrong," says John Lawrence Allen, a San Diego-based securities lawyer and author of *InvestorBeware!*, or *How to Protect Your Money from Wall Street's Dirty Tricks*.

Little wonder claims have skyrocketed to 6,581 in 1993, up from a paltry 630 in 1980. Topping the list of offenses are suitability violations. That's industry perfunctory when a broker convinces your widowed aunt, whose scraping by on a scanty pension and interest from Triple A-rated bonds, to invest in wildcat oil wells. Other common infractions include misrepresentation, when your broker insists those dazzling 20 percent returns on junk bonds are guaranteed, omission of facts, where your friendly money maven conveniently "forgets" to mention the hot shot heading the firm floating those issues was indicted for securities fraud, and churning, where brokers make dozens of trades on an account to generate hefty commissions, not profits.

But now there is something you can do. If you suspect you've been victimized, construct a paper

trail of events: notes of conversations with your broker, account statements, and any other documentation. And then complain—loudly. If you can't get any satisfaction from your broker, write to the firm's branch manager and compliance department. If they stonewall, arbitrate promptly. For filing fees ranging from \$30 for a small case to \$1,800 for claims over \$5 million, this matter can be settled within an average of 10 months. "But once you choose this route," cautions Deborah Masucci, NASD's director of arbitration, "you've surrendered your right to go elsewhere if you're unhappy with the resolution."

But the best way to avoid being suckered is to check out who you are doing business with before you trust him or her with your money. The NASD has a hotline (800-289-9999), where you can find out if a broker has been disciplined by regulators or hit with claims from angry clients. Remember, no one can predict which way the market is headed. But honorable brokers protect their clients from the predators lurking in Wall Street's woods. ☐

It's what courts are set up to do but are too busy to handle. Arbitration is an old way to settle differences, but on Wall Street it's proving to be a successful new trend.



ELECTRONIC UNIVERSE

INTERACTIVE SCIENCE:

Multimedia for mad scientists in the making

By Gregg Keizer

When you were a kid, science at home probably centered around a beaker-packed chemistry set. Home science today comes on the computer. Multimedia and CD-ROM have jolted the subject back into a prominent place in stores.

I've yet to see the science CD that will make me toss the classic book *Aeons' Guide to Science* into the dumpster, but with a CD-ROM drive and speakers, the computer actually mutates in to a science project worth exploring.

DK Multimedia's *Eyewitness Encyclopedia of Science* is a good beginning, and a beginner's guide to the subject. Armed at kids 10 and older, *Eyewitness*'s clear explanations and bright illustrations may be as much help to science-challenged adults as to children. The CD-ROM, which runs under Windows on a PC, has 1,700 entries in five categories: chemistry, mathematics, physics, life sciences, and whole who in science. Separate sections highlight earth and space sciences. Guzman tests your knowledge, a "Whos Who?" section sports short bios of famous scientists, and an interactive periodic table feeds you the elements.

Eyewitness won't get you a B+ in biology, but its presentation is so slick and its language and approach so casual that you'll probably learn something new. Over 500 photos and a couple of hours of audio punch up the text. The video and animations, though not in any great numbers, are just as professionally put together. My only bone to

pick is its price, a steep \$130—enough to buy an armful of good science reference works.

DK publishes an even simpler CD, *The Way Things Work*. It may be more elementary (and more mechanical and technological in coverage), but like the book on which it's based, it gives you an idea of how things like the laser printer and telephone network work. In some ways, it's better than *Eyewitness*.

More substantial—at least on the informational level—the McGraw-Hill Multimedia *Encyclopedia of Science & Technology* is based on the reference work by the same name (minus "Multimedia"). Packing 7,300 articles in 61 disciplines and only a bit of video and audio window-dressing, this PC CD-ROM is really targeted toward librarians. But if you have a spare \$1,300 (that's not a misprint) and an overwhelming interest in science, it may be up your alley. Personally, I'd spend the grand and change on a new computer.

Closer to my budget is Discovery Multimedia's *Sharks!* A TV-style documentary about big fish. Like those shark shows on cable, *Sharks!* skips through, and in some cases over, the subject. Several sections stem such areas as shark anatomy, behavior, and evolution, with plenty of video and voice over narration to keep you from reading. Good thing, too, since this Windows CD-ROM is weak on text. And although the program is video-intensive, *Sharks!* suffers from the typical grainy jerky display seen in most multimedia programs.

Sharks! doesn't overlook the sensational; you won't go begging for video of scary footage of big-mouthed great whites. (There's even a conversation with Peter Benchley author of *Jaws*, but it's boring.) To its credit, *Sharks!* tries to separate some of the fiction about sharks from the facts. But the best part of the disk is "Ask the Experts." Here you get to quiz four different experts by asking ten clickable questions. Since you can ask the same question of all the experts, it's something you won't get from a documentary on the tube.

I'd love to get my hands on a virtual archaeological dig—it's a science fascinating enough to draw a crowd and one seemingly tailor-made for pretend on the PC—but I've not found one. Microsoft's *Ancient Lands* is more a turn-of-the-century than a walk through the science of uncovering antiquities (there's a difference), but it's interesting nonetheless. Like most of the Microsoft CD-ROMs pegged for the home, you may feel shortchanged on content (you get a couple of paragraphs, no more, on any of the digs), but the wide-ranging free-wheeling approach works well as an introduction.

Ancient Lands covers three civilizations: Roman, Greek, and Egyptian (with some extras such as the Minoan, Mycenaean, and Babylonian thrown in for good measure). Scads of illustrations, a bit of animation, and a fair amount of audio support the explorations as you click your way through highlights of everything from architecture and medicine to warfare and religion. When you hit one area, there's always an outlet to an associated topic—you can go from the Parthenon to Egyptian temples. And a timeline is available to help you keep things in context. **DD**

You may not scream "It's alive!" after using a science CD-ROM, but at least there's little chance of something escaping from the beaker and turning a hole in the carpet.



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THE BAD SEED

Amid controversy, scientists hunt for the "aggression" gene

By Jeff Goldberg

Abnormal levels of serotonin and its byproducts have been identified previously in violent criminal offenders, adolescents with conduct disorders, suicides, and impulsive fire starters.

Researchers in the Netherlands claim a genetic defect could account for the behavior of some men in a large Dutch family, who for generations have been prone to periodic, seemingly unprovoked, violent outbursts. Among the men, who are also mildly retarded (with an average IQ of 85) and at other times shy and non-threatening, one raped his sister, and later, in a mental institution, stabbed a warden in the chest with a pitchfork. Another tried to run over his employer with a car after the boss criticized his work, a third sometimes threatened his sisters with a knife, forcing them to uncross, and two were arsonists, according to Han Brunner, a geneticist at the University Hospital in Nijmegen, who has been studying the family since 1988.

The men lack a gene for the production of monoamine oxidase (MAO), an enzyme that breaks down several of the brain's important transmitters. Without MAO, Brunner believes, a surge of excess chemical messengers could flood the victims' brains, causing their funerals. Among the neurochemicals affected by the MAO gene, serotonin—which ironically usually exerts a calming, inhibitory effect on neuronal firing—is considered the prime suspect contributing to the Jekyll-and-Hyde transformations exhibited by the men in the Dutch family. Abnormal levels of serotonin and its byproducts have been identified previously in violent criminal offenders, suicides and impulsive fire starters. Brunner and other scientists contend that malfunctions in genes for the production and destruction of serotonin could be the cause of the chemical imbalance.

While the MAO gene mutation has so far been found only in the

Dutch family, other suspicious genes have been identified elsewhere. Marinka Linols, scientific director of research at the National Institute on Alcohol Abuse and Alcoholism, detected such an altered genetic profile in a group of over 100 unrelated people in his native Finland, including prisoners who have committed acts of impulsive violence and exhibited suicidal behavior. The genetic alteration regulates the production of tryptophan hydroxylase, an enzyme which, like MAO, controls brain levels of serotonin.

Rene Hen, a French re-



searcher now at Columbia University reported another provocative finding when he used cloning techniques to create an abnormally aggressive transgenic mouse. By manipulating mouse fetal cells, Hen was able to "knock out" the gene coding for the production of one of 14 known serotonin receptors that govern a wide range of physiological and behavioral functions. He then injected the mutated cells into a mouse embryo that was implanted into a foster mother. By inbreeding generations of these offspring, Hen eventually produced a strain of

"killer" mouse, totally lacking the receptor and thus, effectively blocking serotonin's calming influence at millions of synaptic connections. The mutant mice develop and live apparently normally, says Hen, until isolated and faced with an intruder—whereupon they attack "impulsively" without the sniffing and approaching behavior that normally accompanies furl wars between rodents.

While such discoveries are intriguing, the possibility they could lead to genetic screening for violent tendencies, perhaps even at birth, opens a Pandora's box of eugenic and racial fears. While the National Research Council has cautiously supported the premise that genetic disorders may contribute to some forms of violent behavior, and the Clinton administration has endorsed a Centers for Disease Control position that violence is a public health problem that can be studied like any disease, NIH researchers investigating the genetic roots of violence remain wary of public reaction and will not talk openly to the press. "We want to keep doing science," one researcher who asked not to be identified, said bluntly.

The European investigators are also quick to qualify their findings. "This is not the aggression gene," says Brunner, noting that the mutation he discovered is likely rare. "Even if we found these mutations in a larger human population, it still wouldn't support a single cause for aggressive or criminal behavior," reflects Rene Hen. "One reason it's dangerous to talk about an 'aggression' gene is people are tired of crime and violence, and they would like an easy answer like a bad gene to explain it. That's an illusion. Crime and violence are very complex issues." □

KID STUFF

NEW TREND IN KIDS MARKET:

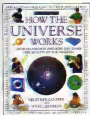
Data storage units

By Lisa G. Casinger

In a smoke-filled boardroom four market analysts frantically rack their brains for the next great cash cow in the kids market. Super-Duper Nintendo, one offers. Been there, done that. Virtual Reality bungee jumping, another suggests. Seen it, did it. How about Chia baby dolls, a third recommends. Not! Timidly, the fourth analyst stops, turns, clears his throat, and says: data storage units, crammed full of text, 'Nes and graphics. Mr. Chia baby-dolls asks, What are data storage units?

Mr. Timed Analyst answers... books. But not ordinary books. We're talking in-your-face, 3-D, full-color, hands-on, poppyruse-sheathed, ink-filled, mega-cool, bound books with information about everything from toilet paper and kaleidoscopes to bugs and solar eclipses.

First we'll inspect "How the Universe Works," the new edition to the Reader's Digest series of *How Things Work* books. There's a book on science, the universe, nature, and the earth—and each one is packed with "one hundred ways parents and kids can share the secrets" by conducting easy experiments. Kids can build anything from a shield volcano to a model lung. All the materials they need—mostly items they'll find around their houses—are listed at the beginning of each book, and a note at the beginning of each experiment tells whether they need a grown-up's help. Ranging from \$24 to \$25 each, these books are hands-on guides for conducting safe and exciting experiments which might



teach kids and their parents a few things about science.

Then we'll focus our attention on that clever new science series from Golden Books. Ever wonder what your taste buds look like magnified 2,000 times? Or how about looking at caterpillar feet magnified 25 times? *Discover Hidden Worlds* (\$10.95 each) focuses on magnified pictures of bugs, the human body, the home, and nature. While the pictures are fascinating, and sometimes gruesome, the books are also full of wacky facts and figures. Did you know, for instance, that the crunchy sound made when you bite into a potato chip is actually air pockets exploding? Or that the air coming out of your lungs when you sneeze is going 95 miles per hour? *Hidden Worlds* books absolutely deserve a closer look.

After that we'll pop over to HarperCollins and check out their new title, *The Most Amazing Science Pop-Up Book* (\$22.95). It is definitely not one of those cutesy, fuzzy, little, Dick-and-Jane, pop-up books kids had when they were four years old. Harper knows pop-up. They've loaded this one up with a working record player, periscope,

compass, microscope, camera obscura, kaleidoscope, and sundial. Each of the pop-ups is surrounded by its own "fun facts," definitions, histories, and easy-to-use instructions. Fortunately, kids don't have to be rocket scientists to read this book and understand the concepts of sound, electromagnetism, heavenly bodies, and thermographs.

Finally we'll wander through the halls of Klutz Press's new "museum." *Earthsearch* is touted as "A Kid's Geography Museum in a Book," but it's neither a museum nor strictly for kids. I suspect kids relies to one's frame of mind rather than age, and museum suggests something that holds a lot of stuff. This book definitely covers a lot of ground: facts, figures, experiments, games, thesauri, dirt, and toilet paper. (Yes, toilet paper.) Designed to be looked, skimmed, played with, used, devoured, and of course read, this wire-bound, sturdy book discusses everything from garbage to evolution and then some. Klutz's idea here is to take science and geography concepts, which are often abstract and make them concrete. *Earthsearch* (\$19.95) is one of those books people will keep on their desks to thumb through from time to time, because each time they pick it up, they'll learn something else.

Mr. Timed Analyst stops and waits for feedback from his co-workers. They glance around at each other—wheels churn in their brains—dollar signs flash in their eyes—and they smile. Another cash cow is born, and children everywhere stand and cheer in unison. ☐

Pick up these books filled with periscopes, facts, experiments, magnified landscapes, information, and toilet paper.



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STARS

COSMIC SPEED TRAP

Capturing cosmic rays will help physicists figure out their origin

By Steve Nadis

In October 1991, a mysterious intruder shattered the calm of a Utah desert. Ever since that night, investigators in the town of Dugway have been asking the usual questions: What was it? Where did it come from? How many others are on the way?

The "intruder" was not your typical UFO. It was a cosmic ray, one of countless particles—protons or heavier atomic nuclei—that continually bombard Earth. High-energy cosmic rays are the most energetic particles in the universe, and the 1991 "visitor" was the wildest and most energetic object ever detected. The record-setting cosmic ray, a proton with an energy of 3×10^{20} electron-volts, hit our atmosphere while traveling at virtually the speed of light. "It was moving closer to the speed of light than anything we've seen before—except light," explains University of Utah physicist Eugene Loh, a member of the Dugway investigation team. With that velocity, the single proton weighing just one-billionth of a billionth of a gram packed the wallop of a tennis ball flying at about 100 miles an hour.

The source of high-energy

cosmic rays is one of astronomy's long-standing puzzles, and the 3×10^{20} eV particle has so far defied efforts to find its roots. "Normally a particle that energetic is like a tracer bullet, you should be able to trace it back to the 'gun' that shot the bullet," Loh says. "We've been trying to trace it back, but it seems to have come from nowhere." It doesn't point to an obvious source, he explains, such as a known "hot" or active—that is, radiation-spewing—galaxy.

Scientists hope to solve the mystery of high-energy cosmic rays by snaring thousands of them in a mammoth speed trap of sorts called the Giant Array. The driving force behind the project is James Cronin, a Nobel Prize-winning physicist from the University of Chicago. He proposes to erect vast networks of cosmic-ray detectors in both the northern and southern hemispheres, each spanning an area of 5,000 square kilometers. Each network consists of two kinds of detectors. One type of detector, located in the network's center, will probe the night sky, looking for the telltale flashes of fluorescent light that occur when a high-energy particle slams into the atmosphere, creating billions of "secondary" particles that rain through the sky and excite nitrogen atoms along the way. Some of these secondary particles survive their passage to the ground. A fraction of these, in turn, might be intercepted by the second batch of detectors—4,000 "scintillators" that emit any light flashes when hit by a charged particle.

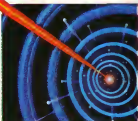
The entire system will cost about \$50 million to \$60 million, Cronin estimates. He's spent the better part of three years trying to sell the idea while lining up participating research teams in the United States, China, Japan,

England, France, and Australia. An international team, hosted by Formelab in Bolivia, Illinois, and supported by the National Science Foundation, the United Nations Educational, Scientific, and Cultural Organization, and private sources, expects to complete a major design study in July. If the necessary funding comes through, the team plans to have the cosmic-ray detectors up and running by the turn of the century.

Cronin admits the price tag is steep compared to typical cosmic-ray efforts, but calls it money well spent "considering that we can finally answer a question people have been thinking about for most of the twentieth century." Unfortunately, there's little room for compromise in the design. Scientists won't be able to get a handle on high-energy cosmic rays without something on the scale of a Giant Array, he insists. That's because 10^{20} eV particles hit Earth so rarely—only one striking a square kilometer each century. "We can't learn much from a single particle, so either we wait a long time or we get a big detector," Loh says. "You can't speed up Mother Nature."

After operating detectors in both hemispheres for five to ten years, Cronin expects to have a map of the entire sky showing what kinds of particles are coming from which locations with what kinds of energies. Although no sources of cosmic rays have yet been identified, research indicates that high-energy rays (anything above 10^{19} eV) must emanate from outside the Milky Way. The reason is simple, Loh explains. Nothing in our galaxy could get a particle going fast enough to reach those extremely high energies. "Our galaxy is not very active. If this were a truly active galaxy we probably would be cooked. In fact, life here on

Poopy particles: Scientists want to know whether high-energy cosmic rays come from black holes, relics of the Big Bang, or somewhere else altogether.



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WAVES

DEEP FLIGHT

Can scientists fly to the bottom of the earth?

By Paul Vintia

As submarine builder Graham Hawkes added the final touches last spring on his newest diving machine, Deep Flight 1, he playfully coined the fledgling science he sure his invention will foster—"hydrobatics." The notion entails spinning, looping, banking, rolling out and ultimately, tailing humpback whales and cruising with dolphins. If all of the sounds like a wet version of the aeronautics industry, it's no coincidence.

"I used to fantasize about the early days of aircraft when guys would throw together canyons and string and fly out of their backyards," says Hawkes, who grew up in England looking the Spitfire pilots of World War II.

Hawkes instead went on to become a leading designer of deep-diving vehicles and robots, but his passions for sky and sea have clearly merged in Deep Flight, a sleek, highly maneuverable machine that more closely resembles a jet fighter than a research submersible. Deep Flight features tapered wings, rear power thrusters, and a transparent, bullet-shaped nose cone. There's just enough room for one person to lie inside the cylindrical hull and pilot the vessel with two joystick controls. Although Hawkes is still testing his creation in the calm waters of San Francisco Bay near his workshop in Point Richmond, California, he has ambitious plans. This year he wants to fly Deep Flight through the kelp forests of Monterey Bay and dip down to 4,000 feet. By 1995, if all goes well, he will launch an expedition dubbed "Ocean Everest"—a seven-mile plunge into the forbidding darkness of the Mariana Trench, the deepest point on the planet.

Deep Flight's design and grandiose mission represent a radical departure from the way

scientists currently study the ocean. Typically, researchers sink awkwardly through the water column in clumsy submersibles, taking notes, gathering samples, and hovering generally above 10,000 feet. In contrast, Hawkes has supplied his vessel with 10 times the thrusting power of traditional subs for speed and maneuverability; two elements he figures are crucial for a sustained exploration of the 35,510-foot-deep Mariana Trench, which is located in the western North Pacific near Guam. For his expedition, Hawkes plans a 600-foot-per-minute head-first dive that would place him at the bottom in about an hour. With a rebreather system comprised of a tank of pure oxygen and a carbon dioxide scrubber, Deep Flight would be able to easily sustain a two-hour exploration of the trench. As for the extreme pressure at that depth—water crushes at eight tons per square inch—Hawkes plans to beef up his hull with

super-strong ceramic, a material four times stronger than titanium.

Whatever the outcome of Ocean Everest, Deep Flight's greatest value may lie in its light weight and low cost. Currently, most research submersibles operate out of ungainly mother ships with sizable crews that can cost researchers as much as \$30,000 per day to use, and scientists often must wait long stretches before an available ship and sub meander to their quadrant of the globe to begin field research. Since Deep Flight requires no mother ship, Hawkes envisions scientists loading five or six of the 17-foot, 4,000-pound machines aboard inexpensive rental boats and zipping out to their research sites providing easy access to the remote and difficult terrain of this final frontier. "On land," says Hawkes, "you'd be hard-pressed to go where no one else has gone before. But in the ocean, there's always the possibility of discovery. **DD**

"It's the mainstream versus the personal computer approach, and we're the PC," says Graham Hawkes about his new concept for submarine transport.



SOUNDS

ANALOG VERSUS DIGITAL:

Has vinyl been wrongly dethroned by the music industry?

By Anthony Liversidge

The symphony flowing from my speakers sounds glorious, much better than your usual CD. Maybe that's because it's not a CD at all but that banished audio relic, an LP.

A Luddite fanatic, you might think, but I have plenty of expert company. Five snazzy CDs were launched as "perfect sound for ever" by Sony and Philips in 1982; they have been criticised as missing something vital. Musicians who have spoken out against digital sound include jazz pianist Keith Jarrett, who complains CDs lose the subtlety "where expression lies." Rock star Neil Young lamented in *Guitar Player* that "digital is a disaster. It's an insult to the brain and heart and feelings."

Of course, CDs have improved a lot recently, and some are very fine. But many "golden ears" still prefer LPs. The Absolute Sound founder and editor Harry Pearson says, "LPs

are decisively more musical CDs offer the soul from music. The emotional involvement disappears. Michael Fremer, senior editor of popular music, adds "Digital preserves much the way formaldehyde preserves frogs. You kill it and it lasts forever."

