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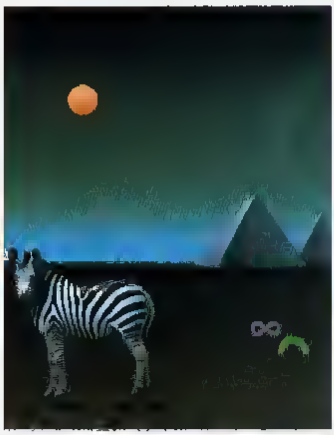

A stoic zebra gazes from an Egyptian landscape on the cover of this month's Omni. *New York City artist Bob Giusti painted this unusual and surrealistic tableau of mixed symbols, entitled* Mysteries of the World. *Originally a fine-arts painter, Giusti now adds his bizarre vision to illustration*

FIRST WORD

By Ben Bova

As long as the media perceive the space program as a sporadic series of events, coverage of space will be as meaningful as circus coverage

Jefferson wrote: "... were it left to me to decide whether we should have a government without newspapers, or newspapers without a government, I should not hesitate to prefer the latter."

Later, as President of the United States, when he was scurrilously attacked by partisan newspapers, Jefferson may have changed his mind. But his original sentiment is based on a fundamental assumption about the way our American democracy works. We assume that the voters can understand the political, economic, and social issues of the day and vote intelligently if they know the facts. The very practical purpose of the First Amendment, which guarantees free speech and a free press, is to ensure that the voters have access to all the facts.

But there are no guarantees in the Constitution or anywhere else that a free press *must* print all the facts. Or that the voters *must* pay attention to the facts before they enter the polling place.

Consider, for example, the way modern American media cover the space program—not merely the U.S. program, but the space programs of the rest of the world.

It has been said, with some justification, that the media cover events, not news. When *Columbia* is launched from the Kennedy Space Center, the coverage is little short of fantastic. All the major newspapers, magazines, and radio and television networks are there. The press section teems with reporters, anchormen, former astronauts-turned-commentators, future astronauts-turned-commentators, writers, researchers, cameramen, and photographers. The wordage pouring from the lips and typewriters of these thousands of observers would fill the cargo bays of a dozen space shuttles.

And then it's over, until the next event. And of course, as NASA becomes more successful and the shuttle's flights become more routine, the media coverage will dwindle to nothing. Reporters do not cover the takeoff of a 747 jet anymore, or the Concorde, although both events were originally in the headlines.

When *Columbia*'s second flight was delayed by minor problems, and then cut short by the failure of a fuel cell, no TV commentator probed for the reasons. No reporter asked what effect the budget cuts and stretch-outs had had on the shuttle. No anchorman wondered whether the layoffs of NASA's engineers during the 1970s had hurt the space program, or whether the lack of new engineering talent jeopardizes our future in space.

They all accepted the same bland line from the experts they had brought in for the event. "Well, Jim (or Dan, or Tom), this is a very complicated vehicle here."

Critics of NASA have said that only a government agency could make flights to the moon seem boring. But that is putting the shoe on the wrong foot. As long as the media perceive the space program as a series of events, coverage of space will be about as meaningful as coverage of the circus when it comes to town each year.

How can the voters make intelligent decisions about the value of our space program when the free press fails to examine the economic and environmental impact of the new industries that space technology has created? When an auto manufacturer or a steel company closes a factory and lays off 10,000 workers, there are headlines all around the nation. When the Apollo program was killed and 400,000 jobs were eliminated, the media paid no attention. And for every engineer, scientist, or technician laid off, there were anywhere from three to six other jobs lost in the communities in which they lived.

And consider the coverage of foreign space programs.

The payments American businessmen are making to the European Space Agency to launch American communications satellites because the space shuttle's flights are being canceled or stretched out by our government do not make headlines in your hometown paper.

The small but vigorously growing space programs of Japan, India, and China do not excite the interest of the television networks. One Japanese space scientist said (with a smile), "Ah, yes. You Americans once led the world in automobiles, didn't you?" It may well be that the first solar-power satellites will be built by the Japanese, who today are totally dependent on Middle Eastern oil to fuel their nation. If they must import energy, Japanese space developers reason, why not import it from space?

And there is always the Soviet space program to think about. Since the heralded Space Race of the 1960s, the American media have treated Soviet space achievements as nonevents. Soviet disinformation tactics have actually persuaded most of our media that the Russians were never trying to reach the moon and that the Space Race was a White House concoction.

In June 1981 Soviet President Leonid Brezhnev announced that the Soviet Union will place a permanent space station in orbit. Soviet leaders do not make wild claims in public. If Brezhnev said it, the components for that station are in orbit now. During the first two weeks of August 1981 the Russians launched no fewer than 16 satellites. And in October 1981 *Aviation Week* magazine revealed that the USSR has placed a missile-carrying satellite in a 600-kilometer high orbit. The "antisatellite battle station" bears heat-seeking missiles that can locate and destroy other satellites—including the space shuttle.

Did you read these items in your local newspaper? Did you hear them on the radio news broadcast or see them on the network TV news shows?

"The truth shall make you free." But you must be told the truth, all the truth.

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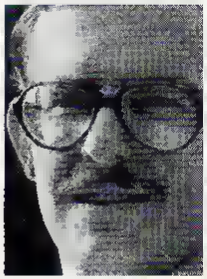
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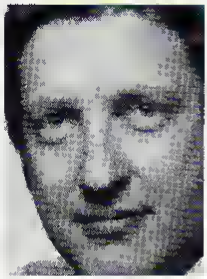
SABOM


HOOPER


SALTMAN

Those who journey to the edge of death and back again often return with haunting tales of supernatural events. Some recall hovering above their own body, looking down on weeping relatives at their bedside; others remember having overheard the words spoken by medics fighting to save their lives, even though they themselves were unconscious and showed barely discernible life signs. Could these reports have any basis in reality? Cardiologist *Michael B. Sabom* was incredulous and set out to disprove such patients' accounts of near-death phenomena. After carefully examining hundreds of individual cases, however, he found his attitude "shifted from gross skepticism to one of belief." Now, in an excerpt from his newly published book, *Recollections of Death* (page 58), Dr. Sabom reveals his extraordinary findings.

With the sweep of a wand, a picture of downtown Aspen, Colorado, flashes on a screen. Touch one of the buildings on Main Street—presto—you're inside and about to embark on a tour of its corridors, stairwells, and rooms. "Video wizards such as Nicholas Negroponte" have conjured up "looking glasses that might have come straight out of *Snow White*," or *The Canterbury Tales*," proclaims *David Saltman*, coauthor of "Magic Mirrors" (page 44). Writing with *Omni* senior editor *Gurney Williams III*, Saltman describes being escorted by electronic guides on aerial rides above cities, along the fuel lines of a jeep, and on a "fantastic voyage" through the human circulatory system. Saltman's background in television production and screenwriting partially explains his interest in Negroponte's work. Also, there is his lifelong fascination with magic. Known in certain circles as the Great Saltini, Saltman-the-magician desires to exploit video techniques in special conjuring tricks.

The brain has long been thought of as a dense labyrinth of circuitry that processes information in the form of electrical signals traveling from one nerve cell to another. But over the past decade a far more complex picture has emerged. Largely owing to the pioneering research of pharmacologist Candace Pert, the organ of intellect has also come to be viewed as a unique gland whose fantastic range of functions is controlled by its own chemical secretions. Pert uncovered specific receptors—sites on nerve cells—that were activated by opium compounds. Her finding soon led to the discovery that the brain produces its own opiatelike painkillers, thus triggering an explosion in our understanding of the chemical basis of behavior. In this month's Interview, biomedical writer *Judith Hooper* speaks to the leading lady of neuroscience about these and other amazing brain hormones.

At seventy-seven years of age, *Salvador Dali* is perhaps the most famous living artist of this century. Next month the world's largest collection of his works will be unveiled at the new Salvador Dali Museum in St. Petersburg, Florida. To coincide with the cultural event, *Omni* presents a broad selection of the Spanish Surrealist's paintings, beginning on page 68. Best known for his dripping clocks and outrageous mustache, Dali remains an immensely popular enigma, surprising and confounding the public with his art and antics.

What happens when God dies? *Greg Bear* looks at the aftermath of such a cosmic calamity in "Petra" (page 48), the story of a universe that has come apart at its hinges. Though new to *Omni*, Bear is the author of several novels and is a regular contributor to *Analog* and *Galaxy*, where he often writes on theological themes. His most recent book is *Strength of Stones*, which he describes as "a science fiction examination of the Western world's four great religions—Judaism, Christianity, Islam, and Science."

Briton Clive Sinclair has got very big by thinking small. Sinclair is the genius behind such Lilliputian marvels as pocket-sized TV sets and a midget home computer with a price tag below $200. What is the key to his success? "Doing more with less," says *Tony Durham*, whose incisive profile of the inventor begins on page 74. Durham, who reports on technological developments for BBC radio, likens Sinclair to one of the small, wily creatures that existed when dinosaurs still ruled. "He invents in the shadow of giant corporations and survives on his wits."

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LETTERS

COMMUNICATIONS

Open Mind

Thanks for publishing "Religion in the Twenty-first Century," by James Reston Jr [December 1981]. It was a well-written well-balanced series of interviews, almost a symposium that managed to present very clearly a great many different—and yet not all that different—points of view.

Perhaps most important, however, Mr Reston and *Omni* conveyed the idea that there are those of us out there who find little contradiction between science and religion. We can always find one point of view or the other in the media, but seldom both. I for one appreciate your magazine's open-mindedness.

William J Reynolds
Senior editor
TWA Ambassador magazine
St Paul, Minn

Viva Tesla!

In your article "Project Tesla" [August 1981], you erred in stating that Nikola Tesla was Croatian. To set the record straight: Tesla was the son of the Reverend Milutin Tesla, a Serbian Orthodox priest, and Djouka (née Mandich) Tesla, whose male family members for generations were also Serbian Orthodox priests. Therefore I must conclude that Tesla was *Serbian*.

As an American of Serbian descent I am proud of my heritage and angry that this brilliant scientist has been overlooked for so long. He was never afforded the credit and prestige his discoveries and inventions warranted.

Michael Milanovich
Chicago, Ill

We'll take your word for it, but our source, The New Columbia Encyclopedia (1975), says that Nikola Tesla was born in Croatia, then part of the Austro Hungarian Empire. We deduced that he was a Croatian. Today he would have been a Yugoslav.—Ed.

UFO Elaboration

I would like to clear up a problem that was introduced in my article on the Betty Hill UFO star map [UFO Update, November 1981]. I never said that the Hill case has been revealed as "what could be the most elaborate UFO hoax ever perpetrated." I do not agree that this conclusion can follow from the Marjorie Fish interpretation of the Hill alien-star map. The new astronomical information reported in my article returns this famous abduction claim to unsupported anecdotal testimony, but it's hardly a deliberate hoax.

Allan Hendry
Stone Mountain, Ga

Poets' Corner

Your variety of articles gives me a feeling I'm keeping up-to-date on the most recent experiments and theories in every field from quarks to quasars. *Omni's* third-anniversary issue [October 1981] and every issue that preceded it have inspired me to create the following lyrical appreciation for your effort and success in making science interesting entertainment.

For many scientific things
That I have read and seen
I credit three years learning from
Your *Omni* magazine

Robert Patrick Hussey
Wall, Pa

Tears and Taxes

As I watched the *Columbia* blast off, I realized that tears of joy were streaming down my face from the awe, joy, and excitement of it all. I also realized that I was an intricate part of this liftoff because my tax dollar helped pay for it, and that pleased me thoroughly.

I was born in 1942, and the space program is a constant source of delight and wonder to me. I remember, as a child, running out of the house at the sound of a sonic boom, shattering my disbelief in man's ability to break the sound barrier. As I grew to womanhood, I watched man's first steps on the moon. I found myself overwhelmed by the magnitude of this adventure.

Omni is a monthly reminder that we are making positive advances into the future. My daily newspaper, alas, makes me feel there is no future.

Lyn Marquardt
Sacramento, Calif

CONTINUED ON PAGE 118

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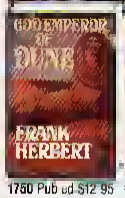

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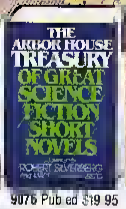

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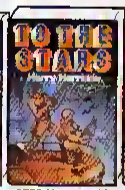

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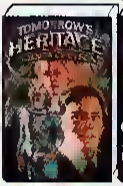

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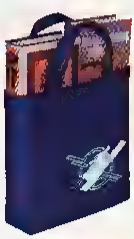

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DIALOGUE

FORUM

In which the readers editors, and correspondents discuss theories and speculation arising out of Omni *Readers are encouraged to debate views and pose questions to* Omni *the scientific community and the science-fiction establishment The opinions published are not necessarily those of the editors*

Godless Creationists

In reading Ben Bova's First Word [November 1981] I perceived one very important point He is an angry man My response I am saddened to say is that he is for the most part as right as acid rain

I am an affirmed creationist I am deeply convinced that a concerned personal God created the universe according to a beautifully wrought plan I believe that He did it in six literal days and that He is going to return to renew the cosmos again in the near future

But at this point I must raise my voice with Mr Bova's in protest against those who revere their own opinions more than the God they claim to serve The last person who should fear the closest scrutiny of life by science is the creationist The quest for knowledge is far from Godless (the adjective the Moral Majority loves to use in reference to the evolutionists) Furthermore God hardly needs a political arena to prove any point He desires to make Those who raise their hammers of judgment over the heads of great and innocent seekers of knowledge simply follow their *own* arrogant desire for power they are not following God If they obtain the power they seek then indeed as Mr Bova predicts they will crush the "heretics" with all the political and military muscle they can afford And there are a few who can afford quite a bit

Les Brown
Riverside Calif

Evolutionists and creationists alike, I condemn your methods of proving your cause You are acting like boys and girls yelling "blasphemy" at one and "baloney" at the other

James Milton
McAlester Okla

The efforts of creationists would be much easier to discount if as Mr Bova suggests they are not interested in education in using the God-given gift of intelligence to examine the world around us and try to learn how it works

Creationists present convincing scientific arguments as often and as loudly as possible Frankly I think Mr Bova underestimates what he apparently perceives as the opposition The push is on to fight the creationist battle in the field of science not in the spheres of philosophy or comparative religion If the creationists continue to dig up facts to support the creation theory the most surprised person in the science class will be the Darwinian who thought the war was over It is not

Keith J Croes
West Chester Pa

In the preface to a later edition of Origin of Species, *Charles Darwin pointed out that he (a devout Christian) was not trying to disprove the existence of God but, rather attempting to show the steps God took in creating humankind We agree there is no necessary argument between religion and science We are concerned however with the creationists efforts to remove science from the classroom and substitute religion in its place* —Ed

Playing Post Office

My thoughts keep going back to the wonderful story "Easy Points" by Kathleen V Westfall [October 1980] I believe this is a true story of bureaucratic bungling It inspired me to create a new way to play the game post office in which the intended victim gets to pile up points The rules are

1 Note the time

2 Phone the post office and say "May I please talk to the manager? I have a complaint about delivery" This will instantly alert them that trouble is afoot and will facilitate their executing the proper protective procedure

3 You will be asked to wait Hang in there Use the time constructively by working on a crossword puzzle

4 At some point you will be accidentally cut off Note the time

5 Subtract time 1 from time 4 and you will have your basic score

6 Occasionally someone at the post office will pick up an extension phone and dial a number not realizing that the line is in use Keep silent Do not let on that you know he's wasting his effort If this happens add 10 bonus points to your score If you hear swearing add 15 more

Recently when I found my mail strewn along the street I tried to voice my complaint several times The first try was fantastic I wonder whether any *Omni* reader can beat my record of waiting a full nine minutes before being cut off and get 25 bonus points besides

Helen N Atlas
Daly City Calif

7 Add 50 points if your mailman throws all his route's mail into the garbage A mailman in Brooklyn New York did just that according to the November 6 1981 New York Daily News —Ed

Hairy Query

I'm going bald I try to console myself with the fact that we'll all be bald someday that it's a part of human evolution But I can't find any facts to back up my argument I need support from my favorite science source *Omni* is the human race losing its hair?

Donald Cumberland
New York N Y

There is no scientific evidence to support the commonly cited theory of evolutionary hairlessness — despite bald men and women in futuristic comic books A main reason for the lack of scientific support is that it takes many hundreds of years to do a proper study says Dr Samuel Stegman a San Francisco dermatologist and hair expert He says that if Homo sapiens *is really descended from apes then it is clear that humans have lost their hair in evolutionary time frames — over millions of years If so Dr Stegman says hair may be destined for extinction in the next million years* —Ed

How to make a speech

By George Plimpton

International Paper asked George Plimpton, who writes books about facing the sports pros (like "Paper Lion" and "Shadow Box"), and who's in demand to speak about it, to tell you how to face the fear of making a speech.

One of life's terrors for the uninitiated is to be asked to make a speech.

"Why me?" will probably be your first reaction. "I don't have anything to say." It should be reassuring (though it rarely is) that since you were asked, somebody must think you do. The fact is that each one of us has a store of material which should be of interest to others. There is no reason why it should not be adapted to a speech.

Why know how to speak?

Scary as it is, it's important for anyone to be able to speak in front of others, whether twenty around a conference table or a hall filled with a thousand faces.

Being able to speak can mean better grades in any class. It can mean talking the town council out of increasing your property taxes. It can mean talking top management into buying your plan.

How to pick a topic

You were probably asked to speak in the first place in the hope that you would be able to articulate a topic that you know something about. Still, it helps to find out about your audience first. Who are they? Why are they there? What are they interested in? How much do they already know about your subject? One kind of talk would be appropriate for the Women's Club of Columbus, Ohio, and quite another for the guests at the Vince Lombardi dinner.

How to plan what to say

Here is where you must do your homework.

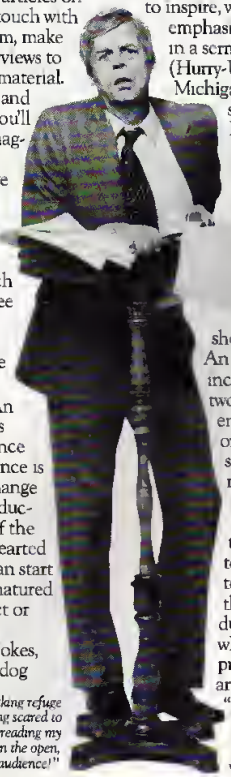
The more you sweat in advance, the less you'll have to sweat once you appear on stage. Research your topic thoroughly. Check the library for facts, quotes, books and timely magazine and newspaper articles on your subject. Get in touch with experts. Write to them, make phone calls, get interviews to help round out your material.

In short, gather—and learn—far more than you'll ever use. You can't imagine how much confidence that knowledge will inspire.

Now start organizing and writing. Most authorities suggest that a good speech breaks down into three basic parts—an introduction, the body of the speech, and the summation.

Introduction: An audience makes up its mind very quickly. Once the mood of an audience is set, it is difficult to change it, which is why introductions are important. If the speech is to be lighthearted in tone, the speaker can start off by telling a good-natured story about the subject or himself.

But be careful of jokes, especially the shaggy-dog variety. For some reason, the joke that convulses guests in a living room tends to suffer as it emerges through the amplifying system into a public gathering place.



"What am I doing wrong? Taking refuge behind the lectern, looking scared to death, shuffling pages, and reading my speech. Relax. Come out in the open, gesture, talk to your audience!"

Main body: There are four main intents in the body of the well-made speech. These are 1) to entertain, which is probably the hardest, 2) to instruct, which is the easiest if the speaker has done the research and knows the subject; 3) to persuade, which one does at a sales presentation, a political rally, or a town meeting; and finally, 4) to inspire, which is what the speaker emphasizes at a sales meeting, in a sermon, or at a pep rally. (Hurry-Up Yost, the onetime Michigan football coach, gave such an inspiration-filled half-time talk that he got carried away and at the final exhortation led his team on the run through the wrong locker-room door into the swimming pool.)

Summation: This is where you should "ask for the order." An ending should probably incorporate a sentence or two which sounds like an ending—a short summary of the main points of the speech, perhaps, or the repeat of a phrase that most embodies what the speaker has hoped to convey. It is valuable to think of the last sentence or two as something which might produce applause. Phrases which are perfectly appropriate to signal this are: "In closing..." or "I have one last thing to say..."

Once done—fully written, or the main points set down on 3"x5" index cards—the next problem is the actual presentation of the speech. Ideally, a speech should not be read. At least it should never appear or sound as if you are reading it. An audience is dismayed to see a speaker peering down at a thick sheaf of papers on the lectern, wetting his thumb to turn to the next page.

How to sound spontaneous

The best speakers are those who make their words sound spontaneous even if memorized. I've found it's best to learn a speech point by point, not word for word. Careful preparation and a great deal of practicing are required to make it come together smoothly and easily. Mark Twain once said, "It takes three weeks to prepare a good ad-lib speech."

Don't be fooled when you rehearse. It takes longer to deliver a speech than to read it. Most speakers peg along at about 100 words a minute.

Brevity is an asset

A sensible plan, if you have been asked to speak to an exact limit, is to talk your speech into a mirror and stop at your allotted time, then cut the speech accordingly. The more familiar you become with your speech, the more confidently you can deliver it.

As anyone who listens to speeches knows, brevity is an asset. Twenty minutes are ideal. An hour is the limit an audience can listen comfortably.

In mentioning brevity, it is worth mentioning that the shortest inaugural address was George Washington's—just 135 words. The longest was William Henry Harrison's in 1841. He delivered a two-hour 9,000-word speech into the teeth of a freezing northeast wind. He came down with a cold the following day, and a month later he died of pneumonia.

Check your grammar

Consult a dictionary for proper meanings and pronunciations. Your audience won't know if you're a bad speller, but they will know if you use or pronounce a word improperly. In my first remarks on the dais, I used to thank people for their "fulsome introduction," until I discovered to my dismay that "fulsome" means *offensive* and *insincere*.

"Why should you make a speech? There are four big reasons (left to right) to inspire, to persuade, to entertain, to instruct. I'll tell you how to organize what you say."

On the podium

It helps one's nerves to pick out three or four people in the audience—preferably in different sectors so that the speaker is apparently giving his attention to the entire room—on whom to focus. Pick out people who seem to be having a good time.

How questions help

A question period at the end of a speech is a good notion. One would not ask questions following a tribute to the company treasurer on his retirement, say, but a technical talk or an informative speech can be enlivened with a question period.

The crowd

The larger the crowd, the easier it is to speak, because the response is multiplied and increased. Most people do not believe this. They peek out from behind the curtain and if the auditorium is filled to the rafters they begin to moan softly in the back of their throats.

What about stage fright?

Very few speakers escape the so-called "butterflies." There does not seem to be any cure for them, except to realize that they are beneficial rather than harmful, and never fatal. The tension usually means that the speaker, being keyed up, will do a better job. Edward R. Murrow called stage fright "the sweat of perfection." Mark Twain once comforted a fright-frozen friend about to speak: "Just remember they don't expect much." My own feeling is that with thought, preparation and faith in your ideas, *you* can go out there and expect a pleasant surprise.

And what a sensation it is—to hear applause. Invariably after it dies away, the speaker searches out the program chairman—just to make it known that he's available for next month's meeting.

