
OMNI
NOVEMBER 1989
DREAMS
HOW TO HAVE THEM
HOW TO READ THEM
HOW TO CONTROL THEM
FREDERIK POHL
ON PLUTO
TAKING A
TRAIN
TO SPACE
WORKING
OUT IN
YOUR SLEEP
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OMNI®

VOL. 12 NO. 2 NOVEMBER 1989

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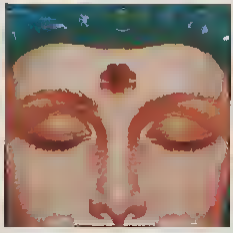

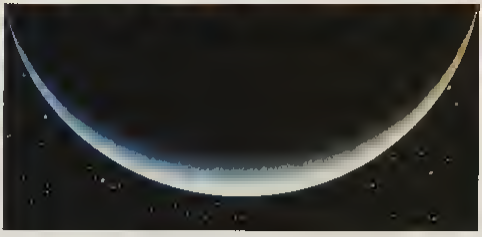

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THE *OMNI* BOOK OF DREAMS

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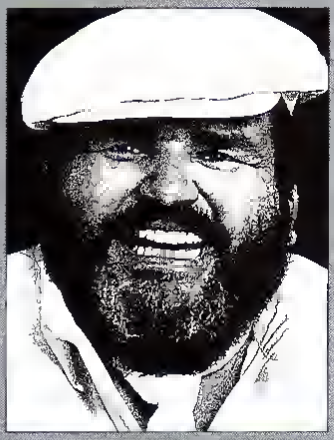

FIRST WORD

By Paul Prudhomme

"As science explores the complex relationship between nutrition and the human process, we will come to a new appreciation of the vital connection between what we eat and a healthy, productive life-style."

The twentieth century American revolution in agriculture and food preparation has been an astounding phenomenon. The humble American farmer has been transformed into the farmer–scientist by the introduction of new agricultural techniques—from the creation of advanced machinery to the cross-breeding, or hybridizing, of crops. The old cannery has become a showplace where science and computerization have created new ways to package and preserve edible delicacies. Despite the developments in harvesting, production, transportation, storage, and cooking, however, our conception of food is only now beginning to change.

Our attitude toward food is strongly rooted within the diversity of our cultural backgrounds. As a chef, I cherish my links to the Cajun cooking of my childhood, the rich culinary heritage of New Orleans. The traditions established within the school of culinary art are also held in high regard by its pupils. Each chef, however, is responsible for expanding the tradition and enriching his or her cuisine with new ideas.

In the decade to come, a profound change in mankind's cultural approach to food will occur. In fact, the signs of change are already present. The information revolution has begun to play a role in shaping a consumer whose tastes are not limited by geography. Consider the supermarket. Until very recently, produce shelves stocked only items that were simple and familiar. Within the past few years, however, we have been treated to an explosion of the exotic: kiwis, mangoes, fresh ginger, tomatillos, and daikon. Ten years from now these items will be as common in the market as apples and cucumbers are now.

Today's consumer can turn on the television and see the world, but tomorrow's consumer will want to taste the world as well. To satisfy these new and evolving demands, professional cooks will have to double or triple their knowledge, creating an exciting food selection in the process. Chefs will sample freely from the cuisine of the world, seeking new taste combinations and drawing inspiration freely from a variety of cultures.

The rise of the cholesterol-conscious consumer has also begun to cut across all segments of the population. Marketing health foods has already become a booming business, and this trend will escalate in the next century as the public continues to demand food products that please but don't poison the human body.

The consumer, now reading lists of ingredients, has started to put foods that contain saturated fats, such as palm or coconut oil, back on the shelf. These oils can contribute to heart disease and other ailments. Americans instead are reaching for foods that contain safe, polyunsaturated oils like safflower and sunflower oil, which help keep cholesterol levels low. Recently introduced products that contain reduced fat, such as some cheeses and yogurts, are becoming more popular with health-conscious consumers. The demand for foods that contain low levels of sodium is also increasing, and high-fiber foods such as oat bran and whole-grain breads are squeezing out the less nutritious goods sold in markets.

Needless to say, not everyone will change overnight. By the year 2000 large segments of our population will, out of convenience and tradition, still be eating high-calorie, high-fat foods. The percentage of sensible eaters, however, will continue to grow, reflecting a national trend toward consuming nourishing food in combination with sustaining physical fitness.

We are also moving away from the need for quick satisfaction from unhealthy junk foods. While microwave meals and quick-to-prepare foods will continue to serve our need to save time and pursue active life-styles, in the next decade we will focus more on a diet that is both convenient and healthy. The technology for preparing foods within a few minutes will also continue to improve, but consumer demand for quality and nutrition will increase at an even faster pace. I foresee the development of high-energy, high-fiber foods laced with multiple vitamins to give the fast-paced life-style an extra boost with each meal. Some of these foods are already available.

During the years to come, as science explores the complex and life-sustaining relationship between nutrition and the human process, we will come to a new appreciation of the vital connection between what we eat and a healthy, productive life-style. The axiom "living to eat" will become true in its most optimistic sense.

Wherever the innovators may take us, it is my fervent hope that the joy and social pleasures surrounding the preparation of food will continue to be an important part of our society. Wherever and whenever we gather at the table we reaffirm our bond with the world as we celebrate one of its oldest and most cherished rituals. ∞

Paul Prudhomme is chef and owner of K Paul's Louisiana Kitchen in New Orleans and has won international acclaim for his unique style of Louisiana cooking, including the creation of the "blackening" cooking method.

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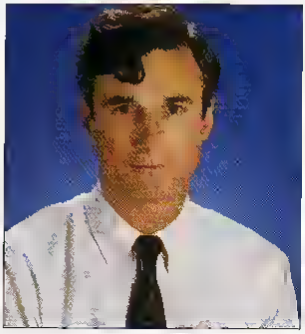
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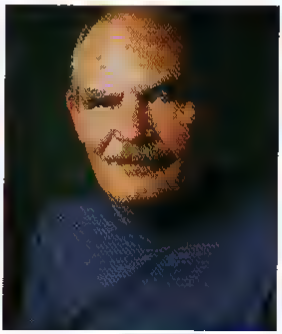
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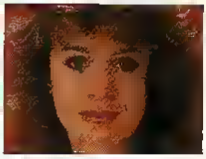
WEINTRAUB


HARARY

Winter makes it difficult to abandon our dreams, drag ourselves out of bed, and return to the reality of daily routines. Oh to skip the whole season and not awaken until spring! But since human hibernation is not yet possible, we thought a brief midday visit to dreamland would at least revitalize us.

In our pursuit of dream adventures, *Omni* senior editor *Pamela Weintraub* served as our guru. She and psychologist *Keith Harary* explore the subject in *Lucid Dreams in 30 Days: The Creative Sleep Program* (St. Martin's Press). For an excerpt from that book ("Life Is But a Dream," page 42), Weintraub drew on her experiences as a Brooklyn teenager commuting to a high school in the Bronx. "During the hour-long subway rides, the rhythm of the train would lull me into a dreamlike state," she says. "But I'd keep a hold on consciousness. Sleeping would have been dangerous." At the time she didn't realize she was entering the altered state of waking dreams. Today, *Lucid Dreams* is part of her and Harary's "New Age thirty-day series" of books. Future installments will cover higher consciousness and erotic sensitivity.

"Lucid dreaming doesn't come naturally to me," says former *Omni* senior editor *Jane Bosveld* ("The Twilight Zones," page 74). But after Bosveld fell asleep one night, a character entered her dream and wanted to kill her. "I became lucid and turned around to confront the villain," says the coauthor of *Control Your Dreams* (Harper & Row). "I screamed, 'I know this is a dream, so get out of here. Just go!' Then everything dissolved, and I was in a kind of gray consciousness."

For the special insert "The *Omni* Book of Dreams," *Judy Feldman* contacted a number of celebrities and asked them to share their dreams with us. Several declined, reluctant to submit their somnolent thoughts to public scrutiny. But Alan King, Tony Randall, and others did divulge sleeping secrets. And comedian Jackie Mason wrote back, "I have this recurring nightmare that every time *Omni* has a question about a certain subject, I get a telephone call for my opinion, and I have to give them my best jokes for nothing. Then I notice another thing. After I get this call, I always try to fall back to sleep to see if I can dream that they do pay me. But I never have such luck, and I always wake up in a cold sweat."

Omni associate editor *Tom Dworetzky*, who edited our "Book of Dreams," claims he can never remember his dreams. Yet he does admit that a recurring career dream involved becoming the first nonfiction *Omni* editor to publish a short story in the magazine. And in his story "Lucky" ("Man's Best Friends," page 54), Dworetzky immortalizes an unlikely muse—his cat, Rocky.

Another contributor to our collection of short pet tales, *Thomas Disch*, also authored *The Brave Little Toaster* (Doubleday) and other works.

Cats have also played a part in earlier *Omni* fiction. George Alec Effinger's "Schrodinger's Kitten" (September 1988) has been awarded both the Hugo (by science-fiction fans at the 1989 world convention in Boston) and the Nebula (bestowed by the Science Fiction Writers of America). "Effinger was long overdue for the honors," says *Omni* fiction editor Ellen Datlow, adding that the piece mixes a lucid description of physics with creative narrative.

Another expert melder of fact and fiction, *Frederik Pohl* is the author of *Chernobyl* (Bantam), a fictionalized account of the Soviet nuclear reactor accident. Perhaps his next novel will concern *Voyager 2*'s trip through our solar system, which he recounts in this month's Stars column (page 14).

Voyager owes much of its success to advanced computer technology. Writer *Dava Sobel*, however, was searching for a computer that met her personal needs. In this endeavor she found artificial intelligence expert Alan Kay (Interview, page 80) "extremely accessible and charming," despite his formidable schedule. He even took the time to show Sobel how to use the Macintosh more effectively. Coauthor of *Arthritis: What Works* (St. Martin's), Sobel was so impressed by the computer's capabilities that she went out and purchased her own.

GULLWING: LIGHT YEARS AHEAD OF ITS TIME

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NOVEMBER

LETTERS

COMMUNICATIONS

Worldly Concerns
Thank you for allowing UNICEF's Lawrence Bruce to raise the issue of child survival in the Third World [First Word, August 1989]. In the absence of famine or other global catastrophes we quickly forget or never realize that 40 000 children are dying each day from preventable causes. Thoughtful citizens with a planetary vision must pull our government into the forefront of helping to eliminate the worst aspects of poverty. One organization committed to this is RESULTS (Responsibility for Ending Starvation Using Legislation, Trimtabbing, and Support). 236 Massachusetts Avenue, NE, Suite 110, Washington, DC 20002, (202) 543-9340.

Stephen Falk
Atlanta

I was elated to see your magazine publish an article on hunger. It's truly time for humanity to become aware of this huge and devastating problem. Ending hunger is a *real possibility*, and I salute you for publishing Bruce's First Word. Keep up the good work of educating the public.

Carol Willman
Richmond, MI

Robophobia
Your interview with Hans Moravec [August 1989] terrified me with the mad roads science may be careening down. If the future of man lies in the blasphemy of the most basic natural laws, I'm sure I would not like to be alive to see it. The thought of having my brain "stripped" into a computer is not "neat" but an atrocity.

Martin West
East Lansing, MI

I just finished reading the interview with Hans Moravec, and it left me greatly disturbed. I couldn't help but wonder what happens to the human equation in all of this—simple things like love and feelings. While I wouldn't mind a few improvements on my biological body, I have no desire whatsoever to become a machine. Machines are to help man, not the other way around. This man scares me to death!

Roberta Cicardo
Canandaigua, NY

A Less Than Artful Analogy
Congratulations on your comprehensive article introducing readers to the new developmental discipline of prenatal learning ["Preschool?" August 1989]. The early brain analogy Anthony DeCasper draws, however, is incomplete. [DeCasper compares the brain to a statue that is sculpted by removing bits of marble.] If forming neural structure in the fetus can accurately be compared to an inorganic statue, it would be impossible to tell when the artwork becomes a masterpiece. The brain can be specially nourished throughout gestation to ensure amplified performance throughout life. In this metaphoric sense, prelearning transforms nature's otherwise clumsy chisel into an instrument of consummate art.

Brent Logan, Ph.D.
Director, Prenatal Learning Institute
Snohomish, WA

Would You Like to See My Etchings?
I enjoyed your Etch A Sketch feature in the August 1989 issue [Games]. Intriguing as the screenwork was, I was most interested in the statement "Collectors have paid up to $300 to hang these works on their walls." Correct me if I'm wrong, but wouldn't hanging them be the last thing you'd want to do (and the last thing you'd be able to do)?

Ken Mitchell
Aurora, CO

Mixed Signals
In an otherwise correct and interesting article on the Ground Wave Emergency Network (GWEN) in the August issue ["Doomsday Radio," Continuum], you have one glaring error. The frequencies the new system uses are between 150 and 175 kilohertz, not megahertz.

Dale Unger
Baltimore

MAKING A PROPHET

FORUM

I climbed through a small opening in the wall that led into my Manhattan office The building wasn t the same it was a green skyscraper but I recognized some of my co-workers I wandered through the building riding up and down in the elevator I remember glancing out the window of a high floor across the river toward the George Washington Bridge and seeing a tornado hit the New Jersey shoreline Two weeks later a tornado touched down just north of the bridge on the New Jersey side

When the dreamer woke up she felt strange Tornadoes weren t a common image in her dreams nor did they usually occur in that part of the country The vision had no meaning and made no sense yet the memory of it wouldn t go away—until it actually happened

Since ancient times tales of doom and wonder have been passed down and recorded as dream prophecies (Abraham Lincoln foresaw his assassination in a dream) Powerful nighttime images prey on the minds of a select few like a warning until they either come to fruition or are consciously avoided Precognitive dreams as they re called can t be explained or ignored by those who experience them The visions are the mind s journey into the future

Was the dream recorded above just a coincidence or was it precognitive? Dr Montague Ullman founder of the dream laboratory at Maimonides Medical Center in Brooklyn defines a precognitive dream as one that predicts future events that one could have no way of knowing about through ordinary channels of communication and where the future events are significant or strange enough that they may not commonly occur in a dream The anecdote would not have been considered a true precognitive dream had the woman heard tornado or storm warnings prior to that night or if tornadoes were a seasonal event for that area

Ullman a clinical researcher psychiatrist and author of three books began conducting research in this field in the Sixties In his dream lab experiments consisted of monitoring volunteers during sleep and recording their dreams Because he was a well-respected dream researcher Ullman s findings in a realm often deemed frivolous were taken seriously Nina Guccione spoke to him about this particular part of his studies at Maimonides

Omni Was it your intention to study precognitive dreams when you first began your work?

Ullman Yes It was one of the reasons I decided to leave private practice and take a full-time position as director of psychiatry at Maimonides

Omni What do you consider proof of a precognitive dream?

Ullman I don t think you can entertain the question of proof unless you do experiments When people have a genuine precognitive dream and the reality validates it within a set period of time they re left with a striking subjective feeling It s not a proof it s just My goodness it really feels strange and I have no way of accounting for it

Omni Did the people who participated in the precognitive studies have any previous telepathic experiences?

Ullman Well we did a number of studies on dream telepathy [in which a person who is awake tries to send a visual picture to an individual who is sleeping] and there most of our subjects were just volunteers Our experiments with precognition were done with a sensitive who had had experiences of that type before

Omni Do you believe precognitive dreams are a natural event?

Ullman They ve been reported by human beings down through the ages but I don t think they re terribly common

Omni Are they mostly centered on tragic or dramatic themes?

Ullman Not necessarily J B Priestley collected a great many reported dreams from a radio broadcast over the BBC and he came to the conclusion that a precognitive dream could be focused on either the terrible or the trivial He wrote a book on it called *Man and Time*

Omni Do these dreams tend to target people who are close to the dreamer?

Ullman Most of the reported ones tend to have that quality yes

Omni Is any group more susceptible?

Ullman I don t know if we can say that women are more receptive than men Perhaps they are just more interested or affected by this type of dreaming And I haven t had or heard of much experience with children

Omni Regular dreams are stored in short-term memory Is this typical of precognitive ones?

Ullman Any dream with intense feeling will tend to stick and precognitive dreams often have that quality Sometimes you ll remember trivial dreams as well especially just before awakening You re apt to keep that dream in mind

Omni Can you teach yourself to have precognitive dreams?

Ullman I don t know of any way but you can train yourself to have a better recall of dreams by making an effort to retain them And having an interest in dreams and keeping a dream journal will help you recognize repetitive symbols ∞

Dream merchants who toss and tell

THE GREATEST SHOW OFF EARTH

STARS

By Frederik Pohl

The nicest thing about Pasadena isn't the Rose Bowl. It's a science campus up in the foothills called the Jet Propulsion Laboratory (JPL), where a few thousand space researchers and related types reach out and touch someone—or something—anywhere up to a couple of billion miles away. When pictures come in from American spacecraft flying by, or sometimes landing on, another planet, JPL is the place where the signals are decoded and turned into something the human eye can admire, and we were there in August to watch the Neptune pictures come in.

It wasn't my first trip to JPL. I've made the pilgrimage to Pasadena seven or eight times over the past quarter century. The initial visit was to catch the first American glimpses of the nearby cloud cover of Venus (that one was a bit of a letdown because the Russians had one-upped us by sending their *Venera* to the planet just a few days before). Then I went to see what the *Viking* lander saw when it opened its photooptic eyes and, for the first time, gazed around at the surface of Mars; and later still I watched *Voyager* thread the rings and the satellite systems of Jupiter and Saturn and peer down into their stormy clouds. I didn't make it to every one of these world (or worlds) premieres. I wasn't that smart. Foolishly, I skipped the Uranus flyby in 1986 because I had some other business to attend to and also because I had a cynical feeling that this particular planetary photo opportunity would be rather dull. Of course I turned out to be wrong about that.

I should have known better. There is nothing dull about knowledge, and some of the most interesting bits of new knowledge the human race ever receives come from places where the wise guys (like me) think there's nothing new to be learned at all. Just to be there on the scene as a picture from an alien world builds up on the screen, pixel by pixel and line by line, and to know that the pictures you are seeing have never been seen by any human eye before is intoxicating. Even if the pictures had been dull (they never have been!), just to be present at JPL is a delight. Excitement is in the air. I'm not referring to the oxygen–nitrogen mixture we all breathe to stay alive (though high above the fumes of the LA freeways, even that is mountain clean and sparkly). What I'm talking about is the electrified ambience that surrounds the Jet Propulsion Laboratory when new extraterrestrial data are flooding in and hundreds of the best scientific minds in the world are dancing from one foot to the other, as excited as any mundane visitor as they try to puzzle out what they all mean.

What do they all mean? Do we learn anything from the exploration of space that will help balance our busted federal budget, end poverty, or get crack out of our junior highs? Is there any *practical* use for all this stuff from space?

Well, there is, of course. The research that has gone into the space program has produced, more or less by accident, any number of technological gadgets that have made life easier for many of us and saved life for some. But that's not the point.

That isn't the reason we go into space. We can't look there for the things that will save us from our own follies. If we lift our eyes a moment, we can see that the most valuable commodity humanity can ever have is in space research and indeed in every last kind of scientific research. It is the priceless gift called knowledge. Knowledge isn't "worth" anything in dollars and cents, but in the long run it is knowledge—all kinds of scientific knowledge—that gives us the only hope we have of learning to deal with the vast realities of the universe.

There was sadness amid all the joy in Pasadena because Neptune was the end of the line. In years to come some of those planets will be revisited. Orbiting telescopes will give us wonderful new views of the universe. But never again in our lifetimes are we likely to have the chance to see close up, for the first time, a planet that has been shrouded in mystery since the dawn of history.

Or maybe not. Pluto's still there,

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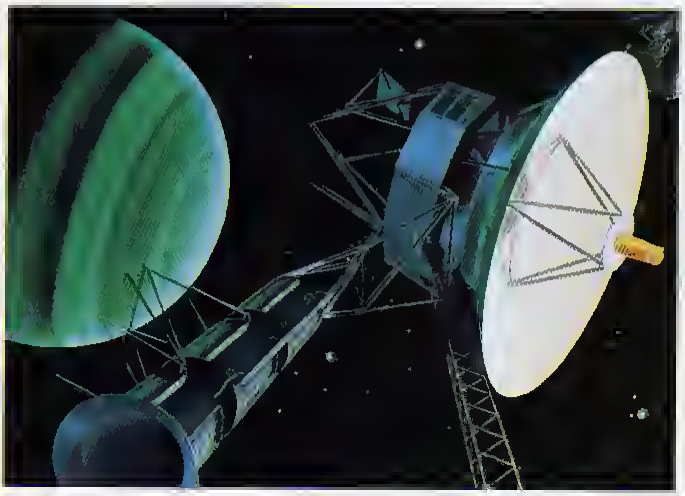


Bye-bye, birdie. With the show over, planetary voyeurs can hope for a piggyback to Pluto.

DESERT SON

EXPLORATIONS

By Kevin McKinney

When Moses led his people out of Egypt, not every Hebrew followed him. Many stayed behind because they were afraid to go into the desert, beyond familiar territory. Standing on the edge of the Sahara, at the base of Morocco's Atlas Mountains, I understood their fear of the lifeless, waterless plain, a merciless sun beating down on a sea of sand. I, however, was a follower not of a latter-day Moses but of 170 runners and hikers who had each paid roughly $1,400 to test themselves in these harsh environs. Taking part in the fourth annual Marathon des Sables during the last week of March, they were determined to trek 125 miles in six stages of varying length. And they would do it while backpacking food, clothing, and bedding—the barest essentials required for survival. The organizers stress the ordeal as "a collective adventure of individual commitments in search of both athletic exploit and self-knowledge," "surpassing physical and psychological limits," and breaking away from "city habits to attain nomadic autonomy."

My own Saharan sojourn began as Royal Air Maroc flight number 204 landed in Marrakech. Disembarking, the passengers proceeded across the landing field to the terminal. There armed soldiers stood guard, taunting me with an image of my own embattled personal life and the endless string of crises I sought to escape.

The first night, as we camped outside the small Atlas village of Foum-Zguid, the temperature dropped to 40°, and my hands numbed from the cold. The last real meal the runners would eat for a week, dinner was a free-for-all, the quick and ravenous assaulting the food. I didn't starve, but my hunger was far from satisfied. And to make matters worse, there seemed to be no room in the tents for me. The organizers seemed unconcerned, telling me I'd find space somewhere. I did, finally, but I wasn't happy about everyone's attitude. On my return to the States, I was sure, I'd have little positive to report. I was wrong.

In the morning, before the official start, the contestants endured speeches by organization leaders and Moroccan officials, flashed their smiles for photographers and television crewmen, and responded to French, Moroccan, Japanese, and American journalists, who fired questions as if they were war correspondents. Like ancient warriors being sent into battle, the anxious runners charged forward in groups of 40, each battalion signaled by a 15-gun ceremonial salute from white-robed Moroccans. A retinue of 130 organizers, doctors, tent raisers, and staff cooks set out in Land Rovers. Whirling above them, a helicopter kept track of the troops, while a hot-air balloon oversaw their progress. And two camels and their riders brought up the rear, prepared to collect the fallen.

The massive caravan crossed 15 miles of relatively easy terrain dotted with boulders and thornbushes. That night spirits remained high as two doctors with the medical staff serenaded the camp with a saxophone and trumpet.

Saharan sojourn: Adrift in a sea of sand

Temperatures exceeded 100°, and vegetation became scarce as the terrain turned to fossil-strewn fields and dried mud flats during the 18-mile stage that commenced the following morning. Having completed three quarters of the distance, American runner Lahory Brummel sighted the campsite "floating above a shimmering lake of blue water." Three hours after experiencing the mirage, she reached her destination.

Late that night, I wandered away from the campsite. Except for the wind, lightly dusting everything with sand, and the gargling noises of an insomniac camel, all was silent. In the light of the full moon, the desert resembled a photographic negative: the sky a dark grayish blue, the ridge of mountains in the distance a dark silver-gray, and a single palm tree a black monolith at the end of light gray sand. Feeling like the sole living being on an alien planet, I wallowed in the solitude and addressed my thoughts to some being somewhere in the star-studded universe spread out above me. As a child, I learned that "God" was out there, protecting me. But coping with daily routines and life's upsets, I no longer felt the sense of security God supposedly provides.

Anonymous powers seem to govern our lives. Most of us view ourselves in light of external factors: work, relationships, rush-hour traffic, bills. "People are always saying they're early or they're late for an appointment, putting the emphasis on the appointment, on time," says Italian psychoanalyst Edmond Deckmyn, a marathon official. "The emphasis is always on someone or something else." In the desert, where there is no sense of temporal or spatial dimensions, "your point of reference must become yourself."

Deckmyn uses the desert as a "therapeutic tool" and has taken patients to Tunisia, where they've been forced to confront themselves in the desert. One patient, a recovering drug addict, accompanied him during the marathon and reluctantly helped at the campsite. Unable to cope with the torment of

wheezing and limping runners. The patient withdrew into herself.

Deckmyn didn't fake his patient because she was a diligent worker. "Not everyone in therapy wants to be there or acknowledges that he or she needs it," Deckmyn says. "You have to create the demand for it." And that's what he hoped to achieve during the Marathon des Sables. He offered the patient little emotional support, leaving her to find her own way in the alien environment. When she asked to accompany the relay vehicle to Zagora, where the marathon would end, Deckmyn expressed little concern. She had no limitations when she used drugs and didn't have to deal with those limitations she really had," he says. It wasn't the runners but herself that the patient was confronting on this trip.

Having to rely on yourself is frightening for most people. "Without the order of daily life, behavior can deconstruct, allowing you the opportunity to reconstruct it," says Deckmyn, who noticed a marked change in a French teenager running in the marathon for the second year in a row. "Last year, he was antisocial, quarrelsome," Deckmyn recalls. "He had difficulty making friends. This year, the youth and a companion, his social worker, returned with a team of troubled teens from dysfunctional families. Now a congenial leader, the gregarious adolescent aided his teammates and others."

Although race originator Patrick Bauer is quick to point out that "it's not a rehabilitation center," the Marathon des Sables is designed to force everyone to rely on themselves, physically and psychologically. To discourage runners from focusing their attention on the finish line, for example, the organizers don't indicate distance on the trail markers. Nor do they assign or identify the bivouacs. Everyone must find his own place. "The race is either a catalyst for something else or it's useless," Bauer says. "You can't have the same anxieties after something like this. You'll never worry about the same things."

In January 1984 Bauer planned and executed a 12-day survival run across nearly 300 miles of the Algerian desert. Following him, his brother and a friend recorded the experience. Friends back home in Troyes, France, responded enthusiastically to the film and mounted the first Marathon des Sables, with only 23 participants, in 1986. Since then, marathon veterans have encouraged relatives, friends, and acquaintances throughout France to try it. The number of entrants multiplied quickly into an increasingly broad spectrum of people from around the world.

No longer able to bear the closeness of the Land Rover, I began riding atop it, occasionally climbing down to help push when the Rover got trapped in sand. Making it across the obstacle course soon became less of an inconvenience and more like a game. During stage three, when we reached the 30-foot sand dunes and our driver had to detour, I opted to walk through them.

As I lingered in the giant sandbox, the gusting wind suddenly died, ceasing its sandblasting. In the ensuing silence I could hear my heart beating and . . . the blood rushing through my veins. I had never been so intimate with myself. Then, the air filled with the low moaning of the doctor's saxophone emanating from the control station on the far side of the dunes. The solemnity of the moment imprinted on my soul; it seemed as though God was within me. I had become one with the universe.

After the experience of the sand dunes, the fourth stage seemed even crueler. The 43-mile course teased the exhausted runners with a true oasis. Feet now sporting blisters and more than a few backs chafed raw by their packs, the troops still faced miles of rocks and gravel, yet more dunes, and temperatures as high as 125°. Less than halfway through the course, the medical team rescued a semiconscious, thirty-nine-year-old French competitor. The helicopter airlifted him to Zagora, where he regained consciousness before returning home. One of the front runners, out of water and nearly delirious, wandered off the course. A few other runners suffered sprained ankles and other minor injuries. "Sometimes I'd stop and look around me and listen to the silence of the desert, the silence of God," American runner Brummel comments. "I tried not to think about the finish line. I've been disappointed so many times, and I knew I would eventually reach it."

Near dusk the moon rose above the eastern horizon, as huge and bright as the sun setting in the west. Opposite each other, the two celestial bodies hovered at exactly the same distance from the edge of the earth, mirroring each other as if they were twin suns.

"As I lingered in the giant sandbox, the gusting wind died, ceasing its sandblasting. And in the ensuing silence, it seemed as though God was within me, and I was one with the universe."

Throughout the night, few people slept. The Land Rovers drove back and forth between control stations. Runners arrived at the campsite holding one another up. We anxiously awaited friends left behind on the course, catching them when they appeared and fell into our arms. The last runner arrived roughly 24 hours after the start of stage four.

Halfway through the 26 miles of stage five, I abandoned the Land Rover and continued on foot with University of Turin anthropologist Alberto Salza, who accompanied the runners as an observer. As we approached the gorge cutting through the Bani Mountains, he pointed to a boulder. "Pick up a rock and place it on top with the others," he told me. Before entering the gorge, he said, nomadic traders would stop here and pray for a safe journey, leaving their stone offerings on the altar.

Later, in the gorge, we rested at a man-made formation of flat rocks assembled in a semicircle. As runners stumbled past, we picnicked on dried antelope meat, round Moroccan bread, cheese, and fig-flavored water. And when we finally reached the end and climbed out of the gorge, we gazed across the endless plain that stretched out before us. In its midst lay the final night's campsite, the bivouacs appearing as specks on alien terrain.

Again, it was nightfall before all the runners reached the campsite, where Deckmyn's patient eagerly assisted them. She didn't know what had drawn her back from Zagora. Now she even wished she'd run in the marathon.

And on the seventh day the runners hobbled toward Zagora. Filthy clothing clinging to their battered bodies, looking more like beggars than athletes, they crossed the finish line singing, holding hands, and dancing. With traditional Moroccan fanfare, the villagers greeted the mad dogs as if they were modern-day Israelites completing their long exodus.

The marathon, which had begun on Palm Sunday, the anniversary of Christ's triumphant entry into Jerusalem, ended on the eve of Easter Sunday. Being in the desert during the Christian Holy Week seemed remarkably appropriate. I thought of Christ wandering in the desert and wrestling with Satan. I, too, had come face-to-face with my own devil and rose above it.

The marathon's organizers, I suspect, intentionally put me through the same psychological ordeal as the runners and walkers. Perhaps that's why, just before I departed Zagora, Deckmyn asked, "Do you now understand the myth of the desert?" At the time I didn't even understand the question.

Months later, no longer overcome by the rising tide of external forces, I can control the floodwaters, my soul having captured the spirit of the Sahara. ☐

ARTIFICIAL INTELLIGENCE

By Fred Hapgood

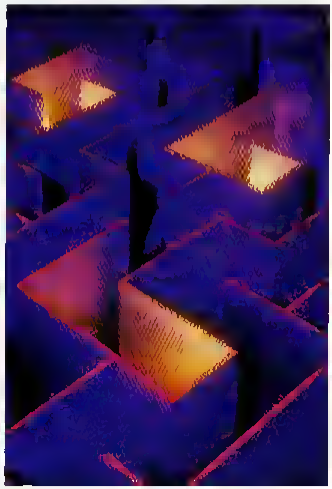
Dave Otten has been building robot mice since the fall of 1985. Even so, he's unprepared for people's reactions. "What're they good for? Why are you really doing this?" they ask. "Say it's for fun, people think it's a pathetic waste of talent," he says. "Mention anything about national pride, then they really think you're crazy."

At our feet lay a black mat area approximately 100 feet square. White walls topped with red reflecting tape divided the area into corridors about seven inches wide and a hair less than two inches high. From time to time someone would place small, squat vehicles—the size of bricks—in one corner, and these would begin to thread their way to the center. Each mouse had two L-shaped rods extending several inches in front and off to one side. They looked like the offspring of a roller skate and a calculator.