Meanwhile the LP isn't so much dethroned as assassinated by a record industry unwilling to market two formats at the same time, is waking from the dead. Thirteen or more companies are releasing audiophile LPs over the next two years. Classic Records' new edition of the highly prized RCA Victor Living Stereo recordings of the Fifties took and sound better than the originals, and they will

"Music as LP is the food of life, while the CD is merely sensational sex: exciting but ultimately unsatisfying. One hurries back to the comfortable embrace of analog."

be using Verne's jazz library soon. Mosaic, Reference Recordings, Mobile Fidelity, Shelflife, Analogues, Chesky and Bluebird are all matching their audiophile CDs with the same music on premium vinyl.

Proponents of digital sound will argue the vinyl revival is merely misplaced nostalgia. Audio *Critic* editor Peter Aczel compares it to "a cult in buggy whips—it doesn't make sense. Vinyl is dead!"

But they cannot deny that the industry is struggling to perfect a CD format, cursed

with grime (16 bits, 44.1K) and that are hard to polish to true sonic excellence. Because the binary "word length" is 16 bits (only 16 slots for the zeros and ones it counts with), the CD can detect only 55,536 levels of sound pressure, far fewer than the sensitivity of human hearing. The digital process also comes up short in capturing low-level sound waves smoothly.

To make up for digital's defects, many mastering engineers keep analog sound in the recording pipeline as long as possible. They say that unless digital standards jump to a new level, analog will remain the touchstone.

The one concession I'll make is that very good audio gear brings the two closer together. I mounted a shootout between the best LPs and CDs on a \$6,000 system (including a flotar deck and amplifier with B and W 640 reference speakers and XLO cables) that made the best of each LPs played on a \$1,600 Townshend Mark III Record turntable (Keith Jarrett chose as the ultimate), established on a Sennheiser CD platform. Lost the last vestige of resonance; the Achilles heel of vinyl.

On this impeccable setup, CDs gained some of the sonic splendor of the LPs and LPs captured the rockability, impact and clarity of CDs. Often it was hard to choose without extended listening. Then the stomach agreed in favor of the vinyl, almost every time.

But with that much needed to make CDs palatable for the living room the LP still reigns. The bottom line is that it is so hard to make an LP sound bad as it is to make a CD sound good. And if a store-of-the-art turntable can lift LPs to digital clarity without digital drawbacks, that's where I'd put my money. **CD**

DIGITAL VERSUS ANALOG:

Digital music on CD reigns as the industry standard

By Ted Libbey

The credo of digital audio is that any sound, including the highly complex sounds of music, can be represented by a finite number of numerical samples and stored and retrieved that way. My introduction to the process came during the mid 1970s when I was a graduate student at Stanford University and had the opportunity to observe at close hand what the computers of Stanford's CCRMA (Center for Computer Research in Music and Acoustics) were achieving. Among the demonstrations I saw was "band" tests of digital versus analog reproduction of sound. My conviction that digital recording and playback is superior to analog was born from these experiences.

In the commercial sector, at least as far as classical music is concerned, digital recording has been the standard since about 1980—two years before the arrival of the compact disc made digital playback a reality. But the debate as to the merits of digital sound continues.

Adherents of analog complain that digital recording takes the "life" out of recorded music by failing to capture its most subtle nuances—and to bolster their argument they talk about sampling rates and conversion and how unrealistic all that stuff is. But saying that our ears process sound by sampling it incrementally and sending discrete messages to the brain for conversion. They claim that, compared with the "warmer" sound of LPs, CDs are cold analytical. Much of the criticism is that the frequency response that has always been a part of recording on magnetic tape (but which one rarely heard on LP because it was masked by surface noise and diminished by the high-end rolloff typical of even the best stereo cartridges).

If the original is a good digital recording, the CD will again sound like the master—clear, warm, and alive, with astonishing impact and presence, like dynamic range, no hiss at all, and no distortion other than that inherent in the microphones that were used

they have become accustomed is enough to drive most serious music lovers—those familiar with the way music sounds in a live environment—crazy. Analog sound is like some people we know: pleasant and attractive, but fairly dishonest.

Of course, vinyl aficionados like to call compact discs "toy discs." But as a playback medium, the CD offers a larger dynamic range and much less distortion than either the LP or cassette. Whether the program encoded on a CD was recorded digitally or by an analog process, it can be played back more accurately than call the same program on vinyl or tape, and with no degradation. If the original is, say, a

"The CD offers a larger dynamic range and much less distortion than either the LP or cassette—it is clear, warm, and alive, with natural tonal qualities."

good stereo recording from the 1950s captured on magnetic tape, a properly remastered compact disc will sound exactly like the master tape—clear, warm and alive, with natural tonal quality. And it will accurately reproduce the full frequency response that has always been a part of recording on magnetic tape (but which one rarely heard on LP because it was masked by surface noise and diminished by the high-end rolloff typical of even the best stereo cartridges).

If the original is a good digital recording, the CD will again sound like the master—clear, warm, and alive, with astonishing impact and presence, like dynamic range, no hiss at all, and no distortion other than that inherent in the microphones that were used

That's what I want to hear.

The prospect of recording music with this technology has created widespread if not universal enthusiasm among classical musicians. Among the early advocates was the Austrian conductor Herbert von Karajan, who hailed digital recording as "definitely superior to any other form of recording we know."

Popular musicians have also embraced the technology. In one celebrated case, documented in the July 1982 issue of *Rolling Stone*, guitarist Robbie Robertson recorded parts of his "Storyville" album simultaneously in analog and digital, then sat down with his musicians and engineer Steve Nye until he saw a device that would put the two versions to an A/B test. The verdict: "We came to the conclusion that the analog machine was like a piece of equipment for an artist."

According to Robertson, distortion in the analog playback was not as good as in the digital, and things in the lower register such as bass drums sounded "mumbly." Most interesting of all, engineer Nye found that "on the digital he could match this effect with just a little bottom EQ and a little compression." In other words, by adding distortion to the digital signal, an analog "artifact" could be created.

Even as evidence like this continues to accumulate, the heated analog versus digital debate goes on. For me, though, the end of the dispute was uttered almost ten years ago by the late Pierre Boulez, a New York-based record producer turned retailer. In answer to a customer's query about the LPs his store used to carry, he shot back, "Our LPs? We sent them to a landfill in Brooklyn." **CD**

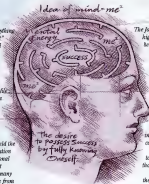
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CONTINUUM

FUTURE FIREARMS

New weapons take law enforcement into the twenty-first century. Plus, a push for smaller people, and the invasion of fire ants

"Police officers are still equipped much as Wyatt Earp was in the nineteenth century," says David Boyd, director of the Science and Technology Division of the National Institute of Justice (NIJ). As head of NIJ's Less-Lethal (LL) technology program, Boyd is equipping police officers for the twenty-first century by designing Robocop-like tools and weapons with an eye both to safety and effectiveness.

Though it sounds a bit like a Hollywood comic device for chase scenes, sticky foam may prove to be a valuable addition to the arsenal of real-world catchers. "Sticky foam stops a suspect because everything it touches becomes stuck to it, immobilizing the subject's legs and arms like contact cement," says Tom Gookby, senior member of the technical staff of the Access Delay Technology Department at Sandia National Laboratories. The foam is stored as a pressurized liquid containing Freon, rubbers, resins, oils, and stabilizers which, when exposed to atmospheric pressure, turns into foam. The process expands the 1 1/2 liters of sticky, rubbery materials into more than 10 gallons of foam with a density of cotton balls.

Gookby says one potential use of the device might be in dealing with difficult prisoners. Presently, prison guards use body armor and riot shields to protect themselves from violent and reluctant prisoners during transport from cell to cell or prison to prison. With sticky foam, the foam can be shot through the food slot with no injury to the guards. Other possible uses might include riot control and added protection for high-security areas. Sticky foam might help to capture intruders by blocking exits with large bags filled with the substance through which an intruder would have to pass in order to escape. In so doing, the suspect would have to break the bag. The sticky foam inside would do the rest. So far, the two major challenges to this technology seem to be environmental and medical. Researchers must find a way to effectively clean up the mess that sticky foam makes and determine if the compound poses any serious health risks to both users and targets.

Another promising idea for law enforcement is the development of smart guns which would employ user-recognizing devices to eliminate the possibility of an unauthorized user getting control of a police officer's firearm. "In the next two years, we will develop a list of as many technologies as possible to choose from, prioritize

them with a ranking scheme, and build working models of at least two," says Douglas R. Weiss, project manager at Sandia, under contract for the NIJ.

One model, for instance, uses a capacitive proximity sensor embedded in the gun. As the hand is wrapped around it, an electric field discriminates between a large and a small hand. Other biometric (the study of unique attributes of the body) devices, like voice recognition, retinal scans, and finger and palm prints, may also be developed. The advantage of such devices is obvious. Sensors ensure that the person who fires the weapon is the person authorized to use it.

Smart gun technologies are based on the simple premise that the more the gun can "know" the more effective it is as a weapon. Electronic tags similar to bar codes in library books or the ubiquitous plastic tags in clothing stores, for example, could be worn by undercover police who would be otherwise unrecognizable. "If an officer wears a tag on the body in a ring, watch, uniform button, or belt buckle a reader in the firearm can scan the tag for the identity either using magnetics, electronics, or radio frequency," says Weiss. It might just be enough to save undercover agents from the dangers of friendly fire.

Weiss stresses that close attention is being paid to safety—reliability, safety, security, and use control of the smart gun. It must work when officers want it to, and not work when they don't want it to. He likens the seriousness of this task to the nearly identical design problems inherent in nuclear weapons. They have to be reliable, but must also be absolutely safe until ready for use.

After safety, cost is a big concern. Because the technology is so expensive to develop, Boyd is planning to expand into the civilian market. But there are better reasons for targeting civilian firearm owners. Smart guns might, for example, greatly reduce the number of in-home firearm thefts. More importantly, many domestic homicides, suicides, and accidental shootings could be prevented with a smart gun. Whatever the technologies are, Weiss plans to design retrofitable devices and to make them easily affordable by all firearm owners. New technologies may not be the solution to increased violence and crime, but safer weapons is a good place to start.—CAROL SILVERMAN SAUNDERS





CONTINUUM

SAY EXCUSE ME, ELSE

Three herds of cows will be outfitted with tiny methane detectors by Utah State University scientists who hope to find out over the next three years if the animals really do produce between 7 and 21 percent of the colorless, odorless gas. Methane absorbs infrared radiation and is believed to contribute to global warming.

It's a problem that has long plagued researchers, who until now could only test cows in small, sealed chambers or follow them around in pastures to monitor the plants they ate and guess at how much methane they produced. A new device patented by Patrick Zimmerman, a senior scientist at the National Center for Atmospheric Research in Boulder, Colorado, should furnish far more precise measurements. If cows or other



Anaerobic bacteria in bovine rumens may produce significant amounts of methane gas, which is released in cow belches.

at one end. A sniffer runs down a halber and ends in an open tube one-sixteenth of an inch in diameter that sits just three or four inches from the animal's mouth, where the methane content from each bovine belch is analyzed.

Kris Johnson, an animal

SILENT PIANO

A common difficulty many serious pianists face is their tendency to practice when the spirit moves them—which is often in the middle of the night—to the annoyance of their neighbors. And while practice can be agony for reluctant kids who are dragged kicking and whining to the piano bench to flail away at scales, their efforts can be just as painful to the rest of the family. What both groups obviously need is a silent piano.

And that is precisely what Yamaha Corporation of America has devised. Its Silent Series pianos look and sound like regular upright pianos, and have all the traditional piano innards in the right places. "This is tradition married with technology," says Yamaha marketing manager Carter Schulz, "not a mere plastic electronic keyboard." When you kick a foot pedal to

the left, the piano is silenced for everyone else in the room. A set of headphones lets the pianist hear the instrument's full, rich tones.

Schulz says that once the mechanism is activated, a device in the depths of the instrument locks the hammers just before they strike the strings, preventing them from vibrating. A set of fiberoptic sensors then takes over, measuring the speed and 127 gradations of intensity with which the individual keys are struck. With the help of a tone chip, a digital simulation or sampling of the sound is hoisted in the headset, pedal action and all.

What the pianist hears may be better than the real thing, because the upright's sampled sound simulation is said to be equivalent to the sounds produced by a concert grand. And when you want to show off, you can play normally by disengaging the system. The premium for the capability isn't too great—a Silent Series upright sells for \$8,395 compared to \$7,495 for a standard Yamaha upright.

—George Nobbie

THE STRUCTURE OF AN IGLOO IS SO WELL INSULATED THAT ONE CAN COMFORTABLY SIT INSIDE WITHOUT A COAT, WHILE THE OUTSIDE TEMPERATURE CAN BE AS LOW AS -40 DEGREES FAHRENHEIT

domestic ruminants are causing problems, either their diets or their genetic predisposition to produce methane could conceivably be altered to reduce the amount of gas generated.

Zimmerman's device consists of two components. A metal canister emits a small amount of sulfur hexafluoride at a steady rate through a plastic component

scientist at Washington State University says small-scale tests there have proven that the device does work on cows. A major problem would seem to be figuring out how to lower the methane production of other free-ranging ruminants such as buffaloes, deer and camels, whose diets cannot be so easily controlled. —George Nobbie



Finally, no more listening to endless hours of "Chopsticks."

FOG COLLECTOR

The Atacama Desert in northern Chile is one of the driest spots on Earth, a place where the 350 villagers who live in Chungungo see no rain for years on end. So when atmospheric scientists from Environment Canada worked with scientists and engineers from Chile to devise a way to harvest drinking water from the clouds that drift in off the Pacific Ocean, their feat was hailed as a

miracle akin to the patenting of desalination in 1959.

Scientists draped 75 sheets of plastic-mesh netting over a line suspended seven feet off the ground, like a washline facing into the wind, along the El Tolo ridge above Chungungo, explains Robert S. Schemensauer, a cloud physicist from Environment Canada in Toronto, who helped find an efficient way to trap billions of tiny fog droplets in the mesh sheeting, each piece of which is about 40 feet long and 13 feet high.

It was a daunting task because it takes about 10 million droplets to yield a single drop of water about the size of a match head, according to Schemensauer. But it worked. An average 3,000 gallons of fog water a day now run down the meshes into collecting troughs. A pipeline then carries it to a storage tank.

Schemensauer says the nets, which cost about \$400 each, collect anywhere from 20 to 65 percent of the moisture available in the dense camanchacas, as the Pacific fogs are called by rural Chileans. Unlike desalination, used extensively and expensively in

the Middle East, the nets cost nothing to operate.

"This system could be applied in arid zones all around the world," says Schemensauer. The Chilean nets yield a gallon of potable water per square yard of the double-folded mesh.

The system works best at altitudes of 1,500 to 3,000 feet, where prevailing winds reach speeds between 5 and 20 miles per hour. He admits that the technique, which was tried experimentally in the 1950s, is not

exactly new. "Pliny the Elder, the Roman historian, mentions collecting water that dripped from trees in catch basins," he says.

Schemensauer and his colleagues have obtained funds from Canada's International Development Research Center to evaluate the fog collection potential in several dry countries, such as Eritrea, Yemen, Kenya, Tanzania, and India, where it could have immense possibilities for agricultural use.

—George Nobile

GLOBALLY, THE MICROBIAL DECAY OF FOREST DEBRIS RETURNS SOME 85 BILLION TONS OF CARBON DIOXIDE TO THE ATMOSPHERE ANNUALLY, OR 233 MILLION TONS EVERY DAY

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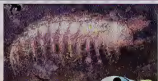
Schemensauer, a cloud physicist from Environment Canada in Toronto, who helped find an efficient way to trap billions of tiny fog droplets in the mesh sheeting, each piece of which is about 40 feet long and 13 feet high.

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JUMBO SHRIMP

Monster shrimp may have once ruled the world. Around 530 million years ago (some 290 million years before dinosaurs), Anomalocare, a terrifying marine creature up to two meters long, was the largest animal on Earth. Until recently it was known only from a few limbs found in Canada. Fossils from the shrimp, however, have now been reported from Chengjiang in South China to Enfu Bay on Kangaroo Island off the South Australian coast.

Anomalocare (weird shrimp) gets its name through a pair of large, spiny appendages protruding from its head. With these it must have gripped its prey, crushing it with an array of teeth in a circular mouth surrounded by horny plates that opened and closed like a clamshell. The fossils show that the shrimp used a variety of hunting techniques. One



of the Australian species apparently combed through mud in search of soft-bodied animals, while the Canadian and Chinese variants swim after their prey, propelling themselves with trunk flaps.

The shrimp looks so bizarre that for more than 70 years the fossil parts found in the Burgess Shale in British Columbia were mistakenly classified as four separate animals. They were pieced together as one creature in the earth sciences department of England's Cambridge University. Professor Derek Briggs, of Bristol Uni-



Millions of years before dinosaurs, a giant shrimp may have been as voracious a predator

versity's geology department worked on the jigsaw. In British Columbia, he says, "I have found fossils of trilobites with W-shaped scars corresponding to the biting action of the shrimp's mouth. As Anomalocare was around when there was no life on land, it probably dominated the world."

—Ivor Smullen

PHOTO BY GARY HARRIS



CONTINUUM

LET'S GET SMALL

Thomas Serniessa believes short people have gotten the short end of the stick. He challenges the conventional "bigger is better" doctrine in *The Truth About Your Height*, a book which has garnered high praise from the Short Stature Foundation and other groups.

Humans have been getting bigger over the generations. Americans are now about four inches taller on average than their colonial ancestors, according to Serniessa, a 5'10" San Diego engineer and author. Japanese youth of today are some three inches taller than their grandparents. In the past two centuries, moreover, the average Norwegian has grown eight inches. Many view this growth as a positive, and indeed natural, thing.

But Serniessa sees a dark side. "Tall people consume more of just about everything—more resources, more food, more space. And they produce more pollution in the process, including more trash," he says. Assuming Americans became 20 percent bigger, annual consumption of mineral resources would increase by 600 million tons, he estimates. Garbage would increase by 80 million tons per year. And we'd need 180 million acres of new farmland. Short people, conversely, place fewer demands on the environment. It costs

less, in short, to keep short people alive.

So what's to be done? "We were smaller once," Serniessa argues. "Whichever is making us bigger can be reversed." First, he says, people must be educated about the consequences of our continued growth. Another battleground is nutrition. "Americans are overfed. We eat too much protein and fat, which doesn't do us any good."

"It's time for a national height policy," he urges. "We can't have such a policy until people acknowledge that there is a problem."

—Steve Nadeau

WHEN YOUR FOOT FALLS ASLEEP, ITS CONDITION IS CALLED TARESITHESIA



HIGH-TECH PROTECTION

Would-be attackers beware. Today's potential crime victims have enlisted the aid of a variety of high-tech defensive devices. They're carrying products like DYEWINDOL, which emits a stream of foaming spray that turns muggers' a startling shade of green on contact, and Voice Defense, an electronic gadget that shrieks a 112 decibel cry for help.

Joseph Finney of Maroon 3 Ltd. in Colorado Springs says the nonlethal DYEWINDOL mace spray creates a stinging effect from a distance of up to 10 feet, and the more an assailant tries to wipe it off, the more it spreads to the face, hands, and hair. It comes in a pocket-size, nonrefillable aerosol container that holds enough spray to fire a 10-second burst.

Finney says the stuff can't be washed off for up to a week, which presents muggers with a problem. "Where's a man with a green face going to hide?" he asks. "The dye contains form-aldehyde, which makes the eyes burn, but the Maroon 3 executive is cagey about what else is in the product, which sells for under \$20 a container.

The handheld, purse-size Voice Defense device, made by Benzel in Towson, Maryland, takes a somewhat more high-tech approach, shrieking

"Help! Help! Someone help me!" at the top of its microphone-amplified voice in both Spanish and English.

At 112 decibels, Benzel marketing executive Mary Blay says the calls for help—male or female, at the touch of an internal switch—can be heard up to 300 yards away in generally quiet environs, and



Attackers may be frightened by Voice Defense's screams.

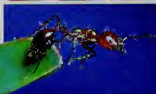
up to 100 yards away on noisier city streets.

Voice Defense will keep on yelling for up to 90 minutes if necessary. It's powered by a 9-volt battery and uses a sound filter to ensure that its shouts are clear enough to be easily understood.

The digital scream for help sells for \$29.95. Its effectiveness lies in the fact that the voice personifies the victim's distress, unlike the mechanical sirens used in car alarms, to which nobody pays much attention anymore. —George Nobbie



CONTINUUM



Ouch! The fire ant uses forceps to lock on and bite, then it pumps up its body and uses a stinger to inject venom.

ANT ATTACK

Foraging fire ants, long a pest in the Deep South, have adapted to cooler temperatures and have begun a march north.

The ants have moved indoors in their search for food, according to Richard A. deShazo, director of the Division of Allergy and Immunology at the University of South Alabama.

College of Medicine. Recent victims include a five-day-old infant asleep in a crib in Alabama, two Florida Alzheimer's patients, and a 69-year-old man who died from a stroke after he was stung while sleeping in a Louisiana motor room.

DeShazo says *Solenopsis* swarms overwhelmed a rival species called *S. richteri* to form a fierce hybrid shortly after it arrived in the port of Mobile from Paraguay in the 1930s. It has since been blamed for 89 reported deaths from anaphylactic reactions, though some victims have managed to survive as many as 10,000 stings. "Insects will bite anything it contacts," he says.

What concerns deShazo is the ingenious survival strategies they have developed. The fire ants make it through the winter by building nests near heat sources like curbs and road ways. They have also developed multiple-queen colonies, forming mounds that house up to 500,000 ants, sometimes as little as 50 yards apart.

Immobile human beings are a likely source of the sugars, proteins, and fats they need, says deShazo. The fire ants, riding shipments of plants and nursery stock, could move westward as far as California and northward into lower Maryland.