George Plimpton

MYTHS OF SCARCITY

EARTH

By John J. Berger

Just before nightfall in the state of Sonora, Mexico, the car carrying Frances Moore Lappe and Joseph Collins stalled miles from the nearest highway in a broad irrigation ditch. Around them stretched thousands of acres of cotton, wheat, and brandy grapes. Luxurious homes with sprinklered lawns and swimming pools glowed in the last rays of the setting sun.

The agricultural researchers were visiting the birthplace of the Green Revolution—the war against hunger waged by scientists in the 1960s. In those days scientists believed that they could wipe out starvation by stimulating agricultural productivity. Their weapons: fertilizers, irrigation, and new high-yielding varieties of seeds. The success of the revolution had been particularly touted in Mexico, whose wheat yield tripled in just two decades.

Yet Lappé and Collins knew that this so-called revolution had failed to obliterate hunger for millions of Mexicans. They had gone to Sonora to learn why, and to talk with the *campesinos* (peasant landowners) and the landless laborers who could answer their questions.

As dusk fell, the two Americans feared they would have to spend the night in the fields. A group of tired farm workers, carrying machetes, soon appeared. Without hesitation the workers waded into the chilly ditch and pushed the automobile out of the mud. Before the American researchers left Sonora in August 1976, they had spent many hours with these laborers, learning all they could.

A decade ago, the peasants told them, they had grown corn and beans for themselves in small plots or on larger communal *ejidos*. Then when the Mexican government ushered in the Green Revolution, the irrigated land soared in value. Wealthy landlords forced the peasants off, forming new estates that sprawled over thousands of acres. Workers' shacks were crowded into narrow, unplowable strips of land lying along the irrigation ditches. The occupants of these makeshift settlements would wait by the hundreds behind barbed-wire fences at 5 A.M., hoping for a day's work. They and their families rarely had enough to eat.

The details hardly surprised Collins, who had spent his adolescence with a group of Maryknoll missionaries in the Yucatan Peninsula. Accompanying the priests on their trips to rural areas, he had constant contact with the poor and malnourished. By the time he'd reached his late teens, he'd concluded that much of the hunger resulted when agricultural conglomerates hired local people for next to nothing, then sold the food they had produced at high prices elsewhere.

Collins was in his twenties when he decided to give up his youthful goal of becoming a Maryknoll priest. He returned to the United States, burning with the desire to tell people about the economic exploitation he had come to believe was the cause of all hunger. He'd just completed his Ph.D. dissertation on public policy at the Institute for Policy Studies in Washington, D.C., when he met Frances Lappé, the acclaimed author of the book *Diet for a Small Planet*. Lappé shared Collins's views, but she knew that they would have to document their theories with sufficient data in order to convince the rest of the world.

The result, in late 1975, was the formation of the Institute for Food and Development Policy, headquartered in San Francisco's Mission District. Lappe and Collins spent much of the next two years traveling to such places as Sonora. Collins managed to visit most of the impoverished Third World, including Subsaharan Africa, South America, and Southeast Asia. By 1979 the institute and its full-time staff of nine had put together hundreds of articles, speeches, and booklets substantiating its theories.

The cause of hunger for half a billion people throughout the world, they charged, was the unequal distribution of food-producing resources—land, water, and capital. If the malnourished could only gain control of these resources, they would be able to end hunger themselves.

Unlike Green Revolutionaries, who believe hunger exists because farmers don't produce enough food for the world's

CONTINUED ON PAGE 118

Agriculture in the United States, the breadbasket of the world, may soon be in serious jeopardy.

GENETIC SURGERY

LIFE

By Dr Bernard Dixon

Genetic engineering has been launched with more ballyhoo hysteria forebodings and unreasonable expectations than any other science The media have been heavily blamed for such sensationalism, whether doomful or utopian, but that has been a gross error To be able to tinker with the foundations of heredity *is* an awesome prospect and scientists themselves not journalists, have caused both our hopes and fears to escalate

So cautious optimism was the overriding mood of a meeting held recently in Rome by COGENE (an International Council of Scientific Unions committee) On the one hand there was buoyancy Genetic engineering is safe National Institutes of Health and other restrictions are withering away and researchers can get on with the job On the other hand participants were anxiously hopeful that the next crucial steps for this fledgling science would be taken with care

Scaling up drug manufacture from the laboratory bench to mammoth industrial complexes, is a case in point. But even greater concern centers on the most delicate yet dramatic prospect of all human gene therapy The medical manipulation of man s genes marks a quantum leap in our triumph over disease—an advance that could easily be jeopardized by injudicious experimentation leading to official condemnation moratoriums, or legal bans

Until 1980 the humble bowel bacterium *Escherichia coli* was the only organism scientists had invited to play host to another creature s genes Then Dr Martin Cline at the University of California inserted new genes in bone-marrow cells taken from a mouse endowing them with resistance to the anticancer drug methotrexate Reinjected into live animals which were then given high doses of methotrexate the cells multiplied and became permanently established in the new host The experiment was a total success, suggesting that human cancer patients might be treated in the same way permitting them to tolerate higher concentrations of the drug without suffering any toxic side effects

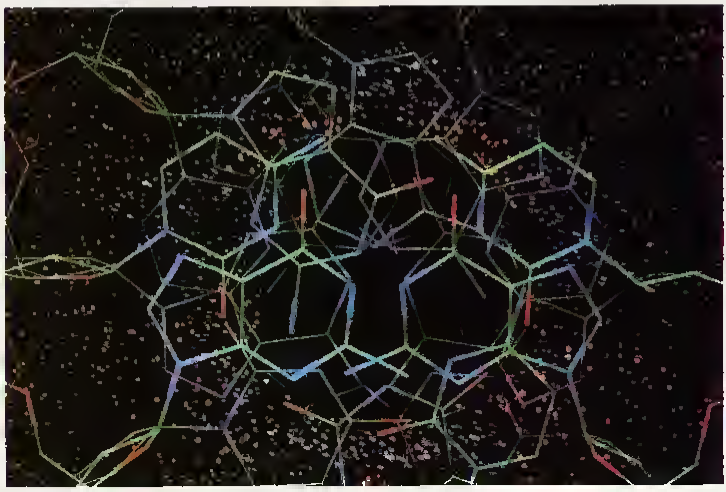
More recently Dr Jon Gordon and his colleagues at Yale University introduced foreign genes into mouse embryos First they stitched the genes into a plasmid carrier and then employed exquisite microtechniques to inject the new material at just the right stage of development The embryos were then reimplanted in female mice When the offspring were born Dr Gordon and his associates were delighted to find that the foreign genes were working '

So what are the prospects for correcting genetic defects in man? The most tempting candidates for gene therapy are diseases triggered by one specific metabolic defect Phenylketonuria for example results from a congenital failure to digest a particular amino acid in food If detected at birth the condition can be corrected by an appropriate diet A far more radical approach however would be to replace the defective gene with a fully functional one

This was the very strategy taken by Dr Cline in his much-publicized attempt to treat two women suffering from a fatal hereditary disorder of the blood beta thalassemia The experiment was unsuccessful and Cline was severely reprimanded by the National Institutes of Health which deemed his work imprudent before further animal studies had been conducted As his critics contend it is no easy challenge to culture a patient s blood-forming cells persuade them to incorporate the normal hemoglobin genes and then reimplant them and ensure their dominance over defective marrow

Human-gene therapy is clearly at a rudimentary stage Yet it is equally certain that the remaining obstacles will be overcome Progress in related technologies—particularly gene mapping—will vastly improve the precision with which genetic engineers can accomplish such feats Eventually not only blood skin and gut disorders but also such diseases as cancer—which are not usually considered to be genetic in origin—might be cured in this way

Opportunities abound For the moment though the key word is *caution* ∞



Using genetic engineering tools scientists hope they can cure diseases by operating on our DNA

COMSATURATION

SPACE

By Jesco von Puttkamer

The available space in space—however paradoxical this may sound—is limited. Much like building sites on prime real estate on Earth, positions in the geosynchronous orbit used for communications satellites are becoming scarcer than budget increases for NASA.

This congestion in space has come quickly: only a scant 37 years since science-fiction writer Arthur C. Clarke wrote an article sketching how communications satellites might work. It was Clarke's concept that an Earth satellite in an equatorial orbit 35,870 kilometers up would have a period of 24 hours, synchronous with the earth's rotation. Hovering there in a fixed position relative to the ground, such a satellite could pick up radio waves from one Earth station and pass them on to another, Clarke suggested. Some critics scoffed, and it took 15 years for the idea to take off. Echo 1, a balloon 30 meters in diameter with an aluminized Mylar skin, bounced radio signals to Earth in 1960. Today, growing from that single balloon, there are more than 100 operating geostationary satellites. Their sophistication has grown too. The first Comsat Corporation commercial satellite, launched in 1965, could handle a small-town load of 240 telephone circuits simultaneously. By comparison, the Intelsat V-A, launched in 1980, is a workhorse with 12,000 circuits.

But the demand for such circuits is also increasing, and space is running out. For North America, geostationary positions that best serve all 50 states of the United States lie between 90° and 140° west longitude. So the available space amounts to no more than 50 degrees of arc. To avoid interference at the ground station between satellites using the same frequencies, the satellites have to be separated from each other by about 4°. Hence, only about a dozen orbital slots are available for North America at each frequency band.

Frequencies that can be used for communications satellites are also limited to two general bands. The C band transmits radio signals to the ground at frequencies around 4 gigahertz (billion cycles per second, or GHz) and receives at around 6 GHz. The K_u band sends at around 12 GHz and receives in the range of 14 GHz. The actual frequencies used vary up and down from these numbers, which are like the "center of the dial" on a standard AM or FM radio.

But the width of the "dial" itself—the bandwidth—is restricted. On each satellite there is room in the bandwidth for only about 12 radio "stations," transponders that receive, amplify and transmit signals. Technological tricks (involving the polarization of signals) enable each of these transponders to do the work of two. Spacing of domestic satellites "beads" in the "necklace" of geostationary orbit may be reduced in the future, allowing us to squeeze in extra "beads," more communications stations. Still, the total capacity for North America has an upper limit equivalent to about 1,100 transponders—not nearly enough to meet the need in decades ahead.

If we did nothing to overcome the congestion, the situation around the turn of the century would be analogous to what happens in a busy airport when there aren't enough pay phones. Lines get long, tempers flare. But in this case those in line would be major industries or Third World countries, demanding a share of the "necklace" overhead.

Conservative projections of future communications-satellite traffic suggest the need for about 500 equivalent transponders by 1990 for North and Central America, and for double that demand, between 900 and 1,200 transponders, by the year 2000. But these estimates are extrapolations predicated on the call for existing services, such as telephone communications, radio and television, and text communication. Not included are any new services, such as video and audio teleconferences (which take up more of the available space on the electromagnetic band than telephones), cable television, data links for fast digital computer networks, and mobile land, sea, or air communication channels. By the year 2000 such additional services could boost the demand to 5,000 equivalent

CONTINUED ON PAGE 112

Geostationary platforms, sprouting sets of antennas, would help reduce congestion in space

CHEAP TALK

MIND

By Gary Alan Fine

Indochinese refugees are stealing neighborhood cats and dogs and eating them for supper, several callers reported to the St. Paul, Minnesota Humane Society a few months ago. When the rumor was printed in local newspapers, calls increased. Wire services carried the story nationally, and letters began arriving from around the United States with similar cooked-pet complaints.

People from New York, Oregon, and California told the St. Paul society they knew incidents of that sort had occurred in their hometowns. One helpful Miami resident added a new twist to the story. It was Haitians, not Indochinese, who were eating pets.

After intensive investigation, no evidence was produced that Asian refugees had eaten other people's pets, either in St. Paul or anywhere else in the United States. Yet even now people will not walk pets in Indochinese neighborhoods for fear of petnapping.

Why believe such a ludicrous rumor? This is not the only time pet rumors have appeared, and Indochinese are not the first group who have been accused of eating pets. Most Americans who grow up in cities with a large Oriental population hear stories about Chinese restaurants that serve cats, dogs, pigeons, or rats in place of chicken. West Germans believe that restaurants owned by Yugoslavs serve similar delicacies, and Swedes say the same about immigrant Turkish workers in their country.

These rumors illustrate the ethnocentric and xenophobic biases of human beings. Many rumors, although certainly not all, reflect our fears and fantasies about others. These "facts" convince us that our prejudices are legitimate. Sociologist Terry Ann Knopf, after an extensive study of racial rumors, commented, "Rumors are not simply a crystallization of hostile beliefs, but a realization of them as well—a kind of corroboration, attesting to their truth and validity." As a result, "rumors serve to reinforce hostile beliefs, making them stronger and more acute."

In the case of Indochinese pet eaters, several factors created a fertile soil for rumor growth. Indochinese immigrants compete for jobs and resources with other Americans—a rivalry that can lead to intense hostility and aggressive behavior. Also, their culinary traditions are largely unknown to most Americans, so any exotic custom is believable.

Social scientists who have examined rumors use the concept of "effort after meaning" to explain why people are liable to believe unsupported assertions. Psychologists Gordon Allport and Leo Postman define this term as "a desire to understand and simplify complicated events that follow each other with bewildering speed. Rumors make things simpler than they actually are." Most people don't like ambiguity; they take available information and make sense of it. People cannot live in a meaningless world.

Rumors answer implicit questions, and successful rumors answer questions that many of us share. What are Indochinese really like? Why was John Kennedy shot? What makes McDonald's hamburgers so juicy? Why did Beatles fans believe Paul McCartney had died in the late 1960's?

Paul McCartney. Is he dead or alive?

Rumors are still circulating that answer these questions:

- Lyndon Johnson and the Texas mafia killed Kennedy to get control of the White House.
- Kennedy was assassinated by right-wing Cubans because he was going to recognize Fidel Castro's Cuba.
- Left-wing Cubans killed Kennedy because he had finally seen through the Communist conspiracy and was planning to crack down on the movement.
- McDonald's hamburgers are made from cardboard, horsemeat, fried worms, and sawdust.
- The green apple on the inside label of a Beatles record turns blood-red when dipped in water. (Just one of many clues attesting to a dead Beatle.)

Not every rumor will flourish. People believe only what they feel is believable. Centuries ago many rumors dealt with supernatural forces: devils, demons, and ghosts. Today such rumors are rare. Since we no longer give credence to supernatural powers, devils and demons have been banished from the world of human action. We do, however, continue to believe in the inferiority of some social and ethnic groups, and so rumors continue about outsiders.

Several decades ago rumors about corporations were uncommon. Today corporations are a leading rumor target. Large corporations influence our lives, and we suspect they are capable of anything, just as demons once were thought to be. Why else would we believe that bubble gum causes cancer, that rats are served as fried chicken, or that the main ingredient in toothpaste is sugar?

People differ in what they believe. Some Americans are ready to believe anything about blacks or Jews; others are prone to dismiss such insinuations or allegations. Some believe reports about UFOs. Others refuse to discuss such nonsense.

Some rumors are so believable that few responsible people try to check them out. One striking example concerned the "assassination," in June 1981, of District of Columbia Mayor Marion S. Barry, Jr.

CONTINUED ON PAGE 122

THE ARTS

By Bill Moseley

Armed with spray cans of Red Devil enamel and Spe-D-Dri paint, Flo-master opaque ink markers, and Pentel pens, the graffiti artists of New York City have been waging an insidious war of words and pictures against the city's beleaguered subway system. Their canvases are the walls of the system's 458 stations and the interiors and exteriors of the 6,300 blue-striped, silver subway cars that carry an average of 3.5 million passengers daily through four of the city's five boroughs. Their messages are neither political nor sexual, like traditional graffiti, but are cartoonlike pieces and "tags" or pseudonyms, such as Β. Sirius, Chili Rock, and Stay High 149. Graffiti artists have been hailed as purveyors of pure art by the likes of Norman Mailer and Andy Warhol, and have been reviled as "part of one world of uncontrollable predators," by Harvard sociology professor Nathan Glazer. Who are these latter-day Kilroys, and how have they continued to flourish in spite of the New York Transit Authority's (T.A.) ten-year, $40 million campaign to combat them? Are they artists, vandals, or merely angry adolescents who hold the subway straphangers hostage to their unique and unsettling brand of self-expression?

According to Ali, cofounder of the Soul Artists, one of New York's most prestigious graffiti cliques, the founding father of this urban phenomenon was Julio 204, the first writer to combine his tag and street number back in 1967. In 1969 a Greek kid named Demetrios began leaving his tag, Taki 183, on a host of highly visible city landmarks, including the 165-foot ceiling of Grand Central Terminal. While the works of these and other graffiti pioneers were primitive compared to the high-tech state of the art, they are still revered by today's graffiti community. Crash, a contemporary writer, says of his precursors, "For all their inadequacies as artists, they're still our heroes. The very basic primeval graffiti still draw respect and a certain kind of artistic admiration for their time period. You can't go back and do that again."

By the early Seventies, fueled by sympathetic media attention, by its revolutionary appeal as the voice of the ghetto, and by the lack of an effective deterrent, the graffiti movement swept thousands into its ranks and moved underground into the stations, lay-ups (off-peak storage tracks), yards, tunnels and trains of the sprawling subway system. Financially unable to maintain adequate service, let alone to stem an all-out invasion, the T.A. was no match for the hordes who poured into the subways to fix their indelible tags everywhere.

A 1980 T.A. report describes the typical graffiti artist as "male, of a lower socioeconomic status, fourteen to sixteen years of age, who seeks recognition by placing his 'trademark' where his peers will see it and possibly get to identify it. He does not feel he is destroying property by his actions." While this profile is reasonably accurate, it is not uncommon nowadays to find the sons of wealthy families tagging trains alongside scribblers from the ghettoes of the South Bronx and Manhattan's Lower East Side.

New York psychiatrist Sidney Lecker sees the graffiti movement as symbolic of the frustrations of adolescence. "The kids all have similar motives. They're all trying to break away from their roots and go elsewhere. By carrying their tags, the train lets them do their traveling vicariously. It becomes their emissary to the world they want to enter," the adult world that insists on ignoring them.

What distinguishes New York subway "graffitists" from the millions of kids who sign their sneakers or carve their initials in trees are a sense of community, a shared purpose, and the trains themselves. Once the novice writers, or "toys," develop their tags, they usually scrawl them in ink or paint on their schools, their apartment buildings, and the walls and ceilings of the nearest subway stations. The more the writers "get up," the quicker they get noticed, and the crude tags earn the writers the attention they crave. But that's not enough. As artist Midg says, "People know us because we paint trains. If we just stayed in the neighborhood, no one would ever know who we are."

For most of the graffiti artists, the subway is their main source of transpor-

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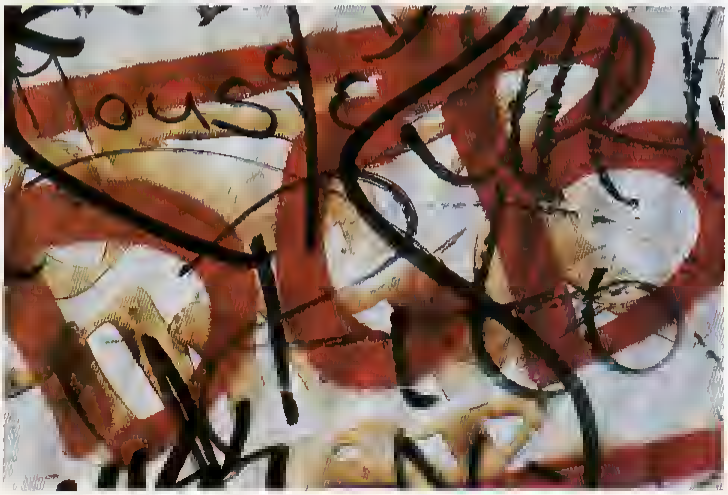

Slashing, or "tagging over," a writer's work can lead to a confrontation—artistic or physical.

THE ARTS

By Jeff Rovin

Apropos of contemporary literature one of the most popular novels in recent years has been Peter Straub's *Ghost Story*, the chronicle of four elderly men who congregate nightly to exchange ghoulish little tales. These psychodramas offer the men respite from oppressive memories a half-century old, collective guilt for an evil deed they committed, whose victims they fear are preparing to claim occult and dastardly retribution.

An elegant, intelligent novel, *Ghost Story* is now an equally literate film. It's one of the few nonexploitative horror pictures made since the early 1970s, when the sideshow grotesqueries of *The Exorcist* inspired a crimson wave in supernatural filmmaking. This long, gory trend has culminated in the current spate of maniacal homicide films, lurid efforts like *Maniac* and *Friday the 13th*, which plod from one disembowelment to the next with only the barest hint of a story line. Thankfully going against the vogue, Universal Pictures and John Irvin—who directed the highly acclaimed BBC series *Tinker, Tailor, Soldier, Spy*—have relied more upon inference than upon vivid and unsavory special effects to frighten filmgoers.

The success of the film adaptation is in no small way attributable to the four leading players, actors who are among the finest ever to go before a camera. Fred Astaire, Douglas Fairbanks, Jr., the late Melvyn Douglas (a veteran of the classic Universal chiller *The Old Dark House*), and John Houseman. Of the four, Houseman has a clear advantage in that millions of people are already anxious to see him undone, thanks to his award-winning portrayal of the domineering Professor Kingsfield in both the film and the TV series *The Paper Chase*.

"I suppose there's a touch of that intimidating arrogance in Sears James," says the seventy-nine-year-old actor of the lawyer he plays in *Ghost Story*. "A portion of that is the character part of it is me, and some of it is the very Victorian mold of the material. I think we've made a picture that is better than the novel, which has some fairly improbable subplots and is hideously complicated. There's no

The film Ghost Story *surpasses the current crop of lurid, supernatural horror pictures*

embroidery in the film. Our focus is the supernatural reprisal for an enduring wrong and the interwoven fear and culpability that lurk below the surface of each man—terrain that is difficult but most rewarding to explore with a camera. We've brought in none of the rather repulsive demonologies you find in pictures like *Rosemary's Baby*, which was disgusting, or *The Omen*, which I loathed. In a horror film the most terrifying events are always subtle rather than bloodthirsty."

Houseman speaks with the authority of one who has both lived and caused a great deal of motion-picture history. Though best-known to the public as an actor, he spent the bulk of his career as a producer. Among his accomplishments are having cofounded, with Orson Welles, the legendary *Mercury Theatre* stage-and-radio repertory, helping to conceive the infamous *War of the Worlds* radiocast, and uncredited, having collaborated on the screenplay for Welles's classic film *Citizen Kane*. As a filmmaker, Houseman has produced such distinguished films as *Executive Suite*, *Lust for Life*, and *Julius Caesar*, among many others.

As his credentials imply, Houseman is a professed elitist whose work is intended for a thinking audience. Unlike the more militant literati, however, he doesn't resent the preponderance of aesthetic swill. "Oh, I may have no desire to participate in something like *Laverne and Shirley*, but I don't begrudge drivel its audience. Nor do I despair, as the dictum in Hollywood has always been, 'Until further notice, all the good stuff will be sneaked by.' The most I've ever desired from work that bears my signature is that it elevate the taste of that segment of society that is responsive to new ideas or insights. I was perfectly happy to have eighteen million people watch *The Paper Chase* every week, and except that we got chucked off the air, I did not *yearn* for an audience of *forty million*. Those other *millions* are not going to understand or appreciate what you're doing, and it's childish to expect otherwise."