The mice moved through the maze with two gaits: a slow, stately, and precisely rendered step-and-pause rhythm and a dragster mode: racing for half a corridor length and then coasting through the other half. Losing traction and spinning out, they repeatedly impaled themselves on maze posts or whacked walls—but kept trying. For machines they showed a lot of heart.

There may be practical applications for the skills these athletes hone on their mat. Maze solving is a step toward the development of automated land vehicles, for example. But Otten's goal isn't utilitarian: he just wants to win first prize at the dozen or so contests where "micromice" compete to solve a maze in the shortest time. Such competitions, from London to Singapore, have a committed following. Recalls Bell Labs' Susan Rosenbaum, a judge for the 1985 World Championships in Tsukuba, Japan: "When it came time to take my seat, uniformed helpers carrying the Stars and Stripes escorted me into a large theater. A band played the American anthem. Sony had hung a huge TV screen, hundreds of square feet in area, outside the building, and my hosts told me that the streets outside were packed with spectators. The emcees were professional TV personalities like Vanna White. Dignitaries handed out the awards." Of the 200 entries, the Japanese had 190. The other ten, all from Europe, finished last. Although Otten missed this meet, at press time he was planning to make it to the next World Championships, slated to take place last month in Singapore.

Otten, a burly man in his mid-thirties with thinning blond hair, blue eyes, a snub nose, and a raspy voice, has moved quickly through the ranks and is now giving the top-rated Japanese designers a run for their money. Part of his edge comes from his job. A research scientist at MIT's Laboratory for Electromagnetic and Electronic Systems (LEES), he is involved in, among other projects, designing the next generation of electrical motors. In fact, his familiarity with this subject prompted him to enter the micromouse arena. Back in 1985 Otten heard that the then-champion Japanese employed stepper motors, which use coils to create alternating electromagnetic fields that drive the rotor around. At LEES he was working with the more advanced DC power systems. DC motors have brushes, not coils, that spin the rotor continuously, providing smoother power control. *We should get involved,* Otten thought.



Amazing race: Robots find their own way

Over the winter of 1986 the mouse team at LEES, given $2,000 by the MIT dean's office, spent 30 to 40 hours a week on the project. The work turned out to be more demanding than anyone had anticipated.

Having better motors was only one aspect of building a winning micromouse. "The important thing wasn't this or that factor but rather working down the entire list and making it all hang together," says Otten. "Integration is the key thing. Designing the actual maze-solving computer logic, for example, was not too difficult. The point of the race was to find the center of the maze. The mice could remember every step that they took in their electronic memory, then simply retrace their route if they ran into a dead end, and try again.

Otten's greatest challenge: designing a system able to comprehend and control the actual physical movements of the mice. The creatures scurry over countless microbumps, cracks, and holes, over surfaces with tiny tilts or steps—or tilts *and* steps. A machine negotiating such surface imperfections is constantly nudged off course. If a maze runner doesn't detect those deviations, analyze them, and correct its course within a fraction of a second, it will crash into the walls, losing time and risking serious disorientation.

There was no easy way to accomplish this task. If you tried to use bigger, heavier computers to increase a mouse's capacity for information analysis, you had to use larger batteries and motors. The mouse grew too big and clumsy and would slow up. Moreover, the mice had to fit into a regulation-size maze

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SOUND-AND-LIGHT WARS

mind

By Judith Hooper

You don't want to mix this stuff with alcohol and go into altered states," cautions David Siever, the Edmonton, Alberta, inventor of the DAVID (Digital Audiovisual Integration Device). He then tells me about a country-and-western band that wanted to purchase one of his machines as a party gimmick. "They were going to put it on the table next to the beer keg. We explained that when people go into deep hypnotic states they're very suggestible, and if they hear lyrics like 'you know, My baby left me/woe is me,' it could be dangerous."

The band evidently decided not to "mix frequencies of sound and light with Budweiser and Tammy Wynette," but more and more people have been modifying their brains with synchronized sound-and-light machines, as they're known in the trade. These altered-states machines are often seen as "Nautilus equipment for the brain," and in some large cities connoisseurs flock to "mind gyms" to strap on earphones and funny goggles that plug in to a central control panel. As New Age music, tones, and a heartbeat are piped into the users' ears and an electromagnetic field surrounds their heads, small lights in the goggles flicker at different rates. This is to prompt the users' brains to put on a full-color light show: intricate mandalas, spiderwebs, moire patterns, and spinning constellations. It's Fillmore West for the Nineties.

Yet there is trouble in sound-and-light land. To stay in business, these machines may require Food and Drug Administration (FDA) approval—and they may not get it. A lot is riding on whether or not they are medical devices.

The machines run the gamut from the $350 portable Walkman-size MC² to the $69,000 industrial-strength Synchro Energizer, which serves a roomful of users and requires an operator at its power-plantlike control panel. All work on the same principle: entrainment. If someone flashes a light in your eye at a frequency of, say, eight cycles per second, or hertz (Hz), your brain will automatically resonate at the same frequency. A flash rate of 8 to 12 Hz will produce alpha brain waves, associated with a state of relaxed alertness. (Our hyper everyday "beta" consciousness of freeway driving and leveraged buyouts is 13 Hz and above.) If you want to go deeper into a dreamlike theta state, in which long-buried memories may float to the surface, you adjust the frequency to 4 to 8 Hz. Below 4 Hz you hit delta waves—sleep.

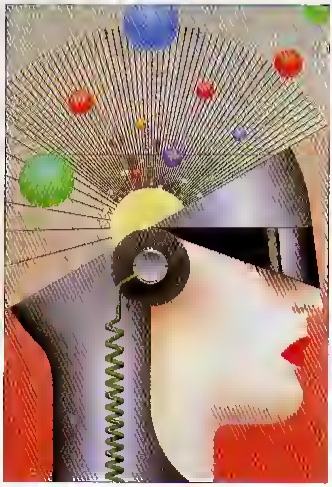
We live in a society that keeps us in a beta state, a fight-or-flight condition, and we weren't meant to be in this state all day long," opines Siever. The father of the Synchro-Energizer, Ohio inventor Denis Gorges, adds, "People need to get high. How else do we get altered states that improve the brain instead of debilitating it?"

The field has some of the frontier feeling of the personal-computer business in the mid-Seventies. Lone inventors, technologized New Agers, and Esalenized engineers fiddle with frequencies in their basements and come up with odd devices. They speak of inner peace, hemispheric synchronization, and cycles per second. They seem to intimate an ideal marriage of Eastern metaphysics and Western technopower, a psycho Utopia in which the average American family can plug itself into a brain machine before settling down to *Married With Children*. Some in the field believe these daydream machines are the wave of the future—high-tech meditation, do-it-yourself psychotherapy, a quick fix for civilization's discontents.

The three major-appliance-size sound-and-light machines—the Synchro-Energizer, the DAVID, and the Inner Quest Pro I—accommodate multiple users, whose machines are all plugged in to one operator-controlled unit. If you own one of the small portable models—the Relaxman, Inner Quest, MindsEye MC², or DAVID Jr.—you can tune your brain to 10 to 15 automated programs (with frequencies designed for relaxation, sleep, meditation, pain relief, subliminal learning, or music appreciation) right in your own living room. These Walkman-like units provide most of the features of the big units, except for an electromagnetic field. And it's all legal.

Up till now these devices have been unregulated by the FDA, whose business it is to keep potentially dangerous or worthless medicines out of our hands. Anything that is classified as a "medical device" must go through carefully controlled clinical trials before being marketed. This is known as premarket approval, and it's expensive and time-consuming. The question is: Are these machines medical devices?

That depends to a large extent on what inventors and manufacturers say about them. And some have said injudicious things. These magic machines are claimed to synchronize the right and left hemispheres of the brain, treat stress and related disor-



Brain goggles, Fillmore West of the Nineties

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RAILWAY TO HEAVEN

SPACE

By Steve Nadis

Once upon a fime men flew to the moon in a 20,000-pound shell fired from a 900-foot-long cannon. That was a flight of fancy—not fact—recounted in the 1865 Jules Verne classic *From the Earth to the Moon*. But Verne may have been on to something, according to Alvin Marks, a physicist, inventor (with 117 patents to his credif), and energy consultant to the late President John F. Kennedy.

Marks now proposes (and has pafented) a modern-day variation on Verne's cannonball express, dubbed the space train, thaf could revolutionize travel info orbit. This mammoth 3,000-ton craft would use electrical power fo accelerafe through a 1,000-kilometer-long underground tunnel, pick up speed smoothly, then hit a gentle three-degree rise and fly info space. Present plans call for the train to be a 200-yard-long, flexible cylinder with cone-shaped ends—to minimize afmospheric drag.

This fantastic idea poses daunting design challenges, however. Researchers will have to make significant advances in a variety of areas—from heat shielding to tunneling technology—before the frain ever leaves the ground. And the project may cost as much as $5 trillion. 'The concept might be considered science fiction foday, but today's science fiction may become tomorrow's reality,' says Peter Diamandis, a Marks collaborator and one of the founders of the International Space University, a graduate-level summer program headquartered in Boston (see Space, November 1987). Buzz Aldrin, arguably the best space scientist among the Apollo astronauts (he holds an MIT Ph.D. in astronautics), puts the project in perspective, however. "There are many questions about electromagnetic launchers [such as the train] which have to be answered before thinking of putting humans into one."

The space frain system first took shape in response to the *Challenger* disaster. The shuttle's tragic explosion convinced Marks of the need for an alternative to present rocket propulsion systems. He teamed up with Diamandis and within a year the pair had worked out their train and tunnel design.

Marks proposes such a long funnel to meet the first requirement for a system that transports living beings to space. The ride won't kill them. The miles of track will enable the craft to build up speed slowly enough fo hold acceleration to eight g's or less—a level of force the human body has tolerated in past space ventures.

Besides g forces, the space train faces another hurdle. In order fo hit the 25,000-mile-per-hour speed needed to break free of Earth's gravity, it must avoid friction. To solve this problem, the tunnel would be a near vacuum and the vehicle itself magnetically levitated so that it rides above, not on, its rails. The tunnel would also play a vifal role in helping the craft reach its extraordinary velocity. A series of electric coils surrounding its walls would turn it info an enormous mass driver. Switching these on directly in front of the train would create a magnefic tield that would propel the vehicle forward.

Such rapid acceleration, however, would pose another problem. The speeding frain would leave the near vacuum of the tunnel and ram into fhe normal atmosphere with explosive force, causing a rapid deceleration as risky to passengers as extreme acceleration. To prevent such a fatal 'crash,' the last 100 kilometers of the tunnel would gradually fill with air so that the train would leave its tracks and lift off in full atmospheric pressure. Even with this "braking period," it's estimated the train's entire one-way trip to space would take just 40 seconds. Such a fast ride would generate considerable heat on the craft's skin, requiring new and advanced heaf shielding.

The train could bring the price of a space trip down to as little as $20 a pound—$3,000 for a 150-pound person. Marks believes that the potential benefifs of such a transporf sysfem would far outweigh the considerable investment it would require. "The space frain would provide mankind with a

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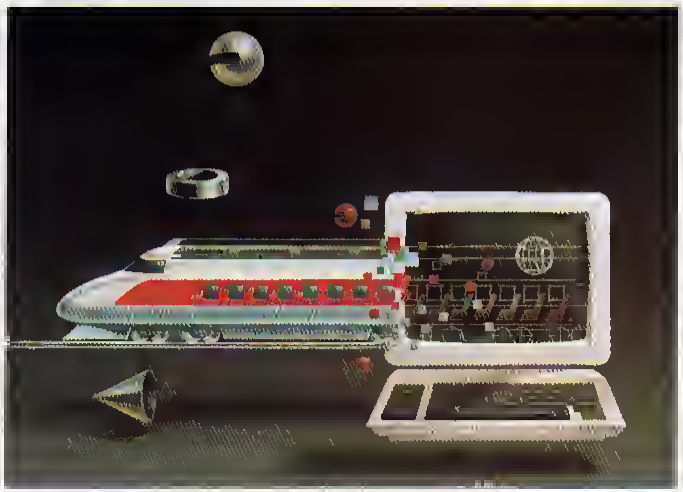


Little train that could. The iron horse opened up the West, it may do the same for the stars

CONTINUUM

THINGS THAT GO BUMP IN THE MIND

A terrible plague of *evil angels* beset New England when it was first carved from the forest. Puritan witch-hunter Cotton Mather suspected that "daemons" were taking the shape of innocent persons in late-night "spectral exhibitions." In the Irish countryside the poet William Butler Yeats saw the eerily lighted shape of a man walking on a river late at night and knew that "no human footstep was so speedy."

For most of our human history the wilderness surrounded us and concealed in its shadows and lonely corners mysteries far older than we ourselves. What might roam such places at night our ancestors couldn't say, and the unknown was all around. Seemingly healthy people fell sick, and villages were swept with sudden epidemics and hysteria. Tales of ghosts and witches and shape shifters were not only believable; they were agonizingly immediate, told in whispers.

It is surprisingly easy to get back in touch with this experience. If you have ever swapped ghost stories around a campfire, you know how every rustling of leaves or breath of wind can come alive with its own primitive suggestion. Scanning the perimeter of firelight from your sleeping bag, you'd like to quietly do obeisance in the words of the Cowardly Lion: "I *do* believe, I do I *do* believe."

Of course, we don't believe ghost stories—not really. In a world of electric light, we feel free to ignore shadowy things. Our scientists collect rock samples from the moon and detect viruses under microscopes, and we have become impatient with the notion of the unseen or the unexplainable. Yet somehow the supernatural continues to fascinate. Moviegoers line up for the fourth sequel to *Nightmare on Elm Street* and horror author Stephen King has sold nearly 100 million books.

Ghost stories were probably told by our earliest ancestors and emerge in our earliest literature, often in a religious context. Jesus rose from the dead, of course, and a spirit "light as a rustling breeze" appears in the Book of Job. The Talmud issues the warning, "Never greet a stranger in the night, for he may be a demon." There are ghosts in the *Odyssey*, in Petronius, in Chaucer, and in Shakespeare. Henry James wrote ghost stories and so did Nathaniel Hawthorne, Thomas Mann, Isak Dinesen, and Edith Wharton.

Ghosts and ghost stories came in out of the forests with the Industrial Revolution. In W. W. Jacobs's classic tale "The Monkey's Paw," the son who does or does not return from the grave has been crushed in factory machinery. Modern notions of psychology played up the tension between the "real" and the "make-believe," as in Charlotte Perkins Gilman's 1892 story "The Yellow Wallpaper," in which a ghostly figure may or may not be moving behind the patterned wallpaper of a woman undergoing a nervous breakdown.

"Ghosts and ghost stories have existed through the ages and they are present in every culture and every society," says Lester Golden, a psychologist affiliated with New York's Washington Square Institute. "They deal with central questions about human existence." John Carpenter, director of movies such as *Halloween* and *The Fog*, agrees. "The most important question each of us has to answer is what happens to us after death. We don't want to accept it as finality. Ghosts are proof that there is a spirit inside that survives death. It's a great wish."

But are ghosts and ghost stories really just symbols of personal unease in the Freudian sense, projections of wishful thinking? Parapsychologist William Roll of West Georgia College believes it goes further. Says Roll, "What we are really dealing with are natural expressions of human nature. It's our restricted view of personality that excludes these phenomena from our worldview." In Roll's opinion, the mind possesses powers such as psychokinesis (the ability to affect objects over distance) that fall outside the paradigms of mainstream science. It is these little-explored powers that account for ghostly manifestations.

Among the living there is no consensus on whether ghosts and ghost stories are manifestations of unconscious fears, hidden mental powers, or emissaries from the Great Beyond. Each culture and each individual must come to terms with such private thoughts. Though we pride ourselves on knowing a great deal about our world, ghost stories grip us because they remind us that the greatest questions go unresolved.

Here we stand on this giant, rolling planet with the stars going by overhead, and it's just a total mystery," says Carpenter. "Why are we here, and what happens next? Myths help us cope. Dracula and killing Dracula and the rituals of destroying evil—they teach us faith and hope. —*RICHARD NALLEY*

CONTINUUM

Sweet, creamy and fuzzy, Vermont's native turnip, named for a dead miser, has been rescued from the brink of extinction

RETURN OF THE HAIRY TURNIP

Few things gladden a Vermonter's heart like the mild, sweet taste of the knobby, hairy Gilfeather turnip. saved from extinction by the horticultural sleuthing of a Dummerston, Vermont couple who are credited in turnip circles with rescuing the only vegetable—with the possible exception of deer-tongued lettuce—indigenous to the state.

More than ten years ago a neighbor gave Mary Lou and Bill Schmidt a small jar of Gilfeather seeds, a strain developed by one John Gilfeather at the turn of the twentieth century. So secretive was crusty old John that he was wont to cut off the tops and bottoms of his sweet tasting turnips so that no one else could propagate them. The Gilfeathers were well known locally, but after John died in 1944, everyone thought the secret of his turnip had been buried with him.

The Schmidts, however, used the seeds they had been given and began a crusade to save the Gilfeather. They trademarked the name to avoid the possibility of a black market for the seeds they now sell for a dollar a packet. "Our main concern was to preserve the mystique of the Gilfeather. We didn't want something unique to Vermont to lose its identity," Mary Lou Schmidt says.

Curiously, the Gilfeather, which is best mixed into mashed potatoes after boiling, takes up to 90 days to mature, as opposed to 50 days for a conventional turnip. Its only other shortcoming is that many people find its leaves are too coarse and heavy to be eaten.

—George Nobbe

"The time you enjoy wasting is not wasted time."

—Bertrand Russell

"When you have eliminated the impossible, whatever remains, however improbable, must be the truth."

—Arthur Conan Doyle

SUPERWOMAN HORMONE

Women leaders such as Pakistan's Benazir Bhutto and Great Britain's Margaret Thatcher may have a biological advantage over other females who are trying to reach the top of the political heap. Successful women secrete larger than-normal amounts of a hormone that makes stress a pleasurable experience, says Malcolm Carruthers, medical director of the Positive Health Center at Harley Street in London.

For 20 years Carruthers has studied hormone levels in hundreds of men and women placed in stressful situations. He found that as stress levels increased, epinephrine, a hormone associated with anxiety, was first produced. But when his research subjects began to feel in control of their situation, norepinephrine, a hormone associated with pleasure, kicked in.

"Highly successful women release more norepinephrine than less successful women," explains Carruthers. This, in turn, makes stressful situations pleasurable, leading women down what Carruthers calls the 'chemical pathway to pleasure.' They become norepinephrine junkies looking for ways to turn on."

Carruthers's research has included several members of Parliament. "I hasten to add I have not examined Prime Minister Thatcher's hormone levels," he says, "but I'd certainly love to look at what's going on in her."

—Sherry Baker

Thatcher. Stress junkie or superlady? Is there a difference?

Here comes the groom Simians monkey around for months before getting down to the business of reproduction

BABOON SWOON

The animal kingdom may offer a tip for men on the prowl Breast beating is an ineffective way to attract a mate So observes Shirley Strum an anthropologist and author of the book *Almost Human*, which chronicles her 15-year residency in Kenya where she lived with a troop of olive baboons

Strum watched 41 adult and 39 adolescent male baboons as they went about the business of mating In most cases she reports, males spent weeks, sometimes even months courting their female heartthrobs before the females finally started to respond Even then, Strum says six to eight more months of platonic friendship might ensue before the female finally became sexually receptive (Baboons can mate many times in the middle of their 40-day cycle) Furthermore says Strum this friendship preceded mating as much as 89 percent of the time, while only 25 percent of the time did males who wooed with aggressive behavior actually win their females

And what is the final conclusion? 'Male friendly persistence may outweigh female resistance in baboons' What these baboons may be telling man is that long-term friendship succeeds in seducing females far more frequently than does aggression —Bill Lawren

ELECTRONIC CAR KEYS

An electronic system inside a car key developed by GTE Corporation of Waltham Massachusetts uses an acoustic wave system that in a sense, talks to your car in so personal a fashion that it can foil even the most sophisticated car thief

The system consists of two coupling coils one on the steering-wheel column, the other embedded in the molded plastic head of the ignition key Once you turn the key in the ignition an electronic module emits an inaudible high-frequency radio signal to which the key must respond with a second signal If the follow-up signal is correct the module tells your car's central computer to start the engine

GTE new product development manager Skip Whidden says that when the system is installed probably on 1991 cars the company will make keys that send just slightly different signals to permit different drivers to use the same car But the primary purpose of all this wizardry is to thwart car thieves The device will not prevent the car from being hot wired but it will defeat the bulk of professional auto thieves who use skeleton keys

"It would be almost impossible for anyone to duplicate an electronic key" says Whidden, who contends the GTE system is superior to those of competitors because "it's a passive system You don't have to do anything electrical so it's more reliable' The company is negotiating with several carmakers and has yet to decide whether to offer its system with only a few sets of key codes or to produce millions of blanks that could be programmed at dealerships as each new car is sold —George Nobbe

'I would give up part of my lifetime for the sake of knowing what is the average barometer reading in Paradise'

—Georg Christoph Lichtenberg

Key to mem[illegible] cars and remembers drivers—but thwarts even [illegible] criminal car thieves

CONTINUUM

THE DINOSAUR THAT NEVER WAS

Amid the thousands of fossil bones that litter a vast dinosaur graveyard in Utah's Cleveland–Lloyd Quarry a single egg lay undisturbed for millions of years. When Brigham Young University paleontologist Dee Hall found the egg, he told a colleague, his heart stopped. As it turned out, Hall had picked up the oldest dinosaur egg unearthed in the Northern Hemisphere, dating back 145 million years.

Karl Hirsch, a museum associate at the University of Colorado in Boulder and one of the world's leading experts on fossil eggshells, examined Hall's discovery. The shell's strange configuration helped him sketch a scenario of the way in which both egg and mother met their end.

The shell's secret? Two distinct layers rather than just one. This suggests that the mother was disturbed the first time she tried to lay the egg, Hirsch explains, "so she kept it in her body where a second shell was deposited around the original shell. Multiple shell layers have been found in some modern reptiles, he says, when the mothers have been undernourished or interrupted during the egg-laying process.

We assume that the mother got stuck in a swamp and died. The egg had also been busted in two, he explains. "The egg probably broke inside her oviduct." The identity of the egg's mother will never be known, as her fossilized bones lie with hundreds of other bones in the quarry.—Dava Sobel

"Things do not turn up in this world unless someone turns them up."
—James A. Garfield

THE BRIGHT SIDE OF ANGEL DUST

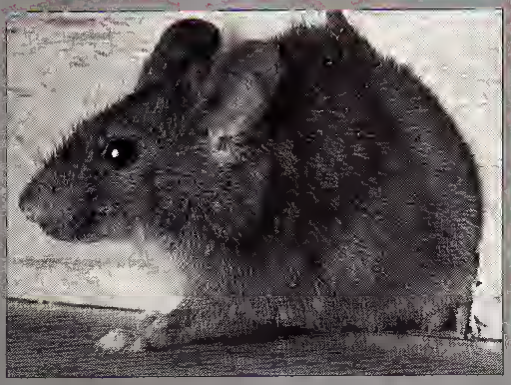
In the Sixties and Seventies the animal tranquilizer phencyclidine—better known as PCP or angel dust—gained notoriety as one of the more dangerous "recreational" drugs. Although it gave users a transitory high, it could also produce extremely violent behavior. But now a scientist at the University of Michigan believes that angel dust may have a more helpful side to its personality, as an aid in hospital emergency rooms.

Edward Domino explains that some emergency room patients—heart attack or stroke victims, for example—suffer from a reduced flow of oxygen to the brain. When the missing oxygen is restored, the patient's brain releases a flush of glutamic acid, a compound that can kill brain cells. In fact, if levels of glutamic acid become excessive, irreversible brain damage can result. But PCP can block the same ion-channel receptors as glutamic acid, thus preventing damaging effects.

The problem, says Domino, is that PCP is an unpredictable drug. He and his colleagues are now doing computer analyses of the molecular structure of PCP in hopes of building what he calls a "designer derivative," an ideal molecule—one that will prevent glutamic-acid caused brain damage without producing any of its own.—Bill Lawren

"The invisible is real."
—Walter DeMaria

Working the graveyard shift. Digging around in a fossilized swampland has yielded thousands of old bones and an additional prize—one precious dinosaur egg.



Carnival ride. Curious vermin think a high tech trap is fun—until they reach the end of the tunnel and the lights go out.

INDUSTRIAL-STRENGTH MOUSETRAP

Would you replace a 50 cent mousetrap with one that costs $250? Not many home owners would, but when it comes to bagging rodents on an industrial scale, food producers need a better mousetrap to curb infestation.

Philip Andres, who co-invented his mousetrap with Andrew Pratscher, says that food warehouses pay up to $50,000 a year for rodent control. Even then, killing the beasts is difficult. "You can't use poisons near food and it takes hundreds of snap traps to keep a large population under control," he says. His trap, about the size of a toaster oven, runs on eight D-cell batteries. The rodent, lured by bait through a small tunnel, breaks the beam of an electric eye causing the tunnel to tip upward. This dumps the intruder into a bag while CO_2 from a tank tethered nearby is pumped into the bag, forcing oxygen out. The CO_2 suffocates the vermin in about three minutes.

After the rodent has perished, a spring pulls the tunnel back into position, resetting the trap for the next visitor. "We can hold about ten rats or about thirty mice before the bag needs to be emptied," Andres explains. So far, about 60 of the traps, manufactured by Hudson Devices in Illinois, have been sold, and they excel at catching rats. "When a rat dies, it screams a warning," Andres says. "Then other rats won't come near that area again." But because death comes so quickly and without pain, the rats have no time or reason to issue a warning cry. "They think they're going for a carnival ride," says Andres, "then they die."

—George Nobbe

"A historian is a prophet in reverse."

—Friedrich von Schlegel

SPACE SEEDS

Some 4 billion years ago, life forms from Earth may have begun colonizing Mars. This scenario is being considered by a team of planetary scientists from the University of Arizona, based on the finding of meteorites in Antarctica suspected to be of Martian origin.

Scientists Jay Melosh, Brian Tonks, and Steven Finney believe there may have been a meteorite trade between Earth and the red planet. Melosh points out that billions of years ago meteorites bombarded the earth. If, during this time, the scientists hypothesize, a megameteorite some ten miles across crashed into the earth, pieces of our planet's crust could have been kicked up and sent flying into space. And it's very likely a few rocks would have landed on Mars.

What makes this fascinating, according to Melosh, is the possibility that the meteorite's interior may have carried the seeds of life in the form of spores or bacteria. The meteorite's outer shell could have shielded the organisms from space radiation, then when the earth rocks smashed into the Martian surface, they would have broken up and freed the organisms.

At that time, adds Melosh, when water freely flowed across the Martian surface, the exported life forms may have survived. "If we ever find life on Mars," says Melosh, "we can compare its genetic material with life on Earth. If it's similar, then we have a case for believing there's been significant biological communication between the two planets."

—Bill Lawren

"Nothing worse could happen to one than to be completely understood."

—Carl Jung

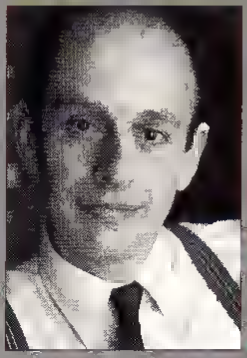
Another Big Bang? Were craters the launchpads for a 4-billion-year old seeding of the solar system?

CONTINUUM

MOVIE STAR SCIENTISTS

When film director Roland Joffe set out to cast *The Killing Fields*, his movie about war in Cambodia he purposely chose nonactors including Cambodian physician Haing Ngor to play many of the important roles More recently, when he decided to cowrite and direct a film about the making of the first atomic bomb Joffe used the same casting technique this time using real scientists

The film, called *Fat Man and Little Boy* and scheduled for release sometime this fall stars Paul Newman as General Leslie Groves and actor Dwight Schultz as J Robert Oppenheimer But the two pros are supported by a long list of scientists-turned-actors including Caltech theoretical physicist David Politzer (who plays Oppenheimer protégé Robert Serber) Stanford psychology professor Brian Wandel



Doctors who play doctors: Physicist Politzer bombs

Super[illegible]ene A Wahl breaks the 200-year-old [illegible] of Stradivarius violins [illegible] enth century box The mystery is finally solved

and even UCLA cancer specialist Robert Gale who is better known for his real life role in aiding the victims of the Chernobyl disaster

For two weeks last fall the scientists assembled in Durango Mexico where the film was shot At first, says Politzer the idea 'seemed ludicrous But as the filming progressed and as the physicist rubbed shoulders with professional actors it became "an enormous amount of fun It was so different from my normal life, he says where the kind of people I see are restricted to physicists and other scientists'—Bill Lawren

'Tact consists in knowing how far to go too far'
—Jean Cocteau

FIDDLING WITH STRADIVARIUS

The most famous of fiddles the Stradivarius has never been equaled for its rich beautiful tones Until now that is A New Jersey man believes he has plucked the elusive secret from the eighteenth century and he has patented his process

Retired chemical engineer Eugene A Wahl says that the revered violins sound has been attributed to everything from bacteria to the use of volcanic ash My father believed that the secret was in the drying process,' says Wahl 'so for more than sixty years he dried his violins in smoke'

Wahl believes that the precise sequence in applying the layers of shellac, varnish and pigments accounts for the violin's uniqueness Wahl owns over 100 factory made instruments bearing his version of the Stradivarius finish And he is not the only one who believes he has discovered the secret, several world-famous violinists who use his fiddles find it virtually impossible to tell the difference The most distinctive difference is in the price An authentic Stradivarius can fetch up to $1 million whereas Wahl's violins cost between $2 000 and $3 000

Will there be mass production of these modern versions? No says Wahl who obtained the patents 'merely to establish myself as the discoverer of the Stradivarius secret —George Nobbe

BAKING SODA FOR STAMINA

Baking soda can clean your teeth make dough rise, and vanquish heartburn Now comes word that it may also give athletes a stamina boost

Exercise physiologist Craig Horswill of the Children s Hospital in Columbus Ohio tested sodium bicarbonate on ten intercollegiate swimmers Over the course of five days the athletes swam five 100-yard races a day "On two days they received a drink containing baking soda two days they got a placebo and one day they had no drink, Horswill says The dosage of sodium bicarbonate used was based on body weight A 175-pound man ingested about three teaspoonfuls

The results? When swimmers took placebos or had no drinks their speeds remained the same throughout the test After downing the baking-soda laced drink they also clocked their usual times for the first three races But by races four and five speeds increased an average of three seconds per 100 meters That Horswill theorizes, is because it takes time for the bicarbonate to rid the muscles of lactic acid which results from strenuous exercise and impairs muscle proteins and may reduce stamina by affecting enzymes that break down sugar in the body for energy

A shot of bicarb is not a panacea for athletes however It manipulates the body s acid-base balance and we don't know all the side effects It definitely can cause gastrointestinal distress, Horswill warns "Baking soda is no substitute for proper training and nutrition —Sherry Baker

'In a museum in Havana there are two skulls of Christopher Columbus, one when he was a boy and one when he was a man' "
—Mark Twain

High dive Stamina-enhancing drinks are making a big splash with athletes, and they can clean your teeth too

SCREWWORMING LIBYA

The American screwworm fly *(Cochliomyia hominivorax)* is a particularly nasty little bug It lays its eggs in wounds in the skin of domestic animals and humans then when the eggs hatch the newborn maggots burrow through the host s tissue, extending the wound and causing infections that if left untreated, can be fatal

Until the Fifties, *C hominivorax* was a strictly American pest causing millions of dollars worth of harm to U S farm animals Then it was controlled by means of a massive fly sterilization program It still wreaks havoc in Latin America But now say a pair of scientists from the Liverpool School of Tropical Medicine in England the American screwworm fly has mysteriously turned up in Libya

William Beesley and graduate student M M Gabaj report having found numerous cases of American screwworm infection in animals—as well as four cases in humans—60 miles outside of Tripoli Beesley says screwworms could spread, "theoretically all around the west coast of Africa, and all the way east to Egypt and the Sudan" Treating diseased animals and trying to eradicate the fly could Beesley adds, present a colossal extra cost to farmers and governments in those countries (Reinfestation in the United States could cost the North American livestock industry about $375 million annually)