—George Nobbe

HELPING HAND

Around Boston, there's talk of a new physical therapist in town. Manus is the name, and rehab's the game. He's trained to guide patients through exercises, methodically charting their progress. Unlike some of his colleagues, Manus is never too busy to work with you. He's got all the time in the world. Another thing about Manus: He was built at MIT.

The robot was conceived by MIT professor Neville Hogan and put together by a team of students and researchers. Though other robots are capable of doing chores for people—picking up objects, carrying things, and so forth—Manus is different, Hogan says, because it is designed for

"direct human contact."

The first application his team is testing involves helping stroke patients recover movement in their hands and wrists. This is a potentially large application. Hogan points out, since more than

10 million people have lost a limb. The robot can assist with the motion, providing guidance or resistance when needed, all the while recording the patient's performance. "You may want to know how strong Mrs. X is six days after the stroke."

Hogan explains. "It's hard for a person to measure that, but the robot can do it."

Manus will begin clinical trials this fall with patients at the Burke Rehabilitation Hospital in White Plains, New York. —Steve Nadis

VEINS IN AN ELEPHANT'S EARS FORM A PATTERN THAT IS AS UNIQUE AS A HUMAN FINGERPRINT

250,000 Americans suffer a stroke each year.

According to current plans, a human therapist would specify the movements for a patient to perform. Manus can learn these maneuvers and "play them back" with a patient's arm strapped to the ro-



Hernando Kozak hopes develop Manus, a robotic arm that can guide patients through therapy and track their progress.



CAST FAR ACROSS THE GALAXY, STARFLEET OFFICERS AND MAQUIS REBELS MUST WORK AS A TEAM TO BRING THE U.S.S. VOYAGER BACK HOME.



many 18-hour days on these sets, filming the two-hour *Star Trek: Voyager* movie that will beam this new cast into millions of homes. Everyone was supposed to have this day off, but the filming has spilled over into a week of hiatus. Yet I see no tension among director Rick Berman, the cast, the prop folks, or the make-up artists. Only professionalism, enthusiasm, and even the occasional quip or joke.

The show's oddball alien has a few of those as he grabs a bagel and some juice. Neelix, played by Ethan Phillips, *TV Guide* calls him the breakout character of the series.

"They were referring to the fact that after a month I will have a very bad case of acne," says the actor. "You've seen him before. Short, balding, bright, and baby-boomer-something. You won't see the human version of his face on *Voyager*, though."

Phillips describes his character "Neelix has a huge sunken forehead and a large cranium with a mohawk cut and big orange eyes. Not the

greatest teeth in the world. High, austere cheekbones. Fuzzy little eyebrows and fuzzy little hair. He's pudgy. But he can be lightning if he wants. He's very courageous." Rick Berman said to Michael Westmore that he thought this was the best makeup he'd ever done. I've never seen anybody look like me on the show ever.

"He likes women. He likes *Nine Inch Nails*. He's a big fan of Trent Reznor's. You'll catch him at the Viper Club."

Neelix is a Taliani. "He's a scavenger," says Phillips. "he's kind of a twenty-fourth-century homeless person, really. He has a little junk ship, and he wanders around and collects debris and stuff, but he's really savvy, and he knows this quadrant of the universe really well."

That would be the Delta Quadrant. The *Voyager* bumps into it thousands of light-years from Earth, 75 years at top warp speed from Federation space.

Who hurled this new ship way out there?

The same studio that put

that fake hippo in the middle of its lot.

"Paramount wanted a show very much like *The Next Generation*," says Michael Piller, a slender, boyish fellow wearing jeans and tennis shoes, as he relaxes between phone calls in a quiet office in the Hart Building. Piller is one of the three executive producers and creators of *Voyager*. His third-season addition to *The Next Generation*'s staff is credited by many as the reason the show steadied after a shaky start and sailed into its astonishing success. "Rick Berman, Jon Taylor, and I felt that we could not simply create a new ship and put a new cast in it and call it *Star Trek*—something and basically do the same show that we've been doing for seven years. It would not be creatively exciting for us. We felt we had to take the universe that Gene had given us and find a different perspective on it."

A different perspective, certainly. Try clear on the other side of the Milky Way

The *Voyager*, with a crew of 125 and designed for scientific missions of only a year or so, is one of a new line of vessels smaller than the *Enterprise*. Captained by Katherine Janeway, it is sent out after a ship crewed by outlaws called the Maquis. The Maquis are ex-Federation freedom fighters, with a chip on their shoulder against the Feds and a plank against the Cardassians. The Maquis ship has disappeared in the Badlands, an unusual region of space. The *Voyager* gets swept up in the same phenomenon that captured the Maquis—an ancient artificial spatial time rift called the Array—and finds itself far from home in the model of a *Star Wars*-scale intergalactic battle. To survive and get back, the *Voyager* allies with the Maquis; however, the Maquis ship is destroyed, and its members must be beamed aboard. A fateful choice is made: the Array collapses, and the two crews—once antagonists—find themselves in a struggle for survival in

John's losing his hair. His mission: get it back.

ASAP!

But how?

Weaving? No.

Transplant?

Not for him.

A hairpiece?

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wants is his
own hair back.

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baldness, only

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Will *Rogaine* work for you?

Dermatologists conducted 12-month clinical tests. After 4 months, 26% of patients using *Rogaine* reported moderate to dense hair regrowth, compared with 11% of those using a placebo (a similar solution without minoxidil — the active ingredient in *Rogaine*). After 1 year of use, almost half of the men who continued using *Rogaine* in the study rated their regrowth as moderate (40%) to dense (8%). Thirty-six percent reported minimal regrowth. The rest (18%) had no regrowth.

Side effects were minimal: 7% of those who used *Rogaine* had itching of the scalp (compared 5% of those using a placebo).

reported the same minor irritations.) *Rogaine* should only be applied to a normal, healthy scalp (not sunburned or irritated).

Make a commitment to see results.

Studies indicate that at least 4 months of twice-daily treatment with *Rogaine* are usually necessary before there is evidence of regrowth. So why not make it part of your normal routine when you wake up and go to bed, like brushing your teeth.

As you'd expect, if you're younger, have been losing your hair for a shorter period of time, and have less initial hair loss, you're more likely to have a better response.

Rogaine is a treatment, not a cure. So further progress is only possible by using it continuously. If you stop using it, you will probably shed the newly regrown hair within a few months.

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Like its predecessors, this starship is crewed by a diverse mix of personalities.

"Tom Paris is loosely based on a guest star role I did on *The Next Generation* episode called 'First Duty,'" says Robert Duncan McNeill, a handsome, affable guy with a strong acting background that spans soaps, prime time, and features. He's the navigator, he flies the ship. He flew for the Maquis, but was captured and put in jail. Now Starfleet has pulled him from jail and asked his assistance. McNeill explains, "His job was to help find the Maquis. At best, he might have gotten paroled from jail, but he'd never be able to fly again. With the *Voyager* lost, he can start over again."

"There are a lot of strong wills among the characters. They're going to struggle for power. There will be a lot of head butting." On screen certainly. But what about on the set? "Kate and I were talking last week. We were both amazed at the great ensemble that has been put together. We've quickly become a family and bonded with a sense of joy and fun on the set."

One particularly joyous fellow is Garret Wang, who plays Harry Kim. His thrill with being on *Voyager* is infectious; his identification with his character is irrefutable. "I am the operations/communications officer on the bridge. I had a stellar Starfleet Academy career and am basically the rookie on the bridge. I'm Asian-American. There's the professional competence, but there's also the inner fear. 'Oh my God, are these breeches too big for me?' His heritage is one of focus, of Zen and martial arts."

Garrett knocked about the acting business for a mere year and a half before landing this plum role. More experienced but no less enthusiastic is Tim Russ, who plays Tuvok.

"Tuvok is a full Vulcan. He's not a half-breed like Spock, and therefore there's not quite the struggle to keep his emotions in control—though it's certainly there," asserts the very strong man. "He's the tactical officer and tactical security. Vulcans are said to be peaceful. In fact, if you were in a war situation, you'd want someone calm and level-headed [like Tuvok]. Strategy is based in logic." Russ isn't here just for the bucks. He's been a fan of the show since he first saw it in the Seventies. His interests span beyond the series, he adds. "I read science fiction. My favorites are Alan Dean Foster and the classic *Trek* novels. I also enjoy Ben Bova, Arthur C. Clarke, Michael Crichton, and Stephen King. I read

and I watch. I'm into this genre."

Star Trek has a history of openness to authors with science-fiction backgrounds. Harlan Ellison, Theodore Sturgeon, Robert Bloch, and others originally, David Gerrold striding the generations: Michael Reaves, Diane Duane, and recently story editor Melinda Snodgrass. But actors who read science fiction?

Ethan Phillips also reads science fiction. "I'm a great fan of Greg Bear. I like Frederik Pohl. I love Kim Stanley Robinson. I've read a lot of Heinlein and a fair amount of Dick. Actually, I just finished [Clarke's] *Garden of Rama*, the final book of the whole trilogy. Ursula LeGuin, Philip Jose Farmer. I just read *Shiver* by Neil Stephenson. And Paul Parks stuff. He's really terrific."

Phillips himself would probably be at home on the *Voyager*. "What appeals to me in science fiction is being taken to a place that's really different."

Phillips' character Neelix, looks the

strong, breakthrough characters. "Some of B'Etanna's characteristics aren't very attractive. There are also some strong and intelligent aspects. I'm exploring both sides."

Another example of the ethnic diversity of character is Chakotay, played by Robert Beltran. "He's a Native American of no specific tribe or culture. I'm trying to get [the producers] to go Mayan or Aztec, who were very advanced in astronomy. Chakotay is a Maquis who left Earth to join a rebellion. He was an academy graduate. He's going to be First Officer. He has a tattoo above and around his left eye. It means whatever [makeup maven] Michael Westmore says it means."

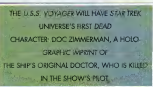
Finally, *Voyager* will have Star Trek's first dead character. Doc Zimmerman, played by Robert Picardo of *China Beach* fame.

"He's a hologram, and he's turning out to be a wonderful character," says Michael Piller.

The original Doctor Zimmerman is killed in the pilot. However, he has left behind a holographic imprint of himself stored in the *Voyager*'s computer.

"We talked at one point about changing him to suit somebody's need for a bedside manner, but we found a voice for the character writing the pilot and first couple of episodes that we liked a lot," says Piller. "He's a very Neotest man in that he is somebody who is programmed only for work. He has no life beyond his work and has no way of understanding the needs and demands of a life except what is basically put in front of him to stitch up or sew or cure. We have to learn what the value of a hologram is, whether or not it's to be treated as a life form or as a member of the crew."

"This show is really bringing in some new scientific ideas," says Robert Duncan McNeill. Indeed, the pseudo-science sounds remarkably well thought-out. "For example, this ship runs on neural gel-packs," Rick Sternbach, artist and resident techie, explains. "The neural gel-pack takes the isolinear computer chip and moves it one step further. Since it utilizes synthetic neurons, it essentially grows a new kind of computer circuit. It's a head end for any device on the ship. Instead of, say, an isolinear-optical-based computer thinking out every move in a chess game, the neural gel-pack system will think out some of those moves, but will be able to come



Voyager into helping him retrieve a girl-riend named Kes, played by strikingly sweet and beautiful Jennifer Lien, late of the sitcom *Phantasies*.

"Kes is of an alien species, the Ocampe. She's very young and ethereal. She's telepathic," Lien explains. "Young? You bet. Though she's clearly sexually mature, Kes is only one year old. The Ocampe have a nine-year life span."

"The Ocampe live at a quicker rate in every way. I learn faster. I grow faster! There's no fatalism, though. 'The Ocampe are very open and at ease with being themselves.'"

Less easy-going will be Chief Engineer B'Etanna T'Pol, played by Roxann Biggs-Dawson. "Basically, she's trying to reconcile both sides of herself, her human heritage and her Klingon heritage. There's so much potential here. She's half-Klingon and half-human, but she's all woman." Roxann seems charming and demure. It's hard to imagine her sharing and aggressive, but clearly she exerts, and will carry on the *Star Trek* tradition of

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Stress is the worst and substance use disorder suffers. Stress is half as bad as the substance use disorder.

ARTICLE BY DENNY ATKIN

VIRTUAL BLUE YONDER: FIGHTERTOWN TAKES OFF

PHOTOGRAPHS BY DOUGLAS KIRKLAND



WEDNESDAY EVENING: ARRIVAL, FIGHTERTOWN

T

he Golden Eagle

Squadron pilots scramble into headquarters, adrenaline pumping as they grab their helmets, flight suits, and mission orders. After months of training and mock battles, the squadron will taste combat for the first time. Under strict rules of engagement, these elite pilots will fly a series of retaliatory missions against an aggressive foreign power that has invaded allied territory.

The location isn't a forward airbase somewhere in the Middle East, but rather a large, white building just around the corner from a Carl's Jr. fast-food restaurant in Lake Forest, California. The pilots



don't fly for the U.S. Navy or Air Force, but rather for the Golden Eagles, a squadron based at the Fightertown



Virtual Simulation Center

The pilots are gathered for Operation Dominion, Fightertown's test full-blown combat campaign, pitting the virtual-reality center's best pilots against both real and computer-controlled opponents. "The flight is simulated, but the experience is real," claims Fightertown's brochure. I'm wondering just how real my first experience as a correspondent for a simulated war is going to be as I pull into Fightertown's parking lot. Suddenly my vehicle (a rented Corolla—you only get Humvees for real wars) begins to vibrate. I look up to see six Marine F/A-18 Hornets attack fighters from the nearby El Toro airbase screaming overhead. The mood is set.

The mood isn't broken as I follow a group of pilots through Fightertown's entrance. After checking in with a uniformed attendant, I'm escorted back to the supply



**THE SIM DRIVERS
EXECUTE HIGH-
YO-YOS AND RPLWT-S
MANEUVERS
WITH THE PRECISION
OF AIRSHOW
PILOTS. THERE'S A
TACTICAL
OBVIOUSNESS EXHIB-
ITED BY HUMAN
PILOTS THAT CAN'T BE
SIMULATED
BY A COMPUTER.**

room where I'm issued a green bag (flight suit). Walking down the hall I spot walls lined with pictures of fighter planes, lockers covered with squadron stickers, and map-filled briefing rooms. Once you've passed through Fightertown's front doors, the only indication you're not walking through a squadron headquarters on a real military base is the presence of civilian customers looking for a chance to visit the wild blue yonder.

Today, though, there are no such distractions. There's a war on, and Fightertown is closed to the public. Only the Fightertown staff—the 20 Golden Eagle pilots, and the correspondent are present. As the pilots file in, they're handed papers containing a campaign overview and rules of engagement and told to report to the Officer's Lounge at 1800 hours for a briefing.

In the meantime, I head

to the flight line to check out the pilot's mounts. Entering the huge simulation room, I'm surprised by the scale. A two-story control tower dominates the dimly lit, warehouse-size room. Surrounding the tower are 11 full-size fighter jet cockpits. Some are fiberglass replicas, but the F-111 and F-4 Phantom cockpits are actual converted military simulators. Some of the fighters face huge, 12-foot video screens while others have large monitors mounted above the instrument panel. Taking a closer look, I'm impressed by the number of switches in a replica F-16 Fighting Falcon cockpit. Fightertown co-founder John Araki reminds me that there's a lot more to the Fightertown experience than the cockpit simulators. "We don't build just pods here," he admonishes, "we build an experience." Still, the cockpits are impressive, which is

F-15 EAGLE: THIS IS NOT A SIMULATION

After piloting the authentic simulators at Rightstown, I was starting to get cocky about my flying skills. One quick phone call from Air Force Lieutenant Bryan Hubbard brought my bristles right back down to earth.

"How would you like to fly an F-15 Eagle?" he asked.

Gathering my scattered wits, I confidently responded, "Uh, yeah!" The Air Force wanted me to visit its semiannual William Tell air-to-air weapons meet at Florida's Tyndall Air Force Base. This would be a chance to see in use some of the hottest defense technologies around: sophisticated unpiloted drone aircraft, the AMRAAM radar-guided missile, and 3-D computer-generated ACMI playbacks of combat maneuvers.

Arriving at Tyndall, I don't go straight to the flight line. The F-15 is equipped with ejection seats, and one has to go through egress training before flying. This involves sitting in a full-size cockpit mockup and learning how to get out of the plane—the slow way, by climbing out, and the very fast way, by ejecting. Next comes parachute training, as well as learning how to utilize the beacons, flares, rations, and raft included in the seat-cushion survival kit. After a quick visit to the flight surgeon, I'm fitted for my flight suit. After nearly three hours of preparation, I'm off to the flight line.

My pilot, Major Michael J. Simpson, escorts me to the two-seat F-15D. Although the F-15 first flew way back in 1972, it's still considered the premier air-superiority fighter in service anywhere in the world. Nearly 64 feet long and 18 feet tall, the mach 2.5-plus fighter is an imposing sight.

We take into position, and we're off! And I mean off! We execute a full-afterburner takeoff at a 45-degree rate of climb (it feels more like 90). The F-15 feels as if it's been

**SIMULATORS ALLOW
YOU TO PILOT
VESICLES RANGING
FROM FOKKER
TRIPLANES TO F-14
TOMCATS TO
GALAXY-CLASS STAR-
SCIPS, BUT
EVEN THE MOST**



**REALISTIC
SIMS CAN'T PREPARE
YOU FOR THE
FEELING OF NEARLY
EIGHT TIMES
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OF GRAVITY
PRESSING YOU IN
YOUR SEAT.**

jerked up to 20,000 feet in a matter of moments. (The Eagle holds six time-to-height records, including a climb to 66,616 feet in 2 minutes, 29.4 seconds.)

We turn up with another F-15, the planes maneuver with such precision that it seems as if there's an invisible rod locking them together. Then we break off and perform some basic fighter maneuvers, with each pilot trying to stay on the other's tail. You don't gently bank an Eagle—you roll it 90 degrees and pull back hard on the stick. It's at this point that I understand the biggest difference between flying a simulator and the real thing: G-forces. Simpson shows me some light maneuvers, at one point pulling 7.8 Gs. During severe maneuvering the G-suit tightens on your legs and lower abdomen to keep the blood from rushing from your head and pooling near your feet, but that's not enough to keep you conscious. You also have to tighten your muscles manually and perform breathing exercises to keep the oxygen flowing to your brain. My vision starts to gray out on the 7.8-G maneuver, and I'm amazed that pilots can even stay conscious during 9-G maneuvers, much less successfully dogfight.

At that point my equilibrium protests, and my stomach promises to leave me a flight souvenir if we don't calm our flying, so Simpson leads me through some banks and rolls, and then lets me take the shock. The Eagle maneuvers with a light touch, with real-world feedback around you, it's actually easier to fly than the simulators.

Finally we touch down at Tyndall; the F-15's huge airbrake quickly slowing the fighter to a stop. I climb from the Eagle following one of the most exciting hours of my life with even greater respect and awe for military pilots and the planes they fly.

probably in no small part a result of Araki's and co-founder Dave Kinney's experiences in the 1960s working on Northrop's B-2 night fighter project.

1600 Hours: Briefing

In the Officer's Lounge, the Golden Eagle pilots are poring over their briefing information. This may be a simulation—a very sophisticated game, in all honesty—but they're taking it very seriously. The pilots—all male and mostly in their 30s and 30s—are all clad in authentic flight suits, some Rightstown issued, others personally owned. Squadron patches adorn all the uniforms, and some pilots even have planning notepads strapped to their legs.

I sit down at a table with four Rightstown pilots: Slider, Hollywood, Wolf, and Bigger. (Everyone is known by his call sign, just like in *Top Gun*.) They're the night pilots for the first mission, ready to take to the air as reinforcements when allied aircraft are shot down. Colonel Gary "Six Gun" Woods, the squadron commander, comes in to address the flyers. Air squadrons and ground troops from the nation of Sijan have captured two allied islands, Bear Trap and North Java, he explains. We watch a fictional news broadcast recounting the day's events, including an interview with a Sijenian pilot whose taunts help rile the Rightstown jet-jockeys toward action.

Our boys have two goals. First they must repatriate the captured territories, then they must teach the Sijenians not to mess with the United States.

The G-C quote over the radio of engagement. All combat will be gun-only. This is a compromise to help keep the simulated combat exciting—these pilots are serious, but they're here to have fun, and being shot down by a computer-generated missile fired from 20 miles away just isn't fun. The Golden Eagles will face five computer-generated F-4 Phantoms, as well as two F-4s piloted by human pilots (Rightstown employees, who are just as anxious to add some kills to their flight logs). The squadrons will be able

FLYING THE 'UNFRIENDLY SKIES

If you can't get to Fightertown, you can still get a taste of what it's like to fly high-performance jets if you have a personal computer. Home PCs have grown so powerful that they can simulate air combat with incredible realism. "We do a lot of out-side flying that way," says John "Wolf" Rawson, a member of Fightertown's VMF-115 Silver Eagles Squadron. "Falcon 3.0 is popular, and Chuck Yeager's Air Combat handles real well."

Spectrum Holobyte's Falcon 3.0 is a favorite combat simulator among serious PC pilots. The simulator lets you fly the Air Force's F-16 Fighting Falcon in a series of missions over trouble spots around the world. Although it's been surpassed graphically by more recent simulators, nobody has topped it for overall situational realism and sophistication. The missions you fly—ranging from up to seven F-16s on your wings—are part of a larger campaign where the success of each mission determines what threats you'll face next. You must carefully plan every aspect of your mission: How many planes you'll take along, which weapons to carry, and what path to take to the target.