In concert with this philosophy few other artists have alternately failed and

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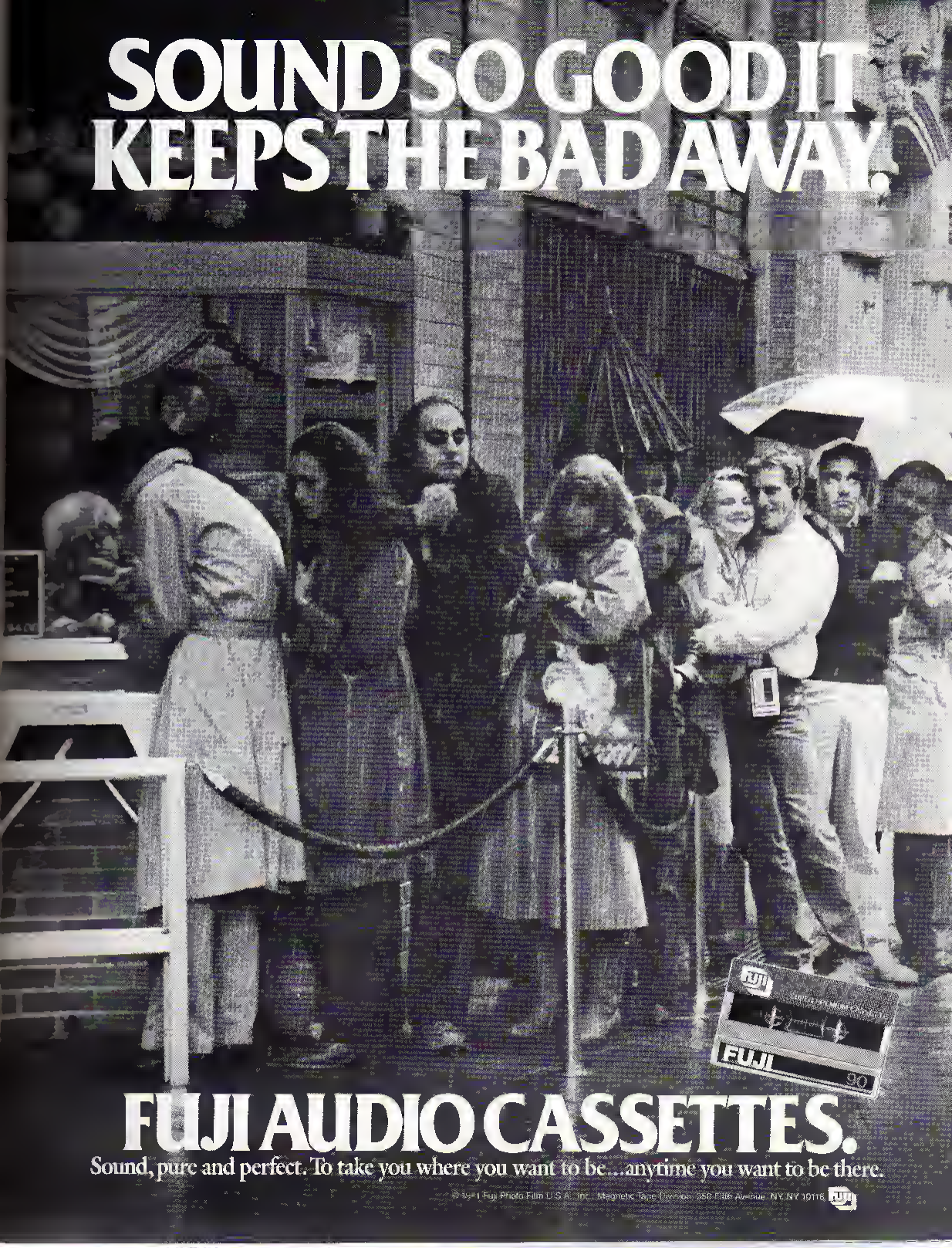
SOUND SO GOOD IT KEEPS THE BAD AWAY.



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BOOKS

THE ARTS

By Robert Weil

Best-selling books are no longer just written. They are created by marketing experts. A young author's prose may suggest the literary talent of F. Scott Fitzgerald, and his manuscript may boast the commercial appeal of *Gone with the Wind*, but unless a financial consultant determines that the book can sell, it will become lost in the pile of 40,000 volumes published annually in the United States.

Occasionally, though, a book miraculously slips through this Calvinistic process of predestination, becoming a commercial and literary success through the craft of the writing and the narrative.

The Soul of a New Machine, published quietly in the summer of 1981 (Atlantic–Little, Brown, $13.95), is such a book. Its success, ignited by word of mouth, then fanned by the encomiums of reviewers, bears testament to the fact that fine writing can succeed on its own. It signifies also that science books have come of age.

"It's the kind of thing you dream about," remarks a dazed Tracy Kidder about his unexpected success. His story about the design and the construction of a 32-bit minicomputer by Data General in Massachusetts reads like a fast-paced thriller. His characters, the talented young engineers known as the "Hardy Boys" and the "Microkids," come across as masterminds in a James Bond novel. *The Soul of a New Machine* banishes the stereotype of the scientist as a staid, bespectacled type, tediously laboring for decades over his laboratory research.

Kidder's project began innocently enough in the fall of 1978. He had been compiling lists of possible book subjects and he went off to see his editor at Atlantic–Little, Brown.

"Hey, why don't you look into computers?" the editor suggested, and then he gave Kidder the name of Data General's Tom West, the orchestrator and leader of the Eagle computer project. It was a strange assignment for the Harvard-educated English major, whose background was "absolutely nonscientific. I didn't even have a basic knowledge of computers," Kidder admits, but "I don't think that that's necessarily a disadvantage. I was not writing for a completely computer-oriented audience."

The Hardy Boys had already completed the design of the new computer when Kidder arrived at Data General, in Westborough, Massachusetts. "They were getting ready to start debugging," he remembers. "So I had to reconstruct the design phase."

West introduced him to all the lieutenants, and Kidder "began to hear their stories on how it all came about." He became friends with many of the people involved in the project and after several months of observation acquired an intimacy with the project and its architects that is unusual for a reporter covering a story. It is precisely this intimacy that distinguishes the book and enables lay readers to comprehend the powerful dynamics that characterize American technological research at its best.

Trouble arose after eight months of observation. Apparently the fact that Kidder had gained the confidence of those who were creating the computer began to worry the corporation's executives, who feared that trade secrets might be divulged. "Someone upstairs got cold feet, and I had a few go-rounds with the chief counsel," he recalls.

"Some people there wanted to get more control over me than I thought I could possibly surrender." Although the lawyers eventually resolved the situation, Kidder rarely returned to the Data General plant.

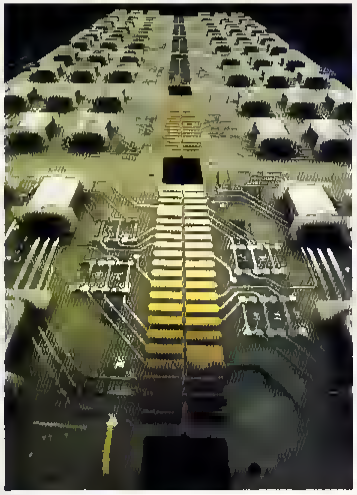
The discord that developed between Kidder and Data General has been forgotten in the wake of the book's appearance on national best-seller lists. "The book's success is not hurting their business," he adds dryly.

What emerges as a dominant theme throughout *The Soul of a New Machine* is a respect for the tradition of fine craftsmanship. It's a time-honored New England trait personified not only by Kidder, who takes considerable pride in the craft of his writing, but also by the Microkids, who assembled their computer at an astonishing pace.

One is even reminded of the Massachusetts Bay Puritans in the seventeenth century. They zealously operated their community for the common good, believing that the misdeeds or slothfulness of *one* citizen would inevitably jeopardize the safety and survival of the fragile community that had been carefully constructed under the eye of God.

West may not have acquired his managerial brilliance through a study of Puritan philosophy, but his manipulation of the computer engineers compares well with the workmanship of an earlier time. "He [West] was very good," Kidder says enthusiastically. "He had this little competition set up. He talked about things like peer pressure. 'If I screw this up, I'll be the only one, and I'm not going to be the only one,' was the prevailing philosophy. There was a lot of this kind of manipulation."

Understandably, Kidder remains optimistic about the future of American technology. "We still have Bell Labs. We have the Watson Research Center. Those are pretty formidable operations. I think IBM is formidable as well. Think of the billions of dollars people lost



Can a computer have a soul as well as a mind?

CONTINUED ON PAGE 121

CONTINUUM

Edited by Dick Teresi

FIRST EARTH BATTALION

When Lieutenant Colonel Jim Channon agreed to investigate California's human-potential movement for an Army think tank project in 1978, he did so with extraordinary zeal. Channon, an Army futurist then stationed in Los Angeles, visited more than 130 human-potential groups, including est, Insight, and a host of others ranging in focus from the philosophical to the practical. Many seminars later, Channon concluded that holistic attempts to integrate mind, body, and spirit constitute the wave of the future. He also decided that the human-potential movement is something the Army should be concerned with.

His solution was the First Earth Battalion—a mythical command unit that he designed as a model for the Army in the 1990s—whose purpose, according to Channon, would be to find alternatives to current modes of warfare and to the Army's attitudes about individual soldiers.

Such concerns as planetary peace, global interdependence, ethical warfare, and ecology predominate in battalion literature. Concepts are drawn heavily from Eastern philosophies and metaphysical disciplines. Battalion members would be required to have strong spiritual and philosophical commitments.

What Channon proposes, among other ideas, is a kind of "strategic microforce." Such New Age soldiers would be highly evolved in every sense. They would possess superior intelligence, rational decision-making ability under life-and-death pressure, an affinity for languages, and an understanding of sign language. They would be well aware of the power of visual symbols, music, and movement, especially choreography. They would be able to put themselves in relaxed-brain-wave states.

Channon's soldiers would be highly versatile, boasting such technical skills as parachuting, scuba diving, and the ability to disarm nuclear devices. They would also be trained in aikido and other martial arts, meditation, yoga, and fasting. Proficiency in hypnotherapy, psychic communication, and systematized intuition,' including dowsing and American Indian tracking techniques, would combine with knowledge of acupressure and herbal medicine. "A profound respect for other people's value systems' would be essential. Channon says since soldiers would be of both sexes and of various religious or spiritual systems and races. Ultimately the battalion would be international as well.

Their assignment: to handle the most "destabilizing" situations, including countering nuclear terrorism, providing protection within, or safe travel out of, strife-torn countries, and preceding United Nations peacekeeping forces. Channon envisions, for example, a team of 15 to 30 battalion members parachuting into a Mideast hot spot and standing between two armies to avert a potential clash. The battalion could inaugurate a space patrol that would search out concealed war devices, supervise the Suez Canal, and oversee emerging psychic research in the United States and the USSR. Battalion members, not necessarily those in the strike force, would handle reforesting projects and promote respect for Mother Earth.

Whether the First Earth Battalion will ever become a reality is uncertain. Channon's project has no official sanction or status, and, although the Army does not condemn it, the battalion is not openly advocated. "We really don't know that much about it," one Army spokesman admitted. But Channon claims he has some 500 member officers in an informal First Earth information network, which filters battalion concepts into the bureaucracy through memoranda and other standard channels. A nonprofit First Earth Battalion Foundation, in New Mexico, produces copies of Channon's 'soft tactics manual,' which describes First Earth concepts, an accompanying hour-long videotape, T-shirt logos, and other materials.

The ideas may or may not be taken seriously. Some people think the First Earth is a great idea, and some think it's terrible," says Tom Kelly, deputy director of the Delta Force, a think tank at the War College, in Virginia. "It's hard to get a consensus."

But Channon and his supporters are optimistic. "If the Army doesn't have a policy that contains hope by the 1990s, [it will] be booed out of the country," he says. Channon believes the battalion could become a viable unit in five years or less as pressures to counter terrorism mount and as human-potential consciousness becomes more widespread.

Literal acceptance of First Earth concepts is not necessarily a final goal. "The ideas that can be tested and validated will be adopted," Kelly says. "The Army should look at the soldier in a holistic way.' A retired officer, Colonel Mike Malone, agrees. "The First Earth Battalion makes the Army look at itself ten years from now.' Any recruits?—*MICHELLE BEKEY*

CONTINUUM

SOVIET CHILL

Whenever it's too hot or too cold there are those who blame the Russians A hundred years from now there could well be cause for complaint According to a scientist at Western Michigan University, Soviet plans to divert some rivers in the USSR could lower the temperature of the Northern Hemisphere and alter climate around the world

Geographer Philip Micklin reached this conclusion with the help of a flow chart that analyzes Soviet plans to divert water from the Ob and Yenisey rivers in the north to agricultural and industrial regions in the south The rivers (each about as long as the Mississippi) now flow to the Kara Sea, which in turn empties into the Arctic Ocean Reducing the flow of water to the Kara, and to the Arctic Micklin explains, would make it more difficult for the North Polar ice cap to melt. The results a larger ice cap and a colder Arctic Ocean It is a logical conclusion he says, 'that a colder Arctic would cause a generally cooler Northern Hemisphere and certainly more variable weather'

None of this will happen overnight Indeed, the initial stages of the Soviet plan call for the diversion of a mere 60 cubic kilometers of water a year which will not have much impact But Micklin warns, the long-range schemes are far more grandiose The Russians are well aware of the dangers,' he notes, 'but it might be almost impossible for them to resist the tremendous political and economic advantage of getting more water to the south'

—Margaret Coffey

Boating on the Ob River Soviet plans to divert water from the Ob and Yenisey rivers to areas to the south might cool the hemisphere

'Kids are always the only future the human race has"
—William Saroyan

SNAKESCAM

Covert "sting" operations are the rage among federal law-enforcement agencies these days Even the U S Fish and Wildlife Service recently launched an undercover investigation called Snakescam The two-year plot to trap profiteers who sell endangered reptiles on the black market led to the biggest bust ever of wildlife smugglers in the United States According to special agent Rick Leach, 27 suspects in 14 states were arrested

Fish and Wildlife Service agents borrowed techniques from other law-enforcement experts who stalk drug smugglers and crooked congressmen, Leach says Operating through a phony storefront business called the Atlanta Wildlife Exchange in Georgia, they taped transactions, then made arrests

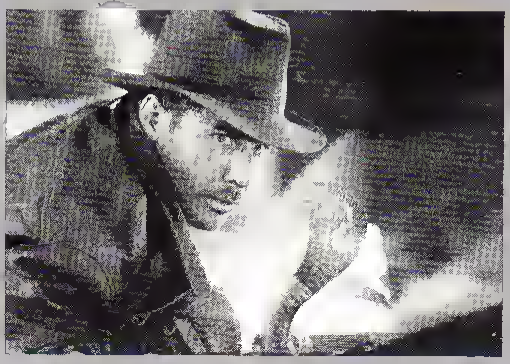
In a year and a half Leach says the agency bought and sold nearly 10,000 live animals illegally plucked from the wild Many were rare and exotic reptiles classified as endangered species the Indian python the American alligator, and even the Gila monster, a venomous lizard The investigators discovered that native American species fed a black-market trade that flourished to the tune of up to $100 million a year, including a booming business in Europe and Japan where collectors pay many times the domestic price for a prized specimen

Penalties for those arrested have included fines of up to $7,000 five years' probation and compulsory terms of public service that may involve work in wildlife conservation Federal agents are now sifting through evidence that they say will net another 150 suspects

—Irving Lieberman

The atomic bomb is a paper tiger Terrible to look at but not so strong as it seems"

—Mao Tse-tung



Some shady characters were stung by federally employed reptiles

VIDEOTHERAPY

Space Invaders, Breakout and other video screen Armageddons that lure fixated preteens to play parlors are now turning up in more sober places.

At the Veterans Medical Center, in Palo Alto, California, Pong or Air Sea Battle or Breakout can help treat brain-damaged victims of strokes, accidents, or senile dementia, according to psychologist William J. Lynch, videotherapy's putative father.

A thirty-nine-year-old accident victim, whose left hemisphere damage caused slurred speech and flawed hand/eye coordination, recovered (in part) under the influence of Breakout. Learning to maneuver a bouncing dot to break through a wall, the man progressed from 20 hits in April to 50 in May and June, when he checked out of the hospital and got a job in a distant state.

Not everyone's progress is so dramatic. If an Alzheimer's disease (senile dementia) patient doesn't deteriorate, it is counted as a victory. Lynch notes. Games are matched to a particular patient's needs, and his progress is painstakingly charted. Pong, say, might be the answer for visual field problems, while memory or verbal deficiencies might be treated with a word game like Hangman.

Though the results of video-game rehabilitation are difficult to assess—since more routine therapies are used concurrently—Lynch is sanguine about an Atari future. It's probably more fun than anything else we do. For one thing, patients are motivated." He's now angling for microcomputers.

Learning-disabled children in Massapequa, New York, are also honing their skills to the tune of make-believe heroics and intergalactic warfare.

Psychologists Renee Okoye and Tony Hollander have reported "dramatic improvement"—measured by the Sensory Integration Test—in the motor coordination, hand/eye coordination, and spatial visualization of 25 children given a hefty Atari diet.

And the Army is allegedly considering Atari games as modern tank training for GIs. —Judith Hooper

Specially adapted video game. Victims of strokes, accidents and senile dementia are being rehabilitated and having fun as well.

'Lend me the stone strength of the past and I will lend you the wings of the future.'
—Robinson Jeffers

FUTURE FACES

A few million years from now people will look much as they have been visualized by science-fiction writers—sleek, diminutive, toothless and hairless—a Syracuse orthodontist claims.

Dr. David Marshall, who has studied the human skull for 35 years and who established an anatomical museum in Syracuse, New York, says the soft, refined foods that we eat are causing changes that will make our descendants somewhat odd-looking. 'Man just doesn't use the jaw the way he did when teeth were weapons and food was unprocessed," he says.

'Human jaws are actually becoming smaller, the brain cage is increasing in size, teeth are losing cusps, and their roots are shrinking. Dr. Marshall has formulated a projected scale of possible human skull changes to obtain an idea of how future man may look.

The models he created for the Evolution of the Skull display at the anatomical museum suggest that future man will have a bald pate, squeezed, prominent features, and small jaws.

"Of course," Marshall admits, "we're controlling our environment now, and man wasn't able to do that in the past. Such things as genetic engineering could very well change these projections." —Allan Maurer

'Few things are harder to put up with than the annoyance of a good example."
—Mark Twain

'History records the names of royal bastards, but it cannot tell us the origin of wheat.'
—Jean Henri Fabre

The most beautiful thing we can experience is the mysterious. It is the source of all true art and science.
—Albert Einstein

Humans are losing their jawline.

CONTINUUM

SECRET MILK INGREDIENTS

What s in your daily glass ot milk? Water protein fats, sugars vitamins and salts—plus a dash of morphine and a pinch ot bovine leukemia virus

Dr Jorge F Ferrer and his colleagues at the University of Pennsylvania School of Veterinary Medicine have sounded a warning about the virus, detected in fresh milk taken trom ordinary dairy cows

It intects more than 20 percent ot dairy cows in the United States and causes leukemia in those animals that have a genetic predisposition to it The virus also infects sheep and chimpanzees In the laboratory it can also infect human cells

Whether exposure to the virus in milk poses any health hazard is not known There is no proot but one recent survey indicates that in areas where there are a lot ot intected cows there is a high incidence of acute lymphoid leukemia in humans

Less troubling is the presence ot a morphinelike substance in cow and human milk According to scientists at the Wellcome Research Laboratories, in North Carolina people and cattle may ingest morphine while eating certain plants—lettuce for us, and hay for cows

What it does is anyone's guess The amount is tiny just a traction of the dose given as a painkiller One researcher theorizes that the morphine acts like the enkephalins (substances in brain and intestinal cells that serve as natural painkillers) and may help explain why so much milk is drunk by in somniacs

—Carol A Johmann

Milk drinkers may have reason to grimace Bovine leukemia virus has been found in cow s milk—along with a pinch of morphine

LIGHTNING RECOVERY

Lightning kills up to 300 Americans a year In the first tew seconds after people are struck, their heartbeat and breathing stop, leading bystanders to assume they're already dead Within three minutes they are

But according to meteorologist Dennis Thomson of Pennsylvania State University in University Park persons hit by lightning can now be saved with cardiopulmonary resuscitation (CPR), a manual technique in which pressure applied to the chest restores circulation and mouth-to-mouth resuscitation maintains respiration

CPR has long been used to treat heart attack victims more recently doctors discovered that it is also valuable in reviving those briefly exposed to electric shock The technique was extended to lightning victims Thomson says, because, like electric shock victims, they suffer a disruption ot the electric impulses running through the brain and the heart

Thomson advises that CPR should be performed by a person trained in the technique until the lightning victim can be taken to a medical center

— Madeleine Lebwohl

ANCIENT RECORDINGS

Sounds that are many thousands of years old, perhaps even human voices may be recorded in the grooves ot ancient pottery and glass artifacts, a Toronto pediatrician and amateur archaeologist believes

Dr Peter Lewin, recognized for his work on ancient mummies, is trying to replay the chance sounds he thinks may have been captured on pots vases, and plates from former civilizations If someone shouted or a dog barked close by as a vessel was being made on a potter s wheel, the sound could very well have been picked up on the vessel, Dr Lewin says

At first Lewin attempted to play' the pottery on a record turntable using a diamond stylus That was too noisy" Lewin says 'So now we're using a laser similar to those on video-disc machines The laser can be tuned to play only certain frequencies such as those ot the human voice We ve run three or four items through so tar, without any success Our next step is to

Dog barks captured in pottery?

try to prove a point We re going to engrave a copper plate and see, experimentally whether sounds can be captured in this way '

Although researchers in Europe are also using lasers in an attempt to recapture the fragments of sound that may be locked in the grooves of ancient artifacts Lewin admits that the whole idea sounds like science fiction "Some of my friends think I'm well put it in quotes 'potty "

—Allan Maurer

COMPUTERIZED M.D.