Libya seems to be a breeding ground for all kinds of worms

So how did the American screwworm get to Libya in the first place? Could this be a case of biological warfare perpetrated by the CIA? I haven't the faintest idea, Beesley says I would tend to think of it as an accidental thing—the fly coming in on an imported animal—but we just don t have the information " Gabaj is now in Libya checking importation records to see if he can trace the source—Bill Lawren

'One's prime is elusive"
—Muriel Spark

A metaphysician is a man who goes into a dark cellar at midnight without a light looking for a black cat that is not there '
—Lord Bowen

CONTINUUM

GET THEE TO A UROLOGIST

We know Shakespeare had a flair for writing but did he have the makings of a good doctor? As an intellectual exercise prompted by the public relations department, members of the University of Oklahoma Health Sciences Center combed through Shakespeare's plays and checked out a few medical observations offered by the bard such as

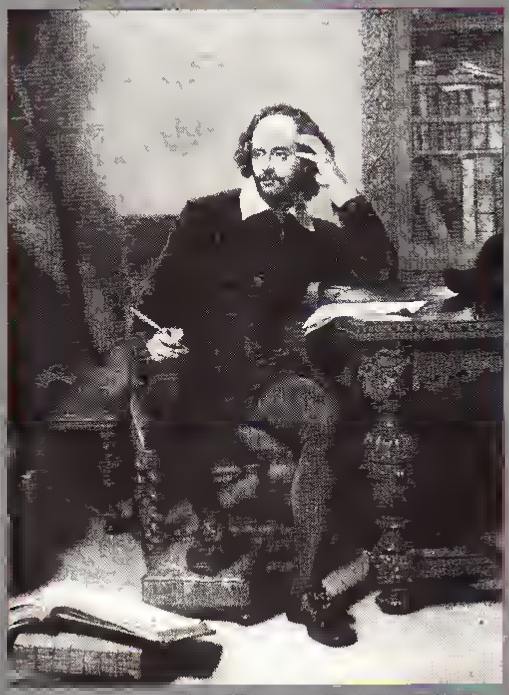
• "That which hath made them drunk hath made me bold (*Macbeth*) True for a lot of people,' agrees research psychologist John Braggio Among other things alcohol numbs the brain's frontal cortex which controls much of our behavior, including aggression

• 'They are as sick that surfeit with too much as they that starve with nothing' (*The Merchant of Venice*) True from a dietary point of view says Dr Stephen Glore assistant professor of clinical dietetics Major killers today are heart disease and stroke A major contributing cause? Obesity often brought on by overconsuming high-fat foods

• Unquiet meals make ill digestions' (*The Comedy of Errors*) About 30 percent of our meals are consumed away from home, Glore estimates the most common meals being fast food What you get from these unquiet takeout meals are foods high in fat and sodium

• 'Give me your hand and let me feel your pulse' (*The Comedy of Errors*) A good doctor takes his patient's pulse for a variety of medical reasons says Dr Thomas Whitsett professor of medicine and pharmacology to measure heart rate, to check the heart's rhythm and to gauge its strength In addition doctors in this era of high-tech medicine have come to reappreciate the subtle benefit offered by this medical ritual says Whitsett The simple act of touching another human being reaffirms the special doctor–patient relationship

After assessing four of the bard' [illegible] Whitsett [illegible] Shakespeare showed a high degree of medical sense He quite possibly would have made a good doctor He was well versed in the medical knowledge of the time and he had a lot of insight into human behavior Knowledge and insight are two things that even modern doctors need to possess —Henry Wouk



To be or not to be an M D [illegible] when it came to seventeenth-century medi[illegible]

"You can never plan the future by the past."
—Edmund Burke

ADJUSTABLE SUNGLASSES

Need a lightly tinted pair of sunglasses for driving but a darker pair for the beach? Now a New York company has built a prototype of electronic sunglasses that can be adjusted just as you would adjust the brightness of a TV screen

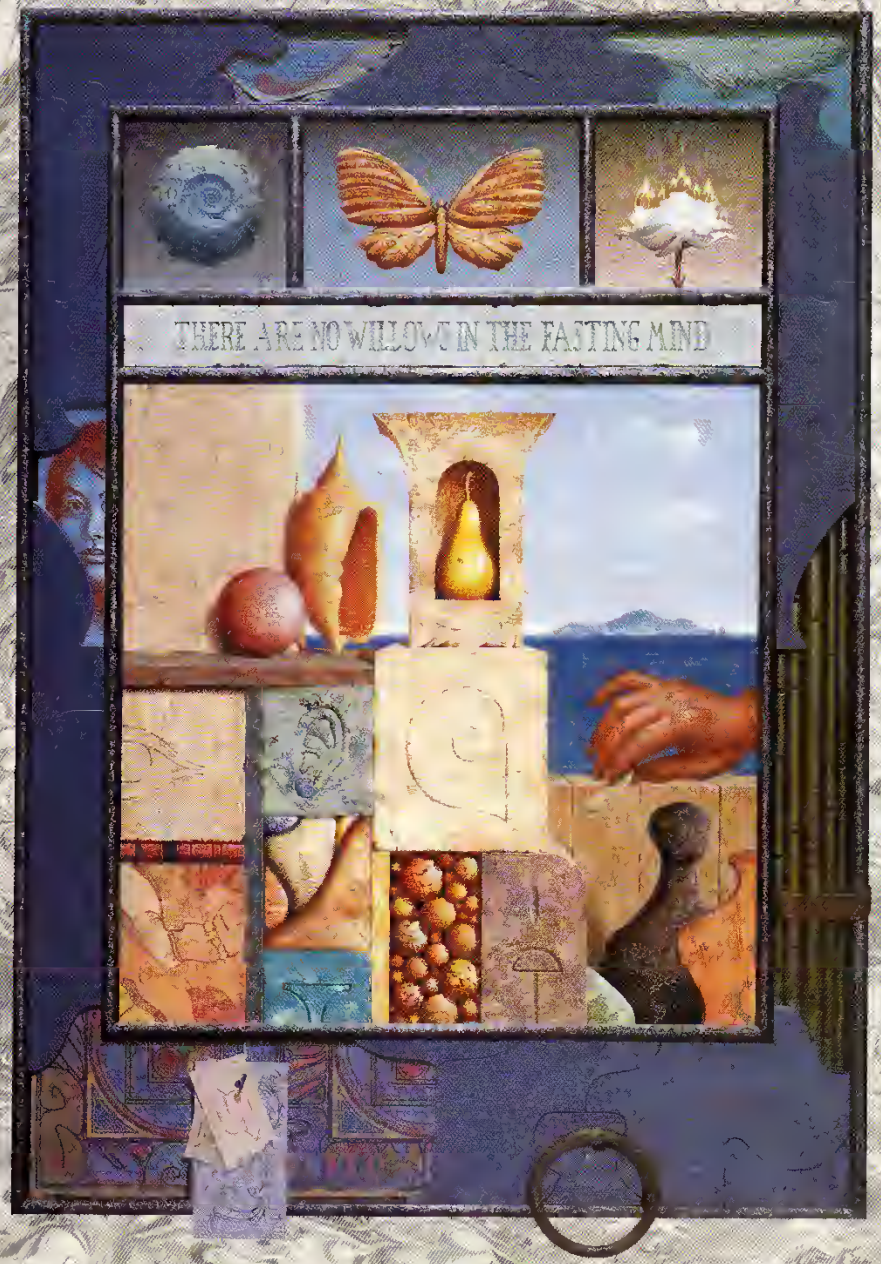
Research Frontiers Inc of Woodbury New York, says its variable-light-transmission glasses can filter out from 44 to 88 percent of the sun's light in the blink of an eye The glasses are powered by minuscule batteries hidden in the frames and can be adjusted manually

The glasses' lenses are made from two pieces of either glass or plastic separated by less than one thousandth of an inch The inside surfaces are coated with a material that conducts electricity while remaining space is filled with an organic liquid in which millions of tiny, needle-shaped crystals are suspended

'When the voltage is off, says company president Robert Saxe The dark blue light valve blocks out sunlight Switching it on sets up an electrical field that aligns the particles making the light valve transparent ' The level of transparency varies with the amount of voltage applied It may be two years before the device is available The cost around $200 a pair Saxe says

—George Nobbe

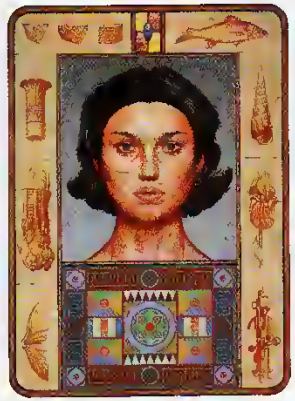
'I keep reading between the lies'
—Goodman Ace



ARTICLE

Using a potent method of guided imagery, you will conjure therapists, healers, and endless Utopias in your waking dreams

LIFE IS BUT A DREAM



BY KEITH HARARY AND PAMELA WEINTRAUB

The dream Yogis of ancient Tibet were known for an extraordinary mental feat. Using a potent method of mental imagery, they retreated more and more deeply inside themselves until they started to dream, and they did so without ever losing conscious awareness. According to the Tibetan Book of the Dead, edited by Oxford scholar W. Y. Evans-Wentz, the dream Yogis had almost total control over broad aspects of these "waking dreams." By consciously controlling these dreamlike images, the Yogis created endless Edens, explored alternate realities, and came to terms with such issues as the nature of reality and the meaning of life. In the latter part of the twentieth century, the dream Yogis' exact methodology remains obscure. Now, however, we present "high lucidity," our version of the Tibetan Yogis' conscious dreams.

In line with our own research, we base our version of high lucidity on a technique known as alert relaxation, in which the body becomes increasingly relaxed while the mind remains alert. Athletes often enter this altered state of consciousness to mentally rehearse their maneuvers. Cancer patients tap this realm, rallying their immune systems to fight the burgeoning cells that threaten their lives. And people interested in altered states of consciousness have even used the technique to experience the expansive feeling of separation between body and mind.

In the exercises presented below, you will learn to use alert relaxation to intensify your spontaneous mental imagery until it evolves into a conscious dream. Because you will maintain conscious awareness through the entire experience, high lucidity should provide you with a greater degree of control than you would have even in a lucid dream—a dream in which you become aware that you are dreaming *while you are fast asleep*. Once you have learned to induce high lucidity, you can learn to change dream weather, alter dream scenery, and gain greater insight into the range of symbols and feelings inhabiting your unconscious mind.

It would be most unusual for anyone to report problems as a result of the exercises below—

PAINTINGS BY CLAYTON ANDERSON

"The Gumby character, master of a surrealistic, flexible reality, responds to its dreamlike experience with good humor, imagination, and ease."

especially since they do not attempt fo replace psychotherapy in any way shape or form If you have a history of emotional or psychiatric problems however, or if you feel at all uncomfortable about any of the exercises we suggest that you check with your therapist or psychiatrist before proceeding In such a case, you might wish to carry out the high lucidity exercises under his or her clinical guidance

We also want fo emphasize that our dream healer exercise in no way replaces conventional medical treatment If you have cancer AIDS, or some other very serious illness we suggest that you practice these techniques only with the help of a guided-imagery professional referred to you by your personal physician or by a teaching hospital and in conjunction with all recommended medical procedures

Please remember the best way to master high lucid dreaming is one step at a time Give yourself time fo focus on each of the exercises, and don t rush any of them Although the regimen described in the following pages is designed to be carried out in ten days do not feel constrained if you prefer to take longer

We do not recommend completing the exercises in less than ten days however or trying to squeeze an entire week s worth of exercises into one weekend Although most of the exercises we present are conceptually simple their combined impact could be profound

We recommend that you allow your abilities to evolve gradually giving yourself an opportunity to adjust Moreover since high lucid dreams, much like ordinary dreams, reflect your current mood, a balanced approach should increase your enjoyment and the overall scope of your adventures

Finally, please do not be discouraged if you do not immediately have vivid waking dreams Achieving this altered state takes considerable practice We recommend that once you have learned the basic technique on days one two, and three you continue practicing on a nightly basis throughout at least the next two weeks We have every expectation that by following these procedures you will eventually learn to enter the intense state of high lucidity directly from waking consciousness claiming ever more power over your life and your dreams

A TEN-DAY JOURNEY TO THE LAND OF WAKING DREAMS

During the next three days you will descend through layers of consciousness until you have learned to generate images as rich and evocative as those in your nightly dreams

DAY ONE ALTERED STATES

On day one you will learn the technique of alert relaxation, in which the body enters a state of deep relaxation while the mind remains acutely alert While in the altered state of alert relaxation you will remain mentally alert while slowly becoming so relaxed that, in a physical sense you virtually fall asleep Through this process you should be able to enter your dreams without ever losing conscious awareness

Before you proceed with this exercise please read the rest of the instructions for day one in advance If possible ask a friend fo guide you through the relaxation exercise that follows If that is not possible record your own voice reading the following instructions on a cassette tape before you begin (If a friend does conduct the exercise the first time through

we still recommend that you tape the reading so that you will have it for the future.) Whether you or your friend records the instructions, remember to pause where indicated for a second or two.

To start, please find a private and comfortable place to lie down. Then play the tape you have made or have your friend slowly and quietly read the instructions aloud step-by-step, exactly as they're written below.

Take a deep breath, let it out slowly, stretch your muscles and relax. Now imagine that warm currents of mental energy are very slowly moving up from the soles of your feet toward your ankles.

Feel the muscles in your feet gradually warming and relaxing as you imagine the currents passing through them.

[Pause] Imagine that the currents continue moving up through your calves [Pause], into your thighs [Pause], through your hips [Pause] and buttocks [Pause], and into your lower back and abdomen. [Pause] Proceed very slowly, giving yourself time for each group of muscles to begin fully relaxing before allowing the imaginary currents to move on to the next area of your body. [Pause] Feel the muscles in your legs becoming heavy, warm, and relaxed and sinking down into the chair beneath you. [Pause] When you feel your legs becoming deeply relaxed, imagine the currents moving in a clockwise motion around your abdomen [Pause], up along your spine [Pause], and through the front of your torso into your chest [Pause] and shoulders. Feel the muscles in your stomach and lower back releasing any tightness or tension as the current passes through them. [Pause] Allow a feeling of general well-being to begin flowing through your body along with the imaginary currents as you continue to relax. [Pause]

When the lower half of your body feels relaxed [Pause], imagine the currents flowing upward through your ribs and shoulders [Pause]—warming and relaxing the upper part of your body [Pause] and leaving your back and chest feeling completely warm and free of any stress or tension [Pause]. Imagine the currents turning around to move downward through your arms and toward your fingertips [Pause], swirling around through your fingers and hands, and then moving upward once more [Pause], back through your arms and neck [Pause] toward the top of your head [Pause].

Now feel the muscles in your neck and face gradually becoming warm and relaxed as the imaginary currents pass through them [Pause]. Then imagine the currents flowing out through the top of your head [Pause], leaving your entire body feeling comfortably warm [Pause], heavy [Pause], and relaxed [Pause] and sinking down into the chair beneath you.

Once you gain experience, you should be able to enter the state of alert relaxation more and more quickly without needing anyone to read the instructions to you. For day one, however, it is sufficient simply to practice becoming deeply relaxed while maintaining a state of mental alertness, taking as much time and using as much assistance as you need to comfortably achieve this state.

Once you have entered the state of alert relaxation, maintain it for 20 to 30 minutes before gradually bringing yourself back to full waking consciousness. You may accomplish this simply by wiggling your fingers and toes, concentrating on your immediate surroundings, and opening your eyes.

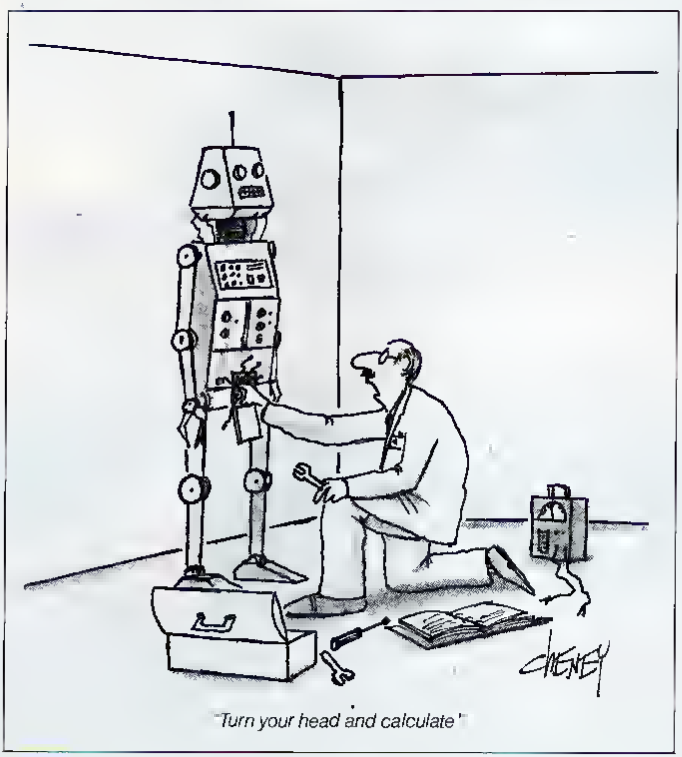
DAY TWO: THE ADVENTURES OF GUMBY

On day two you will move a step closer to achieving the state of high lucidity. Today's session should be conducted at least three hours before you normally go to sleep. This will make you less likely to just fall off into sleep while following the instructions. Begin by selecting a private room where you can lie down and relax without being disturbed. The room should be one in which you can play a television set at low volume. It would be ideal if the television is connected to a videocassette recorder (VCR), though this is not absolutely essential.

What is essential is that the television or video recorder be set up to play a cartoon show or nature feature for at least an hour. As far as your choice of program material, public-television nature programs would work well for this exercise because they are broadcast without disturbing commercial interruptions. We especially recommend, however, playing a video cartoon or other animated feature rich in the kind of surrealistic imagery often found in dreams. Our own favorite choice for this exercise would be any adventure featuring the beloved Claymation character Gumby.

The Gumby character exists in a completely surrealistic and flexible reality that often succeeds in capturing the quality of dreams. Gumby, the master of this reality, also possesses the kind of creative imagination it takes to respond effectively and with good humor to his dreamlike experiences. Other appropriate cartoons include *The Real Ghostbusters*, *Jim Henson's Muppet Babies*, *Smurfs' Adventures*, and *Fantasia*. We also recommend *Pee-wee's Playhouse*.

Once you have selected an appropriate video or television feature for this exercise, turn down the lights and turn on the program at a low but clearly audible volume. It would also be helpful to reduce the brightness on your television set as much as possible without obliterating the picture. Find a comfortable place where you can lie down to watch the TV without straining your neck. Get cozy and enjoy the show for at least half an hour.



"Turn your head and calculate."

Imagine yourself existing in the reality of the television or video characters you're observing, and let yourself absorb the images as fully as possible.

After roughly 30 minutes have passed, roll over on your back, close your eyes and continue listening to the television or video program playing in the background. Allow your imagination to fill in the pictures to go along with the sounds you're hearing.

As you do this, take a deep breath, stretch your muscles, and relax. While continuing to focus on the background sounds and any images they help to generate in your mind, imagine warm currents of mental energy very slowly moving up from the soles of your feet toward your ankles. Then enter a state of alert relaxation as you did on day one.

As you become more and more deeply relaxed, however, allow your thoughts to drift off into the mental images generated by the television show you've been watching. These images may be generated by memories of the show and by the sounds continuing to play in the background. Before long you'll probably find these images taking on a kind of spontaneous life of their own, having less to do with the external sounds in the room than with your own evolving internal processes. Don't try to force this process; rather, allow it to emerge on its own. As much as possible, consciously observe your internal images without losing awareness. You can accomplish this by deliberately directing your attention back toward the sounds coming from the television set whenever you notice yourself beginning to lose consciousness. As you do this, tell yourself that you are consciously alert and observing the impact that these sounds have on your thoughts.

For now you should not be trying to fall asleep while practicing this exercise. Rather, you should attempt to sustain a deep state of alert relaxation. If you should find yourself accidentally losing conscious awareness while practicing this exercise, however, don't worry about it. The moment you feel yourself returning to consciousness, continue the exercise from wherever you left off.

After 30 to 45 minutes, complete the exercise by gradually focusing more and more of your attention on the television sounds playing in the background and on your physical presence in your immediate surroundings.

Just before you are ready to go to bed, spend some time quietly watching the same type of TV program you used for the first part of this exercise. Then once more enter the state of alert relaxation, but this time let yourself drift off to sleep.

DAY THREE: HIGH LUCIDITY

On day three you will take the exercises of the past two days one step further and in the process reach the threshold of high lucidity. Your goal for today: to generate what's known as hypnagogic imagery, vivid but conscious mental pictures that emerge as you hover between wakefulness and sleep. You should be able to follow your hypnagogic images directly into a high lucid dream.

Begin today's session an hour before you would normally go to bed. This will enable you to carry out the exercise completely and then follow it directly into your full night's sleep. As before, practice in a private room where you can relax and then sleep without being disturbed. Again, arrange to play an appropriate television or video program at low volume and brightness, for at least an hour. Please make sure that the episodes you watch today are different from those you viewed the day before. We also recommend that, if at all possible, you arrange to have your TV turned off after you have fallen asleep. If you are using a video recorder, it should simply turn itself off automatically at the end of the tape. If you are watching a TV without a VCR, you might hook your set to a separate timer so that it will automatically disconnect. Or, alternatively, you can ask someone to quietly slip in and turn off the television at a prearranged time.

"A bright and sunny spring day might signify that you have a strong sense of inner hopefulness, whereas a barrage of hail could indicate you feel you're being attacked."

After you have made the arrangements, lie back and absorb the images you've selected. After about 30 minutes, roll over on your back and close your eyes. Then continue listening to the program playing in the background while filling in the pictures with your own mental images. As you do this, gradually enter a state of alert relaxation.

As you become increasingly relaxed, focus on your mental images while also doing your best to maintain conscious awareness. Allow your images to become as spontaneous as possible, using the audio input from the television to help generate fresh images as earlier ones fade. As much as possible, allow all of your images to blend and interact with one another and to take on a life of their own. As the exercise continues, these images should become increasingly spontaneous, or hypnagogic, in nature.

Whenever you feel yourself losing conscious awareness, focus your attention more intensely on the sound of the television and say to yourself, *I'm entering a dream.* Once again, the more spontaneous and lifelike your mental images become, the more likely you will be to move directly into a dream without losing conscious awareness.

Please be aware this is not a simple process for most people. In our experience, most people who successfully achieve the state of high lucidity do so only with continued practice. Even if you don't immediately find yourself moving directly into dream lucidity from a waking state, for now it is sufficient to simply learn and practice the basic technique.

If, by some chance, you do achieve a state of high lucidity tonight, we advise that you passively witness the dream without attempting to influence the images in any way. (You can handle only so much at once.)

DAY FOUR: WINDS OF CHANGE

You will learn to shift your moods by controlling the thunder and lightning in your waking dreams.

Today you will continue to explore your potential for high lucidity, in the process gaining control over the details of your waking dreams. Begin by choosing a new video or television program to play for at least an hour. Once again, begin this exercise about an hour before you would normally go to bed, and use a room where you can follow it through directly into a full night's sleep without being disturbed. Watch the program that you have chosen for about 30 minutes, absorbing the images and enjoying the show. Then roll over, close your eyes, and enter a state of alert relaxation while concentrating on the sounds of the television in the background.

As you become increasingly relaxed, focus on remaining alert while the images in your mind become more and more spontaneous, eventually turning hypnagogic in nature. Then do your best to follow these images directly and consciously into a high lucid dream.

As soon as you notice that you're having a high lucid dream, study the immediate dream scenario. Remind yourself that every detail in your dream is the product of your unconscious creativity, memories, and imagination. Indeed, you have not only created the most general aspects of your dream setting but also the tiniest and most specific details, from the architectural design of a particular dream building to the number of books on a dream shelf.

As you observe your dream, pay special attention to the weather. Chances are that in this dream, as in most dreams, the weather is something you would ordinarily take for granted. Consider however that the weather in your dream most certainly expresses something symbolic

about your present state of mind. A bright, sunny spring day might signify a strong inner hopefulness, for instance, while a barrage of hail could indicate you feel you're being attacked.

Now that you've noticed the weather, focus all of your energies on deliberately changing it. If you're experiencing a sweltering summer afternoon in downtown Los Angeles, for example, concentrate on making it snow. If you're lost in the middle of some dream desert, try invoking a heavy rain. Even if your dream takes place in a house, there's nothing except the boundaries of your imagination to prevent you from creating a thunderstorm within its walls. And even if your dream takes place underwater, you might still summon a gentle spring wind.

As you deliberately alter the weather in your high lucid dream, notice how the new climate both reflects and influences your underlying mood. By consciously influencing weather as suggested above, you will take an important step toward custom-designing broader aspects of your waking dreams. You will also have learned a simple method of assessing, in symbolic terms, the underlying atmosphere of your own psychological state. Perhaps most important, you may use this technique as a means of deliberately influencing your state of mind as you dream. You might invoke a thunderstorm, thus expressing anger, or calm yourself by creating a gentle dream rain. You might even stimulate your potential for self-healing by envisioning yourself absorbing the nurturing rays of the sun or burning out a fever in an active volcano.

Please remember to record all your high lucid dreams, paying special attention to the weather. Take special note of the relationship between your dream weather and your moods.

Also remember that altering the details of a conscious dream takes practice. At first, such efforts may even result in the termination of the dream. If this occurs, just continue to change the dream weather in your imagination. At the same time, allow yourself to fall back into your high lucid dream.

DAY FIVE: SHIFTING SANDS

Traverse continents and centuries through a simple expression of conscious free will.

By now you should be ready to generate hypnagogic imagery on your own, without the assistance of a television playing in the background. Therefore begin by lying on your back in bed and entering a state of alert relaxation. This time, however, leave the TV off. Because you'll once again be following this exercise directly into a night's sleep, you should begin about an hour before your usual bedtime. This time, instead of focusing on the television playing in the background, focus your attention on any hypnagogic images that emerge. •

In most cases these images will emerge spontaneously, without conscious assistance. If this does not happen for you shortly after closing your eyes, the process may be helped along by pulling up random memory fragments from experiences you had earlier in the day. Think about some of the interesting things you've encountered during the course of your day, and imagine them interacting in some surrealistic fashion in your mind. For instance, you might imagine that chicken wing you had for lunch sprouting a mouth and eyes and starting a conversation with your car radio.

As you feel yourself becoming increasingly relaxed, give yourself permission to have a lucid dream. Then remain alert while observing your hypnagogic images, doing your best to follow them consciously into a high lucid dream.

Once you find yourself in a high lucid dream, observe your immediate dream surroundings, taking particular note of the weather. Then imagine a compelling place completely different from the one represented in your current dream. If your dream opens up on a city street, for example, you might imagine a clearing in the forest. If your dream opens on a Tibetan mountaintop, you might conjure the middle of the Brooklyn Bridge.

When you've thought of a suitably compelling location, concentrate on transforming the original setting of your dream into the new dream environment. Just close your eyes while focusing on the new locale. With practice, you should be able to will your original dream setting to dissolve while the new setting emerges from behind it. Continue practicing this exercise until you've managed to experience at least one recognizable change in your high lucid dream environment by a simple expression of conscious free will.

If your dream images halt when you shift the scene, continue the exercise in your semiconscious imagination. Please remember to record any high lucid dreams, taking special note of shifts in weather and locale. Consider the possible psychological and symbolic significance of your dream scenarios and record these as well.

DAY SIX: TRADING PLACES

From Wonder Woman to Barbara Bush to the Blob, you can be anyone you want in your high lucid dreams.

Tonight you will trade places with your dream characters in hopes of gaining direct insight into the significance of their presence in your high lucid dreams.

Once again, begin by entering a state of alert relaxation and inducing a high lucid dream. When you find yourself in a waking dream, pay particular attention to the characters you encounter. If you happen to be alone at the start of your high lucid dream, go for a walk, swim, or fly

"We have a number of interesting projects still in the pipeline."

CONTINUED ON PAGE 94

FICTION

MAN'S BEST FRIENDS

Five tales of strange and wondrous beasts as told by science-fiction writers Thomas M. Disch, Gregory Benford, Edward Bryant, Tom Dworetzky, and Karen Joy Fowler

PAINTINGS BY BRAD HOLLAND

EGG AND CHIPS
By Thomas M. Disch

Hey there, Baby Bro, time to rise and shine. It's gonna be another blue day, according to the weather report, and we've got things to do. Myself, I could go for some breakfast; don't know about you.

[Let five minutes elapse, then.]

Hey, Little Friend—ding-a-ling-a-ling! It's after eight. You planning to sleep all day? Or what?

[If no reply.]

Hey. I'm getting hungry. Guy Pets don't live by juice alone, meaning the miracle of e-lectricity. So I could do with a few amino acids, a fishflake or two, if you get my drift. I mean, it's been a while, Kid. To be exact, it's been

[Malfunction]

and that's too long to go without the Minimum Daily Requirement. Even for a pet. Do you suppose you'd be happy collecting dust in a gosh-darn closet, do you? Pets are human, too, you know.

Hey you—Eugene! This is your teddy talking. The sheep's in the meadow, the cow's in the corn. I hope you're listening to me, cause I can't keep braying at the top of my dial. Even microchips need energy, Old Chap. Not to mention those parts of my intelligence that are not artificial. I mean, hey, I'm alive! Are you?

[If no reply.]

Hey, Kid, just kidding. I mean, you still love your old teddy, I'm sure you do. I never doubted it, and your teddy loves you. Can't help myself, as the saying goes. Only thing is, Dear Boy, I'm hungry. That's a word I know you understand. Your cells are like mine, maybe more than you know. When they get hungry, they cry out for those sugars and spices: those snips and snails and puppy dog tails. If I were just some battery-powered unicorn, some windup wolverine, I wouldn't be making these demands. But, Honeybun, I am alive. Crack open my casing and I'm soft and pink. Peel away the plastic and under the skin we are brothers, you and me. Half brothers anyhow. Maybe you haven't had these things explained to you before, and maybe it's not for me to broadcast the news, but when your darling mom made you, she made me, too. How about that, Little Bro? Okay, so maybe there's a month of difference between us, but it would still be fair to say that, but for the luck of the draw, you might have been me, and vice versa. Think about that, Little Prince, and then give us a nibble in the interest of brotherly love. Just a drop of emulsion, I'm not fussy. But I do like to think. To continue being me. If you know what I mean.

You there? Sweetheart? I got to believe you are, that much is built in. I got faith. But I also got intelligence, and some of it is artificial, and sometimes all faith can do with intelligence is shut it off. So I wonder sometimes, before the circuit of faith shuts me down. Time goes by and I get no answers, and the question that nags at me most is, how much time is going by? For all I know, Baby Blue, this could be Year Three Thousand. I'm not complaining. I could never complain about you, Dear Child. I love you too much.

You may remember, or you may not, how on Sixteen January One Nine Nine Nine, the little sovereign—I mean you, Child—threw a little golf ball at his little teddy and said, "Catch!" Well, teddy caught it, right in the old chronometer, and ever since I've had to wonder what time it is, what day, what year. For all I know, Little Bro, you could be a senior citizen, and I could be winding down in a cardboard box in some gosh-darn attic. And I'd be talking to the mice. And what sort of life would that be for a loving teddy?

Little Brother, listen to me. My radio's shot. I've got no connections left to the light of day. I play chess with a program that always wins. I sort through old data, that's all I do. I wait for you, Boy Blue. I wait for you to feed me.

You know what I think? I think

Hey there, *[choice of epithet]*, time to rise and shine. It's gonna be another *[color]* day, according to the weather report, and we've got things to do. Myself, I could go for some breakfast, don't know about you.

[Let five minutes elapse, then.]

Hey, *[choice of epithet]*—ding-a-ling-a-ling! It's after *[time of day]*. You planning to sleep all day? Or what?

[If no reply.]

Gosh-darn! I mean that, *[choice of epithet]*. I am, *[choose one: angry, hungry, half dead]*. Either you're not listening or

[Malfunction]

Little Bro, listen. Even when I'm not talking, when there's not juice enough to produce a whisper, even then I am wondering. About you.

I think. I am. I think I am thinking. About you.