Much of the appeal of Falcon 3.0 comes from its connectivity. You can fly head-to-head or cooperative missions against another Falcon owner over a telephone modem connection, or, for a real thrill, fly with or against one to five players using a group of networked PCs. There are Falcon squadrons who meet periodically on services such as CompuServe to plan elaborate online battles.

The best way to check out Falcon 3.0 is to pick up the recently released Falcon Gold CD-ROM compilation, which features Falcon 3.0, add-on planes such as the MIG-29, and other add-on content. It's available in a full combat training video. It's available from Spectrum Holobyte, (510) 523-1164. The company also makes Falcon MC, a similar program for the color Macintosh. Later this year Spectrum plans to release

WHILE YOUR HOME PC MAY NOT BE EQUIPPED WITH A CUSTOM DISPLAY CARD, 12-FOOT PROJECT SCREEN, FIGHTERJET COMBAT NETWORK,



AND FULL-SIZE REPLICA OF AN F-16 COCKPIT LIKE THE FIGHTERTOWN RIDE, IT CAN STILL CAPTURE THE EXCITEMENT OF AIR COMBAT.

two new simulators: Top Gun, an F-14 simulator based on the film and geared toward the novice computer pilot, and Falcon 4.0, updated with state-of-the-art graphics, live-action video, and a more sophisticated ground campaign.

Electronic Arts' U.S. Navy Fighters is a bit easier for novices to master. You're not saddled with the responsibility of managing the entire air war; you only have to worry about accomplishing individual missions. The missions are interesting, and some are a welcome change from the typical "blow up ground target after ground target" flight simulator fare. For example, the first mission in the Russian campaign has you escorting an tanker carrying Boris Yeltsin through hostile territory after an uprising in the former Soviet Union. You fly Navy planes ranging from the submarine A-7 Corsair II attack jet to a novelized F-22 Lightning II fighter against an armada of computerized opponents that includes most of the major combat aircraft in service today.

Designed by Brent Iverson, the programmer responsible for the popular Chuck Yeager series of flight simulators, U.S. Navy Fighters features graphics and sound unparalleled by any other flight simulator. SuperVGA graphics, beautifully textured clouds, and 16-bit stereo sound help pull you into the fantasy. If you got a new Pentium PC as a holiday gift, this is the program to push it to its limits. On CD-ROM for IBM PC compatible computers, U.S. Navy Fighters is available from Electronic Arts, (800) 245-4525.

If you want to learn everything there is to know about modern PC flight simulators, check out Intercept: The Journal for Combat Flight Simulation Pilots. This bimonthly publication, distributed free to subscribers, covers the latest and greatest flight sims in existing detail, including information about the simulators and technical details on the actual aircraft they model. For information contact SIMCAP at (314) 338-8520.

to choose which planes to send on a strike, they will have F-14 Tomcats, F/A-18 Hornets, and A-6 Intruders available, as well as a KC-10 tanker. Pilots must make it back to a safe zone near friendly territory before ejecting, or they'll be considered captured by enemy forces.

The pilots are broken up into groups. Eight pilots will fly on each strike, with four Alert pilots on standby for each mission. While one group is in the air, the second group will plan the next

strike. Seven missions will be flown tonight, and if all goes well, Span will feel the wrath of Fightertown's air forces.

1700 Hours: Mission Planning

I follow the first group downstairs to the briefing room. One wall is covered with a map of the International Gulf of Spain. The C.O. points out the targets for the first mission. Radar sites must be knocked out so that later strikes can be mounted in an effort to recapture the airbase there. The planning is intricate

and the pilots are considering all the factors that can affect the success of their mission. They calculate the distance to the target and the fuel load needed, what kinds of enemy forces they might face, the best altitude to fly, and what sort of weapons they'll need to knock out the radar site. "Watch out for small-arms fire," warns Six Gun. The pilots should break to the left after firing at the radar site. "Break off the wrong way, and you'll run into AAA (antiaircraft artillery)," cautions the

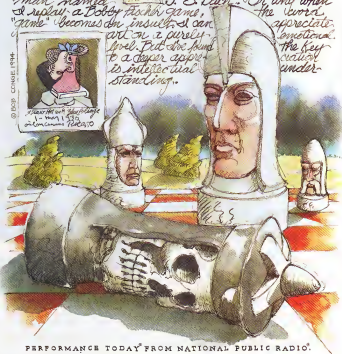
October 31

My King met an unexpected demise. Giving me, yet again, a deeper understanding of a beautiful game and reminding me of an oft forgotten truth. It's why I find a Picasso more interesting when I know a distorted head. It's why the me when I realize a piece was composed by a mortal. It's why when I replay a Bobby Fischer game, the word "game" becomes an insult. I can art on a purely emotional level. But the found to a deeper appreciation is intellectual understanding.



A drawing of a woman by Pablo Picasso
1 - May 1930
in Louvre Museum Paris

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C.O. The flight will take F-4s due to range and self-defense considerations. The pilots break into individual flights and plan their exact attack routines.

An officer sticks his head through the door. "Time to fly," he says, and the pilots grab their helmets from the wall and scramble to their cockpits. I head back up to the Officers Lounge, where I'll be able to watch the mission on monitors that show the cockpit views from the allied aircraft and the enemy F-4s. A group of Flightline employees sits across the room—they'll be flying for the Red Syrian squadron as the night goes on. Some good-natured banter is exchanged between the pilots on the two sides. I ask John "Wolf" Peterson if the competition between pilots ever heats up.

"I've seen very few personality conflicts," he explains. "We may have some disputes over who shot down whom, but everyone gets along well." Things might get heated occasionally because of the realism of the situation. "There is pressure on you to perform," he admits, "but it's more a fun than anything else." That's actually written into the rules of engagement: "Please—F-4s, F-16s, F-18s, F-19s, F-20s, F-21s, F-22s, F-23s, F-24s, F-25s, F-26s, F-27s, F-28s, F-29s, F-30s, F-31s, F-32s, F-33s, F-34s, F-35s, F-36s, F-37s, F-38s, F-39s, F-40s, F-41s, F-42s, F-43s, F-44s, F-45s, F-46s, F-47s, F-48s, F-49s, F-50s, F-51s, F-52s, F-53s, F-54s, F-55s, F-56s, F-57s, F-58s, F-59s, F-60s, F-61s, F-62s, F-63s, F-64s, F-65s, F-66s, F-67s, F-68s, F-69s, F-70s, F-71s, F-72s, F-73s, F-74s, F-75s, F-76s, F-77s, F-78s, F-79s, F-80s, F-81s, F-82s, F-83s, F-84s, F-85s, F-86s, F-87s, F-88s, F-89s, F-90s, F-91s, F-92s, F-93s, F-94s, F-95s, F-96s, F-97s, F-98s, F-99s, F-100s, F-101s, F-102s, F-103s, F-104s, F-105s, F-106s, F-107s, F-108s, F-109s, F-110s, F-111s, F-112s, F-113s, F-114s, F-115s, F-116s, F-117s, F-118s, F-119s, F-120s, F-121s, F-122s, F-123s, F-124s, F-125s, F-126s, F-127s, F-128s, F-129s, F-130s, F-131s, F-132s, F-133s, F-134s, F-135s, F-136s, F-137s, F-138s, F-139s, F-140s, F-141s, F-142s, F-143s, 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flaps are down and to raise their gear as soon as they unstick from the runway. As it is, they'll have to fly with a less-than-maximum load just to get off the ground. It turns out one pilot doesn't make it, turning his plane into a "lean dart" embedded in the hill at the end of the runway.

The strikes continue as pilots destroy ground and air targets and are shot down themselves. Suspension of disbelief is broken just a bit whenever shot-down pilots come up to the lounge to order a Snapple while they wait to hear whether they were rescued or captured, but after all, this is just a simulated war.

And in the end, it's a simulated war that the good guys win. Having recaptured the lost territory, a final series of flights launches toward Syon itself, where they wipe out an oil refinery as a retaliatory measure. A cheer goes up in the lounge as the tower confirms the destruction of the refinery, and we head down to greet and congratulate the last group of pilots upon their return to base. It's like watching a scene from *Top Gun*—pilots are patting each other on the back, moving their hands through the air re-creating maneuvers, and good-naturedly ragging the guys who come home riding silk elevators.

Thursday Doodling

John "Wolf" Rawson describes one of the later missions: flying a two-seat A-6 with Badger. "Dominion took a lot out of me. We were up there for a long time, and then we got hit over the target. We fired a Zuni at some airplanes on the runway, then shifted over and fired some at the tower that was the target. We hit it, and there was an explosion, and we got hit by that. Almost immediately a fuel leak started.

"We immediately had to shift our thoughts to how to get back. We were already low on fuel from dodging enemy planes in the area, so we had to figure out how to get back to the safety zone where we could eject. Right at the end an enemy aircraft forced us down with gunfire, and we had to eject early." He adds, with relief, "We got picked up by a rescue chopper, so we made it back."

Rawson, an electrical engineer from nearby Orange, California, flies real planes as well. He owns a Stearman biplane, which is currently in the process of restoration. He says the Fightertown pilots aren't fascinated with the war aspects of the simulation; they're just people with a similar interest in aviation and the challenge of flying military jets. "It's like a group of guys who get together to play basketball on Sunday af-

ternoons, except that we get together once a month to test our skills as a team in the air."

The Fightertown simulators do fly a lot like real planes, Rawson says, except for the lack of G-forces and peripheral vision. Still, the simulators are realistic enough that he feels some aspects are good practice for real flying, such as the IFR (Instrument Flight Rules) departures and approaches the pilots often practice. Plus it gives him a chance to try things that you don't normally get a chance to do over the skies of Southern California. "Formation flying is a bit of a jump," he says. "It's probably one of the most difficult things you can do in an airplane."

Test Flight

Operation Dominion was flown by some of Fightertown's most talented and dedicated pilots. These are regular customers who have flown a series of qualification missions, learning real piloting, navigation, and combat skills, until finally receiving their wings. These are the de-hards, pilots so enthusiastic about the Fightertown experience that some of them volunteer time waiting in the tower and performing other duties in exchange for time in the cockpit.

But Fightertown isn't just an experi-



Siamese twins, separated at Perth

ende for winnable Chuck Yeagers. First-time pilots are given an introductory briefing that combines video of Fighterdown cockpits and actual jet operations with instruction by a Fighterdown officer. First flight is in an easy-to-handle T-45 Goshawk trainer and the tower controller is always a microphone button press away if you have any questions.

I strap into one of the F-16 cockpits for an introductory flight. Although the cockpit looks like an F-16, it'll be flying the T-45 on this run. Any of the cockpits can be programmed to simulate a variety of aircraft, including the F-14 Tomcat, F-16 Fighting Falcon, A-6 Intruder, F/A 15 Hornet, Russian SU-27 Flanker, and even the AA-8B Hammer jump jet.

Full throttle, pull back on the stick at 120 knots, and raise the gear and flaps. This is as easy to fly as the personal computer flight sims I'm used to, but that experience can't compare to this. Wearing a flight suit, listening to lower communications through an authentic combat helmet, and feeling the cockpit vibrate from engine noise—all that's missing is the sensation of movement. (Fighterdown has two full-motion cockpits that can even provide that.) The tower controller vectors me to a canyon for a high-speed run. I push the throttle forward, nose down, and hang on for the ride of my life. At the end of the canyon is a suspension bridge. I lower my altitude a bit, scream under it, then pull the stick hard back and hit the switch on the control stick for a rear view so I can watch the bridge retreat into the distance behind me.

The controller knows five town sies before, so he gives me a taste of what more advanced pilots will encounter in the simulated skies. "Two banders at your six," he calls urgently. I pull on the stick, lock up one bander on the authentic heads-up display call "Fox One!" and uncage a missile at him. Splash one bad guy. Meanwhile I've lost the second bander. I find him soon enough, when I hear the impact of gun shells on my plane's fuselage. Jerking back and forth, I manage to get out of his line of fire. My plane nearly becomes one with a nearby mountain as I try to maneuver onto his tail, but I pull out at the last second. Finally I squeeze off a shot and take him out. Just when I think it's safe to let the adrenaline level drop, the controller's back on the radio: "Ready to try a carrier landing?" On my first attempt at what amounts to a controlled crash on a postage stamp, I miss the wires and bolt off the end of the ship, but on the second go I trap the three-wire

Virtual Air Base

Fighterdown isn't about gadgets and electronics; it's not a "here's a jet, fly it" experience. The human element—with tower controllers, uniformed flight instructors, a rank structure that regular customers can work through, and the ability to fly against live opponents—is what makes this a reality simulation rather than just an arcade experience. The Fighterdown folks want to make the experience a realistic one you'll want to come back and try again, something you can learn more about and enjoy in greater depth. "We're not here to do a thrill ride," says John Anaki. Well, hopefully it will thrill you, adds Dave Krimley. "But we want to provide something more substantive than that."

For \$30 (the full-motion simulators are a lot more), the Fighterdown pilot gets a half-hour of instruction and another half hour in the air. For an aviation enthusiast, that's not a lot of money, but for some potential customers that expense might make Fighterdown a one-time "gee-whiz" experience. To make Fighterdown more attractive to casual fliers, and to folks who might want to bring the whole family along, a new Battle Over the Pacific feature will be opening soon. This section will feature a bank of full-motion World War II F4U Corsair fighter cockpits that will be easier—and less expensive at about \$10—to fly than the current jet simulators. Like the jets, though, the realism level is adjustable, so expert pilots can battle with torque sticks and spins not to mention Zeros and P-51s.

At the moment Fighterdown's Orange County center is the only location, but the company is looking to expand into a nationwide network of virtual entertainment centers. The company hopes to open another 50 locations nationwide within five years. Anaki says that the initial plan is to allow the various centers to compete in tournaments by comparing rankings and kill statistics. As computer communication technology advances, though, he hopes that they will eventually be able to link the simulators in real-time, so a pilot in Lake Forest could take on a flier in Chicago.

While most of the industry is still struggling toward electronic interactive entertainment, Fighterdown has found a winning combination of simulation, human elements, and atmosphere that works for the uninitiated as well as the technical-minded fighter-plane buff. "We think that for most of our customers, it's as close to a jet or an F4U as they're probably going to get, so it's really important that it live up to their expectations," says Krimley. **CC**

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ANATOMY OF AN ABDUCTION

INVESTIGATED BY A. J. S. RAYL

PRIMARY WITNESS:

Leah A. Haley

VITAL STATISTICS:

Accountant, mother of two, from
Columbus, Mississippi

SUMMARY:

By 1990 Leah Haley had begun
recalling unsettling
dreams of visits aboard spacecraft with
aliens; the images were at
once so "strange" and so "real" she
sought professional help.
Her therapist, Springfield, Missouri,
social worker John Carpenter,
known for his work with UFO abduc-
tees, says Haley's case is
special. "The details were amazingly

PHOTOGRAPH BY JOYCE TENNESON

specific and corroborated unpublished details from the best case data we have so far." What's more, he points out, Haley's story had a spin. Her "recollections" apparently involved the United States military, which she claimed harassed her so she wouldn't go public with her tale.

After undergoing hypnosis, Haley has come to believe her abduction dreams were real. She eventually went public in 1993 with a self-published book, *Lost Was the Key*, after legally changing her name to Leah A. Haley "to protect my family and children."

Inventory of Claims

Memories from the Deep: In 1980 Haley, then nine years old, and her brother, then seven, saw what they thought was a spacecraft landing in the woods near their home in Gardendale, Alabama. "I saw three objects, two of which quickly darted away," she explains. "The third was silver, completely spherical in shape, and it sat still for a long time in the sky."

Decades later, in July 1980, Haley visited with her mother and brother in Alabama, and during a conversation about extraterrestrials sparked by a newspaper article, Haley recounted a "strange, very real dream I was in a spaceship, in a round room, lying on a platform with small, chalky white creatures with big black eyes doing some kind of medical things to me," she recalls.

After the dreams increased, she contacted John Carpenter in hopes of finding some mental illness or disorder to explain what was going on. Instead, during 15 sessions of hypnotic regression, she recalled countless specific abductions starting at age 3. She even conjured an underside alien facility complete with alien craft and a captive soldier, held against his will.

Military Intervention: During hypnosis and in flashbacks, Haley also recalled her abduction by military personnel. For instance, she told of an alien craft that she believes crashed near a beach while she was aboard, after which military personnel escorted her away. Comments Carpenter, "That episode unraveled as vividly as any I've heard."

Since September 1980, Haley claims, she has been "followed by military types in navy blue or white cars" and occasionally by black unmarked helicopters. She also claims she has been monitored via her telephone and in person because she now speculates "I was on that alien craft when it crashed and the military wanted to glean infor-

mation and make me shut up."

In April 1991, Haley charges, military harassment made its most inebriated appearance at the Columbus Air Force Base in the form of Major (then Captain) Tacy Poole, whose wife was in Haley's accounting class. Haley says Poole extended "an unusually persistent invitation" to view space shuttle Endeavour during its stopover at the base. Armed guards surrounding the shuttle and signs posted around the spacecraft warning that "Deadly force is authorized," Haley notes, explain why she considered the invitation "a possible setup to interrogate or kill me."

Technology Gone Awry: Haley also reports loosened locks and window screens, disturbances in the phone line, and the spontaneous dismantling of her security system, not to mention strange sounds throughout her house, leading her to believe someone or something was inside.

Ward Body Marks: Haley has found "more than one hundred strange

marks that the actual experience was a sexual molestation." It is my professional opinion," he concluded, "that you suffer from delayed Post Traumatic Stress Disorder (PTSD) due to childhood experiences, complicated by a paranoid state caused by the hypnosis sessions, and I've recommended you undergo treatment by a licensed M.D. or Ph.D. certified in hypnotherapy to help you resolve these issues."

In the fall of 1992, Haley also completed a Fantasy Prono Test given to numerous abductees by the Center for UFO Studies (CUFOS). According to Carpenter, "It revealed that she was less likely than the normal person to be fantasy prone. She fell in the frank, down-to-earth, conservative range."

The Investigation

Memory Lane: Like most abductees, Haley has recalled her alien encounters primarily through hypnotic regression. "Haley deliberately did not read anything and did not want to be an abductee or involved in any of this," says her hypnotist John Carpenter, who has to date regressed 90 other abductees. Under hypnosis, she had the classic response to all this: it brought tears.

Haley's brother, who is a law enforcement officer with the state of Alabama and, as such, requested anonymity was present at the first two hypnosis sessions. Carpenter did not

SHE REPORTS MORE THAN
100 STRANGE MARKS ON DIFFERENT PARTS OF
HER BODY: INJECTION
MARKS, SCOOP MARKS, AND CIRCULAR,
VACCINATION MARKS
SEEMINGLY FORMED WITH THREE PRONGS.

ask leading questions, rather he tried to lead her away from anything having to do with aliens," he says. After the sessions, he says, "she was in disbelief, denial, shock, but there was no doubt in my mind that she was deeply affected by what she was remembering."

All this say critics does not prove Haley's recollection to be real. Robert A. Baker, psychology professor emeritus at the University of Kentucky, who has studied psychological anomalies, says, "These encounters are really hypnagogic images, essentially waking hallucinations or dreams, and nothing more." Adds Baker, researchers like Carpenter may be putting aliens in people's heads.

Baker has not looked at my work or my methods," responds Carpenter. "My trademark is deliberately suggesting logical responses to the point of misleading these abductees. These abductees come from all walks of life and economic status, and yet they all tell the same story about the same little guys. It doesn't make sense that these

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EDITED BY
JAMES H. HARRIS

PROFILES IN ARTIFICIAL INTELLIGENCE

EDITED BY
JAMES H. HARRIS

LIKE A LOT OF THINGS, ACHIEVING ARTIFICIAL INTELLIGENCE IS HARDER THAN IT LOOKS. IN THE 1950s, THE PIONEERS OF AI CONFIDENTLY PREDICTED THAT, BY THE END OF THE CENTURY, COMPUTERS WOULD BE CONVERSING WITH US AT WORK AND ROBOTS WOULD BE PERFORMING OUR HOUSEWORK. BUT AS USEFUL AS COMPUTERS ARE, THEY'RE NOWHERE CLOSE TO ACHIEVING ANYTHING REMOTELY RESEMBLING THESE EARLY ASPIRATIONS FOR HUMANLIKE BEHAVIOR. NEVER MIND SOMETHING AS COMPLEX AS CONVERSATION: THE MOST POWERFUL COMPUTERS STRUGGLE TO RELIABLY

RECOGNIZE THE SHAPE OF AN OBJECT, THE MOST ELEMENTARY OF TASKS FOR A TODDLER.

A GROWING GROUP OF AI RESEARCHERS THINKS IT KNOWS WHERE THE FIELD WENT WRONG. THE PROBLEM, THE SCIENTISTS SAY, IS THAT AI HAS BEEN TRYING TO "CHERRY-PICK" INTELLIGENCE—THAT IS, TO SEPARATE THE HIGHEST, MOST ABSTRACT LEVELS OF THOUGHT, LIKE LANGUAGE AND MATHEMATICS, AND TO DUPLICATE THEM WITH LOGICAL, STEP-BY-STEP PROGRAMS. A NEW

movement in AI, on the other hand, takes a closer look at the more roundabout way in which nature came up with intelligence. Many of these researchers study evolution and natural adaptation instead of formal logic and conventional computer programs. Rather than digital computers and theorems, some want to work with brain cells and proteins. The results of these early efforts are as promising as they are peculiar, and the new nature-based AI movement is slowly but surely moving to the forefront of the field.