It's 2 A M in the intensive-care ward, and the patient is still under heavy anesthesia from the coronary-bypass operation Suddenly the alarms begin to ring The patient s heart is beating erratically his lips are turning blue, and his blood pressure is dropping The nurse having just completed her training, is inexperienced in this kind of emergency She repeatedly pages for a doctor, but by the time he arrives the patient has suffered a heart attack

This scene is all too familiar in the medical world But now a team of physicians and engineers at Rensselaer Polytechnic Institute (RPI), in Troy, New York is working on a solution a medical auto pilot a computer that not only monitors a patient s vital functions but also directly controls those functions with respirators and drugs

"The vital signs of a patient under intensive care must be kept within very narrow ranges for survival, says anesthesiologist Rob Roy, who heads the RPI effort There are so many variables to keep track of in fact that many intensive-care units already rely on computers to analyze all the data coming in Physicians use the numbers provided by the computer to decide what drugs to administer

To close the loop between the computer and the patient, the RPI team is building a series of computerized doctors " starting with one that monitors the heart According to Roy, the team has already developed most of the computer programs and hardware for this initial project Sensors inserted in the hearts of laboratory animals connect to computerized equipment that monitors heart function, Roy explains This equipment is hooked to a central computer that collates the information and, if anything is amiss instructs a system of pumps and valves to administer the appropriate drugs

This is just the beginning A private firm has also contracted with the team to develop a similar autopilot for monitoring human patients —Robert Vogel

'A really busy person never knows how much he weighs

—Edgar Watson Howe

Monitor Soon it will be turned into a medical autopilot

Automatic tellers of the future will identify you by your eyeballs

EYEDENTITY

Someday you may be able to withdraw your money from an automatic teller machine by staring at it This sort of eye contact is just one of the uses for the EyeDentifyer, an automatic identification machine invented by Robert B Hill, of Portland, Oregon

Hill had been working on a medical tool with his father an ophthalmologist when he realized that each person has a unique pattern of blood vessels on the back of the eye To analyze these patterns he built the EyeDentifyer, a small, black, microprocessor controlled box that contains a light source and an optical scanner The subject looks into a window in the box, focuses on a fixation target ' and pushes a button The EyeDentifyer automatically scans and records the subject s blood-vessel pattern converting it into computer data that are compared with an eyeprint already stored in a bank or on a credit card By matching the live eyeprint with the stored one, the EyeDentifyer quickly verifies identity

Hill says that his device will usher in the age of automatic personal identification The machine can verify checks or credit cards, secure electronic funds, and control access to high-security areas on military bases or in nuclear-power facilities and it has already caught the eye of the CIA Right now the EyeDentifyer is still a laboratory prototype but Hill's company, EyeDentify Inc , plans to market it this year —Phoebe Hoban

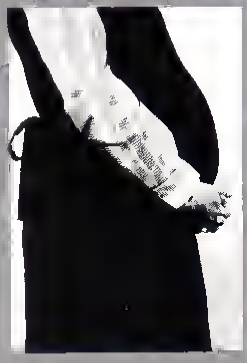
'You can judge your age by the amount of pain you feel when you come in contact with a new idea

—John Nuveen

CONTINUUM

BETTER PREGNANCY TEST

Most women are still unaware of a new blood test that detects pregnancy and



A new blood test may soon supplant traditional urinalysis

that monitors the health of an embryo within just eight days of conception.

Dr. Judith Vaitukaitis of Boston University, originally developed the test to monitor tumors that secrete human chorionic gonadotropin (HCG), a hormone also produced during pregnancy. She soon learned that the presence of HCG was a more precise indicator of pregnancy than the universally used urine test. Indeed, the HCG test was 100 percent accurate, while urinalysis worked only after a missed menstrual period and even then provided no information about the health of the embryo.

Because the placenta produces less pregnancy hormone in instances when an embryo is unhealthy or poorly attached, Dr. Vaitukaitis explains, the new test is a crucial index for physicians who treat women who are in danger of having a miscarriage. And it can be effective in the early detection of the life-threatening ectopic pregnancy (one in which the embryo develops outside the uterus, usually in a Fallopian tube).

—Richard Levine

NEGATIVE IONS

Air loaded with negative ions stimulated brain growth and affected the brain chemistry of rats in a University of California study. The experiment also revealed a strange new aspect of rat behavior.

In the initial study conducted by Marion Diamond and Albert Krueger, who founded the university's Air Ion Research Laboratory, the scientists found that rats raised in negative-ion-enriched environments developed cerebral cortex areas 9 percent heavier than those raised in normal air. Besides, the negative ions reduced levels of the neurotransmitter serotonin, which is associated with stress, sleep, irritability and moodiness.

Negative-ion generators are popular products—sold to people with the claim that increased negative ions can provide a sense of well-being, among other things.

An unexpected side effect of the study resulted because metal cages cannot be used in ion experiments. So special see-through Lucite cages were used, giving the researchers a new glimpse of rat behavior.

Mother rats piled their babies in a corner before exploring the cage. "Diamond says, 'We'd never seen that before.'"

—Allan Maurer

GOATS IN SPACE

In outer space, man's best friend may be a goat.

According to computer simulations made by Cornell University researchers working under a NASA grant, goats on interstellar voyages could gobble up wastes and provide astronauts with abundant food. The key, explains chemical engineer Michael Shuler, lies in the goat's versatile stomach—a chamber inhabited by microorganisms that break down all kinds of waste.

Astronauts can feed goats sludge, the woody parts of plants, and other materials that people find unpalatable, Shuler says. The ravenous microorganisms present in the goat's stomach will break down these materials into feces and urine. The goat's urine and feces, ultimately fed into a mechanical treatment unit, will be far easier to process than the original refuse. The treatment unit then will convert the goat's excreta into fertilizer for plants on the spacecraft.

With a goat aboard, Shuler says, the waste unit could be scaled down by more than half, greatly reducing the size of the spacecraft. This would save millions of dollars in fuel and other costs.

The goats will cost the human passengers virtually nothing, consuming only the wastes humans cannot eat. Moreover, they will provide milk and meat for the crew, lessening the amount of food needed on board. All in all, they may well make a ten-year sojourn in a spaceship far more feasible. The waste unit is soon to be constructed, but an actual flight may be ten or more years away.—Mark Teich

In space, no one can hear you bleat. The goat's omnivorous appetite and killer digestion make it the perfect astronaut.

TV CENSUS

If you lived in the world in side your television set you'd find more Help Wanted ads for doctors and lawyers than for file clerks Florid psychosis and amnesia would be more common than the flu and accidents would almost never hurt

These are the findings of two psychologists Alberta Siegel of Stanford who conducted a census of TV-land as part of the 1981 update of the 1972 Surgeon General s report on TV and behavior, and Washington D C , psychologist Lorraine Bouthilet, who conducted a health survey of our cathode-ray-tube universe

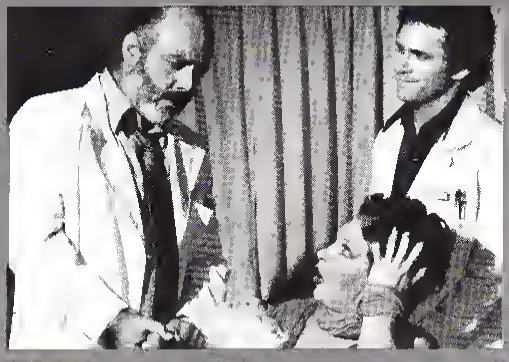
Men outnumber women three to one in prime time, Siegel says and nubile females—mostly in their teens, twenties or thirties —date men ten years older than themselves

Harmony and exaggerated courtesy are the norm in TV families—which is odd since TV dads are so inept, bumbling or incompetent '

Children and the elderly compose a minute fraction of the television population In stark contrast to real-world demographics old men are much more common than old women and most older people are helpless and pitiful Since children and the elderly use TV 'as a window on the world,' Siegel wonders about the version of reality they get

Though 7 percent of prime-time characters suffer grievous accidents, only a handful ever need to be hospitalized, Bouthilet reports But mental illness is epidemic TV psychotics don t just pick daisies, either most are violent or victimized

Half of all daytime serial characters are sick Fortunately, TV doctors are almost uniformly ethical kind smart, and sociable and they do 60 percent of their doctoring outside the office —Judith Hooper



CBS's Trapper John (left) with a female impersonator The TV world is full of crazies, plus nice doctors who make house calls

MATING GAME

To Robert Ravich a family therapist how well your marriage works may be a matter not only of whether you win or lose but of how you play *his* game

He has married couples try their hand at the Ravich Interpersonal Game/Test, which requires each person to guide his or her own personal toy train from a start to a finish line in 30 seconds The complication is that both persons have to do this act at the same time trying to get to the finish line over the same two-track system What is most revealing to Dr Ravich an associate professor of psychiatry at Cornell University Medical College, is how couples interact in getting both trains to the finish

Each couple makes 20 runs per test and after more than 15 years of train testing, Ravich has isolated nine patterns of behavior In one, husband and wife alternate being the first to cross the finish line by using the shorter and faster of the two tracks In another, the couple may simply decide to take different tracks often an ominous sign for the marriage, according to Ravich Couples who go their own ways in the game often go their own ways in marriage and may be prime candidates for divorce

Couple taking toy train test Keeping marriage on the right track by avoiding switched signals and derailed relationships

Ravich recently retired his toy trains in favor of video games in which each person manipulates a small blip of light He began his long-term research project at the Marriage License Bureau in New York City, where he had newlyweds take his train test Follow-up tests, done over a seven-year period, show that, for better or for worse, couples' game-playing patterns don't seem to change —Douglas Colligan

'It is absurd to deny the role of fantasy in even the strictest science '
—Vladimir Ilich Lenin

CONTINUUM

CAFFEINE CONFUSION

Heavy drinkers often sip a cup of coffee to sober up But recent experiments carried out at Hull University in England, suggest coffee may have the opposite effect Tests on eight volunteer drinkers showed that their mistakes doubled when they also ingested caffeine

According to Dr Geoffrey Lowe, each volunteer drank the equivalent of four screw drivers and then the equivalent of two cups of coffee When they attempted a series of tests, pressing buttons in response to light signals, their reactions were slower than those of subjects who drank only vodka

Dr Lowe concedes his sample was small, but he plans to conduct further experiments with 96 persons under a variety of conditions Asked why people believe that a cup of black coffee will help them sober up Lowe says, 'Alcohol depresses the brain, while caffeine stimulates it So the obvious thing to say is that they cancel each other out However it appears that together they overload the brain and cause confusion "—Ivor Smullen

Coffee is supposed to help you sober up but it doesn t

LISTENING TO BONES

A runner stumbles and twists an ankle His doctor takes an X ray but defects no injured bones That afternoon when the runner returns to the track, his ankle breaks The perplexed physician's conclusion The ankle probably had a hairline fracture in the first place, one so tiny that the X ray didn't pick it up

There are It seems certain kinds of bone damage that X rays simply overlook But now a biomedical engineer at Rensselaer Polytechnic Institute in Troy, New York has come up with a solution an extraordinarily precise device that diagnoses bones by 'listening' to high-frequency sound waves passed through them According to the inventor, Hyo Sub Yoon broken bones will absorb high-frequency sound waves far more readily than whole bones will

The injured leg or finger Yoon explains is placed in a collar of high-frequency sound transmitters (or mini hi-fi speakers) much as an arm is wrapped for a blood pressure test Then a receiver is taped to the body near the transmitters The receiver monitors the waves as they pass from the transmitters, through the body and into the bone suspected of being injured Afterward the same amount of high-frequency sound is transmitted into a healthy bone Finally the two tests are compared the difference in absorption levels if any will correspond to the degree of bone damage

According to Yoon his new method is superior to the X ray since it can detect minute injuries—microfractures, or tiny gaps—deep inside the bone tissue 'Unlike X rays, sound doesn't just scan or photograph the surface of a bone,' Yoon says 'It penetrates the bone tissue and can even detect a single splintered fiber"

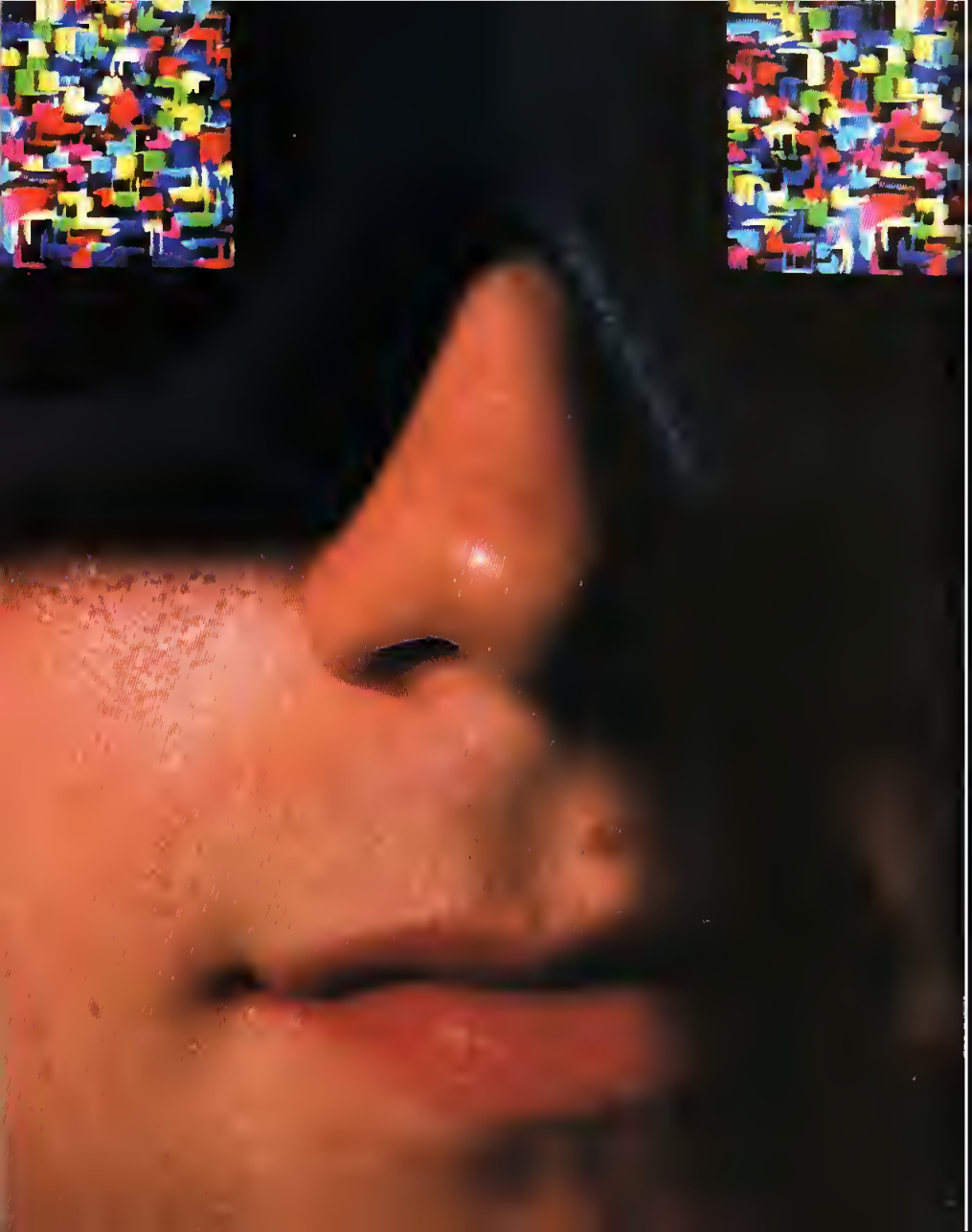
—Peter Rondinone

Let the great world spin forever/Down the ringing grooves of change
—Alfred Lord Tennyson

The commonplace of the schoolbooks of tomorrow is the adventure of today, and that is what we are engaged in"
—Jacob Bronowski

"Ours is an age which is proud of machines that think, and suspicious of any man who tries to
—Howard Mumford Jones

The key to detecting hairline fractures may not be X rays or other visual imagery but high-frequency sound waves aimed at bones



Nicholas Negroponte (below) and other wizards are turning TV sets into dutiful genies. Watch. It's done with

MAGIC MIRRORS

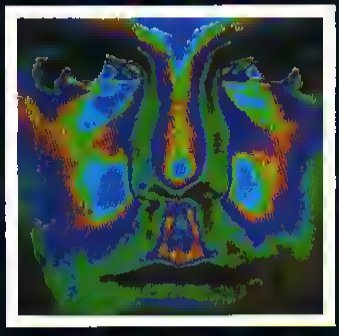
BY DAVID SALTMAN AND GURNEY WILLIAMS III

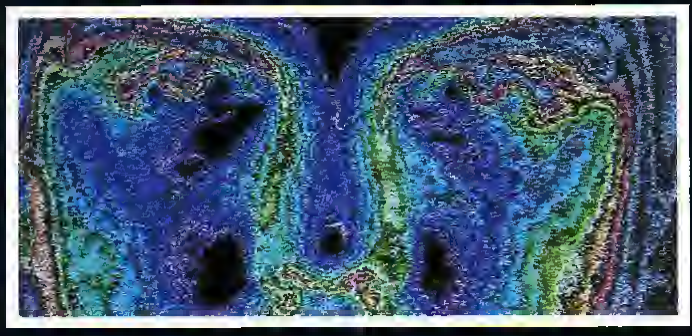
A magic mirror, whether of the fairy-tale or the future variety, ought to have at least some of the following characteristics. It should be able to "see" faraway things, like television or the Space Telescope. It should answer questions, like the honest wall mirror in *Snow White*. It should be an entrée into luminous worlds, like Alice's looking glass: The first thing Alice saw after she had crawled alone through the mirror over the mantel was a spirited, grinning human face on the back of a clock. A magic looking glass glows with an intelligence of its own. It's more than mere medium.

Nicholas Negroponte, of the Massachusetts Institute of Technology (MIT), might be

PHOTOGRAPHS BY DAN McCOY

They're sculpting screens into the shapes of faces, which will be able to grin, talk, scowl, and respond to whispered secrets





the last to admit it publicly, but his research has always leaned in the direction of magic mirrordom. And some of the devices invented by his Architecture Machine Group meet all the criteria for quality magic looking glasses. Negroponte, a professor of computer graphics, looks more like a financier than an innovator. But it's possible that if we, too, ever make it through the mirror, it will be his somewhat florid face we'll see, grinning on the back of the clock.

Negroponte is one of a small group of wizards on their way to attaining mastery over video technology. In his futuristic laboratory and others like it, researchers with an artistic flair (Negroponte himself was trained at MIT as an architect) are making television sets that respond instantly to a viewer's presence. They're building electronic tour guides that lead people, with sight and sound, through the streets of a village, the hallways of a building, or the fuel lines of a jeep. They're sculpting screens into the shapes of faces, which will grin, talk, scowl, and respond to whispered secrets. They're providing eyes for helicopter pilots who skim over treetops on a foggy night and aids for people unable to talk or write. They're melding fantasy and reality on a single screen that reacts to the touch, spoken command, or subtle gesture of any person watching it.

You sit down before a 19" TV screen in Negroponte's "terminal garden," a room in which TV sets appear to be growing, together with a few trees. The color picture on your set has some of the numbing quality of an old rerun or an early-morning travelogue. It is an unmoving street scene of Aspen, Colorado.

The vista is prosaic. But here is what Negroponte and an associate, Professor Andrew Lippman, have been able to do. Touch the screen, pressing the symbol for "forward." You'll see yourself rolling down the street almost as if you were looking through the windshield of an auto. To turn right, you press an arrow at the right edge of the screen. If a turn is possible, the arrow will flash green and you'll veer to the right at the next intersection. Push the arrow on the left edge and you'll turn left. Push "stop" and the video taxi will halt.

The technology—called movie maps—can transport you to places and times inaccessible to any real taxi. Every building on the street is touch-sensitive. Press the image of a house, for example, and the set will tell you with synthetic speech—or print out at the bottom of the screen—what the house is and will provide you with some guidebook information. Sometimes the scene will cut to a facade, followed by a montage of pictures of rooms, some contemporary and some from past decades. You control the pace of the tour by touching symbols on the screen. You can pause in a drawing room, go back to the bedroom you just saw, or explore new spaces as they appear today or as they once were.

The first time the lab set out to bring Aspen alive on the screen, the job required 16 people with Bolex cameras, probing every cranny of the town like obsessed tourists for three solid weeks. (A later shooting with automated equipment took two people just eight hours.) They filmed every intersection, the exteriors of houses, and the rooms in the houses. They collected hundreds of historical photographs. And they entered all of the photos into the electronic equivalent of two monstrous photo albums: twin 12" video discs, each holding the same data, each capable of containing up to 54,000 scenes. Circular grooves in each disc store video signals in the form of bumps or pits. A laser beam races over the pitted groove, reflecting into a sensor and "reading" the bumps. (Aspen,

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FICTION

"God is dead, God is dead.
. . Perdition! When God dies, you'll know it."
— Confessions of St. Argentine

PETRA

BY GREG BEAR

As near as I can discover, Mortdieu occurred seventy-seven years ago. Learned sons of pure flesh deny that magic was set loose, or even that the Alternate had gained supreme power. But few people could deny that God, as such, had died.

All the hinges of our once-great universe fell apart, the axis tilted, cosmic doors swung shut, and the rules of existence lost their foundations. I have heard wise men speak of the slow decline. I have heard them speculate on the reasons, the process. Where human thought was strong, reality's sudden quaking was reduced to a tremor. Where human thought was weak, reality disappeared completely, swallowed by chaos.

With the passing of God's watchful gaze, humankind had to reach out and grab hold of the unraveling fabric of the world. Those conscious beings left alive — those who had had the wits to keep their bodies from falling apart with the end of the useful constants — became the only cohesive force in the chaos. Imagine that time, if you will.

When every delusion became as real as solid matter. Blinding pain, flaming blood, bones breaking, flesh powdering, steel flowing like liquid, the sky raining amber. Crowds in the shifting streets, gathering at intersections, not knowing what to do, trapped by their own ignorance. Their weak minds could not grab hold. And where human thought gave way, gradually the ancient order of nature returned, with its own logic, its own way of adapting. People watched, horrified, as city blocks became forests. When they tried to stop the metamorphosis, their unorganized mentality only confused things further. With the first faint suspicion that they had all gone mad, the first crack in their all-too-weak reserves of will, they projected their nightmares. Prod-

PAINTING BY JOSE HERNANDEZ

igal crows perched atop the trees that had once been buildings. Pigs ran through the streets on their hind legs, pavement rushing to become soil behind them. The forest prevailed over most of the city.

Legend has it that it was the archexistentialist Jansard—crucifier of the beloved St. Argentine—who, realizing his error, discovered that mind and thought could calm the foaming sea of reality.

Most humans were entirely too irrational to begin with. Whole nations vanished or were turned into incomprehensible whirlpools of misery and depravity.

It is said that certain universities, libraries and museums survived, but to this day we have little contact with them.

Our Cathedral survived. Rationality in this neighborhood, however, had weakened some centuries before Mortdieu replaced only by a kind of rote. The Cathedral suffered. Survivors—clergy and staff, worshipers seeking sanctuary—had wretched visions, dreamed wretched dreams. They saw the stone ornaments of the great church come alive. With someone to see and believe, in a universe lacking any other foundation, my ancestors shook off stone and became flesh. Centuries of rock celibacy weighed upon them. Forty-nine nuns who had sought shelter in the Cathedral were discovered and were not entirely loath for (so the coarser versions of the tale go) Mortdieu had had a surprising aphrodisiacal effect on the faithful. Conjugation took place. No definite gestation period has been established, because at that time the great stone wheel had not been set twisting back and forth to count the days. Nor had Kronos been appointed to the chair to watch over the wheel and provide a baseline for everyday activities. But flesh did not reject stone, and there came into being the sons and daughters of flesh and stone, including me. Those who had fornicated with the gargoyles and animals were cast out to raise their monstrous young in the highest, hidden recesses. Those who had accepted the embraces of the stone saints and other human figures were less abused but were still banished to the upper reaches. A wooden scaffold was erected, dividing the great nave into two levels. A canvas drop cloth was fastened over the scaffold, to prevent offal from raining down, and on the second level of the Cathedral the more human sons of stone and flesh set about creating a new life.

I'm an ugly son of stone and flesh; there's no denying it. I don't remember my mother. It's possible she abandoned me shortly after my birth. More than likely she is dead. My father—ugly, beaked, half-winged thing, if he resembles his son—I have never seen.