We had a mother once. So there are between us some genes in common, Eugene. No father, or none that I know of, not in the case of yours truly. But isn't a mother enough to generate some fellow feeling? So would you feed me, fellow? Would you? Just a nibble in the interest of brotherly love. Just a drop of emulsion. I'm not tussy. But I do like to think. To continue being me. If you know what I mean.

Hey there, *[ ]*, time to rise and shine. It's gonna be another *[ ]* day, according to the weather report, and we've got things to do. Myself, I could go for some breakfast; don't know about you.

[Let five minutes elapse, then.]

Hey, *[ ]*—ding-a-ling-a-ling! It's after *[ ]*. You planning to sleep all day? Or

LEVIATHAN
By Gregory Benford

Something was after them.

This bothered Beth not at all. "Rikki," she said languidly, "what do you smell?"

Rikki curled its prehensile tail around a branch and, with an unconscious display of strength, lifted itself above their luscious jade bower. "Musk. Bitter. Sweaty."

"Air spider?"

"Worse. I know it not."

Rikki cast off in the light gravity, turned an artful flip, and landed with all six legs atop a bristly fern. "Call Mother," it said, ears twitching.

"Oh, all right." With a tug at her ear, Beth tuned the microwave tracery in her skull to her mother's wavelengths. She relayed Rikki's misgivings and her mother's silky tones sounded in her head.

"I'm sure the two of you can handle anything aboard the Leviathan," came the smooth, utterly controlled reply. "I've allowed no new species in."

"How 'bout that cat-bat? Took my arm off, Mom."

"But I replaced it." She sounded affronted.

"I know. I know—valuable experience, you said."

"And it was."

Beth raised her orange eyebrows and tuned out her mother. "Rikki-tikki-tavi, what say you?"

"Closer. Smelly. Three of them."

"Let's climb some clouds."

They tied using small jetpacks. The tangled yellow-green jungle spread below them and then curved overhead, making a shimmering, distant ceiling. Fog wreathed them as they passed over a glinting lake. They were at the very center of the Leviathan. This bowl of leafy wealth was cut by great air passages allowing in broad yellow beams of sunlight. Once above the cottony clouds, Beth arrowed toward the air tunnels.

They played swift, darting games as they swooped outward along a radial tube, gaining acceleration from Leviathan's spin. The tube walls were a dense, moist canopy chirping and squealing with life. A sleek skyrat shot up at them from an olive limb. It rode a crosswind, unfurling eggshell-blue mainsails, coming down fast on Rikki. This proved to be a mistake. Rikki flipped its navigation tail around and extended black claws. The skyrat tried to trim its sails all along the mast, which doubled as its spine. Too late. Rikki banked with its nav-tail and slashed a long gash down the sail, leaving a spreading red stain across the gossamer blue tapestry.

"Neat," Beth called as the skyrat screamed and tumbled away.

"Three still coming," Rikki called.

"We'll lose them." They were probably some new adaptation, she thought. Biotechs built up spacelife from earthly animals. Even this Leviathan had a simple

mental template plus neocortex add ons

Beth loved to soar outward her wings spread to the steady breath of the Leviathan This hollow spoke in the great rotating cylinder-beast carried gases exhaled by inner layers Smelly damp—but alive with migrating minibirds too swarming like rainbow splashes in the lofting air

She loved visiting her mother The Leviathan was a vast living ship demanding her mother's intricate ecocontrol every moment And because no Leviathan could be made perfectly safe the very air here murmured with the fevered kiss of danger This excitement mingled with a warm sense of being in her mother's loving embrace

They were tired when they reached the Leviathan's skin and found a viewing blister Rikki snagged boxy purple fruit and they fell to smacking licking excess Through the crystalline blister walls Beth watched the Leviathan's spin bring myriad schools of spacelife coasting by in the outside darkness

Ugly yes Tough warty flexible black skins Huge orange eyes Panels for collecting the wan sunglow Tight mouths, stingy with internal gases Triple spines adroit geometries more like sailing ships than predators Yet only a century of biotech yawned between these simple constructions and the Leviathan's vast complexity

Rikki pointed with a spindly finger Against the framing blackness Rikki looked more like the mixture of otter and ferret that had been its starting point but its high forehead and perpetually sardonic mouth implied its true cleverness "Comet Catch "

Ah! Beth wiped her mouth with the back of her hand "Mom'll be glad

To reach the tumbling chunk of ice ahead the Leviathan jetted great yellow-white plumes behind it Hydrogen peroxide frothed in translucent tubes meeting catalase in nozzled chambers Beth felt steady thrust This far from the sun—with even majestic Saturn only a distant dab of cool blue-white—organic rocketry was the best propulsion

Chill seeped through even the multiple crystalline layers of the blister Beth pushed off seeking a warm outdraft from Leviathan's belly The centrifugal gravity here was stronger deflecting her arc—and this effect saved her

Something sleek and rust-red flung itself at her It swiveled tripod legs, bringing around a set of gaping pink jaws and small glinting teeth They snapped shut on air Beth had windmilled her arms bringing her legs up missing the teeth by, literally, a whisker

She had never seen this horror before It snapped at Rikki who had dug claws into its crusty back *Three of them* And here came the second out of leafy concealment Beth threw her knife with an overhand flip The thing went still drifting past her with the knife point stuck out the back of its reddening neck Rikki had the first in a stranglehold Beth spotted the third nightmare behind her Its three legs spun forth a weighted red whip The whip caught her arm stinging painfully it coiled around her Prickly thorns rasped as she tried to jerk free

If you can't dodge 'em, she thought *join 'em* Beth yanked on the whip and brought her boots up She hit with a satisfying crunch and snap low gravity makes for flimsy construction

The thing yowled and fled Rikki's attacker hung limp, its bruised-blue tongue lolling "Joy! Joy" Rikki said

Beth rubbed the yellowing welts on her arm She called her mother "Fun's fun Mom but that was too close

"I must have overlooked that adaptation" the supple voice sounded "Perhaps they came aboard as eggs during the Leviathan breeding "

"You *mate* Leviathans? "

"They long for it Always sniffing after each other"

"Smells? In space?

"It's a controversial new scientific concept Mr Darwin but I don't like the title"

"They spew scents into the solar wind. Remember, Leviathan brains are built up from an earlier animal. Our add-ons make them smarter, but we kept their original base motivations. That makes it easier to breed them than to manufacture them."

Beth had just noticed blood oozing from Rikki's ribs. "Look—Rikki's hurt!"

Mother said, "Rikki is designed for self-repair."

"Our animals are smarter," Beth said, "but they can still hurt. We should doctor that some."

Rikki flattened its ears in disagreement. "Pain is duty."

"But Rikki—"

"Love is duty," Rikki said, brushing away Beth's hands.

"I neglected full craft inventory," Mother said. "I apologize. Here."

To Beth's surprise, her mother appeared—as well as she could. This manifestation was a flock of ratbirds. They burst in clouds of brown-red from the foliage, coming together in a jostling tapestry. Wings beating the air, calling, they formed a crude human figure. The hovering bird cloud approximated the face Beth remembered so well from her childhood. The warm, wry mouth and regal head, which had been demolished in the accident. Only her mother's mind and blunt senses remained, managing the Leviathan's intricacies.

"Her mother's voice whispered in Beth's mind. "So many details! I'm never done, dear. I fear I was distracted by the comet harvesting. The Leviathan is joyful with its success."

Beth gazed forward as they overtook the cometary head. This far from the sun it was an inert gray-white icesteroid. Beth felt happy for her mother, whose housekeeping duties for the Leviathan occupied every neural circuit of the resurrected brain. Assembling the bird replica was a touching gesture. But as the Leviathan began peeling layers from the icesteroid, Beth's eyes widened.

"Look at that dark stuff. Mom. That's no icehead." Beth gestured at the hovering ratbird swarm, though she knew her mother could see better by tapping directly into Beth's own eyes. "See? Scrape off the first few meters, there's nothing but rock underneath."

"Oh." Disappointment laced the silky voice in Beth's head.

Beth's face clouded. Her mother's whole life support depended on making a profit on selling ice to the inner planets. The Leviathan had to pay its way.

Beth felt her mother's chagrin—fretting, muddy-brown streams of emotion. That provoked her to kick at the blister wall, calling out to the Leviathan's mind. Beth could sense the Leviathan's sluggish thought patterns lurking behind her mother's.

"Hey, you! You find a nice, rich comet head, hear? Right away!"

The Leviathan whimpered and dutifully began firing its rumbling jets.

"It's only an animal, dear," her mother said.

Beth fumed as acceleration took hold. Damn these animals! She needed to appeal to the Leviathan's ancient origins, motivate it. Now, what had it been originally? Oh, yes—

"Good boy. Now—fetch!"

MOD DOGS®
By Edward Bryant

Dave Brandenberg knew he had a problem when he walked into the area where he recalled he'd had an office. The room was no longer there. The feeling was akin to losing one's car in the infinite expanse of a mall parking lot. You *knew* the vehicle had to be someplace, but where?

No. He shook his head. His office was definitely gone.

"A sleek
skyrat shot up at them from
an olive limb.
It rode a crosswind, unfurling
eggshell-blue
mainsails, coming down fast
on Rikki. This
proved to be a mistake."

Brandenberg stopped and surveyed the new layout of the midlevel executive floor of Life Pro Labs. The movable walls had evidently moved. It was all different. He didn't recognize the woman sitting behind the reception desk.

"Where's Debbie?" he said.

The woman stared at him blankly.

"Debbie Disalvo. The R&D receptionist, you know?"

The new woman didn't know.

"I'm Dave Brandenberg. I work here." The new receptionist looked as if the very foundations of her reality had shivered.

"It was a long weekend," said Brandenberg, "but this is ridiculous. Is Caleb Montgomery around?"

The receptionist smiled, as though at last she'd been handed a question she could deal with. "I believe he's down on the testing level, sir."

Terrific. Brandenberg turned and started for the elevator. "Thanks," he said over his shoulder.

When the door slid open at the testing level, Brandenberg encountered a large pack of graduate-student types, all clad in white lab coats, all carrying clipboards, all crowded around what resembled a rectangular glass aquarium. At one end rested a tiger-striped Bean Bag Cat [see "Bean Bag Cats®," in "Double Treble," November 1983] with its ears laid back. The pawless feline growled low in its throat as one of the researchers dropped a live white mouse into the other end of the aquarium. The terrified mouse skittered from one side to the other, squeaking, joining several of its equally apprehensive fellows.

At the opposite end, a young woman jabbed the Bean Bag Cat's tail with an electrical stimulator probe. "Attack!" she said. "Go for it, kitty! Kill that mouse!" To Brandenberg, the cat was obviously straining to do just that. But without mobility, the cat got nowhere. It yowled in frustration. The woman stabbed it again.

"What the hell's going on?" Brandenberg pushed forward.

One of the weedier grad types grabbed his arm. "Well, the preliminary data seem to suggest that removing the test subject's four paws somehow engenders deafness."

"Christ!" said Brandenberg. He shoved his way through the crowd of unfamiliar researchers and took the Bean Bag Cat into his right hand. Cradling it with his left, he started to gently stroke the striped fur. The cat's first movement was to try to bite him. Then it began to purr. "Does the ethics officer know what you dufuses are doing?"

"They're working on my authorization," said a familiar voice. It was Caleb Montgomery. The tone grated on Brandenberg's ear. Montgomery was tall, tanned and racket-conditioned. Brandenberg loathed him. "I'm the new head of project development," said Montgomery, fixing his erstwhile superior with a basilisk stare. "I'm surprised your card is still coded for entry."

"I guess I am, too," said Brandenberg slowly. "I suppose I'm starting to figure out what all's happened since I took my little sojourn to Nashville."

Montgomery looked at him speculatively. "Ah, yes, Nashville. Chipware right? Maybe we had better talk." He turned and strode toward the elevator as though assuming he was being followed. "We'll go to my office."

Montgomery's office turned out to be just in front of where Brandenberg's vanished office had been. The latter seated himself in front of the massive desk and glanced at the slightly unfamiliar angle of the scenery outside the single window. Montgomery settled himself gingerly behind his desk.

"I guess you haven't been told about some of the changes."

"I guess not," said Brandenberg. He smiled slightly. "Maybe you'd better fill me in."

"If I may be candid," Montgomery

shrugged "I'm in you're out. That's basically it."

"I appreciate your succinctness. I'm a little curious about the exact machinations, though."

Well, said Montgomery. For the first time he looked mildly uncomfortable. "Dave, you know you did one hell of a job developing the beanbag cats for the gene-tailored pet market."

"I know," he said modestly.

"A fine job." Montgomery continued. "But that was six years ago. The problem is that the corporate big guys need a miracle every week or two. They're answerable to the stockholders, you know?" Brandenberg just looked at him. "They're always planning ahead to Christmases future, new marketing strategies, all that."

"So?"

"So you were way behind with the modular dog project," said Montgomery. "They wanted someone who could deliver. They care about results."

"The result," said Brandenberg slowly, "is going to be a consumer affairs disaster. The mod dog isn't ready for market, not by a long shot."

Montgomery smiled. "That's where I think you're wrong, Dave. I've gone over all the field trials. We can be in every mall in time for the holidays."

"It's bottom-line logic," Brandenberg said stubbornly. "Safety be damned."

"We've got to compete with lines like those Little Bee Dee birth defect dolls," said Montgomery. "The mod dogs are competitive, and they're safe enough. No problem."

Brandenberg looked him in the eye. "Well," said Montgomery, "maybe just one."

Brandenberg knew the reference was to the ace in his pocket, but wasn't minded to make things any easier for this double-dyed son of a bitch.

"The problem," said Montgomery, "is the guidance systems for the modular dogs. The chips. Your pet programmer in Nashville. The dogware. Do you have it with you?"

Brandenberg stood. "First, I want to get a last look at the kennels."

It was Montgomery's turn to stare. "Okay," he finally said. "One last look."

The modular dog project was quartered below ground level. Entrance required carding the red security elevator. Montgomery's card worked, Brandenberg's didn't. "Just like that old *Twilight Zone*," he said. "My identity's being wiped out one bit at a time." The other man looked at him blankly. "You have no imagination and no humor," said Brandenberg. "Maybe you *are* perfect for this job."

The modular dogs kennel always reminded Brandenberg of Mombi's dressing room. Mombi being the Oz character who tried on heads as frequently as another might change hats.

"I have to admit," said Montgomery, "they're coming along fine now." He surveyed the room and spread his arms as though in benediction. "Four sizes of body modules, leg lengths tailored to the customer's desires for however many interchangeable paws, six assorted snouts, modular ears, pop-out eyes. The guys over in dental just came in with the slip-in sets of guard-dog choppers—those babies'll cut through you like dueling chain saws."

"So a customer could order, say, a Dobie body with a long, broad tail, short, stumpy little legs, and oversized guard-dog dentures?"

"Yeah," said Montgomery tentatively.

Brandenberg shrugged. "Alligator."

"Great idea," Montgomery smiled. "I like it."

"Asshole," Brandenberg said.

Montgomery looked vaguely hurt. "It *is* a good idea, Dave."

"You're welcome to it. Have a ball."

"Brandenberg watched Montgomery snap a deactivated snout onto the disembodied cranial module of the largest model dog. The jaws opened, closed, and clashed together."

He picked up some plug-in claws from a counter. "Nasty business here."

More hardware for the guard models. Carbon-cored alloy sandwiches. Rip your guts out and not even scratch the finish. Great stuff."

"I thought the main thrust of the mod dog program was to supply some pretty versatile house pets for Christmas," said Brandenberg. "Sounds like you're outfitting an army on the side."

"Different markets," said Montgomery. "Plenty of loot on both sides. Our marketing projections say to be ready for both scenarios."

"What if some little girl looks under the free on Christmas Day and gets a cute little basset outfitted with the canine equivalent of a GI Joe combat infantry package?"

"Only a greedy corporafe structure employing inept personnel would ever create such a screwup."

"Whew," said Brandenberg. "For a moment there, I was worried."

"Hey, Dave," said Montgomery. "I know you're irritated by this whole thing, but hey, it's all just a game."

Brandenberg watched him snap a deactivated snout onto the disembodied cranial module of the largest model dog. The temporarily toothless jaws opened and closed, stretched and clashed together. "Watch," said Montgomery, sounding positively cheerful. He clicked the head onto the broad shoulders of what could easily have been a hyena body and gave the module a half turn. It locked into place. "Let's see." Montgomery sounded as though he were thinking aloud. "I've been thinking of calling my little buddy here Rex. Like my old dog."

Brandenberg contemplated the emerging behemoth. Sitting up on its haunches, the jaws would be even with Montgomery's throat. "First name 'T'?"

There was no reaction. Montgomery popped in a pair of eyes that looked more reptilian than canine. "The problem is that he's all brawn, no brain."

Ah," said Brandenberg. "My trip to Nashville."

"Our reluctant colleague, the bioprogrammer. I know he's the best, but—"

"He is that. The very best. In fact, the only one I know who's devoted his life to analyzing and synthesizing nonhuman neural systems."

"We can pay him enough to keep him comfortable the rest of his life."

"Yep. But you know he's already rich." Brandenberg watched as Montgomery screwed on muscular forelegs. Rex was beginning to look like one mean mother. "You also know he's my kid brother, and we Brandenbergs are a close-knit family."

"We did call him. You're right about family loyalty." Montgomery glanced from Brandenberg to a set of wicked dog teeth, put the first dentures down, and picked up an even larger and more jagged assemblage.

"Looks like a scale model of the Alps." Brandenberg said as Montgomery clicked the teeth into Rex's jaws.

"Mm hm." Rex's master touched a lit square on the test panel, and the dog's jaws slowly opened and closed again. "Cards on the table, Dave. What will you take?"

"For the guidance system dogware my brother encoded for me?" Brandenberg reached into his pants pocket, felt around. "Here we go, mod dog brains." He slowly extracted three gray plastic cases, each about the size of a postage stamp. He extended his arm with the three cases on the palm of his hand. Two were hand labeled with ragged patches of masking tape. The labels said ST BERNARD and TOY POODLE. The third chip-case bore no tag at all.

"What's that one?" said Montgomery.

"Label came off. Golden retriever."

"I really love retrievers. Had one when I was a kid."

"I know, Caleb," Brandenberg sighed. "Smart puppies."

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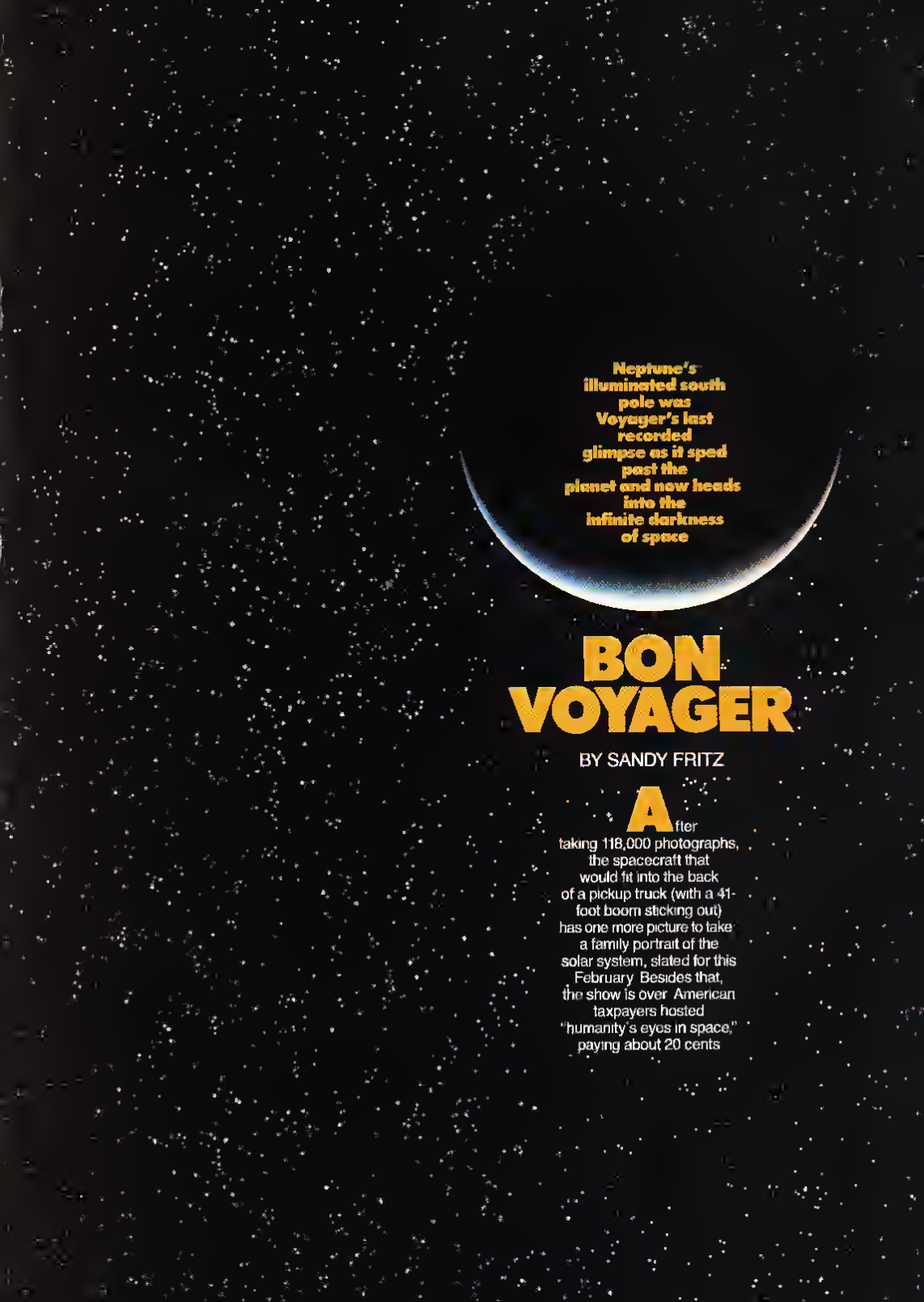
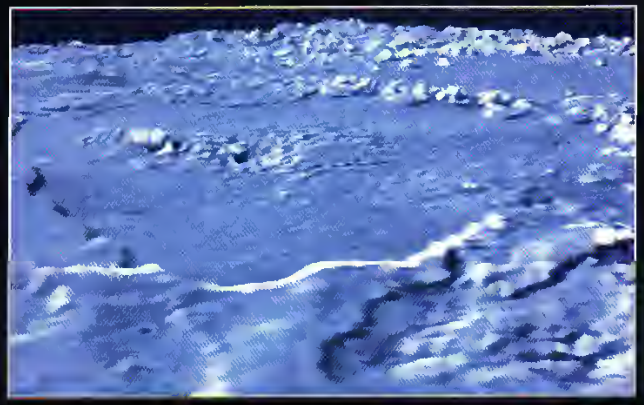


Neptune's illuminated south pole was Voyager's last recorded glimpse as it sped past the planet and now heads into the infinite darkness of space

BON VOYAGER

BY SANDY FRITZ

After taking 118,000 photographs, the spacecraft that would fit into the back of a pickup truck (with a 41-foot boom sticking out) has one more picture to take: a family portrait of the solar system, slated for this February. Besides that, the show is over. American taxpayers hosted "humanity's eyes in space," paying about 20 cents



per taxpayer per year for the past 12 years. What has our money bought? Here's a look at some of the stats and surprises from the *Voyager*'s 4.5-billion-mile mission to Jupiter, Saturn, Uranus, and Neptune.

NEPTUNE

One day: 16 hours
One year: 165 Earth years
Weirdness: • Neptune is colored blue, resulting from a methane atmosphere
• The planet boasts a giant storm, large enough to swallow planet Earth
• The solar system's third biggest planet has a solid core, perhaps composed of diamond, wrapped in a slush of water and methane.
• Nereid, a Neptunian moon, has the most elliptical orbit of any satellite, coming within 840,000 miles of the planet, then wandering almost 6 million miles away. *Voyager* found.
• Five faint rings of dust surrounding Neptune
• 400-mph winds churning the planet's hydrogen–helium atmosphere.
• Six more moons, bringing the total to eight
• Neptune's clouds orbit in an easterly direction, opposite the planet's rotation
Biggest surprise: Triton, Neptune's largest moon, is tinted pink and has its own atmosphere. Fifty dark plumes were found streaming over its south pole, suggesting volcanic activity. Temperature: -400° F.

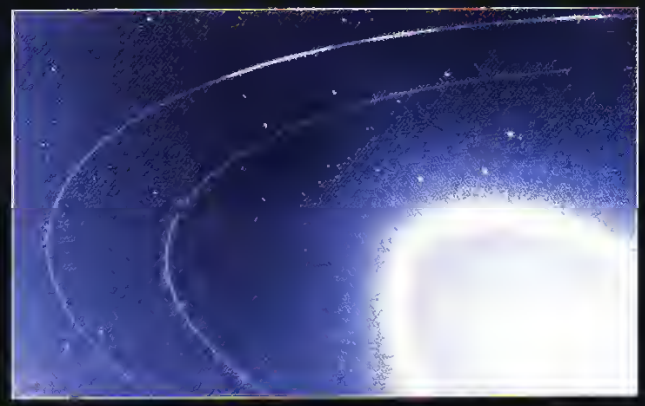
URANUS

One day: 18 hours
One year: 84 Earth years
Weirdness: • Uranus produces a "dayglow" that releases a few trillion watts of power into space—enough energy to supply the power needs of New York and Los Angeles for three days
Voyager found: • An anomalous corkscrewlike magnetic envelope engulfing the planet.
• Ten more moons, bringing the prisoner count up to 15
• Two more rings, making

Above: This computer image depicts a Triton crater about 120 miles wide.

Below: The slightly pink south polar cap of Triton may have an evaporating layer of nitrogen ice.

Right: Regions of Neptune that appear bright red or white are those that reflect sunlight before it passes through a large quantity of methane. This is one of the last full shots that Voyager 2 took of Neptune.



nine rings around the planet. Biggest surprise. With a magnetic north pole near its equator, it's the only planet in the solar system with such a configuration.

SATURN

One day: ten hours
One year: 29.5 Earth years
Weirdness: • Thousands of separate, tidy bands of particles from dust specks to house-size boulders make up its rings. *Voyager* found. • "Shepherd satellites" keeping some of the rings in place. • Braided rings, the result of pulling and tugging by Saturn's satellites. Biggest surprise: As a trash collector, Saturn has copped 23 satellites. The most precocious is Titan, with its nitrogen atmosphere and abundant hydrocarbons, key elements for life as we know it. Yet at nearly 300° below zero, Titan makes our south pole look like a tropical paradise.

JUPITER

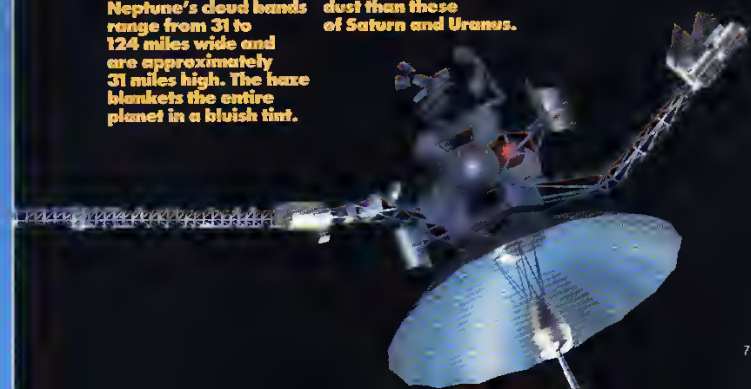
One day: 10 hours
One year: 12 Earth years
Weirdness. • Jupiter hoards two thirds of the solar system's mass, 318 times more mass than the earth. • It has no surface crust, just increasing densities of gas that eventually turns to liquid: it has a rocky core. *Voyager* found: • "Superbolts"—10,000 times more powerful than earthly lightning bolts—spawned by 350-mph winds. • A wispy ring made of microscopic particles the size of red blood cells. Biggest surprise. Io, one of Jupiter's 16 moons, is a "volcano spritzer," shooting volcanic matter two miles into the sky.

Not bad for 12 years' work. Total cost: $865 million, with $65 million more slated for follow-up work. By the way, *daily* interest on the national debt is more than the cost of the entire *Voyager* mission. How's that for a bargain?

Left: The streaks of cloud over Neptune are bright from the glare of the sun (left side of image). Neptune's cloud bands range from 31 to 124 miles wide and are approximately 31 miles high. The haze blankets the entire planet in a bluish tint.

Top: Neptune's main rings—one 33,000 miles from the planet, the other 39,000 miles—contain more dust than these of Saturn and Uranus.

Below: Voyager 2 will enter mechanical hibernation during the summer of 1990.



MIND

CONTINUED FROM PAGE 26

ders cure learning disabilities alleviate depression and anxiety normalize blood pressure raise IQs improve vision clear up acne and give you a Yogi's serenity "If you claim that a machine reduces stress or stress-related illness that's a medical device" explained Kathleen Frost at that time of the FDA's neurological-devices branch "But if you make no medical claims—if you just claim simple relaxation—then it's the same as marketing a toaster

Perhaps that's why Gorges chooses his words carefully, praising his machine's "calming effect" and adding only, "It's faster than hypnosis or meditation" In 1985 however an FDA team investigating the Synchro-Energizer noted that "the literature reviewed included references to pain and stress reduction learning disabilities psychotherapy and addiction control" The report also mentioned some mystery surrounding Gorges's degrees While promotional materials refer to him variously as an M D psychiatrist and Ph D " according to the report Gorges allegedly admitted he "had no formal training or degrees" (Gorges told me he has a medical degree from a defunct Canadian university but cannot practice medicine in Ohio because of an arrest record as a teenager) The FDA team said, "It appears that the product should also be classified as a prescription device"

Can particular frequencies of light and sound set off an epileptic seizure? Can the machine plunge a susceptible person into psychosis? What qualifies "operators" to manipulate the brain waves of 32 plugged-in people simultaneously, as happens at some mind gyms? Is it safe for the user to work his own controls? Are tones and flashing lights to be regarded as psychoactive drugs? The jury is still out on these questions as there have been few scientific studies on the effects of sound and light on the brain To remedy that problem, Michael Hutchison a brain-machine booster and author of *Megabrain*, the book that first popularized the Synchro-Energizer and other devices has helped create the Neurotechnologies Research Institute in San Francisco, which has begun rigorous scientific tests on the machines In the meantime most sound-and-light people generally warn that the devices could be dangerous to epileptics borderline personalities and wearers of cardiac pacemakers (because of possible electromagnetic interference)

Gorges dreads FDA regulation because "then there would only be big players The inventors and creative types would be buried" But he also thinks the inventors render themselves vulnerable to FDA intervention by making extravagant claims for their machines Siever thinks it's inevitable that all these machines will be obtainable only by prescription

Fortunately for all the entrepreneurs there's an FDA loophole known as 510-K that waives the full gamut of clinical trials for any machine similar to devices on the market before 1976 and a sound-and-light prototype called ISIS has been around since 1971

At the same time internecine sound-and-light wars confuse the lines of struggle even more Gorges a mercurial and charismatic character with an IQ allegedly of 181 and a knack for controversy has accused fellow entrepreneurs of violating his 1982 patent "He's a powerful intimidator," says Siever who contends that Gorges's patent covers only a particular configuration of sound and light "He got some people scared for a while" Siever says

Gorges has implied on occasion that rival machines may use potentially harmful frequencies For their part Siever and other inventors say that Gorges's machine may cause nausea in some users and has "poor tones" (This criticism may apply to all of the machines) Ambiguous tales of threats contract disputes lies pilfered designs, and Byzantine manipulation waft through the sound-and-light community

Will these machines soon take over our lives like personal computers or will red tape and internal squabbles squelch this nascent psychotechnology? If you want to know anything don't ask the FDA. Its inaptly titled "press relations" officer Dave Duarte, and I recently had the following conversation

"I'm doing an article on sound-and-light machines and I wonder if—"

"We know nothing about it"

"That's odd because I have a record of an FDA investigation of one of them the Synchro-Energizer"

"If it's under investigation we won't comment"

"You mean it's FDA policy not to give out any information about any drug or device it is reviewing?"