Here is a look at three of the field's most provocative pioneers. The first wants to employ nature's techniques for programming intelligence; the second wants to get computers to imitate precisely the brain's unique style of information processing; and the third wants to replace computers altogether with the chemical building blocks of living tissue.

Pattie Maes has an unusually well-cuddly vision of AI. Originally from Belgium and now one of the stars of MIT's celebrated Media Lab, the slender, energetic Maes eschews screens of text, disembodied voices, and gleaming robots. Instead, her efforts take the form of animated rodentia, puppets, and happy faces among other characters. "My dream," says the researcher in her mellifluous accent, "is to do a really good dog."

Maes' "intelligent agents," as she calls them, are no mere cartoons but artificial intelligence programs capable of sophisticated behavior. What makes them special is that they achieve these behaviors without having Maes or anyone else specifically program them in. Rather, they develop them on their own by interacting with their environment, much as living creatures do.

Maes' happy faces, for example

act as calendar-arranging assistants for their users: intercepting electronic mail messages that request meetings and then scheduling the meetings. But before a program can begin scheduling, it has to learn how its user prioritizes such requests. So for a while, it "watched" the user schedule meetings on a calendar kept on the computer, noting which people tend to get what sort of slot on the user's calendar, in much the same way that a budgeting spreadsheet keeps track of how you spend your money. The assistant might record the fact, for instance, that while the user's boss always gets a brief but more-or-less immediate slot, the old friend down the hall gets the next available lunch hour, and the annoying expense-report auditor in accounting always gets put off. While gathering this information, the assistant shows up on the screen as a square-face icon with a blank expression.

After a while, the assistant program has stored enough information to start trying its hand at scheduling. So the next time the user types the name of someone who wants a meeting, the assistant consults the information it's stored about what sort of priority this person has received in the past. As it does so, the square-face screen up as if in concentration. Then, Eureka! the face suddenly displays delight as the assistant presents the user with a suggested appointment time. If the user approves, the icon grins with pride. If the user rejects the suggestion and picks a different time, the icon looks surprised—but the assistant won't make the same mistake a second time. A total of nine different facial expressions for the icon help the user keep track of what the assistant is up to.

To speed up the learning process, assistants can even "consult" with other assistants over a computer

network to pick up tips. "One of the ways knowledge is transferred among groups of peers is when people share their work habits with colleagues," Maes explains. "I want my agents to have the same opportunity."

Maes has turned to a different technique to help another of her programs sort through electronic bulletin-board messages. This intelligent agent is designed to sift through hundreds of such messages and articles, picking out the few most likely to be of interest to the user by looking for various combinations of key words or phrases. The hard part, of course, is applying the program with exactly the right list of key words that will separate the wheat from the chaff. Coming up with a list precisely tailored to a person's needs could take weeks of work—and it would have to be repeated for each user.

To avoid that chore, Maes employs a form of artificial evolution. A user starts off with not one acting program but a "population" of several hundred of them. Maes calls the programs "retrievers" and represents them on-screen with cartoon faces similar to the scheduling assistants. Each retriever is preassigned a different, randomly chosen set of key words and phrases. One might tag all articles with sports terms as must-read items, for example, while another gives preference to items that include financial terms, such as "interest rates."

After working with the retrievers for a while, the user then picks out the ones that did the best job of filtering through the messages. These are then "mated": that is, a new batch of retrievers is created by mixing and matching the original "parent" retrievers in 15 different ways. In addition, a few random "mutants" are thrown into some of the lists to make them different from those of the parents. The hope is that

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A young
actor learns to
bend but
not break while
he faces
oppression on
his journey
to success and
recognition.

Occam's Ducks

Fiction By Howard Waldrop

Producers Releasing Corporation Executive Bill, you're 45 minutes behind on your shooting schedule.

Headline: You mean, someone's waiting to see this crap?

—William "One-Shot" Beaudine

For a week, late in the year 1919, some of the most famous people in the world seemed to have dropped off its surface.

The Griffith company, filming the motion picture *The Idol Dancer*, with the palm trees and beaches of Florida standing in for the South Seas, took a shooting break.

The mayor of Fort Lauderdale invited them for a 12-hour cruise aboard his yacht, the *Grey Duck*. They sailed out of harbor on a beautiful November morning, just after noon: a late-season hurricane slammed out of the Caribbean.

There was no word of the movie people, the mayor, his yacht, or the crew for five days. The Coast Guard and the Navy sent out every available ship. Two seaplanes flew over the shipping lanes as the storm abated.

Richard Barthelmess came down at first news of the disappearance, while the hurricane still raged. He went out with the crew of the Great War U-boat chase: the *Berry Islands*. The seas were so rough the captain ordered them back in after six hours.

The days stretched on: three, four. The Hearst newspapers put out extras, speculating on the fate of Griffith.

Illustration By Gary Kelley

Gish, the other actors, the mayor. The weather cleared and calm returned. There were no sightings of debris or oil slicks. Reporters did stories on the Marie Celeste mystery. Hearst himself called in journalists in an attempt to contact the presumed dead director and stars.

On the morning of the sixth day, the happy yachting party sailed back in to harbor.

First there were signs of relief.

Then the receptors assured. Someone in Hollywood pointed out that Griffith's next picture, to be released nationwide in three weeks, was called *The Greatest Queston*, and was about life after death and the attempts of mediums to contact the dead.

W. R. Hearst was not amused, and he told the editors of his papers not to be amused either.

Griffith shrugged his shoulders for the newsmen. "A storm came up. The captain put in at the nearest island. We rode out the cyclone. We had plenty to eat and drink and when it was over, we came back."

The island was called Whale Cay. They had been buffeted by the heavy seas and torrential rains the first day and night, but made do by lantern light and electric torches, and the dancing fire of the lightning in the bay around them. They slept stacked like cordwood in the crowded belowdecks.

They had breakfasted in the sunny eye of the hurricane late next morning up on deck. Many of the movie people had had strange dreams, which they related as the far-wall clouds of the back half of the hurricane moved lazily toward them.

Nail Hamilton, the malleable idol who had posed for paintings on the cover of the *Saturday Evening Post* during the Great War, told his dream. He was in a long valley with high cliffs surrounding him. On every side, as far as he could see, the ground, the arroyos were covered with the bones and tusks of elephants. Their cyclopean skulls were tumbled at all angles. There were millions and millions of them, as if every pachyderm that had ever lived had died there. It was near dark, the sky overhead paling, the jumbled bones around him becoming purple and indistinct.

Over the narrow valley against the early stars a strange light appeared. It came from a searchlight somewhere beyond the cliffs, and projected onto a high bank of noctilucent cirrus was a winged black shape. From somewhere behind him a telephone rang with a

sense of urgency. Then he'd awakened with a start.

Lillian Gish, who'd only arrived at the dock the morning they left, going directly from the Florida Special to the yacht, had spent the whole week before at the new studio at Mamaroneck, New York, overseeing its completion and directing her assai in a comedy feature. On the losing, pitching yacht, she'd had a terrible time getting to sleep. She had dreamed, she said, of being an old woman or being dressed like one, and carrying a Browning semiautomatic shotgun. She was being stalked through a swamp by a crazed man with words tattooed on his legs, who sang hymns as he followed her. She was very frightened in her nightmare, she said, not by being pursued, but by the idea of being old. Everyone laughed at that.

They asked David Wark Griffith what he'd dreamed of. "Nothing in particular," he said. But he had dreamed there was a land of fire and eruptions.

THEN THIS YOUNG FILIPINO GUY RAN INTO
THE ROOM YELLING A
MILE A MINUTE AND RAN TO A CLOSET DOOR
AND OPENED IT, AND
A WHITE FELLER FELL OUT OF IT WITH A KNIFE
IN HIS BACK.

where men and women clad in animal skins fought against giant crocodiles and lizards, much like in his film of ten years before, *Marie Celeste*. Hal Roach, the upstart competing producer, was there, too, looking older but he seemed to be telling Griffith what to do. O. W. couldn't imagine such a thing. Griffith attributed the dream to the rolling of the ship, and to an especially fine bowl of turtle soup he'd eaten that morning aboard the *Grey Duck* before the storm hit.

Another person didn't tell of his dreams. He saw no reason to. He was the stubby steward who kept them all rocking with laughter through the storm with his antics and jokes. He said nothing to the film people, because he had a dream so very puzzling to him, a dream unlike any other he'd ever had.

He had been somewhere, a stage, a room. He wore some kind of ivory, a doorman's or a chauffeur's outfit. There was a big Swede standing right in front of him, and the Swedish guy was made up like a Japanese or a Christmas He

had a big mustache like Dr. Fu Manchu on the back jackets, and he wore a tropical planter's suit and hat. Then this young Filipino guy had run into the room yelling a mile a minute, and the Swede asked, "Why number-three son making noise like motorboat?" and the Filipino yelled something else and ran to a closet door and opened it, and a white feller fell out of it with a knife in his back.

Then a voice behind the steward said, "Cut!" and then said "Let's do it again!" and the guy with the knife in his back got up and went back into the closet, and the Filipino guy went back out the door and the big Swede took two puffs on a Camel and handed it to someone and then just stood there and the voice behind the steward said to him "Okay!" and then "This time, Manchu, bug your eyes out a little more!" The dream made no sense at all.

After their return on the yacht, the steward had performed at the wrap party for the productions. An Elk saw him, and they hired him to do their next initiation follies. Then he won a couple of amateur nights and played theaters in a couple of nearby towns. He fetched and carried around the mayors' houses in the daytime, and rolled audiences in the sevens all night.

One day early in 1920 he looked in his monthly pay envelope and found it was about a quarter of what

he'd earned in the theater the last week.

He gave notice, hit the boards running, and never looked back.

So it was that two years later, on April 12, 1922, Marian Brown found himself at eight in the morning, in front of a large building in Fort Lee, New Jersey. He had seen the place the year before when he had been playing a theater down the street. Before the Great War it had been part of Nestor or Centaur or maybe the Thantouser Film Company. The Navy had taken it over for a year to make toothbrushing and trench-foot movies to show new recruits, and films for the public on how to spot the Kaiser in case he was working in disguise on your block.

It was a commercial studio again, but now for rent by the day or week. Most film production had moved out to the western coast, but there were still a few—in Jersey out on Amana, in Manhattan itself—doing some kind of business in the East.

Mantlin had fanned over before

sunup, taken a wheelchair and checked in to the nearby hotel, one that let Negroes stay there as long as they paid in advance.

He went inside, past a desk and a yawning guard who waved him on, and found a guy in coveralls with a broom, which Mantan had learned in two years in the business was where you went to find out stuff.

"I'm looking for The Man with the Shoes," he said.

"You and everybody else," said the handyman. He squinted. "I seen you somewhere before."

"Not unless you pay to get in places I wouldn't," said Mantan.

"Bessie Smith?" said the workman. "I mean, you're not Bessie Smith. But why I think of her when I see you?"

Mantan smiled. "Toured with her and Ma Rainey last year. I tried to tell jokes, and people threw bricks and things at me 'til they came back on and sang. Theater Owners Booking Agency. The TOBA circuit."

The guy smiled. "Tough On Black Apes, huh?"

"You got that right."

"Well, I thought you were pretty good. Caught you somewhere in the City. Want there for the jazz?"

"Thank you."

"Willie!" The janitor stuck out his hand, shook Mantan's.

"Thank you, Willie," Mantan Brown. He looked around. "Can you tell me what the hoodlums going on here?"

"Bessie, ma. I done the strangest things I ever done this past week. I work here—at the studio, teach fitchin' and caryin' and ridin', a mop. Guy rented it two weeks ago—guy with the shoes is named Mr. Meisler, a real yegg. He must be makin' a race movie—the waitin' room second down the hall to the left—looks like Connie's Club on Saturday night after all the slummers left. The guy directin' the thing—Meisler's just the watch chain—name's Slavo. Marcel Slavo. Nice guy, real deliberate and intense—somebody's wrong with him, looks like a jiveleg or blizzard-burnin' to me—he's got some great scheme or somethin'. I been paintin' scenery for it. Don't make sense. You'd think they were making another Intolerance, but they only got cameras coming in Thursday and Friday, shootin' one for a two-ruler. Other than that, Mr. Brown, I don't know a thing more than you do."

"Thanks."

The waiting room wasn't like Connie's. It was like a TOBA tent-show alumnus

reunion. There was lots of yelling and hazing when he came in.

"Mantan! Why Mr. Brown? Looky who's here!"

As he shook hands he saw he was the only comedian there.

There was a pretty young woman, a high-yellow he hadn't seen before, sitting very quietly by herself. She had on a green wool dress and laces, and a wassai-trimmed wrap rooted on the back of her chair.

"Somebody, huh?" asked La Roi Chicken, a dancer from Harlem who'd been in revues with both Moran and Mack and Buck and Bubbles. "Her name's Pauline Christian."

"Hey, Mr. Brown," said someone across the room. "I thought you was just a cadaver in Mantan of the Apes!"

Mantan smiled, pleased. They'd made the film in three days, mostly in the Autherip African Gardens or a white guys' plantation house in Sea Island, Georgia, during the mornings and afternoons before his tent-shows at night. Somebody had called somebody who'd called somebody else to get him the job. He hadn't seen the film yet, but from what he remembered of making it it was probably pretty funny.

"I'm here for the five dollars a day just like all of you," he said.

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G R E A T M O M E N T S I N

February 14, 1987: The first online exclusive dating service makes its timely debut in hopes of capitalizing on the similar computer interests of men and women.

The age-old Valentine's Day dilemma



SATIRE BY ERIC JAY DECETIS

INTERVIEW

A scant generation ago scholars permed a utopian vision of the ancient Maya, whose civilization flourished in Central America from 200 to 900 A.D. The Maya were portrayed as nature-loving pacifists, so immersed in philosophical thought they remained unmoved by power lust or greed. Their cities of magnificent pyramids, wide plazas, and ballcourts were envisioned as sanctuaries where astronomer-priests contemplated the heavens and the endless progression of time. The cryptic writing adorning Mayan architecture, so the experts proclaimed, had nothing to do with history. The deeds of men, they assumed, held no interest for these star-gazed hippies.

We now know this picture is dead wrong. If any person has been instrumental in exploding this myth, it is Tennessee-born Linda Schele, a large-boned woman with a bawdy sense of humor and a dazzling facility for teasing the hidden meaning from the labyrinthine symbols the Maya used to record their language. In the early Seventies, seemingly out of nowhere, she burst into the field of Mayan studies and with her collaborators transformed our understanding of Mayan beliefs and practices.

Previously, experts could decipher only dates encoded in elaborate hieroglyphic signs; now they

SHE ENCODED AN ANCIENT LANGUAGE, SO AFTER CENTURIES OF SILENCE, THE MAYA SPEAK AGAIN.



LINDA SCHELE

PHOTOGRAPHS BY WILLIAM COUPON

read more than 90 percent of some texts. The words in the inscriptions can actually be intoned just as the ancients would have pronounced them. After centuries of silence, the Maya speak again. And what they say is not what Schele's predecessors expected to hear. Formerly cast as the Greeks of the New World, the Maya were actually more like Romans. They loved pomp and pageantry and relished bloodletting on the battlefield, playing ground, or ritual altar. As Schele puts it, "Blood was the mortar of their society."

Like Jean François Champollion of Rosetta Stone fame, Schele follows a long tradition of epigraphers—experts in deciphering lost writing systems—who started as amateurs. In 1970, as a fledgling studio art teacher in Mobile, Alabama, she, her husband, and three students visited Mexico's Mayan ruins over Christmas vacation. Arriving at the ancient site of Palenque, the group planned to stay the obligatory two hours recommended in their travel guide. Instead, they spent over 12 days. "What began as a standard tourist jaunt became for Schele a lifelong obsession."

Schele returned to Palenque each of the next three summers, befriending scholars, knowledgeable laymen, and anyone else who could offer her insights into the vanished society. Eventually the Scheles bought a house in a neighboring village so she could start mapping Palenque's sprawling, vine-covered structures. Three years later, Schele made a formidable impression at an international gathering of Mayanists held near the ruins. After brainstorming with Peter Matthews of Calgary University for just three hours, the duo presented stunning insights into the structure and grammar of the Mayan written language. They also put together 200 years of Palenque's dynastic lineage, spanning the lives of six successive kings—the most complete list of rulers for any Mayan site. "History had been made before our very eyes," recalls Yale Mayanist Michael Coe.

As Schele, Matthews, and others extended and elaborated their approach, the trickle of decipherable glyphs swelled to a torrent. Fragments of texts came together into compelling passages of prose. Along with archaeological finds, those reveal an epic warning of Maya dynasties. The glyphs also provide clues to the sudden, mysterious

JOB DESCRIPTION:

Epigrapher, teacher, leading spokesperson for the Mayan world view

INFLUENTIAL PUBLICATIONS:

The Blood of Kings: Ritual and Dynasty in Maya Art
with Mary Miller and Maya Cosmos
Three Thousand Years On the Shaman's Path with David Freidel and Joy Parker

WHY THE GLYPHS ARE LIKE THE JEFFERSON MEMORIAL:

If our only record of American history were what's written on monuments in Washington, you wouldn't find out much about the average American. Similarly,



there's much the Maya did not write about taxes, trade, thoughts about everyday life. But we can learn who was victorious in war and had the power to commission public monuments and buildings—or at least what they wanted to tell about themselves.

FAVORITE MAYAN BUILDING:

Temple of Inscriptions at Palenque

A LESSON FROM A LOST CIVILIZATION:

In the end of the Mayan empire, so many resources went into warfare the whole social structure became unstable. The question for us is whether the 1980s administrations spent us into oblivion as well.

collapse of the empire, and bear testimony to exotic religious attitudes, shamanistic traditions, and social customs.

Epigrapher Schele is also professor of art history at the University of Texas in Austin, where her annual Mayan hieroglyphics workshops attract hundreds of professionals and lay people. A natural showman, she relishes drawing sweeping parallels from past to present. "Schele has emerged as perhaps the most prominent spokesperson of the Mayan world view," observes Princeton Mayanist Gillett Griffin. The very qualities that make her a successful popularizer, however, make her vulnerable to criticism. Some scholars attack her for being wild and woolly with her facts—or implicitly too colorful. Others, from the archaeological camp, often say Schele and fellow epigraphers' reconstructions of Mayan history rely too heavily on inscriptions which they argue are largely the propaganda of the noble classes. While conceding their point, Schele responds: "Of course their history was biased. So is ours. There's still much we can learn from it."

To interview Schele, Kathleen McAuliffe traveled to Antigua, the old colonial capital of Guatemala, where the historian, now 52, was on a mission to teach modern Mayas the lost writing system of their ancestors. Schele and McAuliffe talked over the span of a week with frequent stops and starts to accommodate the endless stream of Mayan visitors seeking Schele.

Civil: Tell us about that first epiphany at Palenque.

Schele: It was like a dream. You see about 15 pyramids with huge, knee-height steps leading to their tops, silhouetted against forest-covered mountains. The clouds start with one soft then another, answers, and another until it becomes a 12-ton hammer. Creeks tumble down the mountainside. Where water bubbles out, the mountain is streaked with limestone. No one knew a single person who had ever lived in this mystical place. It was the most beautiful and sacred place I'd been in my life. I had to find out more about it.

Although no one knew it, the field of Mayan studies was about to crack wide open. Not only did I arrive at the right place at the right time, I met the right anthropologists, zoologists, and

historians. There was no reason for these people to welcome a little ol' Southern girl who'd just gotten a Master of Fine Arts and was teaching at the University of South Alabama. But they didn't care about my credentials. They taught me with generosity and humor, and if I had a good idea, they said, "Wow! Yeah!" and encouraged me.

Ortiz: So nothing was known about Palenque at that time?

Schele: Every guide made up his own story. By 1970, the great tomb in the Temple of Inscriptions had been found. Many believed it showed an astronaut taking off. In the images on the walls people saw astronomer priests or maybe a god. In the palace's southern wing was a bench palace where guides claimed the king took the virginity of all the young girls in the city. A huge vacuum existed, and people fed into it whatever they wanted.

Ortiz: What function did the pyramids the courts, and other structures found at Palenque have?

Schele: The pyramids were, in their words, sacred mountains. Mayas saw the world as this mountainous thing on the back of a turtle floating in the primordial sea. The courts below the pyramids were the valleys. Near the main court would be a ballcourt, repre-

senting an opening or crack leading to the Otherworld. The royal family lived in palaces nearby. On important occasions—holy days, celebrations of a battle victory, the birth of an heir—the king and queen went into the sacred house on top of the pyramid where many rituals took place, including the torture or sacrifice of war captives, and they'd communicate with the Otherworld. Then they'd come out in front of the crowd and perform bloodletting rituals on themselves.

Ortiz: So it is thought they were a pretty violent culture?

Schele: They weren't especially bad—or good. They were not idyllic nature-loving people who never hurt anybody nor were they bloodthirstily sacrificial priests who consumed human beings by the thousands.

Ortiz: But you said "Blood was the mortar of their culture."

Schele: It was. But put this in a different light. If you're a devout Christian, how do you save your soul? By leading an exemplary life—giving away everything you've got. Mayas gave what to them was the most precious substance of all, their blood. From a symbolic perspective, the two most important parts of the human body are the tongue—where intelligent communication

comes from—and the genitals. Those are the parts from which they ritually drew blood.