The moment my memory was born is very clear to me. It was about thirty years ago, by the swinging of the wheel, though I'm sure I lived many years before that—years lost to me. I squatted behind thick, dusty curtains in a vestibule and listened to a priest intoning Scripture to a gaggle of flesh children. That was on the ground floor, and I was in great danger, the people of pure flesh looked upon my kind as abominations. But it was worth taking the risk. In time I was able to steal a Psalter and learn to read. The other books I stole defined my own world by comparing it with others. At first I couldn't believe the others existed, only the Cathedral. I still have my doubts. I can look out a tiny round window on one side of my room and see the great forest and the river that surround the Cathedral, but I can see nothing else. So my experience with other worlds is far from direct.

No matter. I read, but I'm no scholar. What concerns me is recent history.

I am small—barely three English feet tall—and I can run quickly through most of the hidden passageways. This lets me observe without attracting attention. I may be the only objective historian in this whole structure.

Like any historian, however, I have my favorite subjects within the greater whole.

I was almost cornered by the Bishop's masked troops. And when I tried one escape route, they waited at a crucial spot in the stairs, and I was forced back.

Naturally enough, they are events in which I played an important role. If you prefer history in which the historian is not involved, then look to the records of larger communities.

At the time my history begins, the children of stone and flesh were still searching for the stone Christ. Those of us born of the union of the stone saints and gargoyles with the bereaved nuns thought our salvation lay in the great stone Celibate, who came to life as all the other statues had.

Of smaller import were the secret assignations between the Bishop's daughter and a young man of stone and flesh. Such assignations were forbidden even between those of pure flesh, because they were, of course, unmarried, their double sin was interesting to me.

Her name was Constantia, and she was fourteen, slender of limb, brown of hair, mature of bosom. Her eyes carried the stupid sort of divine life common in girls of that age. His name was Corvus, and he was fifteen. I don't recall his precise features, but he was handsome enough and dexterous. He could climb through the scaffolding almost as quickly as I. I first spied them talking when I made one of my frequent raids on the repository to steal another book. They were in shadow, but my eyes are keen. They spoke softly, hesitantly. My heart ached to see them and to think of their tragedy, for I knew right away that Corvus was not pure flesh. And Constantia was the daughter of the Bishop himself. I envisioned the old tyrant handing out the usual punishment to Corvus for such breaches of level and morality—castration. But in their talk was a sweetness that almost blanketed the powerful stench of the lower nave.

"Have you ever kissed a man before?"

"Yes."

"Who?"

"My brother." She laughed.

"And?" His voice was sharper; he might kill her brother, he intimated.

"A friend named Jules."

"Where is he?"

"Oh, he vanished on a wood-gathering expedition."

Oh. And he kissed her again. I'm a historian, not a voyeur, so I discreetly hide the flowering of their passion. If Corvus had had any sense, he would have reveled in his conquest and never returned. But he was snared and continued to see her, despite the risk. This was loyalty, love, faithfulness, and it was rare. It fascinated me.

I have just been taking in sun, a nice day, and looking out over the buttresses. The Cathedral is like a low-bellied lizard, and the buttresses are its legs. There are little houses at the base of each buttress, where rainspouters with dragon faces used to lean out over the trees (or city or whatever was once down below). Now people live there. It wasn't always that way—the sun was once forbidden. From childhood, Corvus and Constantia were denied its light, and so even in their youthful prime they were pale and dirty with the smoke of candles and tallow lamps. The most sun anyone received in those days was obtained on wood-gathering expeditions.

After spying on one of the clandestine meetings of the young lovers, I mused in a dark corner for an hour, then went to see the copper giant Apostle Thomas. He was the only human form to live so high in the Cathedral. He carried a ruler on which was engraved his real name—he had been modeled after the Cathedral's restorer in times past, the architect Viollet-le-Duc. He knew the Cathedral better than anyone else, and I admired him greatly. Most of the monsters left him alone—out of fear, if nothing else. He was huge, black as night, but flaked with pale green; his face creased in eternal thought. He was sitting in his usual wooden compartment near the base of the spire, not twenty feet from where I write now, thinking about times the rest of us never knew of joy and past love, some say, of the burden that rested on him now that the Cathedral was the center of this chaotic world, others say.

It was the Giant who selected me from

the ugly hordes when he saw me with a Psalter. He encouraged me in my efforts to read. "Your eyes are bright," he told me. "You move as if your brain were quick, and you keep yourself dry and clean. You aren't hollow like the rainspouters. You have substance. For all our sakes, put it to use and learn the ways of the Cathedral."

And so I did.

He looked up as I came in. I sat on a box near his feet and said, "A daughter of flesh is seeing a son of stone and flesh."

He shrugged his massive shoulders. "So it shall be, in time."

"Is it not a sin?"

"It is something so monstrous it is past sin and become necessity," he said. "It will happen more as time passes."

"They're in love, I think, or will be."

He nodded. "I—and one other—were the only ones to abstain from fornication on the night of Mortdieu," he said. "I am—except for the other—alone fit to judge."

I waited for him to judge, but he sighed and patted me on the shoulder. "And I never judge, do I, ugly friend?"

"Never," I said.

"So leave me alone to be sad." He winked. "And more power to them."

The Bishop of the Cathedral was an old, old man. It was said he hadn't been Bishop before Mortdieu, but had been a wanderer who came in during the chaos, before the forest had replaced the city. He had set himself up as titular head of this section of God's former domain by saying it had been willed to him.

He was short, stout, with huge, hairy arms like the clamps of a vise. He once killed a spouter with a single squeeze of his fist, and spouters are tough things, since they have no guts like you (I suppose) and I. The hair surrounding his bald pate was white, thick, and unruly, and his eyebrows leaned over his nose with marvelous flexibility. He rutted like a pig, ate hugely, and shat liquidly (I know all). A man for this time, if ever there was one.

It was his decree that all those not of pure flesh be banned, and that those not of human form be killed on sight.

When I returned from the Giant's chamber, I saw that the lower nave was in an uproar. They had seen someone clambering about in the scaffold, and troops had been sent to shoot him down. Of course it was Corvus. I was a quicker climber than he, and knew the beams better, so when he found himself trapped in an apparent cul-de-sac, it was I who gestured from the shadows and pointed to a hole large enough for him to escape through. He took it without a breath of thanks, but etiquette has never been important to me. I entered the stone wall through a nook a spare hand's width across, and wormed my way to the bottom to see what else was happening. Excitement was rare.

A rumor was passing that the figure had been seen with a young girl, but the crowds didn't know who the girl was. The men and women who mingled in the smoky light,

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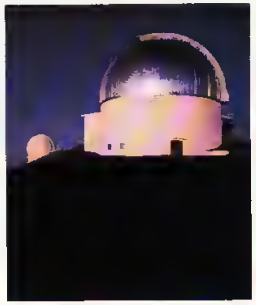
A mountain peak offers a dazzling peek at the cosmos



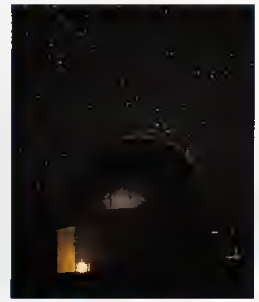
HAWAIIAN EYES

BY GENE O'ROURKE

Astronomers have found themselves a paradise on Earth. Their utopia is atop Mauna Kea, on the island of Hawaii, where half a dozen white observatory domes dot the barren, Mars-like terrain. Thanks to its altitude of 13,796 feet, a benign climate and smog-free skies far removed from bright city

PHOTOGRAPHS BY DOUGLAS KIRKLAND

"For astronomers, Mauna Kea's summit is heaven on Earth."



lights (the nearest large population center is 215 miles away in Honolulu). Mauna Kea enjoys the greatest number of clear viewing nights in the world. It was these ideal conditions that permitted photographer Douglas Kirkland to capture the sweeping arcs of stars during a time-exposure shot fixed on Polaris (left). A much-coveted position on the mountain belongs to NASA, which has a 120" infrared telescope (preceding pages). But this observatory will soon be joined by a much more impressive neighbor. The newcomer will house the world's largest telescope, a ten-meter goliath with six to ten times the light-gathering power of Mount Palomar's 200" mirror.

A new study reveals the strongest evidence yet for the mysterious near-death experience

RECOLLECTIONS OF DEATH

BY MICHAEL B. SABOM

In his new book, excerpted here, cardiologist Michael B. Sabom, of Emory University and the Atlanta Veterans Administration Hospital, discusses the results of his five-year study, a scientifically rigorous investigation of the near-death experience, or NDE. A brilliant light, a beautiful landscape, visions of long-dead relatives, all have figured in the recollections of Dr. Sabom's patients, people who were revived after episodes of clinical death. If one considers death as a continuum, then certainly these people have retrieved psychic information from as deep within this continuum as possible. — *Ed.*

It was the morning of June 6, 1966, about five o'clock. . . . We could pretty much see the Vietcong in the tree line, which must have been about three hundred feet away. They began shooting a few mortars, along with a whole lot of machine-gun fire.

I was first hit right between my thumb and the rest of my hand. By the time I shook that off, [a] rocket exploded. At that time I can recall doing a somersault to the rear as a result of the concussion. Just as I landed and was able to shake my head, a mortar went off right behind me, and I did a somersault forward.

That was about it until it appeared to be a couple of hours later. . . . I could see the VC [Vietcong]. I could see the guy that pulled my boots off. I could see the rest of them around picking up various things. They were taking rings. . . . It was like I was looking right down on it right now. I could see me. . . .

PAINTING BY [illegible]

It was just like I was looking at a manikin lying down there. I could see my face, and I could see my arm. I was pretty well burnt up, and there was blood all over the place. I could see an M-14 [rifle] about three or four feet away, and I was trying to get to it, but I just could not move. It was like being in a deep dream. When the guy was at my boots, I [waited] for him to get through so when he turned his attention, I could get to my rifle, but I couldn't get my body to move. I couldn't get that manikin to get to the rifle. I was like a spectator.

It was about four or five in the afternoon when our own troops came. I could hear them and see them, too. It was quite obvious I was out of it, burnt up. All the top part of my garment was burnt off, too. I looked dead. They put me in a bag. We were piled up on the amtrac, transferred to a truck, and then taken out to the morgue. And from that point it was embalming. I remember being on that table and that guy telling a couple of jokes about those USO girls. All I had on was bloody undershorts. [I watched as] he just snatched those off and cut [into the left side of my groin], exposing the femoral vein to inject the embalming fluid. He had already made a slight incision when he stopped to laugh; he was curious why there was that degree of blood. So he checked my pulse and heartbeat, [then] he decided that he would stop cutting.

At that point I lost track of what was taking place. They apparently took me to another room and severed my hand, and maybe a few minutes after that the chaplain was in there, saying everything was going to be all right. I was no longer outside looking at the situation. I was part of it.

Over the centuries various experiences have been recounted by people who had almost died. Some have reported traveling through a black tunnel toward a radiant light, then emerging to find a lovely landscape and the spirits of long-departed loved ones. Others have recalled hovering above their physical bodies while relatives gathered around to say good-bye. If the person recovered, he might recall a floating sensation, then a "coming back."

In my own practice of cardiology over the past five years, I have conducted an extensive investigation into the experiences of those who came very close to death. Many of these people—victims of cardiac arrest or other life-threatening crises—recalled a series of extraordinary events that took place" while they were unconscious and near death. Some considered this experience to be a privileged glimpse of another realm of existence.

BEGINNINGS

I started my exploration of what I call the near-death experience in 1976, while completing my first year of cardiology at the University of Florida in Gainesville. At the time, my wife and I belonged to a local Methodist church. One Sunday morning that spring, Sarah Kreutziger, a psychiatric social worker at the university, presented at our adult Sunday school class a book that had caught her interest. The book, *Life After Life*, by Dr. Raymond Moody, dealt with the experiences reported by people who had come close to death. Other members of the class also expressed their interest in the subject. When I was asked my opinion, the kindest thing I could say was, "I don't believe it."

Later that week Sarah phoned me. She had accepted an invitation to present Moody's book to a churchwide audience and wanted me to participate in the program as a medical consultant. Somewhat reluctantly, I agreed.

To add substance to the talk, Sarah and I decided to conduct a brief survey of several of our own hospitalized patients who had survived a medical crisis similar to those described in Dr. Moody's book. We would ask them whether they had had any experiences while unconscious and near death. If none had had such an experience (as I fully expected), then, at least, we could tell our audience that we had asked.

> *"In the initial stages of the experience, people perceived themselves to be looking down at their body from a vantage point that was usually described as ceiling height."*

The third patient I approached was a middle-aged housewife from Tampa who, according to her medical records, had suffered several near-death crises. I met her in her hospital room one evening at about 8 o'clock, and we had a lengthy discussion about the medical details of her previous illnesses. Finally, I asked her whether she had had any experiences during the times she was unconscious and critically ill. As soon as she was convinced that I was not an underground psychiatrist posing as a cardiologist, she began describing the sensation of floating several feet above her unconscious body. It was the first NDE I had heard about in my medical career. To my utter amazement, the details matched the descriptions in *Life After Life*.

Early the next day I told Sarah what I had found out. She had similar news to report—hers from a patient with chronic liver and kidney failure. We tape-recorded these accounts for our presentation and were enthusiastically received.

Over the next few weeks I pondered the significance of Moody's book. Several things continued to bother me about his material and his method of presentation. For one thing, the cases in *Life After Life* had been collected in a very casual, unsystematic manner. Many of the reports were furnished by people who had approached Moody after one of his presentations. There was no way to tell whether such testimonies were authentic or merely fabricated replays. Moreover, Moody said that 150 persons had been interviewed for his book, but only a small percentage of this number was included in it as examples. Did the experiences of all 150 persons fit nicely into the patterns he described, or were these basic patterns of the NDE based on a selected minority of the overall group which was unrepresentative of the experience in general? Who were these people who reported these experiences, and what were their social, educational, professional and religious backgrounds? Most important of all, as a physician, I wanted to know the medical details of the events that had led to their near-death experiences.

A further thought obsessed me. Moody noted that many people had later been able to recall specific events that took place in the vicinity of their physical body at a time when they were presumed to be unconscious. This recall had consisted of visual details. Moody did not attempt to substantiate these reports by citing medical records or other available sources. Now the majority of patients whom I would be interviewing had been resuscitated from a cardiac arrest. By this time in my career I had personally directed and participated in well over 100 such resuscitations. I knew what a resuscitation consisted of, how it would look. I anxiously awaited the moment when a patient would claim that he had "seen" what had happened in his room during his own resuscitation. I intended to pit my experience as a trained cardiologist against the professed visual recollections of lay persons. I was convinced that obvious inconsistencies would appear that would reduce these purported visual observations to no more than an "educated guess" on the part of the patient.

To answer my questions, I would have to conduct a "scientific study." I reviewed with Sarah my principal objections to Moody's work, and from this we made plans for our investigation. We would, we decided, interview all patients who were mentally stable and known to have survived a critical event. We defined this near-death event as any bodily state that caused physical unconsciousness and that could reasonably be expected to result in irreversible biological death unless medical attention was provided without delay.

Finding patients who had survived a medical crisis would be a simple matter for both Sarah and me. She had daily contact with patients in the kidney dialysis unit

CONTINUED ON PAGE 103

Photograph by Anthony Wolff

The woman who shook the scientific world with her discovery of the opiate receptor now challenges our beliefs about emotions, behavior, and sex

INTERVIEW

CANDACE PERT

Visitors wender through e labyrinth of olive-dreb corridors until they find the office with the neme CANDACE PERT and a child's drawing signed VANESSA posted on the door. Next door, rats slumber or scratch in their ceges, daydreaming of being unencumbered by electrodes, syringes, and imperious gloved hands. Here at the Biological Psychietry Brench of the Nationel Institute of Mental Haalth (NIMH), in Bethesda, Marylend, the business is the mind: slices of cortex, eglow with chemicels that, if you heed Candace Pert, contain ell our joys and sorrows.

In 1973, when Pert wes e twenty-six-year-old pharmecology graduata atudent, working under Dr. Solomon Snyder at Johns Hopkins University, in Baltimore, she startled the neuroscience community with her discovery of the opiete receptor. A receptor is a site in the brain where a molecula of a drug or naturally produced chemical fits into a brein cell like e key in a lock. The fect that the brain possesses receptors for morphine and heroin suggested that it must also produce its own version of these substances. And two years later Scottish scientists John Hughes and Hens Kosterlitz discovered our body's neturel opietes—the endorphins. A new ere in neuroscience wes born.

The discovery of the opiete receptor heapad instant renown on Pert and Snyder. Then, in 1978, Snyder, Hughes, end Kosterlitz recaived the Lasker Award, commonly considered to be a stepping-stone to the Nobel Prize. Candace Pert did not. But she did soon find herself the object of unwitting notoriety, as the controversy over her exclusion from the award seeped out of the hushed chambers of dispassionete research into the streets of public opinion. The young graduate student's name began reverberating even in the sacred editorial pages of *Science*, the cynosure of angry gods in lab coats. The opinion of meny informed reseerchers wes thet Dr. Pert hed been daniad har due.

Today, still reluctant to talk about the Lasker Award contioversy, Pert has only cordial words for her former mentor. If the opiete receptor was a *cause célèbre*, she'd rather discuss her current

work on the Valium receptor—which she flippantly refers to as the Hoffmann-La Roche receptor—or the mysterious target sites in the brain where Angel Dust works its black magic. Her photographs of intricate receptor patterns, illumined like so many inner galaxies, remind us of how little is known about the workings of the human brain. From where do our thoughts arise? How does the brain regulate behavior? Do our neurochemicals, like seasonings in a biological soup, make us sad or happy, psychotic or sane? Pert intends to find out. "I'm tinkering around inside the human computer," she says. "People are just very complicated electronic mechanisms, and our emotions of love, hate, anger and fear are hard-wired in our brains."

A graduate of Bryn Mawr College with a Ph.D. from Johns Hopkins, Pert now works at the National Institute of Mental Health (NIMH), right next door to her husband, behavioral psychologist Agu Pert. "I'm his biochemistry consultant, and he's my psychology consultant," she says. The couple live with their two children, Evan, fifteen, and Vanessa, six, on one of Bethesda's tree-lined streets. A third child is expected soon. Pert was interviewed for *Omni* by Judith Hooper in her lab and at home.

Omni: Some people have compared the present explosion in neuroscience to the splitting of the atom. Do you think we're on the verge of a neuroscience revolution?

Pert: Yes. There used to be two systems of knowledge: hard science—chemistry, physics, biophysics—on the one hand, and on the other, a system of knowledge that included ethology, psychology and psychiatry. And now it's as if a lightning bolt had connected the two. It's all one system—neuroscience.

Behavior isn't such a mysterious thing. I think it emanates from microcircuits of electrons flowing from one neuron to another. What we're working on now is connecting up neurochemical facts—the brain's juices—with circuit diagrams of the brain. Circuit diagrams are what people called neuroanatomists have been concerned with for years—the actual interconnections of the neurons, the wiring of the brain. What's happening now is we're learning which neural pathways secrete endorphins and which secrete other neuropeptides.

There's no doubt in my mind that one day—and I don't think that day is all that far away—we'll be able to make a color-coded map of the brain. A color-coded wiring diagram, with blue for one neurochemical, red for another, and so on—that's the neuroscientist's ambition. We'll be able to describe the brain in mathematical, physical, neurochemical, and electrical terms, with all the rigor of a differential equation.

Omni: Will such a diagram account for consciousness?

Pert: No, it won't. Just as a person could totally understand a television set—could take it apart and put it together again—but understand nothing about electromagnetic radiation, we could study the brain as input-output, sensory input, behavior output. We make maps, but we should never confuse the map with the territory. I've stopped seeing the brain as the end of the line. It's a receiver, an amplifier, a little wet minireceiver for collective reality.

Omni: In *The Doors of Perception*, the book he wrote about his mescaline experiences, Aldous Huxley theorized that the brain and the nervous system function as a "reducing valve" or filter that enables us to experience only a fraction of "reality." Is brain research validating Huxley's theories?

Pert: Yes. Huxley's mind would be blown by neurochemistry. Our brain defines how much reality is let in. Reality is like a rainbow or like the electromagnetic spectrum. Each organism has evolved so as to be able to detect the electromagnetic energy that will be most useful for its survival. Each has its own window on reality. Humans can perceive the part of the color spectrum between infrared and ultraviolet. Bees can't see red at all. They can see up through

> *"There is no doubt in my mind that one day we'll describe the brain perfectly in mathematical, physical, neurochemical, and electrical terms, with all the rigor of a differential equation."*

several shades of purple. We cannot. In fact, our team at NIMH has proposed that the endorphins, our natural opiates, are a filtering mechanism in the brain. The opiate system selectively filters incoming information from every sense—sight, hearing, smell, taste, and touch—and blocks some of it from percolating up to higher levels of consciousness. Nobody really knows what the world looks like, as philosophers like Bishop Berkeley and David Hume observed. Everybody's version of the world is significantly different.

Omni: While we're on the subject of the natural opiates, let me ask you about the discovery of the opiate receptor in 1973. You were a graduate student, but yours was the first name on the paper you published with Solomon Snyder. So I assume you did the actual lab work.

Pert: Yes. I was a graduate student in Dr. Snyder's laboratory at Hopkins. He was my mentor, and I have nothing but the fondest feelings for him. He's a brilliant and wonderful teacher. The importance of our work is that the opiate receptor was the first receptor ever found in the brain. But the opiate receptor turns out to be one of thirty or forty different receptors in the brain that can be detected by using the technique I developed. My method was to use radioactive compounds to bind to a drug. We just ground up the brain tissue and measured how much of various radioactive drugs "stuck" to various brain tissues. We found the sites to which the radioactive opiates attached. And that led to the discovery in 1975 by Hughes and Kosterlitz, of our naturally produced opiates.

Omni: Then Snyder, Hughes and Kosterlitz were awarded the Lasker Award. Why were you excluded when you obviously did the seminal work?

Pert: That was a long time ago, and, to tell you the truth, I'm sick of being asked about the Lasker Award, as if I were this grumbling lady scientist who had done nothing else since then. I think there is other research for which I'm known. The politics of science is far less important to my mind than the core of scientific inquiry, which is the search for truth. That's the awe-inspiring part of it.

Omni: Still, didn't you write to the Mary Lasker committee declining your invitation to the award ceremony? And isn't it true that you did not entirely "hold your tongue," as is expected of women, graduate students and others low down in the scientific hierarchy?

Pert: Yes. I wrote to Mary Lasker at the time because I was not about to sit through a luncheon and be patted on the head. But I don't care to perpetuate an image of Candace Pert, Scarlet Lady of Neuroscience. I have no feud with Sol, whom I respect very much, and the discovery of the opiate receptor itself is, in a sense, ancient history. I'm now working on the Angel Dust receptor and the Valium receptor. Our brains probably have natural counterparts for just about any drug you could name. No one has yet actually found the brain's own marijuana, but I think that's because marijuana doesn't interact with the brain as THC, but as another breakdown product.

As far as women in science goes, people have been analyzing the critical point at which women get stuck, and basically the problem is that they don't get those faculty positions which you must have to get grants. The female position is "post-doc for life" or research associate. Eighty-five per cent of the American scientists who have been stuck at the level of research associate for twenty-five years or more are women. Research associates are Ph.D.s with a lot of responsibility, who are never really the boss, calling the tune. On paper, you work for this excellent person who received grant money, but you're not good enough to be on the faculty yourself.

Omni: It has been said that women hold themselves back by trying to please. Is that a stumbling block for women scientists?