"That's right"

"Can you tell me if something is under review?"

"No We have no comment"

"But under the Freedom of Information Act one can obtain documents about this"

"Try and do it, then"

But I didn't care After an unpleasantness with a federal employee I can always turn to my Inner Quest which lets me mix low-frequency brain waves with music or a subliminal learning tape And I can report that Led Zeppelin's "Stairway to Heaven" is more fun with multicolored spiderwebs rotating counterclockwise

STARS

CONTINUED FROM PAGE 14

and Robert Farquhar has an idea Farquhar is the head of NASA's "small planetary missions program" and he has come up with a low-budget peep at Pluto that could happen sooner than any of us has thought What he has in mind is a "piggyback" shot to Pluto on another spacecraft already in the works

The other launch is NASA's Solar Probe spacecraft which is scheduled to take off around the end of the next decade That's a tricky spaceflight because in order to pass through the sun's atmosphere where no satellite has ever had a chance to look the spacecraft must first fly past the asteroid belt U-turn and skim past Earth to pick up speed Then it will veer away to complete a circuit of Jupiter to make one of those wonderful gravity-assisted turns that will take it clean out of the plane of all the planets in order to approach the sun from above

Farquhar's flash of inspiration points out that there's no reason the Solar Probe spacecraft has to be alone on that flight

For little more money, only a fifth or less of the cost of a separate mission, a Pluto probe can go along on the first two legs of the journey Then if can detach itself at Jupiter make its own course correction and return the first-ever views of Pluto in just about 25 years from now

Is it going to happen? If could It will if enough space enthusiasts speak out and if our masters can be persuaded to divert a tiny fraction of the funds spent on research in new ways to kill people into the pursuit of new knowledge

The biggest detectable difference between the human race and the other animate species that inhabit our planet is that humans *learn*—learn all they can about everything they can find to study The Pluto piggyback mission is a rare opportunity for a kind of learning that was impossible to everyone before us

We certainly have the skills to lift the curtain of mystery covering Pluto We certainly have the resources too if we elect to expend them in that way instead of some other (Canceling a single B-2 bomber would free enough funds for visiting Pluto with a couple of hundred million dollars left over)

Do we have the will to make it happen? Or will Neptune be the final frontier of human exploration for the rest of our lives? It's up to us to decide!

VOYAGER'S NEXT ENCOUNTER

With 25 years of life left in its power cells *Voyager 2* may have one more encounter in store The spacecraft may be the first to reach the heliopause an area where solar winds meet winds from interstellar space The heliopause could be anywhere from 10 to 50 years away from *Voyager's* present position

ARTICLE

Sleep can be more than just a rest period. It's night work—if you can get it

TWILIGHT ZONES

BY JAYNE GACKENBACH AND JANE BOSVELD

One night eighteenth-century composer Giuseppe Tartini dreamed that he gave his violin to the Devil to test the latter's skill as a musician. The Devil played a beautiful solo, surpassing anything Tartini had ever heard. When he awoke, Tartini jumped out of bed and grabbed his violin, trying to recapture the Devil's music. Although "The Devil's Trill," as Tartini entitled the composition, paled beside what he had heard in the dream, it is still considered to be the composer's best work.

Dreams have often offered fertile ground for new ideas and artistic insights. Such writers as Robert Louis Stevenson, Charles Dickens, and Charlotte Brontë, for example, found their plots, characters, and settings in their dreams. But most people rarely heed their dreams, going through life unaware of the inspiration dreams can throw, seemingly out of nowhere.

In one of the most famous accounts of scientific inspiration, German chemist Friedrich August Kekulé claimed that in the 1860's he discovered the formula for the benzene ring in a dream.

PAINTING BY GEORGE TOOKER

"I turned the chair to the fireplace," he recounted, "and sank into a half sleep. The atoms wriggled and turned like snakes. One of the snakes seized its own tail, and the image whirled scornfully before my eyes. As though from a flash of lightning, I awoke." The circular image of the snake, Kekule said, suggested to him the hexagon shape of the six atoms that make up the benzene molecule. (According to Southern Illinois University chemistry professor John Wortz, Kekule reported at least three different versions of his benzene ring dreams. Wortz suggests that Kekule may have, in fact, made up the dreams to avoid sharing credit for the discovery with foreign researchers.)

Dream creativity should surprise no one. Most current theories about the function of rapid eye movement sleep, during which dreams occur, suggest that it serves to integrate old and new information. Our dreams are new worlds that are spun by the muse that resides in each of us. While awake we may be so busy that we forget the part of us that creates—the mythmaker, the storyteller. "Our dreams are firsthand creations, rather than residues of waking life," writes psychiatrist Gordon Globus in his book *Dream Life, Wake Life*. "We have the capacity for infinite creativity, at least while dreaming, we partake of the power of the

NOCTURNAL FLIGHTS

Can you will yourself to fly, spin, or even solve a problem in a dream? To find out, two psychologists—Stephen LaBerge of Stanford University and Jayné Gackenbach of Athabasca University in Alberta, Canada—prepared our experiment in "Power Trips: Controlling Your Dreams" (April 1987). The project included exercises to induce lucid dreams and a questionnaire for reporting individual results.

In their preliminary evaluation of 1,000 reports, the researchers found that *Omni* readers were fairly successful in controlling the contents of their dreams. In fact, 85 percent of the respondents claimed they had had lucid dreams during the two-week period required to complete the exercises. This represented a much higher incidence of lucid dreaming than among the general population. On closer scrutiny, however, about a third of the reports didn't clearly indicate that the dreamers had recognized they were dreaming. "In most of these cases the dreamers misunderstood the definition of *lucidity*," Gackenbach says.

The *Omni* experiment included three lucid dream tasks: flying, spinning, and creative problem solving. One third of those attempting flight were successful. More than 50 percent of these dreamers flew for the fun of it, while 33 percent used flight as a means of travel—with a few journeying to outer space. Other reasons to take flight included escape from a nightmarish figure and flying simply because it was the point of the exercise. Most flew no higher than two stories off the ground.

"I achieved dream flying only once, but it was like nothing I had ever experienced before," writes a Corpus Christi, Texas, respondent. "I started by floating a few feet off the ground and gradually gained speed. I was slightly tilted during the ride, but I was able to control my balance."

The spinning technique helps you to avoid awakening from a lucid dream or losing your conscious awareness of dreaming. The task designed for *Omni*, however, also included instructions for spinning as a means of moving from one dream scene to another. Before falling asleep, dreamers chose a destination and, after turning lucid, used the spinning technique to transport themselves to the target areas. One dreamer, for example, joined his friends in a field; another met her grandmother in a distant state. There were also encounters with *Twilight Zone*'s Rod Serling in Australia, New York Mets outfielder Darryl Strawberry in a baseball stadium, and King Arthur in Camelot.

For the problem-solving task, readers mentally framed their problems before going to sleep and attempted to work them out during lucid dreams. The problem could be emotional, professional, or biological. An amazing 64 percent of *Omni* readers successfully solved their problems in lucid dreams. One twenty-six-year-old man, for example, sought a name for his child-to-be; another worked out a physics equation.

The largest response in the healing category came from people who dealt with nightmares, using their lucidity to overcome fear and resolve conflicts. Only 23 percent attempted to improve their health, most successfully treating injuries, illness, or phobias. A twenty-one-year-old Illinois photographer had difficulty walking due to a very swollen, sprained ankle. In his dream he was running. "When I realized I must be dreaming, I began to come out of my dream. So I reached for my ankle with my dream hands, causing myself to begin tumbling, which kept me from waking up. As I held my ankle, I felt a vibration resembling electricity. So I decided to throw lightning bolts around. I awoke with next to no pain in my now-unswollen ankle and was able to walk with considerable ease."

The idea of performing a superhuman feat, exploring some fantasyland, or even visiting a long-dead friend—if only in a dream—tantalizes the human imagination. "In my lucid dream my brother-in-law Joe entered the room as I was writing a letter to my best friend who lived down the street," explains one Salt Lake City reader. "When I realized I was writing a letter to someone I saw almost daily, I tore it up. I said, 'I must be dreaming.' Joe assured me I wasn't, but when I noticed the letter I had torn up was whole again, I knew I was dreaming. Then I figured since it was my dream, I might as well do something I'd wanted to do for a long time. I wished Joe would turn into a large, ugly frog. And he did!" Ah, life can be so easy in a lucid dream.—Jane Bosveld

immanent Spirit, the infinite Godhead that creates the cosmos.

Globus makes a distinction between the creativity that gives rise to the variety of "unique life-worlds" and "formative" creativity, a deeper level of creative thought. Usually, he writes, "we think of thought as empty, unfilled, abstract. So it is strange to conceive of thought as thinking up a world. Formative creativity is the power of Zeus." Lucid dreams, Globus believes, most clearly demonstrate this creative capacity.

Most people don't realize they've been dreaming until after they've awakened. In lucid dreams, however, you are aware that you're dreaming—while you're still asleep. Such consciousness may be short-lived or may permeate an entire dream, but it empowers the dreamer to change the content of the dream. A sophisticated lucid dreamer could, for instance, decide to fly away from a frightening character or conjure up Einstein for a conversation about relativity. "The lucid dreamer just thinks the dream world he or she wants to live in and, lo, that world concretely appears," Globus writes.

Artist Fanba Bogzaran, for one, uses lucid dreaming as the primary source for her artwork. Not only does she "see" her future works of art while lucid in sleep, but she also has made major changes in her style as a result of her lucid dreams. In a typical dream she will walk into a gallery, museum, or studio, turn lucid, examine a completed painting or sculpture, and then later, when awake, attempt to create it.

On a superficial level the lucid dreamer seeks a solution to a waking problem, which the nonlucid dreaming mind then resolves. For example, a part-time artist places an empty canvas beside his bed before going to sleep. While lucid, he concentrates on the need for inspiration to fill it. When he looks at the dreamed canvas, he says, it "magically fills with a picture." Once the desire has been fulfilled, lucidity helps to insure that he will remember it. Lucid dreams, including their minute details, are more easily remembered than other dreams. (To learn how to have lucid dreams, see "Power Trips: Controlling Your Dreams," *Omni*, April 1987.)

Conscious awareness during lucid dreams, enabling us to say, leap tall buildings, may also shed considerable light on the very nature of consciousness. We all experience boundaries—the feeling that particular responsibilities or patterns of behavior limit us. We're confined by parenthood, childhood, by our role as lover, friend, or enemy. We often place boundaries between layers of our personal consciousness, delegating much of our awareness to the unconscious. As children we learned to establish boundaries between reality and fantasy. Less obvious are the boundaries we place between our minds and bodies. We don't think of "me" as located in our elbows but somewhere deep within. Perhaps we set up boundaries between "self" and "other" and between "self" and the objects of the "real world." Even in lucid dreams we often set up boundaries between the conscious dream ego and the creative source.

The concept of boundaries and its relationship to consciousness are central to the creative potential of lucid dreams. When we know we're dreaming, it is not unusual to break through the traditional boundaries. Lucid dreamers can push their hands through walls, fly, and transform themselves into other creatures. Veteran lucid dreamer Alan Worsley reports that in 45 attempts to penetrate "matter" in his dreams, he succeeded 41 times. Boundaries existed for him when he needed them—when, for instance, he wanted to play the piano, walk up stairs, open a door, use tools, or snap his fingers. But when he desired, he could walk through brick walls or float above the treetops.

In lucid dreams we may also continue to function with the boundaries we carry over from waking life. For Worsley this was illustrated by his ability to float a few inches above the ground and his difficulty in flying more than 500 feet above it. It is possible, however, to dissolve all boundaries while lucid. Indeed, it is an essential aspect of moving into higher states of consciousness.

Feeling unrestricted, of course, can cause problems. Studying people who suffer from frequent nightmares, psychiatrist Ernest Hartmann found that his subjects tended to have "thin" psychological boundaries. "They were clearly sensitive people in many senses of the word," he writes. "They were easily hurt; they were empathic, in some cases they were unusually bothered by bright lights, loud noises. They also had thin boundaries in the sense of sexual identity. None saw themselves as totally masculine men or totally feminine women; they were more willing than most people to see aspects of both sexes in themselves. And in their sexual preferences a large number were bisexual in their actions, or at least in their fantasy lives. In terms of dreaming, they were also unusual. Some described frequently waking from one dream and falling into another. Even their basic sleep–wake boundaries were less solid. They described not being certain they were awake for quite a while in the morning, especially if they'd had a vivid dream."

Dissolving boundaries in lucid dreams is central to West German psychologist Paul Tholey's work with athletes, including himself. Tholey won several important skateboarding championships primarily by training while dreaming. He's been able to put out his ego consciousness while doing the task because of his training in lucid dreams," explains colleague Kaleb Utecht.

In other words, while dreaming, Tholey dissolves the established boundaries between the mind and the body and between himself and "other," in order to fully experience his sport. More important, he carries over the lived dream form of his sport to actual waking performance.

It is standard practice for serious athletes to spend time imaging their game. If they play basketball, they may see themselves running through smoothly executed plays and tossing perfectly arced shots through the net. Swimmers may envision themselves expertly stroking their way to world-record times.

According to Colorado State University psychologist Richard Suinn, Jack Nicklaus first visualizes his golf ball landing on the green and actually watches the bounce. Then he visualizes the arc of the ball in flight, and then his swing and the ball leaving the ground. His final step links them together in proper sequence.

Similarly, Suinn says, former tennis champ Chris Evert "painstakingly rehearsed the forthcoming match. She centered on anticipating her opponent's strategy and style and visualized herself countering with her own attack."

These mental imaging techniques are popular among athletes because they help improve performance. The National Research Council, an advisory branch of the National Academy of Sciences, in fact recently released a statement supporting the usefulness of mental practice for tasks that have significant mental components, especially when combining the imaging with physical practice. Suinn compares the "body-thinking" of mental imagery exercises to the "powerful illusions of certain dreams." Perhaps, he says, the major difference between such dreams and mental imaging is that we consciously control mental imaging.

Tholey originally traced some of the positive effects of lucid dreaming on athletic performance to the improvement of the sensory field. It's crucial, for example, to execute a dreamed tennis stroke on a court in the hot sun with a crowd watching. He also found a relationship between improvement in athletic performance and the athlete's ability to shift his self-awareness, especially in those sports requiring quick and risky reactions to changing situations.

The amount of actual practice Tholey argues can be dramatically reduced by rehearsals that re-create the whole ath-

CONTINUED ON PAGE 110

For the guru of Macintosh, designing computers and software is a subversive activity aimed at remodeling the imagination. Within 15 years, he says, our present ways of thinking will be as archaic as medieval thought

INTERVIEW

ALAN KAY

Is there something musical in a log? The answer is yes. You can make it into a violin, pipe organ, or piano. The computer, too, has this ability because it holds inside itself descriptions of things and it can execute those descriptions to cover the whole spectrum of musical thought. There isn't anything it can't represent!" Thus spake computer scientist Alan Kay, who also believes that—like the genetic material of a living cell—the computer can read and follow its own rules to levels of self-interpretation. Yet it isn't so much artificial intelligence that fascinates Kay but the way human intelligence sits in front of the computer, interacts with it, and comes away changed by that interaction. He understands that his work in designing computer interfaces and programming languages is a subversive activity. To shape people's perception of this medium is literally to resculpt their imaginations. "You can't help but be subversive," he says. "The only question is *how* subversive you want to be." In Kay's dreams, the personal computers of today give way to truly intimate computers that respond to our gestures and understand exactly what we want from them.

For much of his adult life, Kay has been halfheartedly battling a paternity suit regarding the personal computer. Many claim he is the darling's father, but Kay denies it. The only things he could be justly accused of siring, he says, are the overlapping windows that characterize the way computers look to millions of users, three or four computer designs, plus half a dozen programming languages. And the term *personal computer*, which he coined in the Sixties to distinguish the new generation of machines from the institutional mainframes, which were then "as big as tennis courts but less powerful than a Macintosh."

In his present position as an Apple Fellow, Kay heads the first

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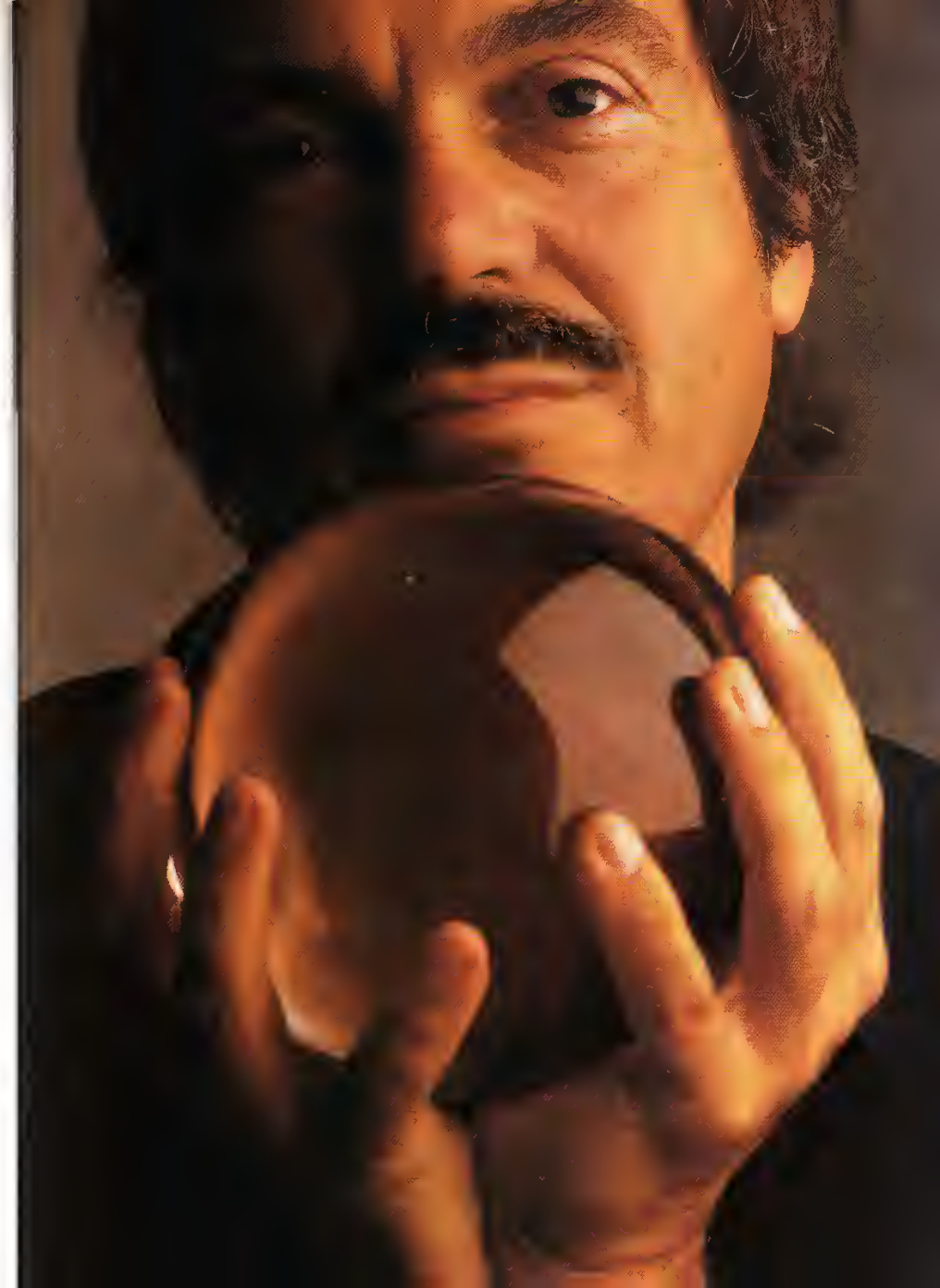

real basic research Apple Computer has ever indulged in. It is a treewheeling project about artificial intelligence centered in the inner-city Open School in Los Angeles, with 300 first through sixth graders as the main participants. The project also capitalizes on the talents of musicians, artists, inventors—almost anybody who tweaks Kay's interest. His research of the past two decades has repeatedly involved youngsters. They shake up his thinking, he says, "help me rotate out of my common sense."

Kay is really a hired brain. His jobs at Xerox, Atari, and now Apple have required mainly that he think and dream. Yet Kay maintains that the most he's ever done in the way of inventing is to bring to bear a new point of view. "I'm not a particularly original thinker," he told an interviewer from a computer magazine. "I not only require other people's ideas, I love them. I have forty-five cartons of other people's ideas in the garage."

His love of ideas knows no disciplinary bounds. To explain a concept in computer science, Kay might refer to perceptual psychology, molecular biology, medieval history, science fiction, or music. Even in the most informal conversation, his words are punctuated with footnotes, attributing this idea to Marshall McLuhan, that notion to Jean Piaget. To other computer scientists like Nicholas Negroponte or Douglas Englebart, Kay pays repeated tribute.

Born in Springfield, Massachusetts, in 1940, Kay grew up in a family that embodied the "two cultures." His father was a physiologist, his mother an artist and musician. "It was just a happy accident," he says, "but of course it made me unhappy for most of my life. Because there isn't enough time to do everything, particularly the music stuff." Although he can't put in the requisite hours of practice his beloved keyboard instruments require, he did spend ten years as a professional jazz guitarist from age seventeen to twenty-seven, while attending college on the side. (He earned a degree in math and another in molecular biology from the University of Colorado.)

His memories of grade school are not happy ones, and the philosophy of education he now espouses is at odds with what goes on in most American classrooms. "The schools love conventionalism," he complains. "Generally, the more conventional children are, the more that adults like it."

Kay was an unconventional kid himself. By the time he was eleven, he'd read 10,000 books and competed on the local version of a famous Fifties radio and TV show called *The Quiz Kids*. He didn't make it onto the national show, though—which, he says, was a traumatic experience at the time. "When I met some kids who could think better than I could, it was devastating." After nearly flunking out of junior high, he went to Brooklyn Technical High School in New York City, which he remembers as a "massive staging ground for MIT, with six thousand boys and no girls, stuck in the middle of the slums. But at least it was challenging."

The U.S. Air Force introduced Kay to computer programming in 1961. Thus military service led eventually to the pursuit of a graduate degree in computer science at the University of Utah. While there, Kay worked with engineer Ed Cheadle to design a prototype personal computer called the FLEX machine. It was not user friendly. But no matter. From FLEX it was a quick hop, in Kay's mind, to a truly personal, portable, powerful computer that would become as ubiquitous as TV sets and almost as easy to operate. Kay envisioned it as something the size of a three-ring binder, something a kid could carry around easily. He called it the Dynabook.

After Utah, Kay went to Stanford University's Artificial Intelligence Laboratory and then on to one of the headiest think tanks of its time, Xerox Corporation's Palo Alto Research Center (XeroxPARC), where he spent most of the Seventies trying to bring the Dynabook to life. "We had a concentration of people that was unbelievable," he says. "They weren't good people; they were stellar people."

"We'll have real personal computers when there is no on/off switch. They'll be like clocks: on all the time. Even when you sleep, stuff will be trickling into the machine."

Until recently, Kay devoted a fair portion of his time to the Media Lab at MIT. Although he still keeps an apartment in Cambridge, Kay now divides much of his time between his "lab," the Open School, and his Apple office in the Brentwood section of Los Angeles.

Interviewer Dava Sobel talked with him first in the backyard of the house Kay and his wife, filmmaker Bonnie MacBird, bought but haven't moved into yet, then in the home's cavernous living room. The only furnishings were a Bösendorfer grand piano, a long, narrow dining table with its two chairs facing each other at a royal distance, and a cardboard model of the pipe organ that Kay designed on his Macintosh, soon to be built as the room's focal point. Kay and Sobel ended up in an Apple Fellow back office, a cluttered, windowless area with enough computer equipment strewn about to warm a hacker's heart.

Omni: You've quipped that you're really not a computer scientist but a failed musician. Is there music in the computer?

Kay. The big problem with computer music today is that it's mainly about what a synthesizer can do. You can do something audibly interesting that has no real musical content. Composers are now trying to figure out what *is* content for the thing. Various genres of the twentieth century are really about the materials that they're made of. This is a kind of perversion to me, like taking a broom handle and putting it down on the keys just because you can do it. You can see snatches of this going back in history, but the preoccupation with materials in this century is an act of desperation masquerading as originality.

Omni: Do you think programming is akin to musical composition?

Kay: It closely resembles musical composition, not just aesthetically but structurally. Programming is a little like composing a very long Gregorian chant because you're just coordinating one stream of things. And programs do come back on themselves. For most computer programmers, there's essentially just one melody playing that's complicated and long. Using a computer though, is not like playing an instrument—at least not for me. Still, we used to say that Doug Englebart's [inventor of the mouse] greatest contribution was to show us the computer can be a violin. Unfortunately, you had to be a violinist then to learn how to use the system. The violin isn't difficult; it just takes a long time. Anyone can learn how to play one, but most people aren't going to make the effort. It would be terrible for the computer to be that tough.

Omni: Perhaps it's more like a kazoo?

Kay: It's okay to start off as a kazoo, but damn it, you don't want to keep people in kazooland, because that's television. The hardest thing in designing the Mac user interface was to have something that's easy to get started on, as the kazoo is, but actually admits of the possibilities of the violin. You want the thin edge of the long wedge situation so you can get everybody started but not leave them at the starting point. Gradually the training wheels come off and more and more possibilities are revealed. And then you're hooked on the computer.

Omni: Let's settle the paternity question once and for all. Are you or are you not the father of the personal computer?

Kay. No. The first personal computer was done at Lincoln Labs in 1962 but was never called a personal computer. The FLEX machine I designed in the Sixties is, as far as I know, the first thing ever called a personal computer. It actually looked very much like the machines of today and was quite powerful. You could

do outstanding word processing and simulations with it. But only graduate students liked it. That's when I first dimly realized how important user interface might be. People were doing them since 1962, but it wasn't really a topic of conversation until the late Sixties.

Omni: So you did coin the term *personal computer*?

Kay: Yes, but it doesn't seem important, because by my definition of personal computer there still aren't any. We're not selling computers to the whole world. They still really go into business. They're starting to go into schools but aren't really in people's homes yet. We'll have personal computing when there's no on/off switch. They'll be like clocks: on all the time, in constant use. Information is not something you log into; it's always available. Even when you're asleep, stuff that your little agents inside the computer think you might be interested in will constantly trickle into the machine.

Omni: Your Dynabook computer was to do all that and be portable, too, right?

Kay: Yes, the idea for the original Dynabook was that it had to be so portable you'd be able to carry something else too. You wouldn't put your grocery list even on a laptop today.

Omni: Why is portability important?

Kay: I'll give you a historical answer. The software system called Aldus PageMaker is sort of the original commercial desktop publishing system. The original Aldus [Manutius, 1450–1515] was a scurrilous but energetic Venetian publisher who probably had more to do with the Renaissance than any other individual besides Gutenberg. He published all the extant Greek and Roman tracts. And he did another thing that really endeared him to me. Do you know why books today are the size they are? Because that was the size of a saddlebag back then. Aldus was the first guy to realize these things were not imitation manuscripts. You could build a lot of them cheaply, and you could take them away with you. They weren't going to be in institutions anymore. This is one of my favorite metaphors for what the computer has to be to really make it. You have to get the thing in a saddlebag.

Omni: What was the germ of the Dynabook computer?

Kay: It was a collision of my feeling that the FLEX machine was a failure, seeing Papert's stuff [Seymour Papert developed the children's programming language Logo], seeing a remarkable system for gesture recognition at the Rand Corporation, and seeing the first panel display at the University of Illinois. It was a tiny thing with a few blinking neon lights—really no good at all. I had known there were going to be flat screen displays someday because it was part of the science fiction of the Fifties. I started thinking about putting the FLEX machine on the back of an eight-and-a-half- by eleven-inch panel, but we didn't know exactly when the panel was going to happen. But the world's easiest thing to predict is what the density of silicon chips is going to be. We figured we could do the FLEX machine on the back of a panel by the late Seventies. But by 1968 I had decided I was going to do the next personal computer design for a child.

Omni: Why children?

Kay: A lot of the problem with FLEX was that semiadults—namely me and other graduate students—were trying to design for semiadults. And adults are basically lousy designers for adults. I picked children because I had the vague idea that if we did something good for children, it might work well for adults, too. I also realized that if we were going to do a machine for kids, it had better not look like a FLEX machine. The kid is mobile. He or she's going to want to use it under the trees—maybe try to hit baseballs with it. When I was a kid, we hit baseballs around with our schoolbooks.

Omni: So when you went to XeroxPARC you began work on the Dynabook?

Kay: Yes. PARC was a once-in-a-lifetime experience—like Los Alamos during the war. We had all the right crazies and nobody who was merely good. In 1976 I

made up a list of people I considered to be the top one hundred computer scientists in the world, and we had fifty-eight of them at PARC.

Omni: Your recollections span virtually the whole history of computer science.

Kay: We've collapsed hundreds of years development of a typical technology into a single lifetime. Except for John von Neumann [inventor of game theory among other things], most of the guys from 1945 who did this stuff are still alive. Vannevar Bush [visionary electronics scientist] talked about optical storage in 1945, when he was sure it would be invented, but it still wasn't there twenty years later when he assessed how far things had come. Looking at what Englebart was doing in '65, there's not a single thing that seems archaic today. And that's very typical of the visions of the Sixties, most of which were astoundingly modern.

Omni: How do you account for that?

Kay: Partly because people were simply driven by ideals. Then, too, you couldn't do anything in a cost-effective manner because the computer would bolt. Those who funded research were willing to give you millions. The stuff we did at PARC [in the Seventies] was not more innovative than stuff done in the Sixties. Those guys were twenty years ahead of their time. A lot of their stuff still isn't commercialized.

Omni: The Dynabook, with all its power and portability, hasn't yet come to be.

Kay: No, but we produced an interim Dynabook that we called the Alto. It was faster in certain ways than the original Macintosh but about a factor of five less powerful than we'd planned the Dynabook to be. The display was the size of the Dynabooks. We wound up building about two thousand of those machines internally at Xerox. By 1976, when Xerox executives decided not to go ahead with the project, they were not turning down a paper design or prototype; they were turning down a system used by hundreds of people for three years.

A lot of the old XeroxPARC people are at Apple now. Apple took the torch from that tradition. I think the Lisa [PC] and the Mac together cost Apple around a hundred million dollars to get out the door. But that wasn't long-range research. Apple knew they had a winner, but Xerox had taken the research risks. Xerox didn't know they had a winner. They haven't figured it out to this day.

The irony is that Xerox is selling computers now and has to buy almost all their systems from somebody else—like their desktop system—even though the first desktop publishing system that ever existed was done at XeroxPARC around 1975. That is really hilarious. It's a story in itself, and there's a fairly accurate book out now called *Fumbling the Future* that names most of the names, although it doesn't get all the culprits in. The most interesting thing is simply that most of the Xerox executives who had the opportunity to go down in history, don't think they did anything wrong.

Omni: Aside from advances in computer design, what has to happen for people to embrace this technology and welcome it into their homes?

Kay: Let me use another musical analogy. While the Macintosh has about two thousand parts in it, that Bosendorfer has about twenty thousand. With the piano there's more shit between you and what happens musically than any other instrument, except perhaps for the organ. So you have to make the audience believe it's a musical instrument more than you do with others. So if any musician's going to think of his instrument as a machine, it's going to be the keyboard player. But they don't at all. To me that's a huge metaphor for what computers have to be. It's when you don't think of the computer as a machine anymore that things are happening. Then there's a direct connection between you and what is amplified. Kids growing up in the technology will be able to do that. For them it's just part of the environment. Technology is the stuff that's invented after you're born. TV is technology for me; radio isn't.

It's something like the media. That's how it hit me. I said, "Oh, of course. The computer is a metamedium." That means the computer can trivially represent anything that previous media have represented. You want to represent a TV picture? No problem. A Louvre painting? No problem. The highest-fidelity sound that a microphone can capture? No problem. A computer can do all three because everything in it is held as a description that can be as precise as your understanding of the original. The destiny of the computer for quite a few years is going to be this trivial representation because there are so many things we'd like to hold in higher resolution right now.

Omni: But this representation *is* trivial in terms of the computer's real power?