The Mayan king made the most powerful sacrifices. Our presidents, chancellors, and prime ministers engage in political battles and send 19-year-olds in their place to fight a war. Not only was the Mayan king on the battlefield if the day he died, but he had to open his tongue and penis every time a major ceremony or event took place in the center. Now, can you imagine how many Clintons we'd have if at every major meeting of Congress at every important event, he had to drop his pants and push a great needle through his dick in public? We wouldn't have many men wanting to be politicians, and those who did would be very careful.

Ortiz: The king poked a needle through the central shaft of his penis!

Schele: Through most of the man's life the needle—a bone awl—was poked through the skin and top of the shaft in much the way aborigines scar themselves. There were three diagonal slicing scars across the top of the penis. When a person was taken captive and was going to be killed, it was far more severe. They could be emasculated.

Ortiz: Even in the "milder version," wouldn't this interfere with a man's sexual enjoyment or reproductive ability?

Schele: No. The Australian Aborigines split the penis along the bottom so it splits out like a cut weenie. According to one anthropologist, Aboriginal women much prefer scarred men. It makes the penis much bigger.

Ortiz: What was the underlying meaning of bloodletting?

Schele: A fundamental principle of ancient Mayan beliefs was the idea of reciprocity. The gods of the supernatural world cannot exist without human intervention through ritual and offerings. And humans certainly cannot exist without the intervention of the gods who bring rain, make food grow, and create new life. Underlying bloodletting as a central act of piety is the concept of *ch'ul*. To both the ancients and some modern Maya such as the Tzotzils of the highlands of Chiapas in Mexico, *ch'ul* is a living force permeating everything. They see the entire cosmos imbued with life. Houses, mountains, springs, sacred places—all have *ch'ul*. The most important interactions are not between human and human, human and place, human and animal, but between the *ch'ul* of those things. This force is indestructible and composed of 13 parts. When you are sick, climax in sex, are terribly frightened—these kinds of situations—



you can lose a piece of their soul to the Earth Lord. Then you have to go through ceremonies to get it back.

In the human body, ch'chel resides in the blood. When the Mayan king and queen emerged from the inner sanctum on the top of the pyramid to give a blood offering, the entire community would gather below. They would have already gone many days without sleep or food, possibly dancing the entire time; they'd have taken very hot steam baths. Many would drink chicha, a semifermented beerlike drink, and perhaps they'd process hallucinogens through enemas made of hot water mixed with tobacco or other plants.

Ornel: You can hallucinate on tobacco when taken in enema form?

Schele: Major hallucinators. Tobacco is the sacred plant of all Native American peoples and is widely used to induce trances. Native American tobacco has a nicotine content as high as 18 percent. The stuff we smoke is three percent at best. They also smoked big cigars, chewed, and perhaps even ate tobacco. They also hallucinated on psilocybin mushrooms and possibly mountain laurel or a plant similar to it. Around the world, mountain laurel has been known to induce visions of serpents. Such a vision figured prominently in the Maya bloodletting ceremony. As the king and queen ran ropes through their tongues, and the king pierced his penis, they'd see a snake, a conduit, leading them to the Otherworld. In their rapturous trance, the snake rears up with its mouth open, and within it is the spiritual being, the king and queen talk to.

Ornel: Did commoners engage in bloodletting, too?

Schele: All humans can be conduits to the Otherworld. The sacred ritual the king did in the center was the same as a farmer in his household. But the rulers were thought to be especially powerful—people who could handle the most powerful energies. The Maya then and now view supernatural forces as extremely dangerous, so the person who unleashes them can do as much harm as good. But the common people had ancestors, too. Even today the Tzotzil say if you don't pay attention to your ancestors, they'll release your animal spirit companion, and it will wander the world in that protection and get hurt, and that will make you sick.

Ornel: When you arrived at Palenque, Mayan studies, you said, were poised for a breakthrough. What was it?

Behrler: Much important information was known about the Maya, but nobody had put it all together. One valuable source came from documents

dating from the Spanish invasion.

Ornel: Wait—the Maya civilization collapsed in 900 A.D., and the Spanish didn't arrive until the 1500s. Who told the Spaniards about their culture?

Schele: Just as the Italians didn't go away when Rome collapsed, the Maya didn't vanish when their tenth-century kingdom collapsed. Today they are in the Yucatan, Belize, and highlands of Guatemala in the millions. The records are so valuable because there were still some fierce Mayas. Only instead of carving inscriptions on stone tablets, they'd switched to exquisitely painted books of beaten bark.

Within two centuries of the invasion in the 1500s, the last vestiges of the language also died off: either victims of the Spaniards' swords or more often European germs. But before they died, the Spaniards studied their beliefs in order to convert them. And although the Spanish torched virtually all the thousands of books in America's first library, four survived. Three were apparently sent by Cortes and others to the king of Spain as booty, and later were dispersed to different owners.

Ornel: How did those documents help break the Mayan code?

Schele: In the 1860s and 1870s, scholars found the first Bishop of Yucatan's written description of the Maya, including an analysis of how the Maya calendar worked. The Dresden codex, another critical document uncovered around the same time, was used by diviners to keep track of days and make prophecy. These and other sources enabled scholars to work out the fundamental of their calendar system, leading to a view, dominant in the Fifties, that the Maya dedicated all their energy to mathematics, stargazing, and recording the passage of time.

In the late Fifties, archaeologist Heinrich Berlin figured that several glyphs recorded names of people and places, which ran contrary to the view that there was no historical content to the writing. The most devastating challenge to the reigning view came in a 1960 article published by Tatiana Proskunkoff of the Carnegie Institute. At a Guatemalan Maya site, Piedras Negras, were a series of monuments set up in rows in front of different buildings. She noticed the dates on these rows of monuments always spanned a period of less than 60 or 70 years; the imagery on the stelae [carved stones] recently had the same theme: the extinct date had one glyph associated with it, the next date some 20 or 30 years later, another glyph, and the last date was associated with still another glyph. She proposed the first date was

ADVERTISEMENT

THE ENGINES OF GOD

BY JACK McDEVITT

Review by Andrew Wheeler

Like most SF readers, I started young. I'd read everything in the (admittedly small) "sci-fi" section of my junior high's library before 6th grade was over. I read all the SF classics and many non-so-classics, and some of the books have stuck in my head ever since, though their titles haven't always stayed with me. But my favorite was about a teenage boy who was with an interplanetary archaeological team. They found working alien artifacts, which led them (after whizzing all over the galaxy to discover other wonderful things) to meet the aliens. I loved the book at the time and I've had a soft spot for alien archaeology ever since.

So I had high hopes for this book, about archaeological investigations into three different dead alien races (two of them medium-tech single-planet civilizations that disappeared mysteriously). McDevitt didn't let me down; I was intrigued by the various structures left behind by the enigmatic "Monument-makers" (the third, galaxy-spanning, race) and caught up in the race to excavate the ancient Temple of Winds on the planet of Quaraka before the Kozmik conglomerate began terraforming and destroyed it all. It's a story of discovery, of learning the true history of the past and of alien civilizations. That to me, is the pure core of SF.

I certainly won't spoil it by telling you whether any aliens turn up alive or not, but I will say it reminded me of that long-ago book. What I loved about both of them was the exploration: how each artifact led to another, to a new discovery. I've heard a lot of grumbling lately that there's no "sense of wonder" in SF anymore. Well, there is: it's right here.

The Engines of God is available at your local book store and from The Science Fiction Book Club on p. 45.



ANTIMATTER

UFO UPDATE:

A new development in the age-old question:
Can this marriage be saved?

"Can This Marriage Be Saved?" is a popular advice column from the editors of the *Ladies Home Journal*. Typical topics: drug addiction, alcoholism, and money squabbles. But the editors shouldn't be surprised if they start receiving mail from the spouses of UFO abductees, because alien abductions are testing the ties that bind.

"A husband whose wife has been abducted may feel angry," says Budd Hopkins, the author of two books on UFOs. "He may think, *I can't protect my wife.*" Adds Hopkins, "Wives also feel angry and unloved."

Take Deb Hill, who works with her husband in their product-testing laboratory. Deb's angst stems from her inability to help her husband during abductions which, in his case, can occur as often as three times a month. "I'm especially upset by the sexual activity, resulting in hybrid offspring," she says. "What the aliens do to John is tantamount to rape."

To deal with such feelings, Deb recently attended an abductee support group run by Temple University historian and UFO author David Jacobs. "I needed to hear from other abductees that sex with aliens is very mechanical," she explains.

Animosity, even jealousy, are in fact common responses to a spouse's abduction, according to Dr. Bill Cone, a California psychologist who has treated numerous abductees. "Some people get very hostile, and I've seen several abductee couples divorce."

As a result of all this marital tension, UFO researchers find themselves playing marriage counselor to abductees. "I advise people to be careful with whom they speak about their abductions," says Budd Hopkins, "because going public can exacerbate an already bad situation. Often, a spouse will be tolerated if it doesn't get out to the neighbors."

But even those who couldn't care less what the



neighbors think find that problems abound. Steve and Linda don't care what the neighbors think, but they're still having problems. "My marriage is not on the rocks, but it's not what it used to be," says Linda, who has received extensive national publicity about her alleged ET encounters. "Steve was more affectionate before the abductions started."

"She doesn't pay as much attention to me as she used to," counters husband Steve. "I feel that all the media attention has taken my wife away from me."

Often, when a marriage has been testing under the weight of other problems, abduction does it in. "Our marriage was in trouble to begin with," admits 42-year-old Jeff. "But my wife used my abductions as one excuse

to leave me," Jeff's ex-wife is also using his abductions against him in the pending custody case for their five-year-old son. "We had to take psychological evaluations," says Jeff. "My tests showed me to be normal, so my abductions were the only things her lawyer could find to put me in a bad light. She almost didn't have a child with me in the first place," he adds, "because she was afraid the child might be abducted."

Some marriages have actually been strengthened by abduction. Deb Hill says she now "feels good that my husband trusts me enough to share these experiences with me. That helps us turn this into something positive."

Still, Dr. Cone believes that while many abductees are psychologically well-adjusted, "some of these people are actually suffering from identity disorders and have difficulty telling reality from fantasy and dreams. Even if they hadn't gone through the abduction experience, it is possible that they would be having trouble in their marriages today."

—ANITA BASKIN



ANTIMATTER

BIO TV

TV is bad for you, right? Sit too close and it will ruin your eyes, watch too much and it will rot your brain. The Korean-based Samsung Electronics Company disagrees. The company recently spent \$5 billion won (\$4.1 million) developing their new "bio-TV," which emits far-infrared rays claimed to enhance health.

According to M. W. Lee, of Samsung's public relations team, in studies conducted at Seoul National University, onions grew faster and goldfish and tadpoles lived longer when placed in front of a bio-TV. Lee expects viewers "to get the desired benefit within the normal viewing distance, but closer is better." Although there's no date set for U.S. distribution, Lee says European sales, which began at the end of 1993,

are beginning to pick up.

But to exports outside Samsung, the jury is still out. Engineering professor Frank B. Barnes of the University of Colorado at Boulder, for instance, recently reviewed Samsung's findings. "We're looking at how infrared rays affect biological systems," says Barnes. "We've gotten some interesting data, but I can't yet confirm Samsung's claims."

Professor William Glenn,

WILL YOUR GOLDFISH LIVE LONGER IF THEY ARE NURTURED IN THE LIGHT OF SAMSUNG'S NEW TELEVISION?

of Florida Atlantic University, on the other hand, says the Samsung claims are exaggerated. "The energy level of the infrared rays emitted by their TV will be relatively low compared to infrared sources people are exposed to all the time, such as heating pads and the sun," he says. Moreover, adds Glenn, the notion that conventional TV may be harmful is exaggerated, too. "You'd have to sit with your face almost touching the TV screen for hours each day to experience any physiological affect from those x-rays at all."

—Anita Baskin



SWINE ODOR TASK FORCE

Leave the smell of bacon frying in the morning? You might lose your taste for pig products if you lived downwind from a smelly hog farm. The problem's become so bad in North Carolina, the nation's second-largest hog producer, that the state legislature there recently created a 27-member "Swine Odor Task Force." The force's mission: to find ways to control the pungent odor that emanates from hog houses, lagoons filled with hog waste, and lagoon water that's sprayed on hay fields as fertilizer.

"People who live downwind from hog farms rate themselves as more depressed and anxious than other people," reports Duke University professor and task force member Dr. Susan Schiffman. "It's a huge problem."

"Where there were

once two to three hundred hogs per farm, now it's closer to two to three thousand animals," explains Dr. Jon Ort, North Carolina State University associate dean of the School of Agriculture and Life Science, and another task force member. "We're looking at economically feasible solutions to reduce the odor."

While the task force's report is not yet completed, Schiffman has some ideas for how the odor might be abated. "You might suck odors up into a stack and disperse them high up over a larger area to dilute them," says Schiffman. "Or you can burn them, which oxidizes the compounds. Oxidized compounds don't have any smell."

And how do the hog farmers feel about all this? "They certainly support it," says Ort. "They want to be good stewards of the environment."

—Anita Baskin



THE TRUTH ABOUT 13

The superstition sounds illogical, but maybe Friday the 13th really is unlucky. A study of accident figures on a section of a British superhighway showed that the risk of being hospitalized following a crash soared by 50 percent on that traditionally notorious day.

To reach this conclusion, the researchers examined statistics for six Fridays the 13th over three years. They found that though consistently fewer people drove on those days, there was a slight increase in the number of supermarket shoppers, indicating that people were

IF YOU BELIEVE SOMETHING STRONGLY ENOUGH, WILL IT IN FACT HAPPEN TO YOU?

worried enough to travel by other means.

The increased number of accidents, says Thomas Scanlon, M.D., public health registrar for the Mid Downs Health Authority in Essex, could be explained by unusually high anxiety that serves to reduce concentration. "Are people's perceptions and beliefs self-fulfilling?" he asks.

"While awaiting the answer to this question, we may have to accept that Friday the 13th is indeed unlucky for some, and that for those people, at least, it might be safer to stay home."

—Ivar Simulien

EYEBALL MAGIC

Have you ever felt you were being stared at, only to turn around and discover that someone really did have his or her eyes glued on you? A recent test of the phenomenon suggests it may be real.

The lab studies were conducted by Marilyn Schlitz of the Institute of Noetic Sciences in Sausalito, California, and Stephen LaBerge of the Lucidity Institute in Stanford. To eliminate sensory cuing between the observed and the observer, the experimenters set up a video camera that broadcast the image of the person to be observed to a monitor in a separate room. There an observer spent sixteen 30-second periods concentrating on the image and an equal number of periods not "staring." Rather than asking the observed person to guess when remote "staring" occurred, the experimenters monitored the observed person's galvanic skin response in the



hope that his or her autonomic or unconscious nervous system would react.

According to Schlitz, it does. "In 85 percent of the cases, the participants showed an increase in their autonomic activity during the staring periods compared to 50 percent expected by chance." And, interestingly, the effect was larger when the two people involved

were of the opposite sex.

The results surprised psychologist Ray Hyman. "This has long been a classic classroom demonstration. When you do it under controlled conditions, you can demonstrate that it doesn't work. I guess if you do it enough times though, eventually someone is going to get a positive result."—Patrick Huyghe

to a decision faster. It's almost like it's taking its best guess. Thinking in a more intuitive manner." With an explanation like that, you'd think that isosceles chips really existed.

The *Voyager* will have a different kind of engine, explains Sternbach. "We still have details about how the power is channeled toward those big warp engine nacelles on the outside of the ship, but those nacelles are now mounted on pivotable wings. We figure that since those nacelles are variable geometry wings almost like an F-14 Tomcat, we will be able to say interesting things about why those wings pivot. Some of the thinking is that it may shape the warp field."

Graphic designer and co-author of the *Star Trek: The Next Generation Technical Manual* Mike Okuda adds: "The *Voyager*'s engines are substantially more efficient than the *Enterprise*. They cause significantly less damage to the space/time continuum, showing *Star Trek* to be environmentally conscious."

Mike Okuda and Rick Sternbach haven't left the *Enterprise* behind. Their most recent effort has been *The Star Trek Interactive Technical Manual*, a CD-ROM from Simon and Schuster Interactive. And Sternbach is helping to prepare a set of *Enterprise* blueprints, available next year, "so you'll know where all the toilets are on the *Enterprise*," explains Sternbach.

If we do catch a glimpse of twenty-fourth-century poppies on the *Voyager*, they will have been designed by Richard James, scenic designer for the new show. James designed for *The Next Generation* for many years; he worked on the Apollo space program moon at North American in Downey, California, and then moved on to the TV show *Battlestar Galactica*.

In an office with a drafting board prominently in evidence, James describes how the new sets came into being. Basically the underlying directive from Rick Berman was that if someone was flipping the TV channels and came across *Voyager*, he wanted them to recognize it as *Star Trek*.

The sets are definitely *Star Trek*, but different. "The intention was to make them look more realistic. I wanted them to look more functional, more like a [real] ship," James says. "I always get a lot of the Frank Lloyd Wright look into

my designs. There's also art deco." Military vessels such as atomic submarines, as well as movie designer Syd Meads' work, have also influenced James' design.

Set designs also conform to the "hub-bor" science of the show. Twenty-first-century science, as the writers dub it, is mostly the result of classic *Trek*'s 1960s production limitations. However, for all the beaming and sweeping, there is a remarkable consistency in *Trek* science, and an honest effort to cohere with established scientific thought and principle. In fact, the show even has a science consultant—Andre Bormann, lead of NASA—who looks at every script.

"If a script demands some kind of scientific explanation," says Bormann, "I will always try to find something that is based in fairly well-established real science first. If I can't do that, I will go into the so-called rubber science or the very speculative, consistent with reality. I always try not to violate any basic laws of physics—conservation of en-

ergy, momentum, or anything that we feel is very firmly established."

STAR TREK HAS A HISTORY OF OPENNESS TO
AUTHORS WITH SCIENCE-
FICTION BACKGROUNDS: HARLAN ELLISON,
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OTHERS, BUT ACTORS WHO READ SCIENCE
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ergy, momentum, or anything that we feel is very firmly established."

Bormann describes some upcoming scientific subject matter: "Electrodynamics of interstellar space and how that might be related to living processes. The galactic magnetic field. Whether or not there could be any kind of food supply in space. There's a lot of interstellar matter. One of the most productive areas of study lately has been of the interstellar space material that we didn't realize would be out there. There has even been the tentative confirmation of the presence of simple amino acids in the interstellar medium with some radiotelescope observations."

"We also want to design some sort of closed ecological system, as it's called in the NASA parlance," he adds. "Which means we can look forward to the cast gardening in a hydroponics section."

Conceptually, the original series was ahead of its time. "I'm not Tim Russ," how *Voyager* broadens those steps. There's a wider variety of characters. Our society has changed. We

have a global economy. There's more economic upheaval. *Voyager* says, Look, folks, let's work together. "I would hope that Dana Roddenberry would be excited about our taking his creation further and further," says Mike Okuda. "What Berman and Pillar and Taylor have done... is to take the spirit of *Star Trek*, which is 'boldly going (but) taking away all the familiar trappings that have accreted for the last twenty-five years. Hopefully this is a major step in the aim that will make *Star Trek* fresh again."

Jon Taylor elucidates: "*Star Trek* and science fiction give the opportunity to explore wondrous, imaginative ideas. We want to keep preserving the edges of imagination and creativity of science fiction, to tell those wonderful paradoxical stories that make the mind twist and bend and embrace them."

"Our goal is simply to do what *Star Trek* has always done," asserts Michael Pillar. "That is, to put quality science fiction on week after week, to do stories that people have to think about, talk about, that families can watch together and discuss the meanings of and the relationships to their own lives. To entertain using the best production elements available to us. The chemistry will be different because the characters are different and the needs of those characters are different. We will discover that as we go into the unknown, as enters just as

the audience does. We reall on the journey into the unknown together with that crew. We'll find out who they are and what the surprises are as time goes on."

Paramount is using old show to spearhead its new United Paramount network. That's a very small gamble. The *Star Trek* phenomenon seems destined to be an enduring legend of our culture, prodding us with tabularasa dreams of distant stars and worlds with our descendants among them, finding adventure and purpose.

Whether or not the human race struggles from the bonds of ignorance and bureaucracy and finds its way to a deity beyond our solar system remains to be seen. While we wait, though, shows like *Star Trek: Voyager* keep that phaser-candle burning in our hearts and hopes. **CC**

David Bachoff is co-author of the *Star Trek: The Next Generation* episode "Tin Man." His latest novel is *The Judas Cross* with Charles Sheffield, from Warner Books.

The Artist

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Why
the long face?

It just hit me
I'm a hack!
I'm a manufacturer
not an artist!



Lighten up!
A simple leap
of imagination and
you'll have a style
Picasso would
envy



Once
he stopped
laughing



PROFILES

CONTINUED FROM PAGE 10

the genetic scrambling of the late will create at least one or two retrievers slightly better than either of their parents. The user then works with the new generation, selects those that work the best, and the whole process repeats for several generations until the user is completely satisfied with the work of a particular generation. People who have bred the retrievers, Maes says, report a decrease in time spent reading "junk" messages without missing important ones.

The use of happy faces isn't just for laughs, Maes emphasizes. The personality-laden icons help create an emotional bond of sorts between person and program. Such person-software relationships "will become increasingly important as AI has a bigger impact on people's lives," she believes. "You can bring computers into people's environments with robotics," she says, "or you can bring people into the computer's environment. I believe the second approach is more feasible, at least in the short term. Agents in a computer could have as much effect as agents in the real world."