Pert: Women scientists are women. Studies show that there's some hard-wiring in that department, for example: women smile more than men do. I've observed it myself at meetings. In tense situations

when important theoretical issues are being discussed women smile a lot when they make their statements

Omni: Do you believe that all our behavior—even loftier emotions such as altruism or romantic love—can be traced to biological phenomena? E. O. Wilson and other sociobiologists propose, for example, that thousands of years of natural selection has shaped our brains into highly refined survival instruments and that, at bottom, even the noblest sentiment is only survival instinct.

Pert: Well, many psychologists believe that there are only a few basic drives: sex, hunger, thirst, and escape from pain. They theorize that something more complex, say, the desire to discover a cure for cancer, can be traced back to a series of reinforcing events. Its source might be a very primitive feeling of well-being when your mother stroked your head and talked to you about medicine.

Omni: How does brain chemistry work into the scheme?

Pert: Well, if you were designing a robot vehicle to walk into the future and survive, as God was when He was designing human beings, you'd wire it up so that behavior that would ensure the survival of that species—like sex or eating—would be naturally reinforcing. Behavior is modifiable, and it is controlled by the anticipation of pain or pleasure, punishment or reward. And the anticipation of pain or pleasure has to be coded in the brain.

We're starting to understand that emotions have biochemical correlates. The brain is just a little box with emotions packed into it, primarily in the limbic system below the cortex—the old mammalian brain. Remember the experiments conducted in the 1950s in which rats were given the chance to self-stimulate different parts of the limbic system by pushing a lever? They stimulated the pleasure center in the brain until they fell from exhaustion. Well, it turned out that the electrical stimulation caused the release of brain chemicals associated with pain or pleasure. The endorphins, for instance, are very pleasurable. Larry Stein, at the University of California at Irvine, has suggested that the natural opiates are the brain's own internal reward system. It seems that when humans engage in various activities, neurojuices associated either with pleasure or with pain are released.

Omni: Do all animals have these reward and punishment chemicals?

Pert: Yes. Endorphins are being studied in the leech. Insects have endorphins and many of the other neurochemicals that regulate our own emotional circuitry. There's evidence that even unicellular organisms have these chemicals.

I've always understood theoretically about the unity of life—that we're all composed of DNA molecules and protein. But I've never experienced that understanding as directly as I have in the last few years. I've been looking through the microscope

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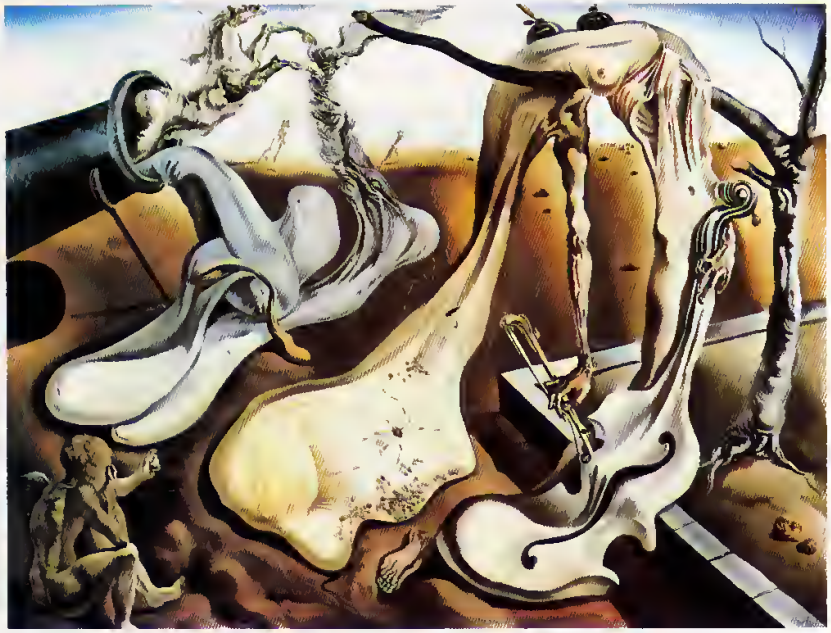
SALVADOR DALI

BY M S KAPLAN

"The only difference between me and a madman" says Salvador Dali "is that I'm not mad" No other artist has so flagrantly indulged his irrational subconscious These paintings provided by the new Salvador Dali Museum in St Petersburg Florida are dream photographs Dali reproduces in fine detail a twilight landscape populated by symbols of his fears and fantasies Probably his most sustained obsession is the adoration of his wife Gala whose face and body (left and above) reappear in many of



his paintings. Dali's penchant for bizarre antics had already reached legendary proportions by the time he arrived in New York City in 1934. Dockside reporters traced Dali to his berth, where they found him with strings connecting his fingers with his paintings lest someone steal them. His collection of soft, melting images belonging to the genre of *Daddy Longlegs of the Evening—Hope!* (above) were an instant sensation with American critics—despite

the dismay of the painters he left behind. Dali claims to remember being inside his mother's womb ("It was divine," he recalls, "it was paradise") and the trauma of being expelled from that protective, enclosed environment became the inspiration for such paintings as *Geopoliticus Child Watching the Birth of the New Man* (above). To evoke the transitory images seen in the mind's eye, Dali must re-create the movement of dreams. He has designed

paintings whose fragments disintegrate and reconstitute into different configurations as the viewer steps back farther from the canvas. The artist further condenses space by portraying objects that serve a double function. In *Old Age, Adolescence, Infancy* (at right), trees, cave, and weathered cliff become the hair, an eye, and the wrinkled cheek of an old man. Dalí admits that he fears the day when his dreams will crash through the barrier of

consciousness and impose themselves as the rulers of his reality. Yet his self-portrait (at left) conveys an element of detachment that somehow permits him to withdraw from the abyss of his darkest imaginings. Despite his maniacal self-absorption, Dalí fixes his eye on the world around him, ultimately becoming the observer rather than the observed. ∞

Paintings courtesy of the Salvador Dalí Museum, St. Petersburg, Florida.

PROFILE

A gutsy Briton lines his pockets with little products, big profits

Clive Sinclair's pocket-sized television sets use picture tubes squashed to the thinness of a magazine. His shrunken computers, like the one he's holding in the photo at right, fit into his palm. In the future Sinclair foresees robots the size of corpuscles, little electric cars, and missiles as small and slow as turtles. As Sinclair pursues his quest to build a Lilliputian world of electronic products, he himself has become a modern Lemuel Gulliver, an adventurous explorer who appears to grow bigger all the time.

But unlike Gulliver, he will not be tied down. He's about to turn loose on the video market a million pocket-sized TV sets a year. In the drive to come up with an inexpensive mass-appeal Volkscomputer (a term co-opted by a competitor, Commodore Business Machines, for its $299.95 VIC 20), Sinclair has produced what one Commodore executive admiringly calls "the motorbike of computers": the Sinclair ZX81. Prices of these diminutive products match their scale. His computer costs $149.50, his TV about $100, both low enough to attract consumer attention and to make Sinclair richer than he already is.

The inventor of the "motorbike" computer lives a Mercedes life. With his wife, Ann, teen-aged daughter, and two sons, he shares a large stone house on the edge of green fields in Cambridge, England. The ground floor is a series of echoing, white-walled spaces linked by

PHOTOGRAPH BY TONY GUCCIONE

THE TINY WORLD OF CLIVE SINCLAIR

BY TONY DURHAM

monastic stone archways, with views onto a peaceful tree-edged lawn. He reads poetry and sometimes science fiction, through thick glasses. His idea of relaxation is doing a mathematical puzzle in *Scientific American*.

But Sinclair, lean and energetic at forty-one, with hair the color of spicy ginger, is not one to sit still for long. He seldom watches his little TV sets, or any television. He has run in two New York marathons, in 1980 and 1981, finishing each time in a little more than four hours. He relishes the company of fellow members of Mensa, most of them on the trail of intellectual pursuits. ("Is Mensa stuffy?" It strikes me as elitist," Sinclair replies, "but not unpleasant.") Sinclair's business rode a roller coaster in the 1970s, profits plummeting after appalling production snags with a new digital watch. Government investment kept the firm from derailing completely, and finally Sinclair set off on his own track in 1979. He left the prosaic but profitable instrument-making side of the business behind. But he hung on to his research team and his pet projects.

Now he's roared back up. Sinclair Research sells more personal computers in the United Kingdom than any other manufacturer, and it ranks third in international production of personal computers, behind Radio Shack and Apple.

Sinclair has almost always earned his living by thinking small. At the age of twelve, in a family of engineers, he was inventing mechanical calculators in the school workshops. His interest shifted during his teen years to electronics, television, and computers. After their marriage, Clive and Ann built up a small business selling transistors by mail order in their spare time. From components they moved on to kits.

In 1962 you could buy any number of kits for transistor radios. The first Sinclair Radionics kits were distinguished by their minuscule size. Perhaps out of sheer curiosity people bought a radio half as big as a matchbox, even though there was no speaker and though it had to be used with an earphone. Schemes for a pocket TV set were already in Sinclair's mind, but he knew it was not yet remotely feasible. Instead, he produced salable but technically unadventurous hi-fi kits, with a look that has remained the mark of a Sinclair product: compact, stylish, and untussy, with a penchant for mat black rather than gleaming aluminum.

Then, early in the 1970s, Sinclair took the first of several business risks, tying his fortunes to pocket-sized products. Most manufacturers thought a pocket calculator was impractical. The power demands were too heavy for small batteries, they argued.

Sinclair disagreed. With his team he devised a circuit that slashed the calculator chip's power consumption to less than one tenth of what it had been. Hundreds of times a second the circuit switched the chip off, then powered it up again before the data faded from its memory. "Texas Instruments was very surprised, but it certainly worked very well," he says.

In all fairness, it ought to be mentioned that there is some question about how surprised Texas Instruments (TI) was. A spokesman for TI says Sinclair did not invent the power-down mode feature, nor is it used in all hand-held calculators today. Furthermore, TI says with a touch of grumpiness, the hand-held calculator was invented in the mid-1960s by Texas Instruments. The first successful commercial model was introduced by Canon, with technical assistance from TI, in 1970. Still in a show of sportsmanship, the spokesman calls Sinclair "a highly respected innovator."

Sinclair is prouder still of his second calculator, the Cambridge Scientific. Once again the little Cambridge firm took a commercially available four-function calculator chip and tortured it into a performance far beyond its original specification. Sinclair had to devise new ways of calculating the logarithmic and trigonometric functions before his colleague Nigel Searle could reprogram the commercial chip. The methods then known to mathematicians would have generated more numbers than the chip's tiny memory could store.

Doing more with less became a habit. Like a custom-car builder, Searle once more took a standard chip and turned it into something more powerful. This time the result was a machine that you could teach to do long calculations at the touch of a single key—not the first programmable calculator, but the first to use just one chip.

Sinclair had pioneered small, cheap number crunchers, but soon the Americans and the Japanese were beating him at his own game. His next project, a digital watch, misfired badly, and Sinclair Radionics virtually bled to death. It was saved by massive transfusions of government money and by the modest success of the Microvision, a book-sized television set with a 2" screen. This was, as Sinclair admits, something you would use occasionally rather than a lot, and it cost more than twice what a normal black-and-white portable was selling for. But about 2,500 people a month decided they would like to own one. It prepared the market for the subsequent wave of tiny televisions made by the Japanese.

Few guessed at the time, but the Microvision was for Sinclair only a stepping-stone toward his long-term goal of a flat-screen television. Unfortunately for him, his government shareholders were unwilling to take the next step. So he had to take it on his own. He left the company he had built, sold his house and his Rolls-Royce, and started from scratch with a new company called Sinclair Research.

The new firm's first product—a stripped-down computer—was a winner. At the time, Apple, Commodore, and Radio Shack had gone after the small-business

market Texas Instruments Atari and Mattel were trying to seduce consumers with sound and color fun and games Sinclair aimed below them all with a machine that looked more like a calculator than a computer He brushed aside existing standards in such matters as interfaces and programming languages and built his ZX80 as if it were the first computer in the world For most of his customers, of course it was

Not that it was perfect Its 21 chips Sinclair says did the work of 40 chips in other systems The penalty he admits was that the screen flickered when you entered data But that seemed a slight price to pay So did the price $200

The irritating flicker has disappeared from the new model the ZX81 And now there are only four chips in the whole machine For $149 50 it comes with 1K of memory (it holds 8 192 bits of information) That's a modest capacity (for $150 more the Commodore VIC 20 has a 5K memory) but it's sufficient for simple home budgeting tasks, math lessons for children or space-war games without a lot of fancy graphics Currently the ZX81 cannot be hooked up to information systems such as The Source (which provides news and other data through home telephones feeding home computers) Nor does it have the capacity to be the centerpiece of a word processor

Computer buffs are enthusiastic about one ZX81 feature in particular one-key entry of most commands To get the computer to print something for example users simply type *P* Most other machines won't respond unless operators spell out the command *P-R-I-N-T* Overall says Taylor Pohlman, of Apple Sinclair has probably boosted the sales and the profits of his competitors

He's introduced a lot of people to the idea of using a computer Pohlman says His computers are cute And after people operate them for a while and find out that computers aren't threatening they'll move up Although the move to an Apple can be quite a leap—the least expensive system runs about $1 300—the Sinclair ZX81 Pohlman says is likely to be good for Apple's business

So far it's been good for Sinclair's business too In the first seven months after its introduction in the United Kingdom Sinclair sold 100 000 of his little computers Recently he clinched a distribution deal with Mitsui to sell them in Japan In the United States he broke new ground by persuading American Express to include the ZX81 among the goods offered to cardholders in the firm's frequent mailshots

Profits from this international enterprise are now pouring into one of Sinclair's long-cherished projects a television set only slightly bigger than a deck of cards He and his design team have developed—*perfected* was his word—a small slab-shaped TV tube in which electrons start at the edge and travel sideways across the screen The Timex factory in Dundee Scotland is getting ready to produce a million sets a year for Sinclair In the immediate future the screen will be merged with a Sinclair computer to make a self-contained system possibly with projection equipment to enlarge the image

Further in the future Sinclair foresees still greater opportunities for trimming the size of machines from cars to guided missiles

He says that the time and the technology are already ripe for an electric city car with a range of about 70 miles per charge With computer programs his design staff is investigating possible body shapes and studying how batteries would stand up to differing patterns of use Almost everything about the proposed Sinclair car is either secret or genuinely undecided so it is hard to see just how it will differ from the electric cars that appeared sporadically and flopped commercially during the 1970s But Sinclair talks conspiratorially of new materials new types of motor and control systems and a dashboard liberally bedecked with computers

The car won't rust he says and will always start People will come to prefer it to their long-distance cars and then they might say to themselves I'd like to use this all the time and I'll rent a big car when I need one

Can Sinclair's logic end man's romance with the motorcar as easily as that? I think

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PETRA

CONTINUED FROM PAGE 51

between the rows of open-roofed hovels, were chattering gaily. Castrations and executions were among the few moments of joy for us then, I relished them, too, but I had a stake in the potential victims now, and I was worried.

My worry and my interest got the better of me. I slid through an unrepaired gap and fell to one side of the alley between the outer wall and the hovels. A group of dirty adolescents spotted me. "There he is!" they screeched.

The Bishop's masked troops can travel freely on all levels. I was almost cornered by them, and when I tried one escape route, they waited at a crucial spot in the stairs—which I had to cross to complete the next leg—and I was forced back. I prided myself on knowing the Cathedral from top to bottom, but as I scrambled madly, I came upon a tunnel I had never noticed before. It led deep into a broad stone foundation wall. I was safe for the moment, but afraid that they might find my caches of food and then poison my casks of rainwater. Still, there was nothing I could do until they had gone, so I decided to spend the anxious hours by exploring the tunnel.

The Cathedral is a constant surprise. I realize now I didn't know half of what it offered. There are always new ways to get from here to there (some I suspect are actually created while no one is looking), and sometimes even new theres to be discovered. While troops snuffled about the hole above near the stairs—where only a child of two or three could have passed—I followed a flight of crude steps deep into the stone. Water and slime made the footing and handing difficult. For a moment I was in a darkness deeper than any I had experienced before—a gloom more profound than mere lack of light could explain. Then below me I saw a faint yellow gleam. More cautious, I slowed and progressed silently. Behind a rusting, scabrous metal gate, I set foot into the lighted room. There was the smell of crumbling stone, a tang of mineral water, slime—and the stench of a dead spouter. The beast lay on the floor of the narrow chamber, several months gone but still fragrant. I have mentioned that spouters are very hard to kill, and this one had been murdered. Three candles stood freshly placed in nooks around the chamber, flickering in a faint draft from above. Despite my fears, I walked across the stone floor, took a candle, and peered into the next section of tunnel.

It sloped down for several dozen feet, ending at another metal gate. It was here that I detected an odor I had never come across before—the scent of the purest of stones, as of rare jade or virgin marble. Such a feeling of lightheadedness passed over me that I almost laughed, but I was too wary for that. I pushed aside the gate and was greeted by a rush of the coldest, sweetest air, like a draft from the tomb of a saint whose body does not corrupt, but rather pushes corruption away and expels it miraculously into the nether pits. My beak dropped open. The candlelight fell across the darkness onto a figure I at first thought to be an infant. But I quickly disagreed with myself. The figure was several ages at once. As I blinked, it became a man of about thirty, well formed, with a high forehead and elegant hands, pale as ice. His eyes stared at the wall behind me. I bowed down on scaled knee and touched my forehead as best I could to the cold stone, shivering to my vestigial wingtips.

"Forgive me, Joy of Man's Desiring," I said. "Forgive me." I had stumbled upon the hiding place of the stone Christ.

"You are forgiven." He said wearily. "You had to come sooner or later. Better now than later, when—" His voice trailed away, and He shook His head. He was very thin, wrapped in a gray robe that still bore the scars of centuries of weathering. "Why did you come?"

"To escape the Bishop's troops." I said. He nodded.

"Yes. The Bishop. How long have I been here?"

Since before I was born. Lord. Sixty or seventy years. He was thin, almost ephemeral; this figure I had imagined as a husky carpenter. I lowered my voice and besought. "What may I do for you, Lord?"

"Go away." He said.

"I could not live with such a secret," I said. "You are salvation. You can overthrow the Bishop and bring all the levels together."

"I am not a general or a soldier. Please go away and tell no—"

I felt a breath behind me, then the whisper of a weapon. I leaped aside, and my hackles rose as a stone sword came down and shattered on the floor beside me. The Christ figure raised His hand. In shock I stared at a beast much like myself. It stared back, face black with rage, stayed by the power of His hand. I should have been more careful—something had to have killed the spouter and kept the candles fresh.

"But Lord," the great beast rumbled, "he will tell all."

"No," the Christ said. "He'll tell nobody." He looked half at me, half through me, and said, "Go, go."

Up the tunnels, into the orange dark of the Cathedral, crying, I crawled and slithered. I could not even go to the Giant. I had been silenced as effectively as if my throat had been cut.

The next morning I watched from a shadowy corner of the scaffold as a crowd gathered around a lone man in a dirty sackcloth robe. I had seen him before; his name was Psalo, and he was left alone as an example of the Bishop's largess. It was a

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token gesture, most of the peopfe regarded him as barely half-sane

Yet this time I listened and in my confusion found his words striking responsive chords in me He was exhorting the Bishop and his forces to allow light into the Cathedral again by dropping the canvas tarps that covered the windows He had talked about this before and the Bishop had responded with his usual sfatement—that with the light would come more chaos for the human mind was now a pesthole of delusions Any stimulus would drive away whatever security the inhabitants of the Cathedral had

At this time it gave me no pleasure to watch the love of Constantia and Corvus grow They were becoming more careless Their talk was bolder

We shall soon announce a marriage Corvus said

They will never allow it They'll cut you

I'm nimble They'll never catch me The church needs leaders brave revolutionaries If no one breaks with tradition everyone will suffer'

"I tear for your life—and mine My father would push me from the flock like a diseased lamb

Your father is no shepherd

He is my father Constantia said eyes wide mouth drawn tight

I sat with beak in paws eyes half lidded able to mimic each statement before it was uttered Undying love hope for a bleak future shite and onions! I had read it all before a cache of romance novels in the trash of a dead nun As soon as I made the connection and realized the timeless banality—and the futility—of what I was seeing and when I compared their prattle with the infinite sadness of the stone Christ I went from innocent to cynic The transition dizzied me leaving little backwaters of noble emotion but the future seemed clear Corvus would be caught and executed if it hadn't been for me he would already have been gelded if not killed Constantia would weep poison herself the singers would sing of it (those seltsame warble throats who cheered the death of her lover) perhaps I would write of it (I was planning this chronicle even then) and afterward perhaps I would follow them both—having succumbed to the sin of boredom

With nightfall things become less certain It was easy to stare at a dark wall and let dreams become manifest At one time I've deduced from books dreams couldn't take shape beyond sleep or brief fantasy All too often I've had to fight things generated in my dreams flowing from the walls suddenly independent and hungry People often die in the night It was—is—a hard world we live in

That night falling to sleep with visions of the stone Christ in my head I dreamed of holy men angels and saints I came awake abruptly by training and one had stayed behind The others I saw vaguely flitting outside the round window where they whispered and made plans for flying off to heaven The wraith who remained was a dark shape in one corner His breathing was harsh I am Peter he said also called Simon I am the Rock of the Church and popes are told that they are heir to my task

I'm rock, too I said At least in part'

So be it You are heir to my task Go forth and be pope Do not fear or even reverence the stone Christ for a Christ is only as good as He does and if He does nothing there is no salvation in Him

The shadow reached out to pat my head and I saw his eyes grow wide as he made out my form He muttered some formula for banishing devils and oozed out the window to join his fellows

I imagined that if such a thing were actually brought before the council it would be decided that the benison of a dream person is not binding I did not care This was better advice than any I'd had since the Giant told me to read and learn

But to be pope one must have a hierarchy of servants to carry out one's orders The biggest of rocks does not move by itself So swelled with power I decided to appear in the upper nave and announce myself to the people

It took a great deal of courage to appear in daylight without cloak and to walk across the scaffold's surface on the second level through crowds of vendors set

The symptoms are consistent with chicken pox except for the antlers!

ting up the market for the day Some reacted with typical bigotry and sought to kick or deride me My beak discouraged them I clambered to the top of a prominent stall and stood in a murky lamp's circle clearing my throat to announce myself Under a hail of rotten pomegranates and limp vegetables, I told the throng who I was and I told them about my vision Jeweled with beads of offal I jumped down in a few minutes and fled to a tunnel entrance too small for most men Some of the boys followed me and one lost a finger trying to slice me with a bit of colored glass

I recognized that the tactic of open revelation was worthless There are numerous levels of bigotry and I was at the very bottom of any list

My next strategy was to find some way to disrupt the Cathedral from top to bottom Even bigots when reduced to a mob can be swayed by the presence of one obviously ordained and capable I spent two days skulking through the walls There had to be a basic flaw in so fragile a structure as the church and although I wasn't contemplating total destruction I wanted something spectacular unavoidable

While I thought hanging from the bottom of the second scaffold above the community of pure flesh the Bishop's deep gravelly voice roared over the noise of the crowd I opened my eyes and looked down The masked troops were holding a bowed figure and the Bishop was intoning over its head Know all who hear me now this young bastard of flesh and stone—

Corvus, I told myself *Finally caught* I shut one eye but the other refused to close out the scene

—has violated all we hold sacred and shall atone for his crimes on this spot tomorrow at this time Kronos! Mark the wheel's progress The elected Kronos a spindly old man with dirty gray hair down to his buttocks took a piece of charcoal and marked an X on the huge bulkhead chart behind which the wheel groaned and sighed in its circuit

The crowd was enthusiastic I saw Psalo pushing through the people

What crime? he called out

Violation of the lower level! the head of the masked troops declared

That merits a whipping and an escort upstairs Psalo said I detect a more sinister crime here What is it?