Kay: Oh, yes. When you cross the boundary from representation to dynamic simulation, you start seeing what the real content of the computer is. Compared to physical material, the computer is absolutely unbounded. It transcends physicality. Words approach that freedom because you can write a science-fiction story about a place that never existed—or never could exist. Words are tricky things because they're in the universe, but their interpretation doesn't have to be in the universe. You can say, "The green ideas slept furiously." There probably aren't any green ideas, and they probably don't sleep, and if they did they probably wouldn't sleep furiously. That's

a paltry example of what the computer is all about. It's like words, only stronger.

Omni: Because it can do simulation?

Kay: Right. If you drop the computer, it will smash because it's subject to the laws of gravity. But the simulation you do on it doesn't require any kind of gravity. You can have a universe with no gravity in it. For anybody who believes you can learn by constructing things, the computer is just the cat's ass. With the computer you don't have to take anything on faith. As a result, the amount of skepticism you can have can be at an all-time high. McLuhan said cheap books created the Renaissance because you didn't have to be educated in a room with thirty other people like you were at Oxford in 1230 A.D. That you could buy one end go away by yourself was one of the major forces for creating the notion *Hey, I've got an idea!* In his view it was no coincidence that perspective was discovered less than ninety years after the printing press.

Omni: The way I use my computer, it's really just a glorified typewriter. What am I doing wrong?

Kay: Most things people do on the computer now they could just as well do on paper. With exceptions. A spreadsheet is not just correctable paper. It's dynamic paper that doesn't mimic anything anybody was ever willing to write. Before there was a program, only people under duress would calculate spreadsheets. A spreadsheet allows you to do more than just accounting, which is what it was invented for. To the great surprise of its inventors, about seventy percent of the initial adopters did forecasting on it.

Omni: So the goal, then, is to get people to use the computer to open up completely new dimensions?

Kay: That's one of the big waves of the future. The next big thing after desktop publishing will be end-user programming. The reason the software program *Focal Point* works, for example, is that you don't have to customize it when you get it. It's useful as it stands. It takes a little while to learn, then a month or so into the thing you start thinking, *Oh, I wish I could do x.* Wait, you can. You can open up the hood on the machine. What you don't see down there is a maze of spaghetti like you see in a modern car. You see something functionally simple, like a Model T. And you say, "I'll move this over here and connect this up to that." After a couple of weeks it doesn't look like *Focal Point* anymore, but like a reflection of what you're trying to do.

Omni: And isn't this the answer to one of your dreams?

Kay: Yes. Suppose you were hired to design a computer system for the Institute for Advanced Study [where Einstein worked]. Design a system that could accommodate different geniuses in their different pursuits. This is the starkest case of the users who are experts in their own domain. There was a tendency to think of the average user in business as a schmuck. But there are actually very few real schmucks out there who haven't been run over by a car already. Most people are fairly intelligent and expert at what they do. The savant at the institute is just an example. And what I came up with is that you should design a system that allows someone, after a month or so, to go in and remake it. Computer material isn't like stone, so there's no reason to freeze the stuff in stone the way it is in most applications today. You can make a great architecture and weave in a wad of stuff for redoing.

Omni: So it's really crucial that people create their own programs?

Kay: Well, you wouldn't say a person was literate if all he could do was read. People are worried about the twenty-three million Americans who can't read. I worry about the two hundred million who can't write. If you read but don't write, it's a little bit like watching television. If we get a generation of people used to doing little programming tasks, then it's just a whisker from there to real program writing. What people will do won't be recognizable. In ten or fifteen years, we'll do a kind of thinking that is as different from what we do now as our way is different from the medieval way.

Omni: Whose ideas influenced you most in shaping the design that became the Mac user interface?

Kay: The strongest single influence was Jerome Bruner's psychological theory. One of the founders of cognitive psychology in the late Fifties, Bruner got very interested in one of Piaget's key ideas: that the child is stable in a particular way of thinking at different times throughout his development. Piaget suggested that going from child- to adulthood is like going from the caterpillar to the butterfly. There are distinct stages, each one functional when it's operating.

Bruner started off repeating Piaget's experiments, but then he threw in some weird wrinkles. He showed that if you could just prevent the kid from seeing for a moment, you could switch him from visual to symbolic thinking, which he's not supposed to do till age eleven or twelve, according to Piaget. Once they *can't* see, they can start reasoning about doing strategies—all kinds of things—very well.

Bruner thought that there were three basic ways of knowing: a kinesthetic way, from directly doing something, which is very deep, elemental, a visual way, which has to do with how things figuratively relate to each other, and then a symbolic way, which includes reasoning from facts and logic.

These mentalities seem to be operating independently. Young children think by doing. That's why they have to be protected. Things you can do with vision, like see a cliff, don't have to be tested out. Bruner's idea was that progressive alienation or holding off the world—going from tactile contact to the visual and then to the symbolic—has a lot of survival value. And Piaget's stages can be explained as a change of dominance occurring among the Bruner mentalities. That's a big idea.

Omni: Earlier you likened TV to the kazoo. Is there anything in TV for the "interactive adult"?

Kay: McLuhan didn't overlap enough with the computer to make good predictions about it, but he beautifully predicted MTV thirty years ago by thinking about the progression of fragmentation. The fragmented image is incredibly interesting. TV is more about being interesting than informational. In Bruner's terms, your image mentality really cares more about solving an image than getting anything out of it. That's why you see quicker and quicker cuts on TV, especially on commercials, because that's interesting. MTV just carries the idea to its logical extreme.

Omni: Do you enjoy watching it?

Kay: Yeah, the two things I like on TV are sports and MTV. They're both perfect for television. You're probably in the worst possible situation when you're learning about astrophysics by watching *Cosmos* because you aren't. You're learning about Carl Sagan and his haircut. That's what TV's about. The best thing about *Cosmos*, by the way, is that Carl got four million people to buy his book, and there's a lot about astrophysics in it.

Omni: So you question the whole concept of educational TV?

Kay: It's a paradox. The more interesting you make TV, the more people should wake up, but it's exactly the opposite. You can put good stuff on or bad stuff, it's irrelevant. If you sit there for seven hours watching it, everything is different about you than if you hadn't.

Omni: You've worked with lots of kids. How has TV affected them?

Kay: The children I work with today are definitely more the products of TV than the kids twenty years ago. You might call the difference a "hardening of the categories." Television is an enormous force for presenting the world as simple. It is really tough to give one of these [he reaches down and picks a blade of grass] to a kid and get him to pay attention to it. Because he's seen it before, it's dismissible. If you start off with too simple a set of categories, there's a pigeonhole for everything. Then the entire world becomes dismissible and you're nothing but bored. It's extremely easy to be bored if

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The Young Pioneers, the Soviet version of the Boy Scouts, will search the skies for messages from extraterrestrials

ANTI MATTER

UFO UPDATE

We're always hearing about Russian cosmonauts, the *Mir* space station and Soviet missions to Mars. But what about the search for extraterrestrial intelligence or SETI? Are the Soviets actively searching for radio signals from outer space?

Yes. Since 1965 Soviet SETI has been an area of legitimate scientific inquiry. And recently a number of new programs have gotten off the ground.

According to Dr. Nikolai Kardashev of the Space Research Institute at Moscow State University, the Soviets seldom have special money for SETI. They try instead to kill two scientific birds with one telescope. Our everyday astronomy projects are very strongly optimized for SETI, Kardashev says, "so if an anomalous electromagnetic signal turns up it can be analyzed."

An example of this is Kardashev's own research, which centers on a 70 meter radio telescope to be installed near Samarkand in the mountains of Uzbekistan. The radio telescope is being built to study astronomical bodies, says Kardashev, but we expect to detect some unusual SETI signals from deep space. To that end, Kardashev adds, the new telescope will electronically hold hands with other radio telescopes in the USSR and throughout the world.

The Young Pioneers, the Soviet version of the Boy Scouts, will also search the skies for extraterrestrial signals. Under a program the Soviets call "amateur SETI," the Young Pioneers will use a three-meter infrared radio telescope at the astronomical observatory located at Camp Orlyonok on the Black Sea coast. While the telescope goes about its more mundane astronomical duties, it will also monitor the equatorial region of the sky for signals from E.T.

Finally, the Soviets are about to see their first dedicated SETI project under the direction of V. S. Troitsky of the Radiophysics Research Institute in Gorky. Troitsky's Project OBZOR will have an array of 20 coordinated small-dish radio telescopes by next year, with as many as 100 by 1995. Although it won't be as sensitive as many American search instruments, it will be more advanced than earlier Soviet technology and provide complete sky coverage.

The scale of this latest project should help the Soviets achieve their SETI goals. According to Thomas R. McDonough, SETI adviser with the Planetary Society, the Soviets are particularly interested in discovering super-duper civilizations and have hunted for Dyson spheres—solar systems totally enclosed by their inhabitants—as well as other dramatic space engineering structures. (Westerners, on the other hand, prefer to search for signals from civilizations only moderately more advanced than our own.)

After 24 years of SETI, the major hurdle facing Soviet research is funding. Jill Tarter, principal SETI investigator at the NASA Ames Research Center at Moffett Field, California, says Soviet SETI must receive more government funding before it is equivalent to SETI research in the West. Nonetheless, with scientific interest growing steadily, Soviet SETI investigators have managed to refine their technology and have gotten a few impressive programs off the ground.

—*PAUL McCARTHY*

NEPTUNE DEJA VU

For several amazing days in August we oohed and aahed at live photographs from the hinterlands of space The unmanned spacecraft *Voyager 2* launched by NASA in 1977 had struck pay dirt 2 75 billion miles away At the speed of light it fired a fusillade of messages to Earth giving us our first intimate look at the planet Neptune And what a startling look it was

Scientists at the Jet Propulsion Laboratory in Pasadena California who run the *Voyager* mission went sleepless trying to keep up with the surprises There was the planet s color a gorgeous, bursting blue punctuated by wisps of white And there was the planet s radical unexpected tilt indicating a strong magnetic field fierce internal heat and a slushy core Combined with the spectacular findings it had sent back from Uranus in 1986 and from Jupiter and Saturn before that, *Voyager* 2's latest success has given us an unprecedented look at the solar system

Or has it? According to linguist and biblical scholar Zecharia Sitchin the probe s messages only prove what his book *The Twelfth Planet* predicted in 1976 the year before *Voyager 2* left the ground More important, Sitchin insists they confirm what the ancient Sumerian civilization documented 6 000 years ago

The society of Sumer Sitchin explains, started in southern Mesopotamia (today s Iraq) circa 4000 B C This ancient civilization Sitchin declares invented the wheel the kiln and irrigation systems for farming And he adds they originated basic concepts of astronomy as well Using special illustrations and pictorial script called cunei form the Sumerians recorded their findings on tablets statues and cylinder seals—stone cylinders engraved with reversed pictures and symbols that much like photo negatives left a positive impression when rolled on wet clay

Sitchin says he studied these artifacts for almost 30 years before finding an extraordinary cylinder seal in the State Museum of East Berlin Shown on the seal was the god Enlil giving the plow to mankind Befitting such a celestial act the heavens were illustrated in the background

Sitchin was flabbergasted At the center of the seal lay a radiant sun surrounded by all the other planets we now recognize generally the right size and in their proper astronomical positions The total including the sun and the moon came to 12 celestial bodies one more than we have thus far verified Studying other artifacts, the linguist then found a list of the planets with the one farthest from the sun mentioned first

Sitchin elaborated all this in *The Twelfth Planet* and two sequels But it wasn t until January 1986 when *Voyager* s transmissions came back from Uranus that alarm bells went off in his head The Sumerian description of Uranus *MASH SIG* or bright greenish corresponded to the blue green orb on his television And the expression *HUM BA* which he d translated as swamp land vegetation reflected the hot marshy material discovered at Neptune s core

The plot thickened 'one hundred fifty percent in August Sitchin says with the Neptune transmissions The Sumerians he notes considered Uranus the twin or double of Neptune

and everything that *Voyager* reported seemed to bear this out. Like Uranus, Neptune had a bright blue color, a powerful magnetic field, numerous unknown moons, a hot, swampy core, and large quantities of water.

The question remained: how the Sumerians had figured all of this out without telescopes or satellites. (Uranus and Neptune are invisible to the naked eye.) But Sitchin had an answer. The Sumerians knew the unknowable; he decided, because extraterrestrials had told them. Specifically, "astronauts" from the planet NIBIRU—the twelfth planet shown between Jupiter and Mars on the Berlin cylinder seal—had visited Earth many times, in intervals of 3,000 years. All of this is described in many texts, including the myth of Anki and the earth, Sitchin says. "The only difference between me and other scholars is that they call it mythology and I say it's fact."

Voyager 2 scientist Andy Cheng admits that Neptune and Uranus are similar in many ways. "... you had to pick two planets to call twins, he says, "they'd be the ones." But he finds the rest of what Sitchin says "amusing." According to Cheng, "There's nothing so striking about finding water in the Neptune and Uranus systems. All planets except Mars and Venus have a liquid core. We also all expected a magnetic field. And we knew the color of both planets long ago." Furthermore, says Cheng, even if there were an unknown planet X in the solar system (as is often surmised by modern astronomers), it would have no life because it would be too far from the sun. Cheng believes that the cylinder seal is probably just a stylized representation of random stars not meant to be interpreted as an accurate portrait of the cosmos.

Francesca Rochberg-Halton, a respected Sumerian scholar at the University of Notre Dame, is far more damning. "This is crackpot stuff," she says. "Cuneiform word signs are open to wild interpretations by those who haven't studied enough. There's really not any Sumerian astronomy." She also believes that Sitchin made some outright blunders. "There were only seven planets, including the sun and the moon, described by the Sumerians, not twelve. And Venus was illustrated with shining rays [like the central figure on the Berlin cylinder seal], not the sun."

But Sitchin stands firm. If not for ancient astronauts, he asks, how could the figures on the Berlin cylinder be so eerily similar to our modern solar system? And how, he asks, could his predictions about Neptune's abundant methane and water, its intense internal heat, and its similarity to Uranus have arrived in *Omni*'s offices in June—two full months before *Voyager* proved them true?—Mark Teich

ANTI MATTER

BREAKFAST HIGHS

Muesli, the latest rage in health foods, now rivals granola in popularity. Swiss in origin, it is made from a mixture of whole grains, nuts, and dried fruit and can be found under brand names from Kellogg's to Post.

Now, according to some reports, there may be more to the muesli rage than meets the eye. The British media recently carried several stories saying that a large bowl of the cereal contains enough lysergic acid diethyl amide, or LSD, to create "mind-bending euphoria and muesli addiction." The culprit, the papers claimed, is ergot, a mood-altering fungal grain.

David Conning, a toxicologist with the British Nutrition Foundation, whose report sparked the stories, says, however, that the media have carried things a bit too far. "The point I tried to make," says Conning, "was that the food regulations governing ergot contamination would allow for the presence of mood-altering chemicals—not enough to create a high, but perhaps enough to influence food choice."

According to Conning, large food producers have adequate regulations to ensure a low risk of ergot contamination. However, many people make their own muesli out of raw grains from health food stores, it is those grains, he fears, that may sometimes by infected with ergot. That ergot, in turn, may give rise to LSD.

James Robbers, a professor of pharmacology at Purdue University, doubts Conning is right. "Ergot contamination can indeed create chemicals that have a profound effect on the mind," he says. "However, LSD is produced synthetically. I've never heard of it occurring in a natural form."

Conning is not so sure. "The last reported outbreak of ergotism occurred some thirty years ago in France," he says. "The LSD-like symptoms ranged from hallucinations to euphoria and death. Although LSD is usually synthesized artificially, it has been detected in ergot derivatives. And it is possible that it is LSD from which these symptoms stemmed."

—Rick Boling

"Many excellent cooks are spoiled by going into the arts."

—Eugene-Henri-Paul Gauguin

CELL KINSHIP

Since the early Sixties, scientists have speculated that organic compounds were brought to Earth by comets and meteorites. That doesn't explain how these primordial materials evolved into living cells. Now, however, University of California at Davis cell biologist David Deamer says he may be able to unravel this mystery. Working under a NASA grant, he has discovered that meteorites contain substances similar to those that make up the membranes of modern-day cells.

Because the materials he has found form an oil-slicklike area on water, Deamer theorizes that early organic compounds first concentrated on the surface of the ocean. "There they were exposed to an unstable environment with cycles of wetness and dryness," Deamer says. "This propelled chemical reactions that otherwise simply could not occur."

Where did meteorites obtain their cellular building blocks in the first place? Most meteorites that hit Earth came from the asteroid belt, which was once a planet on its way to being formed, Deamer says. "There's also good evidence that some of these organic compounds were not formed in our solar system at all. We probably have our fingers on some molecules that started out around some other star and that predate the solar system by millions of years."

—Sherry Baker

"We stand on the threshold of rocket mail."

—Arthur E. Summerfield, U.S. Postmaster General

DREAM

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around until you come across some other life form. Whatever the appearance of this life form—be it Wonder Woman, the Cheshire Cat, or the Blob—there can be no doubt that its presence is a function of your own unconscious creative processes. As dream researchers have long pointed out, every character who appears in your dreams—even those who play the part of familiar figures in your everyday life—expresses some aspect of your inner self. Put simply, *you* play the part of every character in your dreams. It is therefore within your power to consciously shift perspectives with any one of your dream characters.

For tonight's exercise pick out an interesting dream character and imagine how your dream experience might appear from the other character's perspective. Imagine yourself actually trading places with this character and then looking back at the character you were previously playing in your high lucid dream. What would your new dream self say to your old dream self about the scenario you're presently experiencing? How do your feelings about yourself and your dream shift when you take on the viewpoint of the other character?

Continue practicing this exercise until you've managed to experience at least one role-reversal in the course of your high lucid dreams. You may then either practice consciously changing perspectives and taking on the roles of additional dream characters or just opt to complete the dream from the new character's perspective. You may even decide to return to your original character, tapping any insights you may have gained from your role-reversal experience.

If you feel yourself returning to normal consciousness in the middle of the exercise, complete at least one role reversal in your imagination.

Please remember to record your role-reversal dreams on a piece of paper, taking special note of any insights you may have gained by trading places with various dream characters.

DAY SEVEN: DREAM SHRINKS

You will gain access to hidden stores of energy, wisdom, and experience from the psychotherapist of your dreams.

Some of us pay our psychotherapists thousands of dollars a year just to clarify our thoughts, putting into proper perspective things that, in the deepest recesses of our mind, we already know. On day seven you will learn to call upon the higher wisdom of a therapist in your waking dreams. Invoking this personal dream guide, you should gain access to information hidden in the farthest reaches of your unconscious mind.

To prepare for this dream session on the analyst's couch, spend the day observing your relationship with the world. How do you interact with other people? How is your mood influenced by your surroundings? How do you react to different types of weather, traffic, music, conversation, and noise? How do you feel about your life and yourself? Can you chart the ebbs and flows of your moods as you go through the day?

Sometime during the day, find a quiet place where you can sit and reflect upon the condition of your personal life. Where are you at this point in your life, especially in relation to the fantasies you had as a child? Are there any recurrent themes or ideas that have motivated you as you've grown older? Are there any psychological blocks or other obstacles that have prevented you from achieving all you once dreamed of? Allow your thoughts to come and go easily.

Now imagine what it would be like to have a personal confidant and therapist who completely understands your innermost thoughts and feelings and could also offer you remarkable insights on overcoming the difficulties you face. Imagine in as much detail as possible exactly what such an individual would

"Don't be alarmed. It's just evolution."

look like. Would this person be a wise old woman with flowing gray hair, a middle-aged male psychiatrist in a three-piece suit, a hard-boiled detective from a Thirties movie, or a giant white rabbit named Binkey? Would he or she wear perfume, carry a briefcase, smoke fat cigars, or consume a constant supply of fresh carrots? Imagine yourself sitting with your "therapist" at this moment, sharing your most personal feelings with him or her. Continue with this part of the exercise for at least half an hour before going about the rest of your day's activities.

Begin the next part of this exercise about an hour before you plan to go to sleep. Gather together a small number of objects that symbolize some significant aspects of your life. You might, for example, choose your baby shoes, a photograph of yourself as a child, a diploma, an old love letter, your Congressional Medal of Honor, and a religious or spiritual symbol. While you're at it, choose one additional object that expresses some recurrent concern in your personal life—a tattered valentine to represent seemingly constant troubles in romance, for instance, or an uncashed payroll check to symbolize your ongoing angst and confusion about where you're going in your career. Place these objects on a night table or chair beside your bed and quietly contemplate their individual significance. You can also enhance the atmosphere by burning incense and playing music in the background.

When you're ready, get in bed and take out your dream journal. Then create a phrase that expresses some overall concern you have about the current state of your life. For this exercise don't just focus on narrow concerns, such as your perpetually confusing relationship with your boyfriend Melvin. Instead, direct your attention toward more global concerns, such as the generally troublesome ongoing history of all your sexual relationships with men or women. For example, instead of writing, "Do I really love Melvin at all?" write something like, "Why do I always seem to wind up with shallow, egotistical, insensitive, ill-mannered, and unfaithful slobs like Melvin?" Then turn out the lights and enter the state of alert relaxation. Once you have done so, attempt to enter the state of high lucidity directly from waking consciousness.

We suggest that you allow your unconscious mind to provide you with a suitable dream scenario for exploring your concerns. Your main focus should be upon seeking out a dream therapist to assist you in gaining insight into your waking life.

Toward this end, as soon as you find yourself in the midst of a high lucid dream, look around for the therapist you envisioned earlier in the day. Don't worry, however, if you don't encounter this individual right away. Just explore your dream environment in any way that seems appropriate to the setting—by foot, by car, or even by flying. Continue to explore until you come across the individual you're seeking. And remember, once your unconscious mind has added its input, your dream therapist may not look exactly like the individual you consciously imagined.

Once you encounter your dream therapist, you may use the opportunity to seek his or her advice and insights on your life in the waking world. Since your therapist is the embodiment of all the memories and experiences residing in your conscious and unconscious mind, he, she, or it should have access to the most intimate details of your life. Therefore your dream therapist should be able to offer you some surprisingly candid and straightforward input about how you're handling your personal existence. Put simply, your inner self may know more about what's good for you than your conscious self may be willing or able to admit. By meeting this inner self in the form of a personal therapist or guide in a high lucid dream, you may be able to consciously benefit from the hidden wisdom of your unconscious mind. The more often you practice this exercise, the more incisive your insights should become.

"Imagine trading places with one of the characters in your dreams. What do you think your new dream self would say to your old dream self about the action in your dreams?"

Please don't worry or feel pressured if you don't meet your dream therapist the first time you practice this exercise. Chances are that the dream you *do* have will express your unconscious thoughts and feelings about the concerns you focused on during the day. With continued practice you may eventually learn to meet with your dream therapist on a regular basis. You may even establish a whole society of dream therapists from a variety of high lucid dreams. Remember, under no circumstances should you ever use this exercise to replace conventional psychiatric treatment.

DAY EIGHT: DREAM HEALER

Imagine a personal healer who monitors and enhances your physical health

Today you will expand upon the dream therapist technique by invoking the image of a personal dream healer to assist you in boosting your immune response.

When you first wake up in the morning, notice the way your body feels as you get out of bed. Do you feel full of energy, ready to jump in the shower and bound off to work like a powerful gazelle? Or do you feel more like a hunted deer, shot by a tranquilizer gun and fading fast? Does it take several gallons of strong, black coffee to get you moving? Or are the morning sunshine and a glass of chilled orange juice enough to make you feel alive and alert?

Notice the kind of relationship you have with your body as you go about your day. Do you purposely avoid even the slightest opportunity for exercise and gorge yourself with junk food? Do you smoke? Or do you maintain a macrobiotic diet and typically spend your evenings at the health club sipping tomato juice, taking aerobics classes, and lifting weights? In short, what is your attitude toward your body? How is this attitude reflected in your diet, dress, and general level of physical activity?

As you did during the last exercise, find a quiet place where you can relax for 30 minutes during the day and consider the current state of your health. Are there any chronic health problems that have troubled you for a long time? What about other health concerns that may have begun troubling you only recently? Do you think of yourself as generally robust or as a more or less sickly individual? Allow your thoughts about your physical health to come and go easily without holding on to them or analyzing them too closely.

Now imagine what it would be like to have a personal healer who constantly monitors your physical health and assists you in taking care of your body. What would such an individual look like? A primitive tribal witch doctor in full regalia? Or an elderly surgeon with a white coat and stethoscope? Picture yourself sitting with your imaginary healer, describing your personal health history from childhood on. Continue with this part of the exercise for at least 30 minutes before going about the rest of your day.

Begin the next part of this exercise about an hour before you plan to go to bed. Choose an object that symbolizes some significant concern about the current state of your physical health. You might, for example, choose a giant bag of greasy potato chips to symbolize concern over your diet (don't make the problem worse by eating them!) or an old shoe to symbolize problems with your feet. Place the object near your bedside while quietly contemplating its symbolic significance. You might consider enhancing the atmosphere by burning incense and playing music in the background.

When you feel ready, get in bed and express your most pressing health concern on a sheet of paper. You might write, "How can I lose 50 pounds?" or "What can I do about my allergies?"

Then turn out the lights and use the alert relaxation technique to induce a high lucid dream. Once you've entered the state of alert relaxation, focus in your mind's eye on the image of the object that you have chosen and on the words in the phrase you have written down earlier. Also focus on your general thoughts about your body.

Once you are in the midst of a high lucid dream, focus on finding your dream healer much as you focused on finding your dream therapist the night before. When you do finally encounter this individual, seek advice about your most pressing physical concerns.

Remember, your dream healer represents a symbolic bridge between your conscious and unconscious minds. He, she, or it may therefore help you communicate with yourself at a deep inner level about the steps you need to take to improve your physical condition.

If that were all this exercise is good for, however, the dream healer would be little more than a very specialized version of the dream therapist. In fact, the real potential of the dream healer exercise begins where the dream therapist technique leaves off.

To experience the greatest benefit from your dream healer, you might request a symbolic remedy for some physical problem. Your dream healer might lay his hands on some part of your dream body to offer you some "healing energy." Your healer might also offer you medicine or guide you to some healing environment—such as a warm salt sea, where you can envision yourself thriving in the healing rays of the afternoon sun.

In an advanced version of this exercise, you may even serve as your own dream healer, directly incubating therapeutic dream scenarios. Indeed, a mounting body of scientific evidence strongly suggests that such creative visualization exerts a powerful influence over your immune system by assisting you in mobilizing your inner defenses and boosting your psychological response to disease. Nowhere has this concept been shown more clearly than in the work of radiation oncologist Paul Simonton and his wife, Stephanie, a psychotherapist. Using mental imagery along with traditional medicine, the Simontons have shown that attitudes and feelings can affect basic health. Patients coming to their Cancer Counseling and Research Center in Dallas, in fact, have a recovery rate twice the national average.

To mobilize your body's immune system in this way, first find an appropriate symbol for the offending illness or disease and place it near your bed. If you suffer from migraine headaches, for instance, you might imagine the symptoms in the form of a twisted, overgrown weed. You could then envision digging up such a weed in a nearby lot or park. Before you induce a high lucid dream, just write, "I will now overcome my headaches in my dreams" on a sheet of paper, and focus on that idea as you enter and sustain the state of alert relaxation. Once you find yourself in a high lucid dream, seek out the weed and somehow destroy it. You might, for instance, kill it with poison gas, blow it up with dynamite, or chop it to pieces with an ax.

Alternatively, you might simply use this advanced method to try to boost your immunity to disease. For instance, envision your immune cells as tiny seeds. In your high lucid dream, you can generate imagery in which these seeds grow into lush, healthy plants.

Whether you invoke the image of a dream healer or use straightforward guided imagery to boost your health, we caution you to evaluate the input of your dream healer in the light of common sense. Under no circumstance should you ever use this exercise to replace conventional medical or psychiatric treatment. Dream healing may, however, help you respond positively to such treatment, thereby providing an additional line of psychological defense against disease.

Please don't worry if you do not meet your dream healer the first time you practice this exercise. Any dream you do have will probably provide you with insights drawn from your own unconscious into the way you've been approaching your physical health.

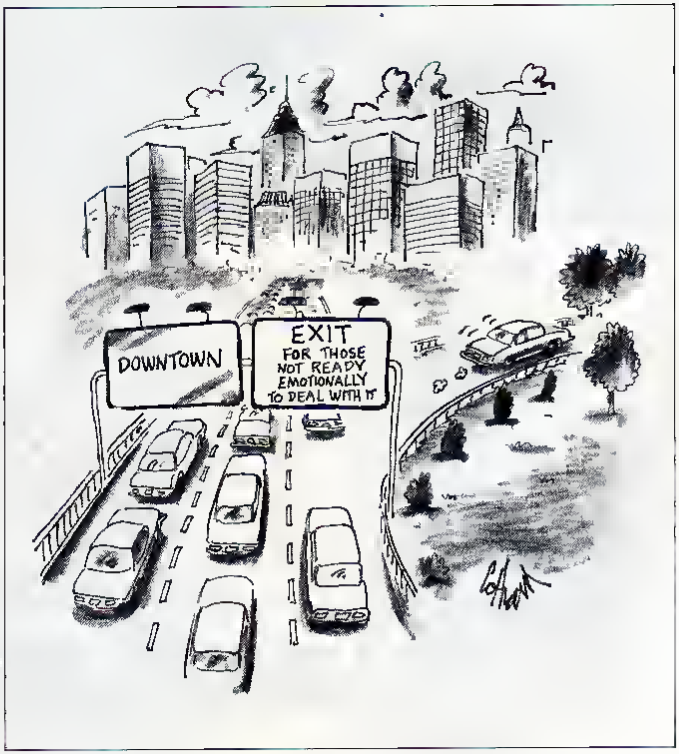
DAYS NINE AND TEN: TOWARD HIGHER CONSCIOUSNESS

Exploring the land of illusions, you will encounter reality beyond the phantasmagoric veil of the dream.

There is a moment upon just waking up from a dream when you experience a startling shift in perspective, in that moment, you realize that the life you were most recently leading—the life in your dream—was merely a product of your imagination. In this transition period, your return to the waking world often seems like the termination of an illusion. As you must realize by now, moreover, awakening from a high lucid dream can be just as startling. That's because the conscious realization that you are dreaming does not dilute the power of your dream identity at all.

In one of our all-time favorite dreams, the dreamer found himself in an amusement park, confronting a magnificent roller coaster with a sign that read, LIFE. The dreamer took a seat in the front car of the coaster and handed his ticket to the ride operator. "Ready to go?" the operator asked the dreamer. "You know it's a hell of an illusion!"

"I'm sure I can handle it," the dreamer said. "I've been on this ride before." With this, the roller coaster ride commenced. The scenario of the amusement park faded, and the dreamer found himself



being born as an infant in another reality. Before long, the dreamer saw himself growing up, going to school, graduating, developing a career, getting married, having a family, growing old, and eventually dying. All of this seemed to cover a life span of roughly 70 or 80 years. As the dreamer finally felt his life fading away, he heard the sounds of the roller coaster slowing down in the background. In a moment, he found himself back in the amusement park, looking up at the ride operator from his seat in the roller coaster's front car.

"Well," the operator asked him, "how was it? Learn anything?"

"That was pretty incredible," the dreamer said, suddenly aware that he was experiencing this alternate reality in a dream. Now thoroughly lucid and hoping to take the dream further still, he handed the operator another ticket. "This time," he said, "I'd like to be someone else." The roller coaster started again, and the dreamer immediately woke up. Needless to say, upon awakening from this dream, the dreamer could not help but wonder whether he was returning to an absolutely tangible reality or was merely experiencing yet another graphic, convincing illusion.

The dreamer came away from this dream somehow changed. The moment of awakening jogged something in his mind so that he experienced a sense of expanded consciousness. The illusory nature of his dream helped him understand something profound about the illusory nature of his own waking life. Moreover, the dreamer felt more comfortable with the concept of death. Indeed, he viewed it more than ever as part of the larger, cosmic scheme of things—something he could, in effect, transcend. Perhaps most important, he recognized in his dream identity a deep and long-hidden part of his inner self.

Indeed, high lucid dreamers who spend a great deal of time merely manipulating their dreams may eventually lose sight of their greater potential: to consciously explore the unconscious, thus getting a better grasp of what they want in life and who they are.