Maes has even tried to blur the line between the computer world and the real world with what she calls a "magic mirror." A videocamera shows a person standing in front of a ten-foot-by-ten-foot projection screen and displays the image on the screen to the person. It looks much as if he or she is standing in front of a mirror. The twist is that the image on the screen stands in a vivid imaginary world inhabited by odd animated creatures—actually intelligent agents whose behaviors are largely spontaneous rather than preprogrammed. In one version, for example, the subject sees him- or herself sharing the mirror world with a hamster and a hawklike predator. The predator tries to catch the hamster, but the person can save the hamster by chasing the predator away. The person can even pick up animated food and feed the hamster.

The magic mirror stole the show at a recent AI conference: children were so mesmerized they had to be dragged away, and even some adults were almost griet-stricken when they proved unable to save the hamster. Maes has received offers to commercialize the system, but she rejects the idea of "focusing too long on any one project." It's nice to do something that gets used in the real world, she explains. "But I'm always looking for new problems to solve."

Stephen Grossberg is fascinated by

optical illusions, which are essentially end-ups in the brain's ability to interpret reality. Such slip-ups, Grossberg maintains, offer important insights into the nuts and bolts of the brain's operation. After all, a scientist can create any number of brain models that can in theory produce accurate perceptions, concocting one that makes exactly the same mistakes as the brain is quite a different story.

The 54-year-old, Queens-born Grossberg has devoted most of his life to creating brain models that trace perception and thought down to the operation of individual brain cells. What's more, he has labored to embody these models in computer programs, some of which have practical applications. Why develop programs that exactly imitate the brain, quips and a? Evolution didn't necessarily find the only way to create intelligence," he explains, "but nothing else comes close to the brain's flexibility and power to deal with rapidly changing, ambiguous information."

Tall and gangly with gentle eyes in a slightly weathered face, Grossberg is considerably older than many of the other researchers leading the new AI movement. But he shares their sense of rebellion. In fact, he began defying the AI establishment before some of them were born. In the late 1960s, Grossberg was one of the first to work with computerized "neural networks." Unlike traditional computer programs that take a step-by-logical-step approach to solving problems, neural networks mimic the brain's strategy of having a large number of switchlike modules (which, in the brain's case, are brain cells) that constantly send each other signals and connect in different ways in an effort to match some pattern, be it an image, a sound, or a string of numbers. Grossberg continued to work exclusively on these pattern-recognizing networks long after the AI community decided to ignore them; only in recent years have neural networks reemerged at the forefront of AI.

Now Grossberg heads Boston University's Center for Adaptive Systems as well as the school's Department of Cognitive and Neural Systems. Though neural networks are in vogue again, Grossberg's versions still stand apart. That's because Grossberg loads each of his networks with internal feedback, giving them, in essence, the ability to reexamine their own "decisions" so as to fine-tune them and perform better the next time. Thus, while most other neural networks have to be "trained" by a programmer who keeps correcting the network's answers until it gradually starts to get them right, Grossberg's

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networks possess the brainlike ability to teach themselves quickly and to immediately adapt to new patterns. "Without internal feedback, we wouldn't be human," Grossberg says. "Without it all you have is another type of computer program."

Grossberg's devotion to feedback has at times allowed him not merely to re-create in a computer program what scientists know about the brain, but even to get ahead of neuroscience. At one point, for example, he saw no way to insert one important type of feedback into his network without a software component analogous to a brain cell capable of responding selectively when two or more visual cues are aligned across space. Unfortunately neuroscience had found no such brain cell. But Grossberg and his colleague Ennio Mingolla predicted the cell had to be there—and within a year the "bipole" brain cell was discovered.

In addition, neuroscientists have recently discovered certain new types of brainwaves, which are surges in activity that move across regions of the brain. Some of these brainwaves have turned out to resemble precisely the feedback patterns Grossberg had incorporated into his networks. For example, the networks have both

temporary and more permanent memories, which constantly signal back and forth. Likewise, the regions of the brain that provide short-term and long-term memories are now known to swap signals known as N200 and P1 waves. And just as the networks employ time-matches and try-again feedback signals when they first fail to identify a pattern, the brain issues "P120" and "P300" waves when it struggles with a confusing pattern. Perhaps most intriguing of all, when deprived of certain types of feedback, Grossberg's networks even imitate human brain disorders, including the spurious signals of Parkinson's disease and memory loss caused by drug abuse.

Versions of Grossberg's feedback-rich networks have begun to prove themselves in the real world. At Boeing, for example, a neural network incorporating one of Grossberg's models catalogs the design specifications of some 10 million aircraft parts. The system will allow the company's engineers to enter the specifications of a proposed new part and receive information on the closest existing part, so that Boeing can modify the existing part instead of having to manufacture the new part from scratch. And a Nevada medical center is developing a similar network

that predicts a patient's length of stay based on the patient's history, current status, and course of treatment. Grossberg's networks are also being incorporated into robots, allowing them to recognize and retrieve objects while moving and even to produce cursive handwriting.

After years of being ignored and even disparaged, the outspoken Grossberg claims he now feels vindicated by the many uses to which his work is being put. "For a long time the same people in AI argued that they had the only game in town," he says. "But now many people are jumping on the neural-network bandwagon."

Imitating the brain's neural network is a huge step in the right direction, says Wayne State University computer scientist and biophysicist Michael Conrad, but it still misses an important aspect of natural intelligence. "People tend to build the brain as if it were made up of color-coded transistors," he explains. "But it's not simply a clever network of switches. There are lots of important things going on inside the brain cells themselves." Specifically, Conrad believes that many of the brain's capabilities stem from the pattern-recognition proficiency of the individual molecules

that make up each brain cell. The best way to build an artificially intelligent device, he claims, would be to build it around the same sort of molecular skills.

For more than a decade Conrad has worked on the design of molecular computers. At the heart of his designs are enzymes, molecules found in all living matter that control the various chemical activities that take place in and around cells. Enzymes are essentially submicroscopic pattern recognizers: in that they only interact with molecules of certain shapes and in certain combinations. When the right molecules come along, they fit lock-and-key style into nooks and crannies of the enzyme, which then changes its shape and activity.

Conrad thinks the process could be utilized in an artificial pattern-recognition device consisting largely of chemicals floating in a jar. If the device has to recognize a set of spoken words, for example, then it could be set up so that certain types of sounds caused certain molecules to be released. The sound "huh" might release one type of molecule, and the sound "lo" another. After a series of molecules are released, their shape would cause them to interact with each other and to form distinct molecular patterns.

At this point enzymes would look onto, and thus recognize, the molecular patterns. The device's answer would be based on which enzymes had locked on, determined by, for example, measuring some change in the enzymes' activity. "Now you've converted a pattern-recognition problem, which is a terribly difficult one for computer science, into one where you let the physics of molecular self-assembly do all the work," Conrad explains. His "computer-in-a-jar," he maintains, could in theory take problems that would take up a digital supercomputer for months and solve them in less than a thousandth of a second. What's more, Conrad has been working on designs in which his molecular recognizers are combined, brain-cell-style, into powerful neural networks capable not only of remembering and learning, but even of evolving into better-performing versions.

For now, though, Conrad's designs exist only in simulation on conventional computers, where they run in hopelessly slow fashion (if they include all relevant molecular interactions). He contends that the designs could easily be implemented more efficiently on microprocessor chips, but even that would be a poor alternative to a working version using enzymes and other

chemicals. Like the brain, he says, his device relies very specifically on the nature of biomolecules.

In fact, he notes, a growing minority of scientists believe that the complex and still poorly understood physics of biomolecules allows the brain to solve certain types of problems that no digital computer could possibly solve, no matter how powerful, how clever its programs, or how long it worked. "Biology still adheres to the old picture of biomolecules as being a sort of digital computing machine, no different really from an old car that you can take apart and put back together again," he says. "But reality is much more complicated and fuzzier around the edges." He notes that today a supercomputer can take thousands of hours to make an unreliable prediction about how four atoms would behave. To predict what a large number of molecules will do, he says, would require a computer the size of a galaxy.

Right now, the notion that conventional computers and software are fundamentally incapable of matching the processes that take place in the brain remains controversial. But if it proves true, then the efforts of Conrad and his fellow AI nerds could turn out to be the only game in town. **GD**



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ABDUCTION

CONTINUED FROM PAGE 43

are all falsely created from the individual imaginations.

But Ronald K. Siegel, associate research professor of psychiatry and biobehavioral sciences at UCLA and author of *Whispers: The Voices of Paranoia* (Crown) does not agree. Those details don't point to anything more than a common mental experience, not unlike paranoia: the belief you're being infested by parasites. Siegel says. Medical history documents that people who suffer from parasitosis reported the same parasites and drew the same drawings with the same details. Given an infinite variety of stimulations, the brain responds in a finite number of ways.

Theoretically, Haley could be experiencing an altered state of consciousness—caused by anything from a food allergy to a physical problem in the brain—and having these fantastic experiences in which she has seemingly real feelings and images associated with being abducted by aliens and which can even include physical manifestations, adds psychologist Keith Harary, research director of the Institute for Advanced Psychology in San Francisco.

Military Coup? Acting as tour guide, Haley drove Omni around the Columbus Air Force Base looking for a one-story building where she believes she was taken and interrogated. No building, however, seemed familiar. Haley also gave Omni the name of a disgruntled civilian employee at Columbus she said might know about the UFOs. When Omni tracked this man down, however, he said, "I just don't have the kind of security clearance to know about these things."

As for Major Poole, he has confirmed that he did give his wife, a student in Haley's accounting class, a spare shuttle Endeavour pass to give to Haley and did invite her to view the shuttle on its stopover at the base. "But it wasn't a personal invitation," he says. "We have standard roped-off areas where the public can stand and take pictures and that's what I invited her to do. On the night in question, I did go to the classroom, but it was to wave to my wife."

Official Denial Have UFOs ever been tracked over Columbus Air Force Base? According to Sergeant Debbie O'Leary, Columbus AFB Public Affairs, "No, there have been no UFOs tracked

here, and we have not interrogated here any people who claim to have had an alien encounter."

Tammy McBride at the POW/MIA office at the Pentagon, meanwhile, conducted a search for one Larry Mitchell, a name that appeared on a soldier's uniform in the underground alien facility Haley described under hypnosis. McBride found three Larrys and one Lawrence all with the last name of Mitchell. All four were killed in action in Vietnam. All bodies have been recovered.

Vehicular Interference Tony Scarborough, physics professor at Delta State University in Cleveland, Mississippi, and state director for the Mutual UFO Network (MUFON), confirmed that a graphic-black helicopter came over a building where Haley was speaking and speeded the students to death. In the summer of 1991, "A year later, a similar helicopter came over my house, then flew at about 500 feet, traveling parallel to me on my way to meet her at Delta State University," he adds, "but the connec-

tion would start without the phone ringing, and the air vent once dropped on the floor."

But these events, says psychologist Harary, who has studied the psychology of coincidence, don't add up to much. "A string of seemingly inexplicable events that occur around the same time are not necessarily related," he says. "You would have to thoroughly investigate each and every one. Sure, there could have been someone physically in the house, unfortunately no one was seen, and it's almost impossible to get to the bottom of what was happening after the fact."

Body Scopes The plethora of unusual marks on Haley's body would seem to be significant physical evidence; however, everyone agrees that without a thorough examination of her environment and sleep patterns, they mean little in the end.

Strange marks appearing overnight is just not true, unusual, and without observing Haley close up during the times these things occur, you cannot draw any kind of valid conclusion about what's going on," says Harary. "We would have to rule out all conventional explanations, including for example, the possibility that she could be doing these things to herself in an altered or even an ordinary state of consciousness."

Get Out the Ink Blots While Shafer stands by his evaluation of Haley psy-

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chologist Siegel insists Haley may just not be sane because "there's an internal reality that everyone shares." Abduction imagery is a manifestation of the limbic system, not outright insanity, Siegel says. Haley is truly an abductee, but the aliens are not out there—they're in her own brain. The scary thing is, we all have the same details in our nervous system; anybody can become an abductee.

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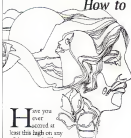
Conclusion Despite the fact that some UFO researchers have called the Haley case one of the most intriguing and apparently best-documented abductions ever without more data it's impossible to know what Haley has experienced, and why. There is no hard evidence and no conclusive circumstantial evidence that proves abduction by extraterrestrial biological entities. Given the caveat that this investigation remains incomplete, there is also no conclusive evidence that Haley has been monitored or harassed by military operatives. □

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OCCAM'S

CONTINUED FROM PAGE 10

"That's funny," said fifteen people in unison. "us all is getting ten dollars a day!"

While they were laughing, a door opened in the far corner. A tough white mug who looked like an icebox smoking a cigar came out, yelled for quiet, and read names off a list.

Marten, Pauline Christian, and Lorenzo Fairweather were taken into an office.

"Welcome, welcome," said Mr. Meister, who was a shorter version of the guy who'd called off the names on the clipboard.

Marcel Slavo sat in a chair facing them. While he had been right, Slavo had dark spots under his eyes and looked like he slept with his face on a wall. Now he was pale as a slug, and smoking a Fatima in a holder.

The others' names will be listed today then sent home. They'll be back Thursday and Friday for the shooting. You three—plus Lafayette Monroe and Arkady Jackson—are the principals. Mr. Meister here—Meister wanted to them and Marcel continued. "—has got

money to shoot a two-reeler race picture. His friends would like to expand their movie investments. We'll go on to the script later, rehearse tomorrow and Wednesday, and shoot for two days. I know that's unusual; not the way you're all used to working, but this isn't the ordinary two-reeler. I want us all to be proud of it."

And I—and my backers—want it in the can by Friday night," said Mr. Meister. They laughed nervously.

The two other principals will go on Wednesday. We can cover most of their shots Thursday afternoon," said Slavo.

He then talked with Lorenzo about the plays he'd been in, and with Marten about his act. Marten of the Apes was why I wanted you," he said. And Pauline, he turned to her. "You've got great potential. I saw you in Upholding the Race last week. A small part, but you brought something to it. I think we can make a funny satire here, one people will remember." He seemed tired. He stopped a moment.

"And—?" said Meister.

"And I want to thank you. There's a movie out there right now. It's the apotheosis of screen art."

What? asked Lorenzo.

The bees' knees," said Marten.

Thank you, Mr. Brown. It's the spi-

ome of moviemaking. It's in trouble because it was made in Germany; veterans' groups picketing outside; all that stuff everywhere it plays. There's have been anything like it, not in America, France, or Italy. And it's just a bunch of boinks keeping people away from it. Well, it's art, and they can't stop it.

And," said Meister conspiratorially, "they can't keep us from sending it up, making a comedy of it, and making some bucks."

"Now," said Slavo, all business. "I'd like you to make yourselves comfortable, while I read through what we've got for you. Some of the titles are just roughs; you'll get the idea though, so bear with me. We have a title what goes over it after we finish the shooting and cutting. Here's the scene. We open on a shot of cotton fields in Alabama, usual stuff, then we come in on a sign. County Fair, September 15-22. Then we come down on a shot of the side-show booths, the midway, log posters, et cetera."

And so it was that Marten Brown found himself in the production of *The Medicine Cabinet of Dr. Kelpaher*.

Marten was on the set, watching them learn scenery.

Slavo was rehearsing Lafayette Monroe and Arkady Jackson, who'd come in that morning. They were still in their street clothes. Monroe must have been 7 feet 3 inches tall.

Here we go," said Slavo, "try these." What he'd given Lafayette were two halves of Ping-Pong balls with black dots drawn on them. The giant placed them over his eyes.

"Man, man," said Arkady. Slavo was back ten feet, holding both arms and hands out, one inverted, forming a square with his thumbs and index fingers.

"Perfect!" he said. "Mantan?"

"Yes, Mr. Slavo?"

"Let's try the scene where you back around the corner and bump into him."

"Okay," said Brown. They ran through it. Mantan backed into Lafayette, did a freeze, reached back, turned, did a double take, and was gone.

Arkady was rolling on the floor. The Ping-Pong balls popped off Lafayette's face as he exploded with laughter.

"Okay," said Slavo, catching his breath. "Okay. This time, Lafayette, just as he touches you, turn your head down a little and toward him. Slowly, but just so you're looking at him when he's looking at you."

"I can't see a thing, Mr. Slavo."

"There'll be holes in the pupils when we do it. And remember a line of smoke's going to come up from the floor where Mr. Brown was when we get finished with the film."

"I'm afraid I'll bust out laughing," said Lafayette.

"Just think about money," said Slavo. "Let's go through it one more time. Only this time, Mantan."

"Yes, sir?"

"This time, Mantan, bug your eyes out a little bit more."

They stood up on his neck. "Yes, sir, Mr. Slavo."

The circles under Slavo's eyes seemed to have darkened as the day wore on.

"I would have liked to have gone out to the West Coast with everyone else," he said, as they took a break during the run-throughs. "Then I realized there was a wide-open field: the race pictures. I make exactly the moves I want. They go out to 800 theaters in the North, and 850 in the South. They make money. Some go into state's rights distribution. I'm happy. Guys like Mr. Meister are happy—" He looked up at the catwalk overhead where Meister usually watched from. "The people who see the films are happy."

He put another cigarette in his holder. "I live like I want," he said. Then "Let's get back to work, people."

"You tell her in this scene," said Slavo. "That as long as you're healed, she has nothing to fear from the somnam—from what Lorenzo refers to as the Sleepy Guy."

He handed Mantan a slim straight razor.

Mantan looked at him. Pauline looked back and forth between them.

"Yes, Mr. Brown?" asked Slavo.

"Well, Mr. Slavo," he said. "This time going out to every Negro theater in the U.S. of A., isn't it?"

"Yes. Well, you'll have everybody laughing at it, but not with it."

"What do you mean?"

"That's the kind of razor cadets use to trim their mustaches before they go

"Well, Mr. Sennet once said, if you bend it, it's funny if you break it, it isn't."

"Now a deluxe is telling me about the Aristophanic roots of comedy!" said Meister, throwing up his hands. "What about this theory of Sennet's?"

"If I use the little razor," said Mantan. "It breaks."

Meister looked at him a moment, then reached in his pocket and pulled three big greenbacks off a roll and handed them to Willie. Willie left.

"I want to see this," said Meister. He crossed his arms. "Good thing you're not getting paid by the hour."

Willie was back in five minutes with a rectangular box. Inside was a cold stainless steel thing, mother-of-pearl handled with a gold thumb-stop, half the size of a meat cleaver. It could have been used to dry-shave the mane off one of Mack Sennett's lions in 15 seconds flat.

"Let's see you bend that!" said Meister.

They rehearsed the scene. Mantan and Pauline. When Brown flourished the razor, opening it with a quick look, a shift of his eyes each way, three guys who'd stopped painting scenery to watch fell down in the corner.

Meister left. Slavo said, "For the next scene."

It was easy to see Slavo wasn't getting whatever it was that was keeping him going.

The first morning of filming was a nightmare. Slavo was inflexible. They shot sequentially for the most part (with a couple of major scenes held back for the next day). All the takes with the extras at the carnival were done early that morning, and some of them let go with enough remaining to cover the inserts with the principals.

The set itself was disorienting. The painted shadows and reflections were so convincing Mantan found himself squinting when moving away from a painted wall because he expected bright light to be in his eyes there. There was no real light on the set except that which came in from the old overhead glass roof of the studio and a few arc lights used for fill.

The walls were painted at odd angles. The merry-go-round was only 2 feet tall, with people standing around it. The Ferris wheel was an ellipsoid of neon, with one car with people (two Negro midgets) in it, the others dimly, insignificantly smaller, then larger around the



down to the dockyards to wait for the newest batch of Irish women for the sporting houses.

"What? That's the incongruity, Mr. Brown."

"Willie? Willie?"

The workman appeared. "Willie get \$2.50 from Mr. Meister, and run down to the drugstore and get a Double Duck Number 2 for me to use."

"What the hell?" asked Meister, who'd been watching. "A tree's a tree. A rock's a rock. A razor's a razor. Use that one."

"It won't be right, Mr. Meister. Mantan it won't be as funny as it can be."

"It's a tiny razor," said Meister. "It's funny if you think it can defend both of you."

Slavo watched and waited.

"Have you seen the films of Mr. Mack Sennet?" asked Brown.

"Who hasn't? But he can't get work now either," said Meister.

I mean his earlier stuff. Kops. Custard. Women in bathing suits. Of course.

circumference. The tents looked like something out of a Jamaica ginger extract-addicts nightmare.

Then they filmed the scene of Dr. Kilpatric at his bedside, opening his giant medicine cabinet. The front was a mirror like in a hotel bathroom. There was a crowd of extras standing in front of it, but what was reflected was a distant, windswept mountain (and in Alabama, too). Mantan watched them do the scene. As the cabinet opened, the mountain disappeared; the image revealed was of Mantan, Pauline, Lorenzo, and the extras.

"How'd you do that, Mr. Slavo?" asked one of the extras.

"Fort Lee magic," said Meister from his position on the catwalk above.

At last the morning was over. As they broke for lunch they heard loud voices coming from Meister's office. They all went to the drugstore across the street.

"Heer it's snow," said Arkady.

"Joke."

"Morphine."

"He's kicking the gong around," said another extra.

One guy who had read a lot of books said, "Has got a surfeit of the twentieth century."

"Whatever, the film's gonna scare the bajezus out of Georgia, funny or not."

Mantan said nothing. He chewed at his sandwich slowly and drank his cup of coffee, looking out the window toward the cold facade of the studio. It looked just like any other warehouse building.

Slavo was a different man when they returned. He moved very slowly taking his time setting things up.