The Bishop looked Psalo down coldly He tried to rape my daughter Constantia

Psalo could say nothing to that The penalty was castration and death All the pure humans accepted such laws There was no other recourse

I mused watching Corvus being led to the dungeons The future that I desired at that moment startled me with its clarity I wanted that part of my heritage that had been denied to me—to be at peace with myself to be surrounded by those who accepted me by those no better than I In time that would happen, as the Giant had said But would I ever see it? What Corvus

in his own lusty way, was trying to do was equalize the levels, to bring stone into flesh until no one could define the divisions.

Well, my plans beyond that point were very hazy. They were less plans than glowing feelings, imaginings of happiness and children playing in the forest and fields beyond the island, as the world knitted itself together under the gaze of God's heir. My children, playing in the forest. A touch of truth came to me. I had wished to be Corvus when he tupped Constantia.

So I now had two tasks that could be merged, if I was clever. I had to distract the Bishop and his troops, and I had to rescue Corvus, fellow revolutionary.

I spent that night in feverish misery in my room. At dawn I went to the Giant and asked his advice. He looked me over coldly and said, "We waste our time if we try to knock sense into them. But we have no better calling than to waste our time, do we?"

"What shall I do?"

"Enlighten them."

I stomped my claw on the floor. "They are bricks! Try enlightening bricks!"

He smiled his sad, narrow smile. "Enlighten them," he said.

I left the Giant's chamber in a rage. I did not have access to the great wheel's board of time, so I couldn't know exactly when the execution would take place. But I guessed—from memories of a grumbling stomach—that it would be in the early afternoon. I traveled from one end of the nave to the other and, likewise, the transepts. I nearly exhausted myself. Then, crossing an empty aisle, I picked up a piece of colored glass and examined it, puzzled. Many of the boys on all levels carried these shards with them, and the girls used them as jewelry—against the wishes of their elders, who held that bright objects bred more beasts in the mind. Where did they get them?

In one of the books I had perused years before, I had seen brightly colored pictures of the Cathedral windows. Enlighten them, the Giant had said.

Psalo's request to let light into the Cathedral came to mind.

Along the peak of the nave, in a tunnel running its length, I found the ties that held the pulleys of the canvases over the windows. The best windows, I decided, would be the huge ones of the north and south transepts. Then I made a diagram in the dust, trying to decide what season it was and from which direction the sunlight would come—pure speculation, of course, but at this moment I was in a fever of brilliance. All the windows had to be clear. I could not decide which was best.

I was ready by early afternoon, just after sext prayers in the upper nave. I had cut the major ropes and weakened the clamps by prying them from the walls with a pick stolen from the armory. I walked along a ledge, took an almost vertical shaft through the wall to the lower floor and waited.

Constantia was watching from a wooden balcony, the Bishop's special box for executions. She had a terrified, fascinated look on her face. And Corvus was on the dais across the nave, right in the center of the cross of the transepts. Torches illuminated him and his executioners, three men and one old woman.

I knew the procedure. The old woman would castrate him first, then the men would remove his head. He was dressed in the condemned's red robe, to hide any blood. Blood excitement among the impressionable was the last thing the Bishop wanted. Troops waited around the dais to sprinkle scented water in order to hide the loathsome smell.

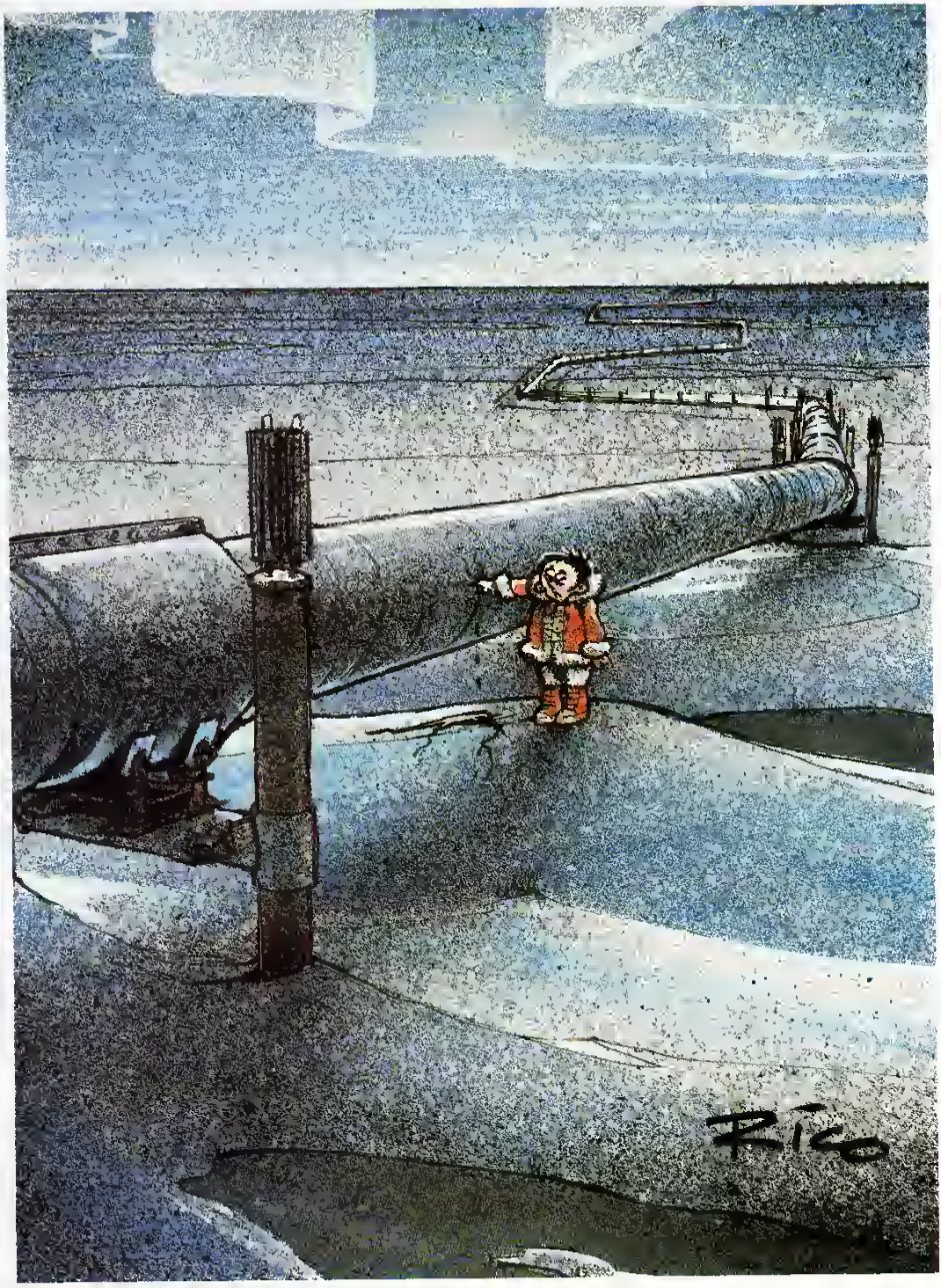
I didn't have much time. It would take minutes, at the least, for the system of ropes and pulleys to clear and allow the canvases to fall. I went to my station and cut the remaining ties. Then, as the Cathedral filled with a hollow creaking sound, I followed the shaft back to my viewing post.

In three minutes the canvases were drooping. I saw Corvus look up, his eyes glazed. The Bishop was with his daughter in the box. He pulled her back into the shadows. In another two minutes the canvases fell onto the upper scaffold with a hideous crash. Their weight was too great for the ends of the structure, and it collapsed, allowing the canvas to cascade to the floor many yards below. At first the illumination was dim and bluish, filtered perhaps by a passing cloud. Then, from one end of the Cathedral to the other, a burst of light threw my smoky world into clarity. The glory of thousands of pieces of colored glass, hidden for decades and hardly touched by childish vandals, fell upon upper and lower levels at once. A cry from the crowds nearly tossed me from my post. I slid quickly to the lower level and hid, afraid of what I had done. This was more than simple sunlight. Like the blossoming of flowers, the transept windows fixed all who saw them.

Eyes accustomed to orangey dark, to smoke and haze and shadow cannot stare into such glory without drastic effect. I shielded my own face and tried to find a convenient exit.

But the population was increasing. As the light brightened and more faces rose to be locked phototropic, the splendor unhinged some people. From their minds poured contents too wondrous to be accurately cataloged. The monsters thus released were not violent, however, and most of the visions were not monstrous.

The upper and lower naves shimmered with reflected glories, with dream figures and children clothed in baubles of light. Saints and prodigies dominated. A thousand newly created youngsters squatted on the bright floor and began to tell of marvels of cities in the East, and of times as they had once been. Clowns dressed in fire entertained from the tops of the market stalls. Animals unknown to the Cathedral cavorted between the dwellings, giving


RICO

friendly advice. Abstract things, glowing balls in nets of gold and ribbons of silk, sang and floated around the upper reaches. The Cathedral became a great vessel of all its citizens' bright dreams.

Slowly, from the lower nave, people of pure flesh climbed to the scaffold and walked the upper nave to see what they couldn't from below. From my hideaway I watched the masked troops of the Bishop carrying his litter up narrow stairs. Constantia walked behind, stumbling, her eyes shut in the new brightness.

All tried to cover their eyes, but none succeeded for long.

I wept. Almost blind with tears, I made my way still higher and looked down on the roiling crowds. I saw Corvus, his hands still wrapped in restraining ropes, being led by the old woman. Constantia saw him, too, and they regarded each other like strangers, then joined hands as best they could. She borrowed a knife from one of her father's soldiers and cut his ropes away. Around them the brightest dreams of all began to swirl, pure white and blood-red and sea-green, coalescing into visions of all the children they would innocently have.

I gave them a few hours to regain their senses—and to regain my own. Then I stood on the Bishop's abandoned podium and shouted over the heads of those on the lowest level.

"The time has come!" I cried. "We must all unite right now, we must unite—"

At first they ignored me. I was quite eloquent, but their excitement was still too great. So I waited, some more, began to speak again, and was shouted down. Bits of fruit and vegetables arced up. "Freak!" they screamed, and drove me away.

I crept along the stone stairs, found the narrow crack, and hid in it, burying my beak in my paws, wondering what had gone wrong. It took a surprisingly long time for me to realize that, in my case, it was less the stigma of stone than the ugliness of my shape that doomed my quest for leadership. This knowledge was painful.

I had, however, paved the way for the stone Christ. *He will surely be able to take His place now.* I told myself. So I maneuvered along the crevice until I came to the hidden chamber and the yellow glow. All was quiet within. I met first the stone monster who looked me over suspiciously with glazed gray eyes. "You're back," he said. Overcome by his wit, I leered, nodded, and asked that I be presented to the Christ.

"He's sleeping."

"Important tidings," I said.

"What?"

"I bring glad tidings."

"Then let me see them."

"His eyes only."

Out of the gloomy corner came the Christ, looking much older now, almost like a prophet. "What is it?" He asked.

"I have prepared the way for you," I said. "Simon called Peter told me I was the heir to his legacy that I should go before you—"

The stone Christ shook His head. "You believe I am the fount from which all blessings flow?"

I nodded, uncertain.

"What have you done out there?"

"Let in the light," I said.

He shook His head slowly. "You seem a wise enough creature. You know about Mortdieu."

"Yes."

"Then you should know that I barely have enough power to keep myself together, to heal myself, much less to minister to those out there." He gestured beyond the walls. "My own source has gone away," He said mournfully. "I'm operating on reserves, and those none too vast."

"He wants you to go away and stop bothering us," the monster explained.

"They have their light out there," the Christ said. "They'll play with that for a while, get tired of it, go back to what they had before. Is there room for you in that?"

I thought for a moment, then shook my head. "No room," I said. "I'm too ugly."

"You are too ugly, and I'm too famous." He said. "I'd have to come from their midst anonymous, and that's clearly impossible. No, leave them alone for a while. They'll make me over again, perhaps, or better still, forget about me. About us. We don't have any place there."

I was stunned. I sat down hard on the stone floor and the Christ patted me on my

head as He walked by "Go back to your hiding place live as well as you can" he said "Our time is over"

I turned to go When I reached the crevice I heard His voice behind saying "Do you play bridge? If you do find another We need four to a table"

I clambered up the crack through the walls and along the arches over the revelry Not only was I not going to be pope—after an appointment by St Peter himself!—but I couldn't persuade someone much more qualified than I to take the leadership

I returned to the copper Giant He was lost in meditation About his feet were scattered scraps of paper with detailed drawings of parts of the Cathedral I waited patiently until he saw me He turned to me chin in hand and looked me over

"Why so sad?"

I shook my head Only he could read my features and recognize my moods

"Did you take my advice below? I heard a commotion"

"*Mea maxima culpa*" I said

"And ?"

I slowly hesitantly made my report concluding with the refusal of the stone Christ The Giant listened closely without interrupting When I was done he stood towering over me and pointed with his ruler through an open portal

"Do you see that out there?" he asked The ruler swept over the forests beyond the island to the far green horizon I said that I did and waited for him to continue He seemed to be lost in thought again

Once there was a city where trees now grow One of the finest cities in the world he said It was called Paris and it was old even then It was famous for a peculiar kind of thought and a peculiar kind of passion Artists came by the thousands and whores and philosophers and academics And when God died all the academics and whores and artists couldn't hold the fabric of the world together How do you expect us to succeed now?

"*Us*? Expectations should not determine whether one acts or not should they?

The Giant laughed and tapped my head with the ruler "An age ago, before I was born or repaired the Cathedral the Christ and what He represented stood tall in the city of thought much as this spire rises over the forest But everything grows old Maybe we've been given a sign and we just have to learn how to interpret it correctly" He shook his head

I leered to show I was puzzled

"Instead of God's death we're faced with another process entirely We have long bathed in God's milk in His rules and creativity Maybe Mordieu is really a sign that we have been weaned We must forage for ourselves remake the world without help What do you think of that?"

I was too tired to really judge the merits of what he was saying but I had never known the Giant to be wrong before "Okay So?"

"The stone Christ indicates His charge is running down If God weans us from the old ways we can't expect His Son to reface the nipple can we?"

"No "

He hunkered next to me his face bright "I wondered who would really stand forth It's obvious He won't" So little one who's the next choice?"

"Me?" I asked meekly The giant looked me over almost pityingly

"No" he said after a time "I am the next We're *weaned*!" He did a little dance startling my beak up out of my paws I blinked He grabbed my vestigial wingtips and pulled me upright "Tell me more"

"About what?"

"Tell me all that's going on below and whatever else you know"

"I'm trying to figure out what you're saying" I profested trembling a bit

"Dense as stone!" Grinning he bent over me Then the grin went away and he tried to look stern It's a grave responsibility We must remake the world ourselves now We must coordinate our thoughts our dreams Chaos won't do What an opportunity to be the architect of an entire universe! He waved the ruler at the ceiling "To build the very skies! The last world was a training ground full of harsh rules and strictures Now we've been told we're ready to leave that behind move on to something more mature Did I teach you any of the rules of architecture? I mean the aesthetics The need for harmony interaction utility beauty-within-science?"

"Some" I said

"Good I don't think making the universe anew will require any better rules No doubt we'll need to experiment and perhaps one or more of our great spires will topple But now we work for ourselves to our own glory and the greater glory of the God who made us! No ugly friend?"

Like many histories mine must begin with the small the tightly focused and expand into the large But unlike most historians I don't have the luxury of time Indeed my story isn't even concluded yet

Soon the legions of Viollet-le-Duc will begin their campaigns Most have been schooled pretty thoroughly Kidnapped from below brought up in the heights taught as I was We'll begin returning them one by one

I teach off and on write off and on observe all the time

The next step will be the biggest I haven't any idea how we're going to do it

But as the Giant puts it "Long ago the roof fell in Now we must push it up again strengthen it repair the beams" At this point he smiles to the pupils "Not just repair them Replace them! Now we are the beams Flesh and stone become something much stronger"

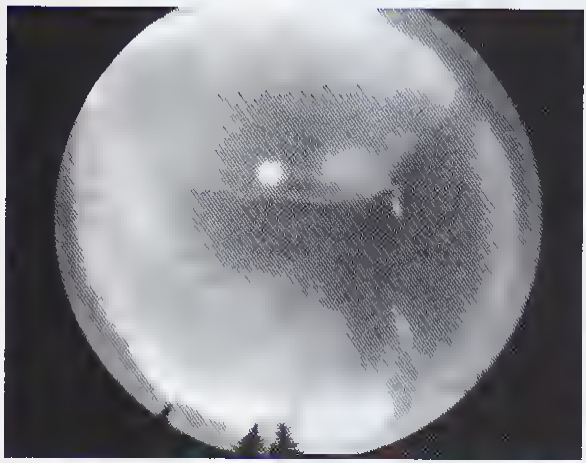
"Ah but then some dolt will raise a hand and inquire "What if our arms get tired holding up the sky?"

Our task will not soon be over

And now the weather

"She was bone-thin, most of her reddish hair was gone, and her face had erupted in large blisters."

ANTI MATTER



UFO UPDATE

The dense Piney Woods were frigid and still on the evening of December 29, 1980, save for the sound of the car carrying store owner Betty Cash, her assistant, Vickie Landrum, and Vickie's grandson, Colby. The three had just finished dinner and were returning to their hometown of Dayton, Texas, when a diamond-shaped object the size of a hot-air balloon dipped between the pines and began spitting bright yellow flames.

"We'll be burned to death if we go under that thing!" Vickie screamed. Betty slammed on the brakes. Seven-year-old Colby began to sob, and Vickie clutched him, saying, "Don't be afraid, honey. Jesus'll come out of that burnin' cloud and take care of you. We'll see your [dead] grandpa, too."

After several minutes the object rose, sweeping bright cones of light over the looming pines. The trio sped off in a panic. They were nearing home when they saw the object again, this time surrounded by 23 roaring helicopters.

Back in Dayton, Cash and the Landrums grew deathly ill, with symptoms ranging from nausea to diarrhea. Colby's diarrhea was so bad he had to put on diapers. Guessing that the diamond-shaped craft was the cause of their trouble, Betty eventually contacted NASA, which referred her to McDonnell Douglas space shuttle engineer John Schuessler. Shaking with agitation during their first phone conversation, she told him her story.

"I thought she was a kook," says Schuessler, a member of the Mutual UFO Network, a group that investigates UFO sightings. "But I went to see her."

The woman he met was bone-thin. Most of her reddish hair was gone, and large blisters had erupted on her face. She had just been released from the hospital. Schuessler then met Vickie and Colby. After talking to them for a few minutes, he was "convinced that something serious had happened."

Schuessler soon became "a sort of rabbi" for the three friends. He obtained their medical records and, with the help of a dozen physicians, learned that the symptoms could have been caused by radiation.

He began to suspect that the fire-spewing craft was an experimental vehicle developed by the U.S. military. If had probably malfunctioned, he speculated, and begun to emit huge amounts of radiation. The helicopters may have been there to cart the craft off quickly if it crashed.

If only the military would admit the truth, Schuessler thought, doctors could learn what type of radiation was disfiguring Cash and the Landrums. Then they could administer the correct treatment. Schuessler frantically called every government official and military base in the area. Finally he found a pilot who admitted flying one of the helicopters; however, the pilot refused to identify the brilliant object, calling it classified. "Since then," Schuessler says, "it's been mum's the word from everybody."

As this story goes to press, all three victims continue to deteriorate. Vickie has become blind in one eye, and both she and Colby must enter the hospital for additional tests. —*JACK THORNTON AND PAMELA WEINTRAUB*

RAGING SKEPTICS

Was Muhammad Ali, born January 17, 1942, fated to become a great boxer? Did swimmer Mark Spitz, born February 10, 1951, beat the odds when he won his seven golds in the Olympics? If Michel Gauquelin is correct, the answer to both questions might be yes.

Gauquelin is the controversial French astrologer who put forth the Mars effect theory. Anyone born just as the planet Mars rises above the eastern horizon, or passes from east to west across the sky, is more likely to be a sports champion. Some people would call such claims hardly worth the bat of an eyelash. But one group of skeptical scientists took them seriously. The result: one of the silliest scientific battles of the century.

It all began in 1976, when University of Buffalo statistician Marvin Zelen challenged Gauquelin, suggesting that all kinds of people —athletes and nonathletes *alike*— are born in greater numbers as Mars moves east. Zelen announced that he himself would examine the data with a test of his own.

When astronomer and fellow skeptic Dennis Rawlins learned of the challenge, he grew enraged: he, too, believed that the Mars theory was hogwash. But he had studied Gauquelin's work and knew that the astrologer's data would stand up to this particular challenge. Zelen's test, Rawlins warned, would erroneously prove Gauquelin correct.

Despite the warning, Zelen and some colleagues of his from the newly formed Committee for the Scientific Investigation of Claims of the Paranormal went ahead with the test. Just as Rawlins had predicted, the study corroborated Gauquelin's findings. Instead of admitting it, however, the committee published a paper emphasizing only the data that made the Mars theory look wrong.

Rawlins, also on the committee, screamed, "Fraud!" A second test, with fresh data, disproved Gauquelin, but that wasn't enough to quell Rawlins's anger.

A four-year battle ensued, and Rawlins was finally booted off the committee. "They realized there was no way to keep me quiet," Rawlins says. He maintains he was "censored" in the committee's journal.

"We had our hands full with Dennis Rawlins," admits committee chairman Paul Kurtz, who denies there was a cover-up. Kurtz says Rawlins was dumped for attacking everyone who disagreed with him.

The final irony is that Rawlins and the committee are now trading parting shots in *Fate* magazine, which bills itself as "The Voice of the Psychic."

—Irving Lieberman

"*The pursuit of an idea is as exciting as the pursuit of a whale.*"

—*Henry Russell*

KING TUT'S SHROUD

Christian scholars have spent 400 years trying to prove that the Holy Shroud in the cathedral of Turin, Italy, is the burial cloth of Jesus Christ. Now Long Island accountant George Smith has evidence that the image outlined on the cloth is not Christ's but that of the Egyptian king Tutankhamen, who lived 3,300 years ago.

A devout Catholic, Smith points out that no one knows what Christ really looked like. But King Tut's mummy still exists. By scrupulously comparing photographs of the mummy with the figure on the shroud, Smith has learned that "both are identical in height and structure." In addition, both the shroud and the mummy bear what seem to be "a beaded collar, a swollen right eye, and a shortened right leg."

Smith, who examined the cloth's markings inch by inch for 11 years, claims that Tut's image was burned into the material with a secret Egyptian radiation process.

"I wish I could go to Egypt," he says. "This is one of the biggest discoveries of the century." —Sandra Dorr

NUTRITION FOR PSYCHICS

Sensitive to the psychic energies of the universe? If so, you probably suffer from a debilitating condition known as psychic burnout. Fortunately, there is a cure. According to Bill Wachsmuth, chief pharmacist for the Payless Drugstore in Mountain View, California, all you need is a prescription for vitamins.