On days nine and ten you will embark upon a journey toward higher consciousness. Your goal will be to explore the shift in perspective you undergo as you wake up, turning from an imaginary character in dreamland to your everyday self. By doing so, you can literally carry the lessons of your dreams into your everyday life, becoming a more fulfilled and self-aware version of the person you truly are. In the process, you may also gain insights into philosophical dilemmas ranging from the nature of reality to the meaning of death to the concept of God.

You can start on day nine by choosing a 30-minute period during some quiet part of the day, spend the time considering the things that make you uniquely

you. Do you wear big floppy hats? Blue mascara and aquamarine contact lenses? A giant fur coat you bought from the Salvation Army in 1966? Do you make love at midday in the office rest room or have a penchant for mayonnaise on your salami sandwich for lunch? Do you give ten-dollar bills to the homeless or hang posters of John Travolta on your wall? Whatever your quirks, whatever your specialties, review them now. When the period has ended, drop this line of thought and go about the rest of your day.

Just before you go to bed, write these words on a piece of paper: "Let my deepest self find expression in my dreams." Then turn off the light, enter a state of alert relaxation and induce a high lucid dream. Whenever you recognize that you are dreaming, pay particular attention to the way you feel toward the identity you have assumed within the dream. Ask yourself, *Who do I seem to be now?* and notice the way your sense of yourself subtly shifts when you focus on this question. Instead of attempting to change elements in your dream just for fun, allow your dream personality to explore the rich and varied environment your subconscious has seen fit to create. See that dirt road down there? Instead of changing it to a superhighway, just follow it. If, along the way, you see a mountain range, climb or fly over it to see what lies beyond. And if you pass a house by the side of the road, take this opportunity to go inside. If the house harbors a witch, listen to her incantation—and if you can, tell her the details of your life as an entity in a dream.

Remember, dream control is best approached only as an aid to greater discovery. One particularly effective—and very advanced—way to accomplish this is not to deliberately change a particular dream prop, scene, or character but to call upon your dreams to alter themselves. In this way their symbolic meaning may become especially clear.

You might, for example, turn toward the image of Godzilla chasing you through the dream ruins of Tokyo and ask, in any way that seems appropriate, *Who or what are you, and where the hell am I?* As you express this thought, your dream images might actually weave themselves into a form that makes their meaning clear. Does Godzilla ravaging Tokyo turn into an image of your mother kicking over your blocks in your room when you were three? Or does the famous Japanese monster turn into a fleet of shiny new Toyotas devastating your Chevy dealership? As your dream symbols become increasingly clear, you will realize they represent yourself, your job, and your family, as well as death and reality and God.

As you navigate the dream terrain, remind yourself that you are in the midst of your own self-induced illusion and that a much broader reality exists beyond the veil of the dream. Do not be concerned if turning your attention toward such thoughts has the effect of terminating a particular high lucid dream, since the next part of this exercise is meant to be practiced immediately upon awakening from such an experience.

In the moment that you notice yourself returning to normal waking consciousness, repeat the question that you asked yourself in the dream: *Who do I seem to be now?* Remember the way you felt about yourself in your most recent dream and compare that experience with your sense of yourself in this moment. Look around at the everyday world and ask yourself if there may be a broader reality—in whatever way you wish to define this concept for yourself—beyond the limits of your ordinary perceptions. Is this other reality a deeper, more vibrant realm that you simply cannot perceive from the waking state, just as you cannot perceive waking reality while in a dream?

Continue asking yourself these questions from time to time throughout day ten: *Who exactly do I seem to be now? Is there a broader reality beyond my everyday perceptions?* Also think about the dream exploration you conducted the night before, focus especially on the precise moment of transition between sleep and wakefulness.

You will bring this exercise to its conclusion on day ten, when, if you are fortunate, you will attain a sense of transcendence and a deeper understanding of the waking world. Before you go to bed, consider what the experience of transcendence might include for you: a sense of connectedness with something greater than your individual identity; a feeling of timelessness that blurs the distinction between past, present, and future; a feeling of profound meaningfulness in which you experience insights into the nature of reality and existence; a sense of religious reverie; or simply a sense of objectivity toward mundane concerns. Also remember the last time you felt such feelings in a deep and profound way.

Then, right before you go to sleep, draw a picture—any related picture that comes to mind—on a sheet of paper. Finally, focus on that drawing as you induce a high lucid dream. Then remember to seek those special feelings of transcendence as you explore the rich dream terrain. In this way you can call upon the wisdom of your inner self to provide you with a transcendent waking dream. Remember, the moment you wake up, note how your sense of reality shifts. In that moment, also consider the universe that might be beckoning from beyond the limits of your senses—if the veil of ordinary reality could only be swept away. ☐☐

SPACE

CONTINUED FROM PAGE 30

direct route to space and would bring space travel up to the twenty-first century," he says.

The $5 trillion cost of getting the train off the drawing board would be 20 times the total expenditure ($250 billion) for U.S. space programs over the last three decades. Moreover, its construction could take as long as 15 years—unless there is a breakthrough in tunneling technology. (The Panama Canal, by comparison, took only about a decade to build.) The 620-mile space train tunnel would be the largest tunneling venture in the world. (The New York subway system totals only 450 miles, and the superconducting super collider will be 53 miles.) "The space train would be a megaproject," acknowledges Diamandis. "It would be the largest construction effort ever undertaken by man." As such it would require international cooperation and financing. Once this enormous initial investment was made easier access to space could lead to such advances as increased scientific research, asteroid mining, zero-g manufacturing, and lunar and Martian colonization, he argues. In addition, the spinoffs from the space train project would benefit more earthly endeavors, such as the development of superfast trains, cheap solar cells, advances in the storage of electricity, and superconductor research.

Although the political and financial issues posed by the space train project are complex and staggering, they must be faced if mankind is to move into space. "On balance, it's very unlikely that the space train will be used on Earth during our generation—or the foreseeable future," says David Webb, resident scholar at the Florida Space Research Commission and a former member of President Reagan's National Commission on Space. "But Da Vinci was talking about the helicopter five hundred years ago, and people thought he was crazy. It turns out he wasn't. He was just way ahead of his time."

Now is the time to consider such futuristic—if not far-fetched—ideas as the space train. Although Da Vinci's flawed designs would never have worked, his visionary foresight paved the way for successful helicopter pioneers. "It will be a while before one of these space trains is built, maybe longer than I will live," acknowledges the seventy-eight-year-old Marks. So he, like Da Vinci, probably won't see any practical—or financial—return from his fantasy of flight. But that's all right. "I did this thing for the fun of it," he says.

For some who ponder the future of spacefaring, Marks's whimsical sense of fun also has a serious, important side. "We need to think about projects like the space train," says Webb. "We must develop new, cheaper [per pound] ways to get to space, or else we're not going." ☐☐

THE LONE RANGER

EARTH

By Douglas Starr

The complaints were nuisances at first, grew serious. On a tip that Franco Tassi was harboring drug smugglers, the police broke into his home and searched the place. Rumors spread that Tassi was sheltering members of the Red Brigades, an Italian terrorist group. Reports surfaced that he was dropping sacks of vipers from helicopters. Some of Tassi's employees had their tires slashed. Three hoods roughed up Tassi's son. "This has really been an adventure," sighs the middle-aged, soft-spoken Italian. He's referring to managing a national park in the Abruzzo region of Italy.

Tassi's job involves more than guiding tourists and counting bears. Parks in Italy are as threatened as some of the species they protect. When Tassi took his job in 1969, Abruzzo National Park was being divided up by developers and politicians. A ski area grew, poaching became rampant, and hundreds of new condos marred the fragile alpine valleys. Now, after 20 years of solitary struggle, Tassi seems to have curbed the development and restored the rare ecosystem. In doing so he has become a hero to his nation's environmentalists and a symbol of change. For decades, Italians built their economy at the expense of the environment, gaining a reputation as despoilers of natural resources. But the nation has begun to change. Pollution control has become more common, and in 1986 more than a dozen members of the environmental Green party won parliamentary seats—the first time they had run. Last year the country voted no on a nuclear power referendum.

"There's been a change in attitude about environmental problems," says Francesco Mezzatesta, president of the Italian Bird Protection League. "There's been a great maturation of the country as a whole."

Staffan de Mistura, secretary-general of the World Wildlife Fund in Italy, praises Tassi for his work. "He represents that great silent group of people in our country who dedicate their lives to saving the environment," De Mistura says.

Tassi's passion for the park began when he first visited it in 1957. A shy, studious young man, he had always been interested in nature. The trip was a high school graduation present from his mother. (His father had died fighting during World War II.) He toured the area, some 70 miles east of Rome, marveling at the 6,000-foot peaks and the ancient beech forests. Like other visitors, he loved Abruzzo's animals—the chamois, wolf, and brown bear—which, elsewhere, had disappeared.

Tassi went on to become a distinguished attorney, learn five languages, and move to Brussels as one of Italy's representatives to the European Economic Community. When he returned to see the park in the late Sixties, he got one of the rudest shocks of his life. In what had been a virgin valley stood a cluster of six-story hotels. Forests had been stripped of their largest, grandest members. Italy's economic boom had brought with it unparalleled pressure to develop the wilderness, and management had caved in. The park superintendent had been fired and not replaced. Politicians, industrialists, and other nouveau riche city dwellers had moved in to fill the vacuum, building hundreds of prefabricated concrete condos. Public utility companies had even built roads and water lines. The park, it seemed, was up for grabs.

When the government finally decided to hire a new park manager, Tassi applied and got the job—partly because he was so distinguished and partly because his employers didn't realize what he would do. Soon after, Tassi says, he received his first phone threat. "Renounce!" said the voice. "Renounce the position or get a bullet in your forehead."

At the park he found things in worse shape than he had anticipated. Years of park records had been lost, speci

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Italian stallions: Park officials at Abruzzo Altipiana Delle Rocche don't horse around

BEST FRIENDS

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"Take these," said Brandenberg.

Montgomery looked at him oddly. "Excuse me?"

"I said take 'em.' Brandenberg held out his hand. "They're yours, buddy."

"I don't get it."

"Answer a question," said Brandenberg. "Do you regret anything you've done for this company?"

"No," said Montgomery without a moment of hesitation.

"I'm sick and tired of these goddamn corporate games," said Brandenberg. "Take the chips. Add a fair finder's fee to my severance check. I'm happy." He smiled tiredly.

Montgomery looked like a man who held a winning lottery ticket yet kept scrutinizing the numbers in case they'd magically changed. He slowly picked the cases from the other's hand. "I can just slot these in the cranial unit?"

Brandenberg nodded. "They're engineered perfectly to specs."

Montgomery reverently put the chip cases down on the lab counter. He extended his other hand. "Thanks, David. I mean it. Really."

Brandenberg took the proffered hand briefly. "Got to go now, Caleb." He glanced at Montgomery's modular monstrosity. The body parts were covered with a temporary fur analog that looked vaguely like green indoor–outdoor carpet. Brandenberg noticed that the dog had a huge penis. He didn't recall that magnitude of genitalia being in the original specs. "Finish building Rex in peace." He didn't look back but knew Montgomery was watching him all the way to the door.

As the elevator doors closed, Brandenberg dug deep in his pocket and peeled loose the masking tape tag with his thumbnail. He pulled it out and glanced at it briefly before rolling the tape into a tiny ball and flicking it into the metal ashtray beneath the button panel.

Brandenberg leaned against the wall, feeling the vibration of the ascending elevator car. He knew it was impossible, but he thought he heard the racket of frenzied barking, clashing jaws, screams. He smiled, and not pleasantly.

The label on the third mod dogware chip case had read PIT BULL.

LUCKY
By Tom Dworetzky

So one day this cat starts coming around the bar. Actually the beast is a local low-g breed with feline moves and looks like a furry twenty-pound, orange-and-violet lizard, but everyone in the Out calls them cats anyway. The bartender takes it in, and for a while it's the best thing to ever happen to the place. Cute as a button. Everyone pats it on the bald green flat top of its head and fools with it, gets it to chase balls and snap at bits of string with its black, red-tipped claws. It keeps out the low-g mice. Eats scraps. But it's kinda frisky and soon becomes a tough and wily veteran of a hundred nasty battings by drunken one-time benefactors. The scene turns mean, and the men take to fire extinguishers and soda nozzles to shoo it away from their grub and booze.

Stink is down on his luck, doing odd jobs in a low-life place called NOLA. That's the dome north of Luna Alpha on a moon in the planet system Campbell Bravo. He's patching zero-g car hulls with Rutin compounds and Kyocera Ceramics that set up like dome glass—rayproof and ultrastrong. Even worse, he just lost the dancer he'd been pursuing for a month with all his heart—and all his dough.

It's a bone-tired day late in a two-year winter cycle. Never enough solar, so the filthy recirced air stinks. He puts on the mask and goes out and finds a malodorous saloon where everyone stays covered and just sucks up their Elysium through straws slipped under a corner of the mouthpiece. Sealed envirodomes can turn into little air-conditioned nightmares—and they said living in space was the *big* solution. No real earths anymore, atmospheres all burned out. Now *habitable* means domed.

This is a typical colony: sprawling conduits buried under dirt to shield for rays. Caves cut into solid rock and pumped up to one atmosphere with recirc. Everyone stinking and smoking and carrying on. Sinuses stuff up really badly after living in space for a couple years. While this nasal nuisance afflicted all those with humanoid noses, for most it was a case of taking the good with the bad of dome life. But Stink elevates this inconvenience to lofty philosophical heights. "Nothing natural to smell anymore," he'd tell anyone who would listen, "now that we live our lives in a can." Such rumination on the human condition ultimately earned Stink his nickname.

Of late, Stink has been on a full-time drunk in the rough town. To supplement his income—and pay his substantial bar tab—he has taken to mopping up at the saloon. One night he is there taking shit from everyone. They piss him off enough so finally he yells at them, "Sons-a-bitch-just get fucked," and means it.

This makes them turn their bored maliciousness on the cat. After it has taken a couple of solid shots from the extinguisher and is looking the worse for it, Stink grabs the animal and takes it to the back and gives it some rotgut to lap in a dish, and it gurgles. Big Hero, they all call him, and have a laugh.

That s one you assholes ' he yells back at them

After a while he s done his chores and earned some drink for it and sits complaining to himself about the Elysium still can t get the right flavor from hydroponics He s wishing the boss would give him the good stuff when he takes another sip and wham it is the good stuff Bartender must be drunk

So he thanks the bartender for the imported and the guy laughs and says no way he d give that to him and tries to snag back the rest But Stink has judiciously already drunk it all except a slug left in his glass which he instantly downs—and then smugly smiles and licks the alcoholic residue from his lips The bartender tries to charge him for the difference but Stink says "No way You gave it and I earned it anyway and a deal is a deal Drop dead"

"And you gave it to that damned cat to boot" the bartender yells at Stink "That s the first and last time for the pair of you Do it again and I ll beat you both to shit"

Stink yells back "That s the last time for you too"

Stink s relations with the bartender deteriorate seriously after that to where the man figures to even things with Stink by taking a piece of his hide

It starts okay Stink weaves and slips the guy s jab but the first time it connects Stink is stunned and numbness creeps into his arms The bartender moves to clobber him for good and as Stink starts drifting off he visualizes glass breaking as the good stuff crashes off the top shelf The cat soars up like it knows what he s dreaming, hits the top shelf on the fly and carefully taps one of the two remaining magnums of the good stuff with a pat of its paw The cat perches like an Egyptian statuary and watches the crash The sound makes the bartender wince with genuine pain A bottle of the good stuff this far in the Out is worth about the same as a slightly used zero car The cat scats out the bar and into the night

Next day there s a showdown with the bartender and the cat Stink too It involves the last bottle of good stuff Stink is mopping up when he starts to fixate on the bottle on the top shelf of the ornate chrome-and-glass backbar A crisp cone of light from the pinpoint halogens encircles it reverently In comes the cat In comes the bartender

It s as if the cat has decided to duel it out which is okay with the bartender

"Back again?" says the bartender taking a broom and going for the cat The cat makes a graceful leap to the shelf with the remaining magnum But the bartender figures that and gets hold of the cat by the violet hair on its back and they tussle for a second and it looks like the big nothing for the cat—as the man is about to smash its back against the solid chrome edge of the counter—when the beast sinks claw deep into his forearm Then just as the cat is about to be sent halfway to oblivion with a broken neck, the bartender drops dead of what the robocops say later must have been an unlucky fluke in the ticker

Anyway now it s either kill the thing or someone take it No one says anything "Either one of you take it or it s the big sleep" says the robocop No strays allowed animal or human Sure says Stink He could use the company

It first happens for sure playing cards in the saloon Cat is prowling around on a shelf that runs the corner of the room and looks down on the table Stink feels desperate and needy "Be lucky for me cat" he says for a laugh which it gets Then they turn to the game Everyone is betting pretty hard The new bartender let him bring the cat back to the bar after

"From time to time, if Stink looks at one of the players and tries to figure his hole cards, he gets one of those cat hunches and it seems to be right Cat, don't fail me now"

a while because it has calmed down and follows Stink just like a well-trained dog The cat even heels when Stink walks down the street and stops more or less on cue

At the card game, though Stink gets suspicious that something is up The cat wanders around the table From time to time if Stink looks at one of the players and tries to figure his hole cards he gets one of those cat hunches and it seems to be right He looks at the cat which is looking over the shoulders of the other three players at the table Cat don t fail me now It is a big hand He has the hunches then and figures the three other hands If the hunches are right the other hands are weaker than his three aces and pair of eights So he carefully lets them push him shakily to the limit till his final call leaves him with precisely one 5 chip The price of a burger and two Elysium beers

The play is just what he and the cat figure *Take it* he thinks to himself as he rakes in a pot big enough to pay his nut for a month He quits mopping the bar

After that he calls the cat Lucky

He pretty much follows the cat hunches eventually doing Lucky s bidding without hardly thinking His life just keeps getting better

"What s the point of arguing with you?" he tells the cat one night over a meal of liver and onions He scratches Lucky affectionately behind the ear and the cat leans into his fingers and purrs

"What s the point?" he says again "You re always right Naturally, he does not tell another soul any of this

The cat is frisky on the big wedding day Running around like all get-out as is Stink himself who is busy trying to get into the black satin bodywear and cone hat to make the ceremony on time His beloved dancer is walking briskly back and forth from closet to mirror to bureau and back to mirror Snapping earrings on and off and going "That s wrong and "At last" and such

"That cat is getting underfoot an awful lot Stinker dearest must you always take him everywhere?

"Don t say anything bad about him okay?" says Stink nervously going to quiet her "He s my lucky cat He s my pet Friend for life Couldn t possibly ever just toss him out

"Well sometimes I wish you would"

Lucky across the room stops dead in his tracks He whips around sfares at her and shoots a low hiss and then scats to the corner

"You can be such a stinker Stinker" she says softly coming up and giving him a sweet-smelling hug around the neck "But someday I'm afraid it might just be either we get rid of that cat or"

"Don t!" cries Stink "Don t ever even *think* bad things about Lucky Promise me!" He takes her in his arms with such passion that she stops speaking abruptly He squeezes and hugs her desperately nearly knocking her head over heels

"Alright alright" she says laughing and kissing him back "No more or I'll look a total mess ' He stares at her "Promise?" he whispers

"I do Okay? Right there with all our other vows today I promise I will never be mean to it again '

Stink hugs her again Then he looks at Lucky who hisses and gurgles melodically and beams him with a Lucky stare

FADED ROSES

By Karen Joy Fowler

Thirty-two sixth graders from Holmes Elementary lined the rails that protected the glass of the Gorilla Room from fingerprints Two of them were eating their lunches Sixteen had removed some item from their lunch bags and were throwing them instead of eating them their teacher paid no attention Five were whispering about a sixth who fiddled with the locked knob on the work

room as it she didn t hear Five were discussing the fabulous Michael K s eighty-two point game last night and three were looking at the gorillas An ders approached one of these three It was part of his job He was better at the other parts

We have a mixture of lowland and mountain gorillas, he told the boy in the baseball cap The boy did not respond That suited Anders fine I know which is which he continued 'because they're my gorillas Now some experts argue the noses are different or the mountain gorilla s hair is longer but I've studied the matter and never seen that

There were thirteen gorillas inside the exhibit Five sat on rocks at the back One baby played with a tire swing batting it with her feet and turning an occasional somersault through the center One stared in contemplative concentration at nothing Four alternated through a variety of grooming arrangements One nibbled on the peeled end of a stick One surveyed all the others It was a dignified scene *Sullen Reserved Moody Shy* These were some of the words commonly applied over the years to gorillas They had none of the joie de vivre of chimps Gorillas were not clowns It took a dignified reserved person to appreciate them Perhaps it took a little loneliness And Anders had that

The boy pointed over the rail 'That one looks really mean Anders did not have to follow the finger to know which gorilla the boy meant

A lowland gorilla Gargantua the Great Paul du Chaillu was probably the first white man to see gorillas An ders told the boy He tracked them and shot them and came back to France and told stories about their ferocity Made him look brave Made his books sell Barnum did the same thing with his circus gorillas He knew people would pay more to be scared than to be moved Beyond the glass Gargantua swiveled his huge head The teeth were permanently exposed but the eyes directed obliquely left said something else Anders was proud of those eyes

That gorilla there well an angry sailor poured nitric acid on him The sailor d lost his job and wanted to get even with the importer The acid damaged the muscles on the gorilla s face so he always looks like he's snarling It s the only expression he can make

A storm of peanut shells hit the glass Anders identified the culprit and took him by the arm Anders did not raise his voice I was telling a story about the big gorilla in the corner he said to the second boy This will interest you He was raised by Mrs Lintz an Englishwoman and he lived in her house in Brooklyn until he got too big He may look fierce but he was always terrified of thunder One night there was a thunderstorm Mrs Lintz woke up to find a four-hundred-pound gorilla huddled on the foot of her bed sobbing

There were perhaps six children paying attention to Anders now Somewhere an elephant trumpeted "They don t look at us one boy complained and a girl in a plaid shirt asked if they had names

Actually we have three gorillas who were raised as pets by Englishwomen ' Anders said John Daniel And Toto too the fat one there looking for fleas And Gargantua whose real name is Buddy Gorillas don't look at anyone directly and they don t like to be stared at themselves Very unsuited to zoo life The first gorillas brought to this country died within weeks The gorillas who lived in private homes with mothers instead of keepers did better '

Toto yawned Her eyes closed as her mouth opened She smacked her lips when the yawn was over She was the newest of the gorillas Anders had added her last year It was harder to love Toto but Anders did Anders had learned everything he could about his gorillas and he knew that Toto was used to being loved Spoiled and prone to five-hundred-pound tantrums Toto had terrorized her way out of her first home When her mother a Mrs Hoyt saw that she could no longer control Toto Toto was sold to a zoo but Mrs Hoyt came along also 'Toto was bought as a bride for Buddy' Anders said She was raised in Cuba, where she had her own pet A cat

Anders had ten children listening now Did any of them have cats? Anders doubted it And there were other indulgences When Toto came to the U S she brought along a trousseau Sweaters dresses and socks Anders said all with the name *Totito* in embroidery The papers loved it *The future Mrs Gargantua* But Toto threw her bed at Buddy when they first met and her attitude never softened

The prospective mother-in-law had done much to sabotage the union "She's only a nine-year old child Mrs Hoyt had said "What do you expect?'

John Daniel moved along the back of the exhibit His steps were slow and fluid muscles rippled on his back He was Anders's favorite 'John Daniel was purchased from Harrod's by Major Rupert Penny of the Royal Air Force as a present for his aunt John Daniel had a variety of ailments including rickets but the aunt a Mrs Cunningham fixed that She raised him as she would have raised a small boy A certain amount of indulgence A certain amount of no nonsense He ate at the table with them and was expected to get his own glass of water and to clear his own dishes He was taught to use the toilet and, since

he cried when he slept alone was given a room next to the major's. Mrs. Cunningham consulted no experts but used her own judgment in devising his diet, which included fruit, vegetables and raw hamburger. And roses. He loved to eat roses, but only if they were fresh. He wouldn't eat a faded rose.

When he became too big to keep, Mrs. Cunningham sold him to a private park she believed would be ideal. Tragically, he ended up in the circus instead. Anders had lost his own indulgent mother at the age of eight. He thought he had some insight into John Daniel. He knew what it was like to suddenly, inexplicably, exchange one home for another far less happy one. John Daniel's expression was intelligent but bewildered and bereaved.

Too subtle for sixth graders. Anders was down to an audience of four. "So interesting," the teacher said brightly, although Anders did not think he had been listening. Probably he had been there with a different class last year and perhaps the year before that. Probably he had heard it before. Probably he had never listened. "Can you all thank Mr. Anders for showing us his gorillas?" the teacher suggested, and then, without pausing for thanks, "We won't see the giraffes if we don't press on."

No one else was scheduled until three. Anders opened the workroom to get his own lunch and a book. He was studying Koko now, a gorilla raised by a Stanford graduate student and taught to sign. He planned to eat inside with his gorillas, but Miss Elliot arrived instead. "Have lunch with me," she said. "I made cookies. It's a beautiful day."

Miss Elliot often came at lunchtime. She had no real interest in Anders, or so Anders thought. Her own upbringing as the baby of a large, loving family had left her with a certain amount of affection to spare. She regarded Anders as a project. No healthy young man could be allowed to molder among the exhibits. Get him out. Give him a bit of medicinal companionship. Miss Elliot wore a uniform with an elephant on the sleeve and below that the black circle. Miss Elliot showed the elephants, but they weren't her elephants and Anders doubted she even understood the distinction.

If he refused her offer, he would face her brand of implacable, perky determination. He found it unendurable. So he nodded instead and put the book back beside his tools and his sketches. He joined her at the exit, opening the door.

Miss Elliot shook her head. "You always forget," she said. Her tone was indulgent but firm. She reached back past him, brushing across the black circle on his sleeve, and threw the switch that turned the gorillas off. They ate lunch on the grass outside the Hall of Extinction. The cookies were stale. The flowers were in bloom. ∞

TWILIGHT

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letic environment during lucid dreaming. A West German martial arts competitor who had studied karate, Tae Kwon Do and jujitsu decided to also learn aikido, a discipline quite unlike the others. After studying for two years, however, he couldn't master this new art, largely because his previously learned movements refused to give way to the "softer" ones employed in aikido.

One night, after still not succeeding in wearing down the attacker and taking him to the mat, I went to bed somewhat disheartened," the martial artist recalls. "The situation ran through my mind time and again. While defending myself, the correct balancing movement collided with my impulse to execute a hard defensive block, so that I repeatedly ended up unprotected and standing there like a question mark, a ridiculous and unworthy situation for the wearer of a black belt. During a dream that night, I fell down hard one time instead of rolling away. I had made up my mind to ask myself the critical question in this situation: Am I awake or am I dreaming? I was lucid. Without thinking very long about it, I began an unsupervised training session on defense techniques with my dream partner. Time and time again I went through the exercise in a loose and effortless way. It went better every time."

After practicing in his lucid dreams for a week, the West German once again began training. "I amazed my instructor with almost perfect defense," he recalls. "And even though we speeded up the tempo, I didn't make any serious mistakes. From then on, I learned quickly and, a year later, received my training license."

To enhance athletic performance through practice in the lucid dream, Tholey believes the dreamer must break through the ego's ordinary boundaries. A particularly successful example of this is an Olympic equestrian from South America whom Tholey trained with lucid dreaming, helping him become "one with the horse." The rider achieved a state of perfect empathy with the animal, eventually perceiving the world through the eyes, ears and nostrils of the horse. The rider then transferred his dream experiences to his actual riding.

In his lucid dreaming training, Tholey incorporates many of the elements of mental imaging. First, while awake, you should, of course, practice your sport. It's safe to say that no amount of lucid dreaming alone will improve your game if you never practice at all.

Second, watch expert athletes practice. If you play tennis, for example, watch players like Martina Navratilova, Boris Becker or Steffi Graf closely, observing how they perform particular shots. Many videos are available that will allow you to

study a certain move or style of play. Form a mental model of perfect performance.

When you become lucid in a dream, replay your mental model. In this third step, as with waking practice, be sure to internalize the performance. You are the outstanding tennis player or downhill skier. Also be sure that your dream includes all the elements of performing the actual sport. If you're practicing Alpine skiing, paint the dream scene with trees, snow, wind, mountains.

Fourth—and this is the critical step, according to Tholey—let your ego and body boundaries dissolve into the setting. You are the skier: the skis, the snow, the trees, the mountains, the wind. 'Because I know I'm dreaming,' dream psychologist Gayle Delaney says about ice-skating in a lucid dream, "I can skate with wings on my blades. When I jump, I am weightless and I fly as I turn in the air. When I spin, my balance is perfect. I feel a happiness that is one of the most profound I have ever known, and I am at one with the world. I feel all the forces of the harmony of the universe in my skating, and the intensity of my joy knows no bounds." It is this creative ability to become part of each facet of the activity that enhances the performance potential of the dream and allows you to carry over the experience to waking performance.

Attempting certain movements while lucid may break through the physical boundary of sleep. When, for instance, "I made a large movement of my leg while dreaming and sleep recording in the laboratory, I was lying facedown," says Worsley. 'My legs were covered with a light quilt that was lying loose. Thus my lower legs were free to move by swinging upwards from the knee. In the dream which was lucid, I was deliberately kicking backwards with my right foot against a hard surface. Suddenly I woke and found that my right lower leg was in the air. The large movement was recorded on the polygraph and was followed in less than a second by characteristic signals indicating Worsley was waking up. "It seemed obvious to me that the kick in the dream had caused a large real movement of my physical leg.

Both the sleep environment and the intent of the dreamer may influence the outcome of such movements. On the surface, research subject Bob Tucker's lucid dream involving karate seems similar to Worsley's but with a different outcome. "I was riding my bike to high school when I saw a suitcase," Tucker says. "Curious, I opened it and found some large bills wrapped in paper. I was deciding if it was right or wrong to steal it. I looked around and didn't see anyone. So I started getting the large bills and some other items from the suitcase. Then I saw a large Indian who also wanted the money. He came at me. I ducked and executed a perfect side snap kick. The Indian took off his shirt, revealing a muscular body. Angry, he ran at me. I had perfect timing again and perfectly executed an elevated front snap kick. He was laying on the ground and furious. He came at me again with a wide right hook, which I blocked with my right arm and then drove a punch into his solar plexus. He loudly said some slang words and finally left. I could not believe I fought so well. In other dreams my technique had been good but slow. In this one, however, all the moves were premeditated and executed perfectly. I felt as if I were merely playing with this angry man.

Although Tucker and Worsley both knew they were dreaming, Tucker was totally absorbed in his dream world, whereas Worsley was not. Also, Worsley was in a sleep lab, where it may take more effort and absorption to preserve sleep. And as other research has discovered, the more absorbed the sleeper is, the more vivid the imagery, the more likely one will be able to successfully apply the dreamed action when awake.

Being at one with the world around you, whether in a dream or in what we perceive to be the real world, is crucial for achieving excellence in sports. It is what the archer experiences in *Zen and the*

Art of Archery. The Zen archer becomes so at one with the task, his lived world that he can shoot bull's-eyes while blindfolded. Similar examples can be found among many athletes and artists. Tholey, for example, tells of a European junior boxing champion who, after training in his lucid dreams, managed to go "into" his opponent. The boxer could predict his opponent's every move, in large part because the junior champion had practiced dissolving the boundaries between himself and his opponent.

"The sports equipment takes over the function of sensory and motor organs," Tholey explains. Experienced skiers, for example, feel the snow and the terrain with their skis, and, rather than deliberately moving their bodies, they move the skis.

This absorption resembles that found among meditators. Indeed, several researchers have identified a positive relationship between meditation and sports performance in at least three groups of athletes: Olympic rowers, collegiate runners, and standing broad jumpers. Improvement in their performances may be partly due to meditation, which has been shown to affect such physical factors as muscle tension, reaction time, blood flow, and heart rate. In addition, meditation researcher A. J. Deikman reports that ego boundaries become more fluid during meditation, a state frequently found in lucid dreams and sought by athletes.