"Okay, lets ... do this night. And all the extras can go home early Lafayette," he said to the black giant who was putting in his Ping-Pong ball eyes. "Carry ... Pauline across to left. Out of sight around the pyramid. Then, extras. Come on, jump around a lot. Shake your loches. Then off left. Simple. Easy. Places. Camera. Action! That's right, that's right. Keep moving. Late, slow but steady. Kick some, ha! Pauline. Good. Now. Show some dirty people. You're indignant. Here's got your choir soloist from the A.M.E. church. That's a Take."

"Stop it! Stop the camera thing. Cut!" yelled Meister from the catwalk.

"What?" yelled Slavo.

"You there! You!" yelled Meister. Are you blind?"

An extra wearing sunglasses

pointed to himself. "Me?"

"If you ain't blind, what're you doing with sunglasses on?" It's right!"

"How the hell would anybody know?" asked the extra, looking around at the panted square moon in the sky. "This is the most fucked-up thing I ever been involved with in all my life."

"You can say that again," said someone else.

"You," said Meister to the first extra. "You're fired. Get out. You only got paid through lunch! He climbed down as the man started to leave, throwing his torch with the paper-maché flames on the floor. "Give me your hat," said Meister. He took it from the man. He jammed it on his head and walked over with the rest of the extras, who had moved back off-camera. "I'll do the damn scene myself!"

Slavo doubled up with laughter in his chair.

"What? What is it?" asked Meister.

"If they're going to notice a guy with sunglasses," laughed

the floor, sprawled out, drinking water from a quart jug. He wore a black body suit, and had one of the Ping-Pong balls out of his eye socket. Arkady had on his doctor's costume—frock coat, hat like a screech owl, big round glasses, gloves with dark lines drawn on the backs of them. A big wobbly crooked cane rested across his knees.

Pauline leaned herself with the hem of her long white nightgown.

"I smell trouble," said Lorenzo. "Big trouble."

The guys with the dark suits came out and went past them without a look.

Meister came out. He took his usual place, clambering up the ladder to the walkway above the set. He leaned on a light railing, saying nothing.

After awhile, a shaken-looking Marcel Slavo came out.

"Ladies and gentlemen," he said. "Let's finish this scene, then set up the next one. By that time, there'll be another gentleman here to finish up today and to direct you tomorrow. I am

off this film after the next scene, so let's make this take a good one, okay?"

They finished the chase setup, and the pursuit. Slavo came and shook their hands and hugged Pauline. "Thank you all," he said, and walked out the door.

Ten minutes later another guy came in, taking off his coat. He looked up at Meister, at the actors

and said, "Another coach pitcher, huh? Gimme five minutes with the script. He went into Meister's office.

Five minutes later he was out again. "What a load of hokey," he said. "Okay," he said to Mantan and the other actors. "Who's who?"

When they were through the next afternoon, Meister peeled bile off a rail gave each of the principals an extra five dollars, and said, "Keep in touch."

Mantan took his friend Freemore up to the place they told him Marcel Slavo lived.

They knocked. Three times before there was a muffled answer.

"Oh, Mr. Brown," said Slavo, as he opened the door. "Who's this?"

"This Joe Freemore. We're just heading out on the 'chill circuit' again."

Well, I can't do anything for you, said Slavo. "I'm through. Haven't you heard? I'm all washed up."

"We wanted to show you our act!"

"Why me?"



Slavo, "they're damn sure gonna notice a white man!"

Meister stood fuming.

"Here go," said Mantan, walking over to the producer. He took the hat from him, pulled it down over his eyes, took off his coat. He got in the middle of the extras and picked up an unused pitchfork. "Nobody'll notice one more dunker," he said.

"Let's do it, then," said Slavo. "Pauline? Lafayette?"

"Meister," said a voice behind them. Three white guys in dark suits and shirts stood there. How long they had been watching no one knew. "Meister lets go talk," said one of them.

You could hear loud noises through the walls of Meister's office. Meister came out in the middle of a take, calling for Slavo.

"Goddammit to hell!" said Slavo. "Cut!" He charged into Meister's office. There was more yelling. Then it was quiet. Then only Meister was heard.

Lafayette Marroe took up most of

"Because you're an impartial audience," said Mantan.

Slavo went back in, sat in a chair at the table. Mantan saw that along with bootleg liquor bottles and ashtrays full of Fatima and Spud butts, the two razors from the movie lay on the table. Slavo followed his gaze.

"Souvenirs," he said. "Something to remind me of all my work. I remember what you said, Mr. Brown. It has been a great lesson to me."

"Comfortable, Mr. Slavo?" asked Freeman.

"Okay. Hellock me."

"Empty stage," said Mantan. "Joe and I meet."

"Why hello!" said Joe.

"Ooily hi," said Mantan, pumping his hand. "I ain't seen you since—"

"—I was longer ago than that. You had just—"

"—that's right. And I hadn't been married for more than—"

"—seemed a lot longer than that. Say, did you hear about—"

"—you don't say! Why, I saw her not more than—"

"—it's the truth! And the cops say she looked—"

"—that bad, huh? Who'd have thought it of her? Why she used to look—"

"—speaking of her, did you hear that her husband—"

"—what? How could he have done that? He always—"

"—yeah, but not this time. I tell you he—"

"—that's impossible! Why, they told me he—"

"—that long, huh? Well, got to go. Give my best to—"

"—I sure will. Goodbye."

"Goodbye."

They turned to Slavo.

"They'll love it down in Mississippi," he said.

It was two weeks later, and the South Carolina weather was the crummiest, said the locals, in half a century. It had been raining—a steady, continuous, maddening drizzle—for three days.

Mantan stopped under the hotel marquee, looking out toward a gray two-by-four excruciation for a city park, where a couple of ducks and a goose were kicking up their feet and enjoying life in its fullest.

He went inside and borrowed a Columbia newspaper from the catalina food manager. He went up the four flights to his semiregular room, took off his soggy raincoat and threw it over the three-dollar Louis Quatorze knock-off chair, and spread the paper out on the bed.

He was reading the national news page when he came across the story from New Jersey.

The police said that, according to witnesses, during the whole time of the attack, the razor-wielding maniac had kept repeating, "Bend, d—n it, don't break! Bend, d—n it, don't break!"

The names of the victims were unknown to Mantan, but the attacker's name was Meister.

Twenty years later, while he was filming *Mr. Pigro Progresses*, a lady brought him a War Bond certificate, and a lobby card for him to autograph.

The card was from *The Medicine Cabinet* of Dr. Kilpatient (Breary Lat! Rot! There were no credits on it, but there on the card were Mantan, Pauline Christian, and Lorenzo Fairweather, and behind them the giant Lalayette Monroe in his medicine cabinet.

Mantan signed it with a great flourish, with one of those huge pencils you get at county fairs when you knock down the Arkansas kitty.

He had never seen the film, never knew till now that it had been released.

As the lady walked away, he wondered if the film had been any good at all.

For Mr. Moreland, and for Icky Twerp. **CC**

Howard Waldrop was born in Mississippi and has been living in Austin, Texas, for many years. He is the author of three novels but is better known for his brilliant, quirky short stories. His stories are collected in *Howard Who?* All About Strange Monsters of the Recent Past, and *Night of the Cockles*. He has been a regular contributor to *Omnis* since 1982.

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INTERVIEW

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the ruler's birth, the middle stood for his inauguration, and the last marked his death. Her insights culminated 150 years of work.

Owen is there an equivalent of the Rosetta Stone that enabled scholars to crack the code?

Schele: A document from the conquistador Relación de las cosas de Yucatán, written by Bishop Landá in 1566, comes closest. On one page, the Bishop wrote down an alphabet dictated to him by a well-educated Maya named Gaspar Antonio Chi. It took almost 400 years to figure out what Gaspar Antonio had given Landá. Like Egyptian hieroglyphics and Sumerian cuneiform, the signs in the Mayan writing system represent syllables, not individual letters. Mayan also has signs for whole words. Landá believed he had an exact alphabet, although you can tell by his writings he was very confused. So were a lot of later scholars—some even concluded the alphabet was a farce the Maya made up to trick Bishop Landá.

A young Russian, Yury Knorozov, figured out what was going on, and he exploited great bilingual dictionaries developed by the Tsars to teach themselves how to speak to the Indians well enough to convert them. So the Mayan vocabulary was available to Knorozov, whose decipherment turned out to be exactly right. But at the time leading Mayanists widely dismissed his work as Soviet propaganda because when Knorozov published his findings in a major Soviet magazine in 1952, a bureaucrat added a paragraph saying, "This is what Leninist-Marxist theory will do. Look at how poor the capitalist pigs in the West are."

Owen: By the time you arrived at Palenque, the key to transcribing the ancient writing system was available?

Schele: Everything was there except for a critical missing part, which was essentially pioneered by Floyd Lounsbury of Yale. He reasoned that if the Mayan writing reflects a spoken language, the spoken language must have a syntax—grammatical rules that determine the order of words in a sentence. Once we figured out the key elements of Mayan syntax, it all came together! At the first Mesa Redonda, held near the Palenque ruins in 1973, I met Peter Mathews, who was about 19 at the time, and I was 31. Using the syntactical approach, we figured out Palenque's dynamic history.

We basically found the major com-

potents of Mayan punctuation. The Maya love to say "So much time after such and such a thing had happened and then something else happened. The 'had' part and the 'and then' part are always the same—road maps through the chronology. Although there are no periods, semicolons, or commas, specific glyphs highlight the beginning and end of a sentence. A sentence typically begins with the verb first and then object and subject. Planted the tree John."

Once we realized that we could say "Okay we may not know the word, but it must be a verb. It has to be a noun. What is the political context? We could build up fields or meanings that limit what the sense can be. We know the sound value and meaning of maybe 50 percent of the signs, including glyphs for which we know the part of speech they represent and have a general idea of their category of meaning, then we know maybe 75 or 80 percent. Once you know their writing records actions in the lives of nobles and kings, and where the verbs are you can begin to reconstruct history. **Omey:** What special talent does it take to be a good epigrapher?

Schele: Good visual pattern recognition and memory. Most epigraphers keep 500 to 600 inscriptions in their heads at all times. Plus, you need to know the context in which you have seen those inscriptions. We're the kind of people who remember where a passage in a book is by how thick the book was, how deep we were into it, and where the passage fell on the page. You also need an ability to see connections between things. There's a playfulness to it; all great epigraphers are call lovers.

Omey: Tell me about the extraordinary Maya ball games.

Schele: Every city had an I-shaped ballcourt ranging from about the size of a volleyball court to as big as a football field. Pictures of the game reveal one-on-one competition and teams of up to 11 players. The ball was larger than a basketball and made of solid rubber that would've bounced like her. It probably weighed up to 40 pounds, so if it hit you at high speed, it could kill you. The competitors wore padding and a U-shaped protector called a yoke around their hips. We know nothing about the rules, but all rubberball games we play today—basketball, soccer, football—descend from Mesoamerican ball games.

Omey: Your ball game sounds like an institution as big as the NBA or NFL.

Schele: You bet—even bigger. The symbolism and meaning of the game

are contained in the Mayan version of Genesis, the Popol Vuh. This is the story of two sets of Hero Twins, largely played out in the arena of the ball game, where the twins encounter the forces of life and death. The first set of twins, the maize gods, are called to the Otherworld because they desecrated the Lords of Death playing their ball game. The lords kill them both, burying one of them in the floor of the ballcourt of the Otherworld, and hanging the skull of the other twin in a gourd tree as a warning against desecrating the lords.

The daughter of one Death Lord walked by the skull, which sat into her hand, thus incorporating her immaculate conception, right? She gave birth to another set of twins, who also disturbed the Death Lords during their ball game. They too were called to the Otherworld, where the lords put them through a series of trials. Each time the twins miraculously outwitted the lords despite overwhelming odds. These trials culminated in the death of the twins, but they came back to life, disguised as great dancers and magicians who could sacrifice themselves and not die. They were called to perform before the Lords of Death and were so good the lords asked to be sacrificed to see what it was like—only they didn't come back to life. The foundation myth explains how the ballcourt came to represent the crack in the earth leading to the Otherworld. The ball game is a metaphor for the fight between good and evil, life and death, signifying that by yielding to sacrifice people achieve resurrection.

Omey: Who competed in the games?

Schele: The teams could be regular people playing for fun, or elites seeking power. Political alliances could be sanctified in the game because allied nobles entered the Otherworld through the ballcourt to talk to the gods and ancestral deities. In the most sacred games, nobles were pitted against high-ranked war captives, and they played for life-and-death stakes. These games were probably rigged so the home team won, but there was the distant possibility that an underdog would win. The loser presumably journeyed to the Otherworld as a messenger for the victor and was possibly buried in the floor. If the war captive won, his reward would be eternal glory, but he still be sacrificed, often after an extended period of torture. Especially important captive nobles were kept alive for 16 or 17 years for harvesting—blood was taken from them.

Before you get too heavily into the horror of this remember Spanish conquistadors tortured innocent people for

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system and making ancient material accessible to modern Mayas, you've said that you hope to enable them to enter the dialogue of history. How so?

Schele: History is a phenomenon living people invent and create to establish who they are based on what they think they were in the past. The history of events can never reach objective truth because each generation has to rewrite history adjusting it to their own expectations and experiences. Native Americans have not been able to contemplate their history in their own words and from their own point of view for 500 years. So these writing workshops provide an experience of profound importance to them.

Suppose the Russians had invaded the United States and set up a Soviet United States for 500 years and told Americans everything they were doing from Marxist-Leninist thought. There was no American Revolution, no great presidents that Americans were in fact a creation of their conquest by Russia. Then one day some people came with a copy of the U.S. Constitution. Declaration of Independence, books about Washington and Jefferson, and said, "hey maybe you want to read these?" Most Mayas are desperately hungry to learn about their heritage. Of course I get tremendous back in return. They speak these languages. We don't.

There are 28 Mayan languages still surviving. Those closest to the ancient languages are Yucatec, spoken in the Yucatan, and Chol, spoken near Palenque. The difference between Yucatec and Chol of today and the languages recorded in the inscriptions is roughly that between Chaucer and modern English. During the workshops the Mayas often say to us, "you're asking us to recall obscure words and expressions—the kinds our grandfathers might have used." Sometimes they don't have the word at all, but frequently we find either the same word root or a close equivalent.

Ortiz: Recently you have reached a new level of understanding of the Popul Vuh. What is the breakthrough?

Schele: By chance Freidel and I discovered that all these events described as myth are really maps of the sky. The Creation myth can be traced back at least as early as the second century B.C. and describes the acts of the gods on two days—August 13, 3114 A.D., and February 5, 3112 A.D. On the first day the gods laid the three stones of the cosmic hearth. Maya women traditionally cook on a hearth made of three stones. The Mayas also saw these three stones as the three stars in the constellation Orion.

In a Maya house, fire is built between the three hearth stones and a large flat clay plate laid on top of them. The woman grinds corn, makes it into a dough, pats the dough into tortillas, then places them on the clay plate over the hearth. The tortillas balloon up to form a *paxka* or "belly." The Mayas see the tortilla as an analog of a human being. The original human beings were made from maize dough in exactly the same way by the grandmother of the Hero Twins. So everyday of her life a woman wakes up, creates food for her family, and replicates at her hearth the acts of creation.

On February 5, more than a year after the first hearth was laid, the gods lifted up the cosmic tree. This is also visible in the sky. The tree is the Milky Way. In 3112 A.D. at about 200 in the morning of February 5, the entire Milky Way rose out of the eastern horizon, until at dawn it stretched north to south across the sky. In several Mayan languages the verb "create" is also "to dawn." At the base of the tree is what we call the constellation Scorpion. The Mayas also saw the picture of a scorpion and called it any of a dozen of their words for scorpion. On August 13, the cosmic hearth rolled up to the center of the sky at dawn, and on February 5, the Milky Way finally was erected in the sky. These events were real.

I can't tell you what a revelation it was to discover their myths were not just stories but actual sky maps. My God! They were doing with their creation myths what Einstein was doing with his formulas. These myths are great overarching symbolic arrays expressing their understanding of creation—their version of what modern cosmologists call the Big Bang.

Ortiz: What can contemporary civilization learn from the rise and fall of the Mayan empire?

Schele: The final episode in the story of creation in the Popul Vuh has the gods creating human beings out of maize—creatures so perfect they understand the world with the same clarity and insight as the gods. Humans' power frightened the gods, but instead of destroying us, they gave us myth so we could only understand what's very close to us. Isn't that the perfect metaphor? We can't see beyond our immediate interests and gods. That's what ultimately brought about the demise of the Mayas, and it could well be our downfall, too. Except we still have a ways to go to emulate them. The United States has existed a bit over 200 years. Their civilization was enormously successful from 500 A.D. to 900 A.D., a span of 1,400 years. **DO**

STARS

CONTINUED FROM PAGE 12

Earth wouldn't have begun in the first place. Although our galaxy contains supernovas—violent explosions or dying stars—they're simply not energetic enough to do the job," Loh adds. The shock wave from a supernova might accelerate a particle to about 10^{10} eV at the very most, he estimates far short of the highest observed values.

A very large black hole, however, could impart the tremendous amounts of energy required—in the neighborhood of 10^{22} eV. The more massive the black hole, the more energy it puts out in the form of radiation. According to the scenario, matter falling in toward a black hole turns into a tremendous blast of radiation pouring out. When these two waves (matter and radiation) collide, they create a shock wave capable of accelerating particles to incredible energies—tens of millions of times higher than those reached in manmade particle accelerators.

The Giant Array just may point to the centers of active galaxies harboring massive black holes, its conceivably on the other hand, that cosmic rays simply fly into Earth from all directions without indicating a specific source. Cronin calls this the "coldest possible result," but his University of Chicago colleague David Schramm considers it the most tantalizing possibility. Such a finding would support Schwarzschild's theory that the highest-energy cosmic rays are produced by the decay of relics from the Big Bang called "topological defects." The idea is not preposterous, according to Loh. "If we cannot correlate cosmic rays with any particular galaxy or black hole, who knows maybe they are from topological defects. The notion is speculative, however, since no one has ever proven the existence of topological defects."

Regardless of whether it's our theory, rotating defects, or something more mundane like black holes, it will be very exciting," Schramm says. "Let's face it, when you consider a black hole the mundane source, you know you're talking about something exciting." **DO**

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GAMES

THE SCIENCE OF FASCINATIONS.

A line of toys combines fun and physics

By Scot Morris

The Magic Sand Wand, created by Fascinations, of Seattle, is a sealed plastic cylinder containing a steel ball and colored sand that fills about 60 percent of its volume. A player must try to get the ball from one end of the tube to the other. Most people hold the wand level and twist it, trying to move the ball through the sand, or hold it vertically with the ball at the top and shake, hoping that the heavy ball will sink. It doesn't work.

The simple solution to the Magic Sand Wand reminds me of a great Martin Gardner puzzle called "Rescuing a Robin," from *More Perplexing Puzzles and Tantalizing Teasers*. At a construction site, a baby robin has fallen into a hole in a cement block. The rectangular hole is big enough to stick a hand and an arm into, but it's more than three feet deep, so you can't reach

Fascinations' Astro-Blasters (left) and Levitron (above) are based on scientific principles.



your hand all the way down to the chick. You don't want to use a long stick for fear of hurting the bird. What do you do?

The solution is to slowly drop sand into the hole. The bird keeps moving its feet to stay on top of the sand until the pile gets high enough that the bird can be reached. The solution to the Magic Sand Wand is quite similar. Hold it vertically with the ball at the bottom. Shake it up and down, and the ball rises to the top in just a few seconds!

Small particles fall into the spaces below large particles, simply because they can, and push the large things up. The same principle explains why the whole potato chips rise to the top of the bag and only broken ones lie at the bottom.

Fascinations bases all of its toys and games on scientific principles. Company president Bill Hones likes to play with science and hopes others will, too. His Magic Sand Wand sells in toy and puzzle stores for \$4.95

Another Fascinations product harks back to science class demonstrations of momentum. Hold a tennis ball on top of a basketball and drop both at the same time. After colliding with the upward-moving basketball and absorbing momentum from the bigger ball, the tennis ball flies up at much greater velocity than it had in falling down. Hones developed the phenomenon into a product called the Astro-Blasters, a "multiple-collision accelerator" (lower left). Hold it at arm's length and drop it when it is perfectly vertical. When the pink ball hits the floor, it bounces up with a velocity close to what it had in falling, but the blue ball bounces up faster, the yellow ball much faster, and the top ball shoots into the air to a height five times higher than that from which it was dropped.

Hones's latest creation makes his other toys look like, well, toys. It's the Levitron (above), a top that actually floats in midair. It uses no wires, batteries,

or electricity, just two carefully designed permanent magnets. The biggest one lies in the wood base with its North side upward. The top itself houses the other. When the top is still, opposite attract, and it flips over so that its South end, the pointed handle, points down to the base. When the top spins, however, gyroscopic action keeps it from turning over. Eventually air friction slows it down enough so that it loses its stability, falls, and flips over, but that can take more than three minutes.

Many people had assumed for years that spinning a top in midair couldn't be done. Scientists have long thought it wouldn't be possible to keep one magnet floating above another by magnetic repulsion without some physical connection between them. A scientific theorem actually states that it is not possible to float one permanent magnet unsupported above another.

A warning: Getting the Levitron to work takes a lot of practice. You have to find just the right weight for your top, which you adjust by adding or removing weighted discs. The right weight for a top can vary from day to day and even minute to minute. So if you're willing to learn how to surf the magnetic waves, the Levitron can reward you with one of the weirdest sights imaginable, all the more fascinating because so many thought it couldn't be done. It retails for about \$45. Call 206-244-6834 for ordering information. **DD**