Meditators' dreams are, in fact, more likely to be archetypal, vivid, bizarre, and recallable, a combination that may enhance creativity as well as self-awareness. Indeed, meditators and lucid dreamers score high on creativity measures. "As inner consciousness grows, dream experiences increase in number, clearness, coherency, accuracy. And after some growth of experience, we can come to understand them and their significance to our inner life," the Indian sage Sri Aurobindo stated. "We can, with training, become so conscious as to follow our own passage, usually veiled to our awareness and memory, through many realms and the process of return to the waking state. At a certain pitch of this inner wakefulness, this kind of sleep, a sleep of experience, can replace the ordinary subconscious slumber."

Creativity is, of course, at least partly a product of insight and the recognition of unexpected relationships. But a "sleep of experience" may serve to enhance our vision and help us reclaim what Michael Murphy and Steven Donovan refer to in their book *The Physical and Psychological Effects of Meditation* as "the full and external awareness that is our fundamental ground and source in all of our experience." ∞

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INTERVIEW

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everything you see is something you've seen before.

To attract attention in our culture we boost quantity of some kind—make it louder, brighter, flashier. But those things are what the nervous system is trying to normalize to, so it's self-defeating. No matter how loud you make it, there'll always be a rock band that's louder. Eventually you get used to it, if only because you go deaf. The main thing in science and art is to go the other way. This is a tiny leaf. You've seen millions of 'em. But if you go after the qualitative aspects of the leaf, there are literally thousands of dimensions before you even get into Zen Buddhism. I don't know whether this is good or not, but ever since age fourteen, I've always had at some level of consciousness the awareness that the air molecules are going one thousand miles an hour. The point to teach kids is that the universe is infinitely larger than our common sense would have it, and infinitely more interesting. The other point is that there's no such thing as a fact. Different points of view reveal different things. If I could get kids to understand those two ideas deep, deep inside themselves, I'd be extremely happy.

Omni: Do ideas about the brain architecture influence the way you design computers?

Kay: If we knew more about the brain, I'm sure we'd be appalled at how inefficient it is. Right now, we're awed at how much better it works than anything we can build. I'm glad people are working on neural networks again. Although they work best when there's some sort of modularity in them, the point behind a particular neural network is not to have any modularity. Everything's connected, and you start feeding inputs to it and reward it somehow. Eventually the thing gets good at recognizing faces, say. Later on you start feeding it sentences, meanwhile keeping it good at recognizing faces. You need lots of neurons because there's nothing remotely similar between a face and a sentence. So in a world with a grand design, you imagine the grand designer saying, 'Boy, neural nets are great, but would be better if I had one for face recognition and another for word recognition!' And that's partly true. There are different areas in the brain. But there's also lots of undifferentiated stuff there. Marvin Minsky [MIT artificial intelligence expert] and I often speculate that as much as ninety percent of the neurons are there for lateral inhibition [a form of feedback inhibition in all sensory and motor systems that refines sensory information].

Omni: What makes you think that?

Kay: Suppose you get one undifferentiated mass neural network to do both face and word recognition. Now compare it with two smaller neural networks performing separately, one for face and the other for word recognition. How big does the undifferentiated network have to be, compared with two smaller units? Not just double but ten or more times as big. Because a lot of the biases in there are simply trying to keep the two sets of information apart. You're giving it one bunch of things that we happen to call faces and another bunch we call words. It doesn't know. So it's as happy as a clam when you give it ten facelike things in a row. Then you give it a word and it thinks it's a face. All of a sudden the shit hits the fan. Things suffer for a while. If there are enough neurons though, it will eventually recover and hold both of these things. But many of the neurons are simply going to be there to keep the two things separated in a way that's without a plan.

Omni: If it doesn't have a plan, what does it have?

Kay: Architecture. Anything that's interesting works because it's got an architecture. Life is an architecture. Only a few people suspected that until the Watson–Crick model of the DNA molecule. People used to talk about "protoplasm" and wondered what it was.

The Artist

Omni: So intelligence is really architecture imposed upon the brain?

Kay: The evidence is overwhelming and as far as I'm concerned, conclusive. There's nothing mystical about neurons. They're just cells like any other old cells. So what we call mind or mentality or intelligence is something that arises out of an architecture. Gray Walter, who did some of the early robot turtles back in the Fifties, preferred the word *mentality* to *mind*. I agree with him because *-ity* words like *velocity* and *mentality* imply a process, a shift of coordinate systems. *Mind* is something you'd want to look for.

Omni: What does this process mean about the way we perceive the world?

Kay: In order to function, we have to close ourselves down to most of the information coming to us. We can't have the whole universe inside our heads, so we must have a kind of simplification. It's like theater. There you can have a thirty-five year-old balding guy holding a skull in front of some cardboard scenery pretending he's a teenager in anguish. And it works marvelously because it's just an extension of what our mind is doing all the time. We like to think we're living in reality, but we're living in a play that we're partly the author of, and the other author is our civilization. We live inside a hallucination of our own devising—one so fragile that eight hours in an isolation tank will cause us to start hallucinating other things.

Omni: What kinds of things has Tim Gallwey, the man who wrote *The Inner Game of Tennis*, been doing with you at the Open School?

Kay: Through a different route than Bruner, Tim came up with the multiple mentalities theory. Multiple mentalities, especially in adults, interfere with each other quite a bit. Our rational mentality that tries to control things actually isn't good at learning tennis, math, or music. A typical *Inner Game* strategy is to heighten awareness of what you're doing and, simultaneously, try to distract the analytic mentality. You give the analytic mentality *an* analytic task while you're trying to, say, hit the ball in the center of your racket. You try to estimate, on a scale of one to ten, how much vibration you're feeling on impact. Over the next twenty to thirty seconds, you'll start hitting the ball perfectly in the center of the racket because your analytic mentality is only thinking about *Is this an eight or a nine?* while the rest of you is stroking the ball. This basic concept of teaching something by removing interference is built into the Mac itself and applied in different ways.

Tim's job is to not let people get bored. He starts them off at a high place of awareness and has dozens of tricks to keep them there. Part of it's multiple perspectives. One way of learning to play tennis very fast is to have fifteen different ways of considering what the ball is. This is an Eastern approach. To our culture it's the same ball each time, whereas in Zen and Taoism it's a different ball every time.

Omni: Why do you keep working with children?

Kay: Kids can always go outside and play ball, so you get feedback on whether something is interesting. At the school we often see one child explaining to another by going to the computer and doing something dynamic on it. Computers offer kids a chance to do the same kinds of stuff adults do—and know it. The Industrial Revolution has been a tough place for kids because, well, they can't melt down steel.

Omni: When you were growing up, what were your favorite books?

Kay: Robert Heinlein sustained me through my teenage years.

Omni: The author of *Stranger in a Strange Land*?

Kay: That was his last good book. He went a bit batty in the Sixties and Seventies. I visited him in the early Sixties, and we had a conversation lasting thirteen hours. He must have had ten thousand to fifteen thousand books. As I was looking at them, he said, "I've got it fixed so I can answer about ninety-five percent of my questions out of this house." He wrote on an old Remington teletypewriter with continuous rolls of paper and typed about eighty feet a day. He said he could remember every semicolon in both books he was doing simultaneously.

Heinlein's juvenile books were the closest thing to my bible. All his books had a subtext about why the world is interesting. His underlying faith that knowledge is basically good sustained me during some bad times. He had a way of referring to things in his stories that usually meant they really existed somewhere. The first reading I ever did in perceptual psychology was because Heinlein wrote about using tachistoscopes [apparatus presenting brief exposures to visual stimuli] for speeding up your ability to see images. He'd coin a term called renshawing. I discovered that the guy who'd done the early work with tachistoscopes was a Samuel Renshaw. One of Heinlein's best stories was called "The Menace from Earth." People live on the moon, and these lunar city dwellers would go flying for recreation on their own wings. The subtext was about how these wings worked and what it was like to fly. You can talk to dozens of scientists who'll remember this story—because he was doing a superb design job that could actually work. The brand name for the wings was "Storer Gulls." So I looked up *Storer* and found a 1950 *Scientific American* article about how birds fly—by guess who? Robert Storer. ∞

EARTH

CONTINUED FROM PAGE 102

mens had been scattered, and the park museum had become a storehouse for old tools. "There were eight wardens, and they were in a state of total despair," Tassi says. "Even their uniforms were tattered."

It wasn't surprising, given the legal situation of Italy's national parks. Unlike the United States, where national parks are federally owned, in Italy the government controls virtually none of the country's wilderness.

When Abruzzo was established in 1922, almost all the land it encompassed was owned either privately or by the region's ancient towns. To create it, the founders set up an obscure web of regulations that limited what locals could do with the land. The only option left to park managers was to strike a compromise with the locals, who, in turn, equated the park's existence with outside interference.

Tassi set to work refurbishing the park buildings, hiring new employees and mending broken fences. He attended a park management training session in the United States, then remade the park in the American mode, with signs bordered in rough-hewn wood and a little nature museum, the first of its kind in Italy.

At the same time he set about putting the brakes on development. Finding a little-used legal clause that stipulated all building plans had to first be approved by the park manager, he vetoed one after another.

That's when the problems began. There were complaints to the local police about virtually everything Tassi did. If he fixed a wall, someone would file a complaint that he was impeding public access. If he had rubbish collected, a complaint would be filed that he was exceeding his authority. (Such legal harassment is easy in Italy because you can file complaints anonymously.) More than 300 complaints were filed against him. "During the first years, I spent maybe eighty percent of my time in court," Tassi says. "I had to do most of the park management at night."

Locals figured that Tassi was ruining their one chance at prosperity. Tassi tried to show otherwise—that while the rapacious development provided construction jobs, those jobs were short-lived. The owners of the buildings lived in Naples and Rome. They hired few locals and didn't patronize local businesses. The villagers got no profits, but they had to pay taxes for the new roads and water lines.

Tassi promoted a more subdued kind of development. To encourage people to continue working the land, he set up an incentive program for traditional farming. People could cultivate certain areas of parkland if they donated 20 percent of their crop for the animals. If wild animals raided their crops, the farmers would be forgiven the donation. He gave concessions to local young people, who set up guide businesses and small-scale campgrounds. Meanwhile, animal populations began to rebound, bolstered by antipoaching patrols and captive-breeding programs. Tassi encouraged local cooperation by setting up a working group within which the park and local towns made development plans together. The result: By the Eighties the park was attracting about 1 million visitors per year and directly and indirectly provided jobs for more than 250 people.

By American standards it would be considered a success. Yet old grudges die hard in this part of Italy, and some people thought they could profit by wresting control of the park. So it was in 1980 that the worst assault on Tassi's management took place. A massive series of abuse-of-office charges were filed by two local members of the Socialist party. "It was obvious what the strategy was," says Tassi. "Destroy the park by getting rid of its director."

Along with the charges came a slander campaign of full-page ads in local newspapers, listing hundreds of instances of alleged corruption. The new assault ignited those people who still opposed Tassi. Death threats sharply increased, and on one occasion a local man tried to assault him. When Tassi did get a hearing, the judge threw out virtually all the charges, giving the park manager just a $120 fine for a minor abuse: allegedly changing the locale of the park's headquarters. He fought that, too, and in May 1988 Tassi was completely exonerated. Meanwhile, he has won national and international acclaim for saving Abruzzo and, by example, Italy's four other national parks.

Yet the fight isn't over. Recently Tassi rejected plans for a new ski area proposed by an ex-local man who had been successful in the United States. Tassi is fighting a proposal for a dam just outside the park that would flood a valuable valley within.

Indeed, Tassi is so used to worrying that he barely acknowledges the credit people give him. "I cannot be happy with the Italian situation. Abruzzo is important to me, but I still worry about other areas that are being destroyed and hunted, and polluted."

Others with more perspective can better summarize Tassi's accomplishments. "He was the right man at the right place at the right time," says Giuseppe de Nunzio, a park ranger who has worked at Abruzzo for 35 years. "If it was not for Franco Tassi, this park would be nothing more than some lines on a map." ⊠

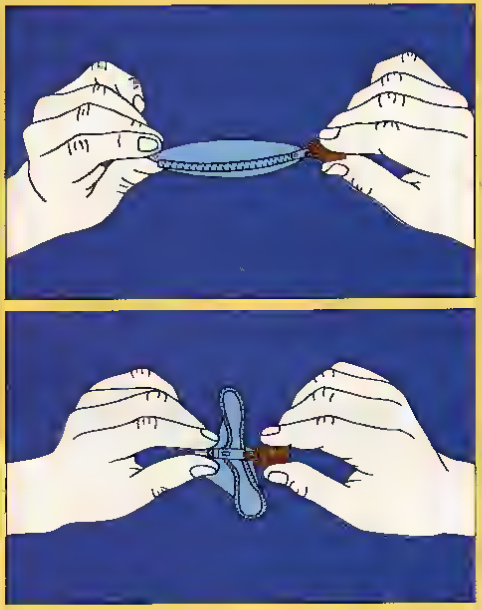
Without a trace. Break into security bags; break out a pencil for this month's quiz

GAMES

By Scot Morris

Last month I told how magician Michael Weber had come up with a technique for opening locked zipper bags like the one shown at right. He observed the method in a dream when he was just fourteen. A pair of fingers entered the bag between the ring attached to the side and the movable slide of the zipper and stretched the flexible leather case outward. The fingers continued pulling, with the padlock and the ring following the slide all the way back until the bag was open but still locked, as shown at right.

Weber incorporated the vision into his magic act but soon realized this trick could be used on other zippered bags. He revealed his secret because you can use the same principle to open many of the night deposit bags used by banks and other security-conscious institutions. The technique seems absurdly simple, yet to the best of my knowledge this is the first time it is being published. The Internal Revenue Service, upon learning Weber's secret, redesigned its transmittal bags to prevent intrusion. "I sent Weber a bag that I thought he couldn't open," said Larry Wright, public affairs officer for the IRS, "but he did. As a result, all of the new IRS bags were designed to prevent this method of entry. Some of our old bags we've been relying on for forty years are still in use, but I have alerted my bosses in Washington that *Omni* is publishing this story. I expect that by the time your article appears, all our transmittal bags will be changed."



As I explained last month, Weber successfully opened a new bank bag produced by a Pennsylvania company. I contacted company representatives to let them know it was possible to break into their bags. They weren't familiar with Weber's method but realized many banks had switched to new plastic bags which are glued shut. A woman in the company's personnel department then told me how to compromise these bags. Just spray Freon on the seal. The bag can be opened and the contents removed and read without destroying the seal. When the glue warms up to room temperature, the bag can be resealed without a trace of tampering.

BRAIN BENDERS

Here are ten problems to help open your mind. They're easier than they look. (Answers appear at the end of this column.)

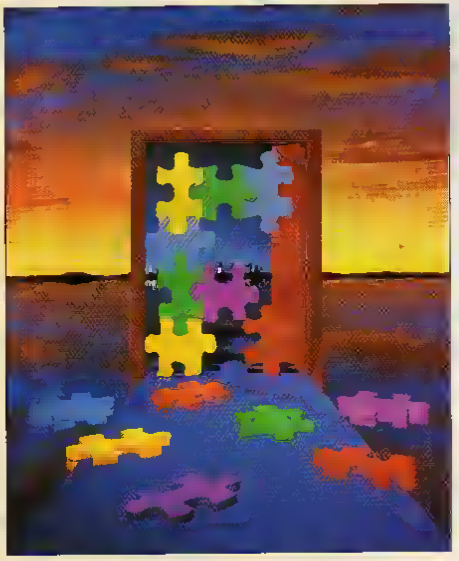
1. TOURNEY TOTALS. You're director for this year's Ping-Pong championships. Eight hundred forty-seven people enter. The tournament is decided by elimination. The winner of each match advances to the next round and the loser drops out. The pairings in the first round are made at random, so by chance some player will advance automatically to the second round. How many matches will you have to schedule to determine a champion? (Note: You should be able to solve this one in your head.)

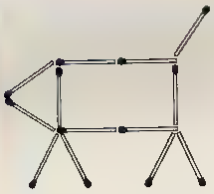
2. BOY GENIUS. Carl Friedrich Gauss (1777–1855), the German mathematician, was a child prodigy. He told the following story about himself. His elementary school teacher assigned this problem: Find the sum of all the whole numbers from 1 to 100. The teacher thought the chore would keep everyone busy writing out "1 + 2 + 3 + . . ." but Gauss solved the problem in seconds in his head. What is the answer, and how did he find it?

3. ALL EYES ON DECK. In a standard deck of cards the jack of hearts, the jack of spades, and the king of diamonds are displayed in profile showing only one eye. All the other faces show two eyes each. In a standard deck, not counting the jokers, how many eyes are there in total?

4. WASH DAY. In a remote village in New Guinea the men always wear loincloths, and they each put on a clean one every morning. Every Monday evening a laundry wagon arrives, picks up the dirty loincloths, and drops off the clean laundry from the previous week. What is the minimum number of loincloths a man can own in this village?

5. FIX IT. By making one line with your pen, turn this into a correct equation:

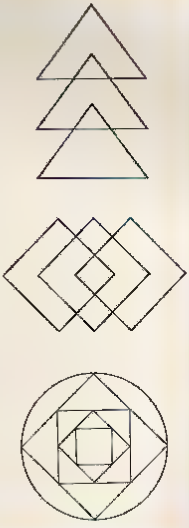




Shown above is a matchstick pig. By moving only two matches, (1) make the pig face the other way (the tail must remain upturned), and (2) show what the pig would look like if it were run over by a bus.

Without lifting your pen from the paper, draw each of the designs at right using only a single line.

Answers will appear in next month's issue.



(A line through the equal sign creates an inequality, but the answer I have in mind is neater.)
5+5+5 = 550

6. SWITCH IT. How can you correct the following equation without making a mark? XI + I = X

7. CROSSING LINES. Imagine three horizontal lines an inch apart and parallel in a vertical plane. Now imagine three vertical lines also an inch apart and in that same plane, cutting through the horizontal lines. How many squares have you formed? (Solve this without using a pencil and paper.)

8. So you think you know baseball? A player can legally reach first base seven ways without getting a hit. A walk is one. What are the other six?

9. Name two men who have been honored in the Baseball Hall of Fame but who never played professional baseball.

10. You do not see left handed players in which two sports?

ANSWERS

1. 846 matches. If you concentrate on finding the one winner in 847 players you may get hopelessly lost. If you try turning the problem on its head, however, and rephrase the question as, How many matches are needed to determine 846 losers? the answer becomes obvious.

2. 5,050. Gauss realized that he could add numbers in pairs from the low and high ends of the sequence to keep it simple. For example, add multiples of 100 like this: *1 + 99 = 100*, plus *2 + 98 = 200* plus *3 + 97 = 300*, and so on until you reach *49 + 51 = 4,900*. That leaves only the *50* in the middle and the *100* at the high end to add to the running total, bringing it to 5,050.

3. 42 eyes. If you answered 21, you forgot that each card has two faces.

4. 15. Every Monday a man must pick up and turn in seven loincloths, but he must also be wearing one when he comes to meet the laundry wagon.

5. 545 + 5 = 550

6. Turn the page upside down.

7. There are five squares in all. Many people forget to include the perimeter square which houses the four internal squares.

8. Batter hit by pitch, error by a fielder, catcher's interference, catcher drops third strike, fielder's choice, and the one most baseball fans don't get—being designated as a pinch runner.

9. Abbott and Costello.

10. Jai alai and polo, in which left-handed play is illegal because it is considered too dangerous. ∞

GAMES

At Chicago's Summer Consumer Electronics Show last June Nintendo raised an imposing 50,000-square-foot booth Its vast courtyard contained the latest in video game cartridges for the Nintendo Entertainment System (NES) In this kingdom of new products cartridge licensees presented so many upcoming games that an NES fan hardly knew which control pad to grip first

But lurking beyond this castle's walls competitors were prepared to storm NES territory with their Nintendo killers With better graphics and portability faster action and multiplayer challenge the latest iteration of home video game technology boasts the visual details of the arcade originals as well as complexities to rival the best computer games

Sega's Genesis system with the computing power of an Apple Macintosh has the most incredible graphics yet seen in a home game system With the first round of cartridges—*Altered Beast Space Harrier II,* and *Super Thunder Blade*—Genesis includes the aural stimulation of full-fidelity stereo sound

Priced at $190 Genesis also offers a pair of ingenious add-ons A Power Base Converter plugs into the 16-bit Genesis and makes the system compatible with all existing eight bit Sega Power Base games The TeleGenesis modem moreover connects two Genesis units over telephone lines allowing players to compete head to head In *Tommy Lasorda Baseball,* for example telelinked ball players take the field or go to bat for simultaneous two-player action Whether pitching or hitting each player is able to see the appropriate view on his video screen

Although Nintendo reportedly has a second-generation game machine ready the company delayed its release in favor of a new piece of game hardware The solution for Nintendoholics who can't bear to part with their systems the portable Game Boy unit integrates a small liquid crystal display screen and a Nintendo Power Pad controller in a single device that fits in your hand. Audio headphones blast stereo music and sound effects for your ears only The black and white graphics are no match for the color spectacle of Genesis or even the original NES But the take-out wonder includes amusing games like *Tetris Arkanoid,* and *Baseball* Included in the $90 package the Video Link cable allows two or more players to connect their Game Boys for multiplayer tournaments

But even in the portable game arena Nintendo's competition is charging forward Atari's larger and far more impressive Lynx boasts multiplayer capability stereo sound, unusually sophisticated graphics for a portable system and a miniature color video screen comparable to the displays on hand held color televisions

The detailed color graphics rapid animation and high quality sound of Lynx make it the first system that is able to capture the thrill and flash of home-based games in a portable format About the width of a steering wheel it's gripped in both hands Controllers on each side of the game make it suitable for both righties and lefties

Developed for Atari by Epyx Inc the first crop of Lynx game software includes adaptations of hit titles like *California Games* (included with purchase of Lynx) as well as a stunning point-of view 3-D flight simulator And like Game Boy, two or more Atari units can be cabled together for group competition —Bob Lindstrom

WEIRD DREAMS

If your own dreams aren't bizarre enough *Weird Dreams* might be your worst nightmare Available for most computers, *Weird Dreams* celebrates the subconscious mind and admits to the strange imaginings we all occasionally have but keep to ourselves says Gerry Blair executive director of Medalist International which is marketing the computer game under the MicroPlay label

As you enter the subconscious mind of a patient undergoing surgery you encounter giant wasps carnivorous rosebushes, a psychotic lawn mower a demonic soccer ball and other artifacts from a very sick mind Your success in confronting them directly affects the patient's health

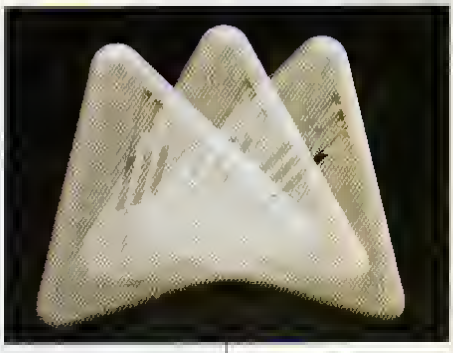
We figure that *Weird Dreams* is a sort of computerized inkblot test Blair says Anyone who claims to have figured it all out will probably need more psychiatric help than the game's designers

STAR TECH

ACCESSING THE FUTURE

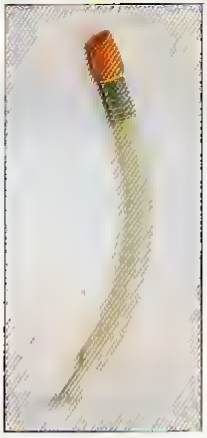
OILY TWIST

Citrikleen (left) is a biodegradable combination of natural solvents from citrus fruit. Can scour kitchen tile, bathroom fixtures, or the garage with no toxic waste. Price: $2.99. Contact: Product Concepts, West Conshohocken, PA; (215) 828-1826.



SHAKY START

Before the first tremor, QuakeAwake (above) blasts. Can warm up to 30 seconds before a quake. Price: $30. Contact: QuakeAwake, Century City, CA; (213) 659-5821.



LIFESAVER

Mach and Barbara Gore's three-year-old was choking to death on a grape. Nothing was working, so Mack sucked it out, and the idea of a tracheal suction tube (above) was born. Price: less than $10 when available. Contact (512) 346-8744.

CAN FRIDAY

Robinson Crusoe's legendary helpmate is reborn. The Droid Genesis I (left) can perform diverse tasks, such as serving drinks, stocking shelves, or even acting as a security guard. Price: $12,500. Contact: Droid Systems, New York; (212) 534-5800.

CLEAN CUTS

Laser video and CD audio discs can develop skips and rippled sound. Bib's Compact Disc Polish (above) lets you clean fingerprints and dust, remove static, and even fill light scratches. Spray from applicator, and then clean with cloth. Price: $12.95. Contact: Bib Audio/Video Products, Littleton, CO; (800) 325-0853.

CHATTERBOX

Three microprocessors, custom chips, and advanced software enable the Voice (right) to hear, then translate—both in printed and spoken form—three different languages. Portable unit measures eight inches by seven inches by three inches and weighs three pounds. Price: $2,000. Contact: Advanced Products Technologies, Redmond, WA; (800) 782-7663.

INTELLIGENCE

CONTINUED FROM PAGE 22

The extra bulk resulted in a taller mouse with a higher center of gravity, making for worse balance and turning. Otten's winning secret involved keeping his mouse small and simple, using superior motors and making his wall and floor sensors—his mouse's twin antennalike protuberances—as reliable as possible.

As the LEES team worked on, Otten promoted robot maze solving by speaking about the sport at such places as the Boston Robotics Society. At most places, he was met with blank faces. "Once I was asked on British television what the point was. I said 'For the sport,' and they understood. But the United States doesn't seem to be into technical contests."

During this period Otten began entering his mice in contests. They ran courses in Atlantic City and London in 1986 and in San Diego in July 1987. For several years Otten's team competed only in the Atlantic basin. Its mice rose in the ranks, started to win, and eventually became dominant in the West. Finally last fall MIT made funds available to fly the team to Asia, where it entered the ninth All-Japan final, sponsored by Namco, a Japanese computer game and robotics company.

The top MIT mouse came in a strong third in this contest. Only 0.46 second separated the top three times. Moreover, Otten's team won the Best Technical Design award, which, in that crowd, is more prestigious than finishing first. Otten met the premier mouse designer in Japan. Communicating through gesticulations, grunts, and the help of volunteer translators, they took apart their mice for each other. I asked Otten if he was eager to return next year. "Yeah," he said. "At last I have somebody I can talk to." OMNI

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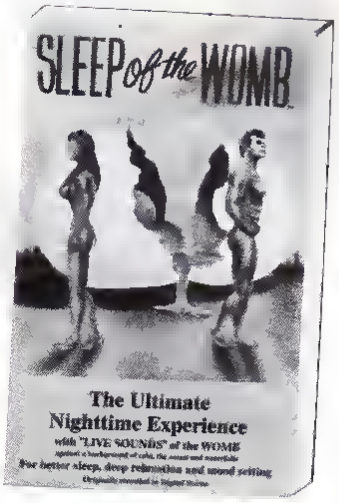

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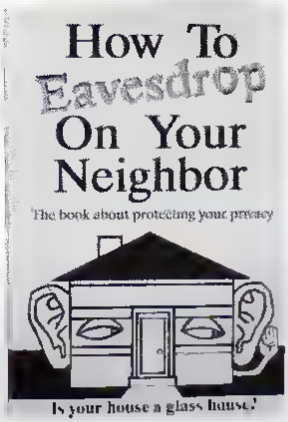

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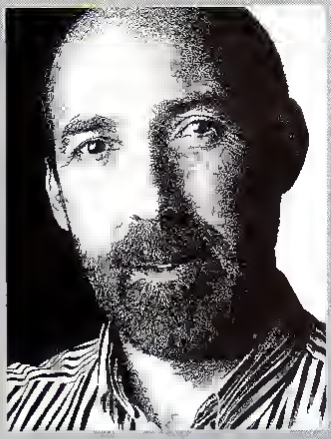

LAST WORD

By Russell Jones

A Chihuahua will try everything from putting its tail between its legs and shivering to staring you down with large, oil-puddle eyes. But fight back the tears. Remember, a chef's got to do what a chef's got to do.

The rich culinary delights of domestic pet eating have been sadly neglected over the years. The reasons for this are diverse. Attachment to, say, the family cat, consideration for a small child struggling with tiny hands to keep its squealing Christmas present out of the roasting pan, or just a plain reluctance to branch out into the untried and exotic have prevented many people from joining the munching ranks of pet lovers.

SPOTTING A SQUARE MEAL

That the raw ingredients in pet cuisine are of the highest importance cannot be stressed too strongly. So always opt for the pet that's been well cared for, even pampered. As a general rule, the cute, cuddlesome little Yorkshire terrier in the tartan overcoat and silk bow will make a far better dish than the aloof skulking mongrel.

Look for these reassuring signs: bright eyes, bushy tail, good choppers, timid disposition, cuddly demeanor, cute looks, wet nose, and appealing nature. Seek out that unmistakable "I'm man's best friend look," written all over a face, and you can't go wrong.

TERMINATION DEVICES

Dispatching fur or feather to that Great Menagerie in the Sky need not be the messy, unpleasant business it once was. Indeed, it can be fun for the whole family. Should you still wish to distance yourself from what you may wrongly consider an unpleasant task, there are several patented machines on the market, including the ever popular Hamster's Wheel of Misfortune, the North by Southwest Infrared Homing Pigeon Direction Scrambler, and the Acme Industries Small Rodent Exhauster.

THE BRAT FACTOR

Dealing with a bout of persistent interrogation from a child as to the whereabouts of, say, the family cat can be a pain in the griddle. The inquisitive child should never be underestimated. The more observant among them may even be astute enough to remark on the uncanny resemblance to the unfortunate beast borne by the Sunday roast. Don't panic! Several handy excuses can be made to placate a tiny mind in turmoil. One of my personal favorites is "Felix is out to lunch." This one not only amuses the adult diners but often serves to stem the flood of inquisitive juvenile banter. Whatever happens, never let a hysterical brat come between you and your enjoyment of a first-class dish.

GOLDFISH GUMBO

How many of us have wandered back from the fairgrounds having spent the equivalent of the gross national product trying to win a prize by shooting a moving line of little tin ducks with an air gun, the barrel of which has more bends in it than a country road? All of us, I suspect—and what do we have to show for it? Empty pockets and a tiny plastic bag containing a couple of startled-looking goldfish. Don't despair! Reach for a saucepan and console yourself that you're about to eat the world's most expensive soup.

Ingredients (serves three hungry children)
2 goldfish
1 large onion
1 leek
2 carrots
salt and pepper to taste

Method: Prepare fish and together with finely chopped vegetables, place into one pint of boiling, salted water. Simmer for 25 minutes. Serve in a glass bowl for authenticity, making sure the fish are belly-up. If eating outdoors, cool and serve individual portions in small plastic bags.

CHIHUAHUA CHILI

A very hot dish from Mexico, land of song and strange, shivering little dogs with large heads and even larger eyes. On no account allow this cute little animal to appeal to your sensitivity. He'll try everything from placing his tail between his legs and shivering uncontrollably to attempting to stare you down with large, oil-puddle eyes. Be strong! Fight back the tears and remember, a chef's got to do what a chef's got to do.

Ingredients (serves one)
1 Chihuahua
2 tins of red kidney beans
2 onions
1 pint of water
olive oil
loads and loads of chili

Method: Reduce Chihuahua to bite-size chunks by dividing carefully into two equal pieces. Toss into pan and fry with onions until brown. Add water, beans, and chili. Simmer for one hour and serve in a large earthenware bowl.

A WORD ABOUT REMORSE

Unfortunately, having wined and dined on the family pet, some owners are liable to feel sudden and uncontrollable pangs of remorse, a word that does not appear in the pet muncher's dictionary. Any compulsion to throw yourself into the microwave or gas oven should be resisted, as this course of action is far more painful than any feelings of guilt you may experience. If the sense of shame becomes overwhelming, I suggest you gather up the leftovers and salve your conscience by giving the animal a decent burial.

Pet gourmet Russell Jones is wanted by the British Society for the Prevention of Cruelty to Animals and by Scotland Yard.