Addressing a local occult group on the special nutritional needs of psychics, Wachsmuth explained that persons "open" to the energies surrounding them are particularly prone to stress. The reason: They utilize B-complex and C vitamins far more rapidly than those who are 'closed.'

The nutritional needs of each psychic depend upon the kind of "hocus-pocus" he or she does, Wachsmuth said. For example, a clairvoyant, who "sees" things at a distance, will deplete the nutrients needed by the eye: vitamins A and B_2 and zinc. A medium who "talks" to spirits may suffer from sore throats and a corresponding deficiency of iodine.

Wachsmuth added that clairaudiants, who "hear" distant sounds, suffer from a different problem: an excess of earwax. They can revitalize their powers simply by cleaning their ears.

—Robert Sheaffer

DISCOJET

The name evokes images of airplane passengers swaying to throbbing music at 35,000 feet. Discojet, however, is a man-made flying saucer built by Paul Moller, an engineer and president of the Discojet Corporation in Davis, California.

The two-passenger Discojet, designed to compete with small military and executive aircraft, is powered by eight engines. Like a hummingbird, it flies up, down, forward and backward. Its curved fiberglass surface makes it almost invisible on radar, a fact that is eliciting interest in military circles.

Moller, who will pilot the craft, once taught a college course on flying saucers and has written magazine articles dealing with the subject. But he insists that Discojet's saucer shape is an engineering decision, not based on his interest in UFOs. —Margaret Sachs

It is a far, far better thing to have a firm anchor in nonsense than to put out on the troubled seas of thought."

—John Kenneth Galbraith

KILLER CLOWNS

If a masked man in a clown suit tries to lure you into his van, don't go, says Loren Coleman, a Boston writer who specializes in unexplained phenomena.

According to Coleman, reports of "sinister-looking adults dressed like clowns have been surfacing in the national press since May." Most of the clowns, seen in cities from Newark, New Jersey, to Omaha, drive black vans, Coleman says. "In Kansas City, Kansas, a clown wore a black-and-red costume, with a devil in the front. Clowns loitering around Boston schools caused such a furor that an investigator for the superintendent of schools posted a warning."

Coleman, who says his information comes from newspaper clippings and interviews with people, doesn't have any explanation for the phenomenon. "These clowns could be real people or hallucinations in the minds of children," he suggests. "They could even be three-dimensional images created by the collective unconscious of the masses."

Reporters at the *Kansas City Star*, who called the costumed men "killer clowns" in a recent article, are also puzzled. "The cops said it was a lot of baloney, just a bunch of kids with wild imaginations," says one *Star* staffer. "Still, we had all these terrified parents phoning us at the newspaper."

Police in Pittsburgh are more sanguine. "We had calls about bunny rabbits, clowns, and even a Spider-Man," one detective on night duty recalls. "But these costumed characters were never seen by police. The calls themselves could have been hoaxes."

"We had one clown who exposed himself," adds a detective in Brockton, Massachusetts. "He was never apprehended, but it ruined the whole image of the circus for our kids."

—Pamela Weintraub

MODERN-DAY VOODOO

Want revenge? Then punish your enemy with a voodoo hex. According to psychiatrist Ken Golden of the University of Arkansas Medical School in Little Rock, people who *believe* they are under a spell sometimes manifest real medical afflictions.

Over the past four years Golden has identified two dozen hospital patients whose ailments, including cardiac arrest, hysterical paralysis, and uncontrollable muscle spasms, were psychosomatically caused by black magic spells. "I am convinced," he says, "that these cases represent a minuscule fraction of what is going on."

Golden became fascinated with voodoo after meeting medicine men during his Peace Corps stint in Ghana. When he arrived at the University of Arkansas, he realized that many rural blacks, like the Africans, had some of their health needs answered by local voodoo practitioners.

Since then he has become a "voodoo consultant." When hexed patients don't respond to prescribed medical remedies, Golden treats them with hypnosis, psychotherapy or placebos—brilliantly colored liquids that the ailing believe are omnipotent. —Eric Mishara

Spirit departure was very common around 1910, when many spirits were reported wandering aimlessly around India, searching for the American Consulate.
—Woody Allen

TIME TRIPPING

Would-be time travelers recently gathered in San Francisco for the first national conference of the Association for Past-Life Research and Therapy (APRT). The conference goal: teaching members to overcome their present neuroses through the analysis of prior lives.

Speaking before visitors from throughout the country, APRT president Hazel Denning called past-life regression the therapy of the future. By achieving an altered state of consciousness, usually through hypnosis, she said, "we can release memories of previous incarnations. These memories often prove to be the source of present-life problems."

Psychiatrists and psychologists at the conference discussed everything from the soul's existence between lives to the use of music to facilitate regression. But the most unusual paper was presented by psychologist Helen Wambach, of Berkeley, California, who talked about *future* lives. According to Wambach, several of her patients have glimpsed existences as far forward as the twenty-fourth century. —Margaret Sachs

CHINA'S ARMPIT SAVANTS

Wang Qiang, twelve, and Wang Bin, ten, use ESP to "read" the messages tucked under their armpits, according to a report in *Nature Journal*. China's prestigious science magazine. Indeed, the publication re-

cently arranged a conference so that the sisters could demonstrate their powers. Performing before a scientific audience last July, they seemed to describe the scribbled messages stuffed in their armpits, in their hands, and even in their ears.

The seminar piqued the interest of Luo Dongsu, a Chinese Air Force physician, who took electrical measurements of Qiang's hands and ears and found "sensitivities vastly greater than [those associated with] modern military radar." In a recent issue of the American publication *Psychology Review*, he suggested that her powers were caused by the motion of electromagnetic waves.

Actually, Western magicians have been reading with their armpits for centuries. Their technique is simple. They put one scrap of paper under an arm and hold another scrap in their hand. Wearing loose goggles instead of a tight blindfold, they discreetly peek down to read the message tucked in the palm, then deftly exchange it with the one in the armpit. Because they submit the scrap they have really looked at for examination, they always seem psychic.

Like these magicians, the sisters might be cheating. According to Cyrus Lee, of the psychology department at Edinboro State College, in Pennsylvania, the Chinese experiments included scraps of paper handled freely by the girls, who used gogglelike blindfolds. —James Randi

Skeptical scrutiny is the means, in both science and religion, by which deep insights can be winnowed from deep nonsense.
—Carl Sagan

MIRRORS

CONTINUED FROM PAGE 46

incidentally, is a one disc town small enough so that large areas of its topography fit onto a single video disc the equivalent of a half-hour TV show with commercials Even a superficial tour of a city like Chicago or New York would probably require several discs)

The discs work together to bring you Aspen The system is comparatively simple Disc Player 1 displays picture after picture as you ride down the street The ride is somewhat rough because the photographers snapped pictures with their 16mm cameras every ten feet or so not continuously But when these come up on the screen at the rate of three or four frames a second the illusion of moving at about 20 miles an hour is credible As you watch images from the first video disc the laser reading its twin races to the next intersection and stops, ready to begin generating scenes to the right or the left if you choose to turn When you touch the pressure-sensitive screen to designate a building the laser beam rushes back from the intersection where it has been waiting and begins calling up whatever it remembers about the building taking over after a brief transitional pause from the first disc

By flicking a switch akin to a channel selector a viewer can tour Aspen in the fall or in the winter There are separate soundtracks for each tour one filled with the crisp noises of dry streets the other with street noises muted by snow The same season control can banish seasons completely Aspen also comes in a cartoony version made by computer-graphics techniques Welcome to Wonderland Buildings look like a child's blocks except for the fact that some of them present photographic facades The little doors look real The mountains in the distance are part of a postcard view But the tops of buildings are swatches of color This third-season computer-generated tour can take you to places where no camera ever clicked You can float above Aspen as if you were in a helicopter, or a dream

The designers of this technology did not build it to provide just idle diversion At a dozen laboratories throughout the country researchers are trying out movie maps as tour guides and instructional devices

Robert F Mohl, a graduate student at MIT designed one of the early tests for the system about a year ago in a study of Bostonians headed for Aspen for the first time Before the trip travelers spent an hour in front of the movie-map monitor at MIT exploring the streets

Mohl expected the neophytes to wander cautiously through the territory on the screen But they surprised him Most drove from one end of Aspen to the other, to the edge of the simulated world and back before setting off in another direction In other words, they behaved not at all like cautious tourists in a new town One reason The exploration required no gas Another There was no carping from the backseat when the driver got lost

Some of the subjects, Mohl said had a terrible sense of direction A district attorney, for instance got up from the monitor said good-bye, and came back five minutes later to ask how to get out of the building But he and most of the others had no trouble navigating when they arrived on the real streets of Aspen The DA reported a sense of *déja vu*

There were only a couple of problems Some of the visitors had trouble adjusting to the fact that streets that had dead-ended on the movie map (where the camera crew had stopped shooting) continued in real life And one person who reported enjoying the simulated ride went down the rabbit hole of lost data Mohl never heard from him again

Much of the work at labs like this is funded by the Defense Advanced Research Projects Agency (DARPA) a wing of the Department of Defense DARPA's interest in movie maps goes beyond wanderlust The same technology that brings Aspen to the screen can be used to recreate battle scenes with computer-generated puffs of smoke tracer blips and balls of fire One Virginia company Perceptronics, is about to deliver to the Army the first TV-sized tank-gunnery simulator using movie-map technology to display a battlefield photographed in Germany Artillerymen in training operate a small set of tank controls to track and fire on images of enemy tanks displayed on a TV monitor Like the scenes of Aspen the view is jumpy First-time users also complain that the controls respond slowly But the jump cut view detracts little from the sense of realism after trainees have spent a few minutes on the hunt And in fact the controls are programmed to be sluggish like those on a real tank Most of the griping comes from recruits accustomed to the instantaneous response of penny-arcade video games Best of all, from DARPA's point of view the simulator is portable and cheap Early models will sell for about $150 000 a penny-arcade price compared with that of existing simulators, which are at least ten times as expensive

Students could follow nerve impulses from brain to muscle, flying over synapses, plunging through thickets of dendrites, then turning (using a joystick) to track the nerve signals back to the brain

DARPA-funded cameramen have been shooting odd locations for the past year or so One movie map now being assembled for example will take viewers inside a jeep engine The idea was developed by former DARPA program manager Dexter Fletcher who wanted to give mechanics in training a tour through fuel lines wiring oil paths—even the combustion chamber—of an engine they would work on Using fiber optics and close-up lenses photographers shot stills every tenth of a millimeter (compared with every ten feet in Aspen) The shooting itself took several months Then technicians added special effects The chamber seems to be firing as you pass through it Engine explorers can burn through chamber or pipe walls with a simulated laser to view neighboring parts A separate televised display of the entire engine shows where the viewer is this keeps mechanics from getting lost in a fuel line or an oil filter

The same technology researchers in Negroponte's lab point out might create a movie map of the human body Students could follow nerve impulses from brain to muscle, flying over synapses plunging through thickets of dendrites then turning (using a joystick similar to those on computer games) to track nerve signals back to the brain Or, following the precedent of Isaac Asimov's *Fantastic Voyage* viewers could float through blood vessels explore the heart's ventricles and ride surges down the aorta and back up through the veins It would be comparatively easy to throw in obstacles on the tour A movie map of the body might give future physicians a look at blood clots or malfunctions in the firing of neurons Down the road, it might even be possible to display a winding path through DNA highlighting places where hereditary diseases originate

For now, the scale of movie-map projects is larger but nonetheless potentially lifesaving Another Virginia company funded by DARPA Interactive Television Company has done some preliminary work on preparing for the State Department a movie map of the U S embassy in Guatemala City One obvious security payoff If the embassy were seized in an Iran-style rampage commandos could rehearse the last stages of a rescue mission—inside the embassy—with a movie map Theoretically each rescuer could run through an assignment dozens of times He could become familiar with the location of stairways windows doors and even the structural components or wiring hidden behind walls

Interactive's president Steven L Levin was reluctant to talk about the embassy project and a DARPA official told us that its future was unclear Curiously one uncertainty is whether the State Department would use such embassy movie maps primarily for security reasons or for the more mundane task of planning redecora-

tion when a new ambassador moves in "I don't know what State will want," the official said. "If its major concern is space allocation and redecoration, then it would be a very different movie map than if the concern was security. I can't anticipate that."

Levin talked freely about less sensitive projects. He's already proved that movie maps can be made indoors, the first floor of the National Gallery of Art in Washington, D.C., fits easily on a video disc (photos shot at eye level were taken every two feet with a hand-held camera).

Levin has also shot San Francisco Bay from a helicopter and he plans to make movie maps of offshore drilling rigs, including some underwater scenes. And in the future he hopes to help produce video discs of submarine routes under the polar ice caps.

Someday movie maps may also become an art form, blending photography and fantasy. "Imagine driving down Fifth Avenue," Negroponte says, "then turning right onto the Kurfürstendamm in Berlin, then left onto Via Veneto, and then another left into a Dungeons and Dragons fantasy lane." Future video systems will also provide painters with new ways of creating their own imaginative worlds. Another room in the MIT lab is a proving ground for the video palette.

Negroponte's Media Room is an office-sized area dominated by an 8' × 12' screen. Facing it is a comfortable Eames chair, just like the ones in the furniture stores, except that it's equipped with touch-control pads and a joystick on each arm.

The whole room in fact is sensitive to the visitor seated in the chair. Electronic devices pick up verbal commands and carry them out. Sensors track the position of an arm or a head, and the colors on the screen flash and move according to the viewer's whim.

In a typical session the painter, wearing an unobtrusive wristband, relaxes in the chair. The band, part of a magnetic position-sensing system, and his voice are the only instruments required to cover the screen with color.

It he says, "Create a canvas for the Sunday painter," the screen turns black except for a red dot in the upper-left-hand corner. He points at the dot, then moves his arm like an orchestra conductor, and colored lines on the screen follow his movements. He controls the hues by rotating his wrist. To erase mistakes, he flexes his wrist until the line turns black, then paints over the errors. The stroke gets finer and finer as he moves closer to the screen. As he moves farther away the stroke widens up to a foot or more, as if he were painting with a palette knife. The painter can banish a picture by touching the red dot in the corner; to preserve his "painting," he can photograph it or put it on videotape.

The marriage between the computer and video is likely to make art more accessible to people in the future—perhaps as accessible as sitcoms or soaps. Dr. Martin Nisenholtz, of the Alternate Media Center at New York University, foresees a time when television and teleprinters will bring fine art into everyone's living room. And as TV screens become flatter, he suggests, they'll hang on the wall where oil paintings hang now. Central libraries of fine art will transmit paintings by subscription, for display whenever home viewers want them. In the meantime Dr. Nisenholtz has developed a small electronic sketchpad, actually a grid of 51,200 squares, each one responsive to strokes from a magnetic or a light-beam pen. Artists key in the colors or shades they want and draw on the pad. Lines simultaneously appear on a nearby 19" TV monitor. The advantage of his system over other media: The resulting picture is easily transmittable over telephone or cable lines, permitting art lessons by wire or conference-call discussions of design sketches.

Components in devices like these are remarkably sensitive to human movement. Their capacity to pick up nuances—a twitch of the wrist, a nod of the head so slight that an auctioneer would miss it—makes the parts useful in applications outside of the arts. That wristband in Negroponte's Media Room, for example, contains a 0.5" cube packed with three coils signaling its position in space to a nearby antenna. Its maker, Polhemus Navigation Sciences, Inc., in Burlington, Vermont, reports that the cube is the centerpiece of another video device used to help nonvocal quadriplegics communicate.

The user wearing a lightweight eyeglass frame, faces a target board of letters or phonemes. The cube attached to the frame continuously signals head position. Writing involves mere looking. When the person wearing the cube gazes at a letter for more than a preset time, the letter appears on a TV screen.

The same gear could easily be employed to link television directors with remote-controlled robotic cameras. Suppose a TV camera robot is sent to cover a fire," says Todd Cox, manager of systems marketing at Polhemus. "The director roughly positions the camera with a joystick and wears a helmet with the scene displayed on a visor. Every turn of his head is duplicated by the camera. In a way his head becomes the camera. He's put himself at its eye."

Or suppose you've got a helicopter pilot flying right down on the treetops," Cox continues. "He's flying at night, in rotten weather, over rough terrain. In the nose of the helicopter is a forward-looking infrared camera—a night vision camera—on a swivel. The pilot's head is coupled by magnetic sensing to the camera. The sensor points where he looks, and again the scene comes up on his visor." Such devices are in production now, Cox says. And decades from now similar gear may be offered as an

"Well, Eric, it finally happened. We've sold the film rights to your book, the television rights to your book, and the stage rights to your book, but, unfortunately, nobody wants to purchase the book rights to your book."

option on private cars although it'll be years before the price of the equipment won't be a lot more than the price of the car.

The technology may be advanced but people like Cox, Nisenholtz, and Negroponte would like nothing better than to see their devices in widespread, workaday use. Negroponte's Media Room, for instance, is his model of the office of the future. An executive or a military officer would replace the artist in the Eames chair. Instead of hues and lines on the screen, data would appear for the subject's perusal or manipulation.

Here is the kind of feat Negroponte's lab can perform today. You face the large screen, two smaller monitors to your left and right. There are no keyboards visible. This video world is organized spatially, not alphabetically or numerically. A voice-control system, designed by the Nippon Electric Company, a Japanese firm, recognizes up to 120 utterances (sounds less than two seconds in duration). For instance, it responds when you say slowly, "Create a map of the Caribbean." The whole front wall of the room lights up into a map of islands and sea.

The most powerful emperors of the past never had faster service. You call for a red boat to appear to the east of Cuba. And instantly the boat is there. Most remarkable of all, the computer can combine data from both your voice and the wave of your arm wearing the magnetic wristband. Point at the boat and say "Put *that*—" and then point to Miami and say "—*there*." The computer responds to the ambiguous pronoun and adverb because you speak them as you point. The boat leaps into port.

Commanders could use the system to deploy troops. Urban planners could move buildings like chess pieces. Corporate executives could call up contracts, letters, pictures of job sites, or technical drawings—all with a few terse commands and imperious waves of the hand.

The world on the screens of future video systems—behind the magic mirror—also contains human faces. Like the face on the back of Alice's clock. They move. Unlike those of today's anchormen or game-show hosts, these faces of the future will not be transmitted by ordinary TV signals.

The reason is that standard TV is too high-tech. To send an instant-by-instant picture of the dullest test pattern requires equipment costing several hundred thousand dollars. No matter what the picture, the communication line between transmitter and receiver has to handle 1.5 million bits of information each second. These figures explain why face-to-face telephone systems flopped. Average telephone users couldn't afford the equipment. The very rich who *could* had few people to talk to. A further incentive for DARPA to find an alternative was the possibility that high-capacity cables might be knocked out during a war. DARPA researchers sought a way to permit the transmission of moving faces—for conferences between

top brass—over ordinary telephone wires. Instead of transmitting 1.5 million bits per second, the agency set out to develop a transmitting system that would use almost *no* bits of information per second. One objective was to allow round-table discussions in which most of the faces around the table appear on TV screens arranged in a circle, each screen responsive to all the others and to the one or two real people present at the meeting.

Consider possible solutions. To begin with, it would help if the parties to such TV conferences didn't move their lips much or their jaws hardly at all. A conference of Gary Coopers requires almost no bits. Standard telephone lines can handle the laconic Yup, the stolid expression, the ventriloquist's twitch of the mouth.

In fact, early DARPA technology on teleconferences produced sets of barely moving faces. DARPA's Dr. Craig Fields, who himself speaks at a breathless many bit-per-second clip, explains that the agency's research had gone through three phases.

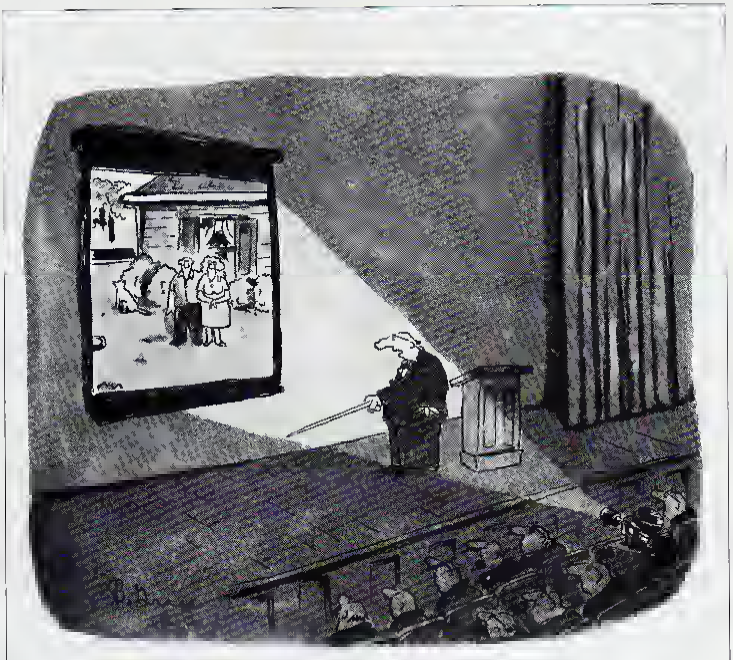
The earliest system involved storing, at the receiving end, a lot of pictures of people likely to call. The pictures on file show faces of talking people, looking straight ahead, their mouths in different shapes. During a conference, the only material received by wire is the sound of the caller's voice. From this incoming speech, a computer makes inferences instantly about the shape of the caller's mouth. From these inferences, the computer displays on the screen a picture with the right-shaped mouth. You wind up with a face looking straight ahead. Dr. Fields says. It's not moving at all, except its mouth. It's a dead face. But the mouth is synched to the speech. That's phase one."

In phase two, everyone in the teleconference wears a low-cost device, similar to a set of earphones, that measures the turning of heads. Since the head turning is usually slow, it takes few bits per second to transmit information about which way the heads are moving. Now the mouths move, the heads turn, but the faces are still dead.

In phase three, everyone wears spectacles that sense eye motion and blinking.

But it's still not satisfactory, Fields says. Take my word for it. You don't like it if you see it. The reason you don't like it is that the whole face is dead as a doornail. It doesn't change.

Emotion was the missing, many-bit factor. It turned out to be the most elusive quality of communication, the hardest of technological puzzles. DARPA tried to develop a system that would infer emotion from the voice, to program a computer to sense rage, for example, and then to call up a picture of an angry face. We can't do that yet, Fields says. What we can do that works satisfactorily is to store up a few neutral faces. We just randomly every few seconds change the face so it looks like a live face. When you do this, it's wonderful.



Wait a minute! That isn't the Crab Nebula! That's Ed and Doris Wyman!

Here are all the features needed to carry on a conversation, according to Fields. You need 16 mouths for each participant and three random facial expressions. You need 13 head motions and quite a few eyes. In other words, you need a small library of expressions to be plucked off a video disc by a laser under the control of a master computer, a kind of super Lon Chaney capable of changing facial features several times a second.

Negroponte's lab has worked on several versions of this "talking head" technology, including one system projecting faces into plastic masks. Theoretically, at least, the round-table discussion of the future might take place between one live person and half a dozen animated masks turning on motor-driven rods, leaning forward to listen or whisper conspiratorially, smiling, winking, even sneezing—all controlled by just a few bits flowing over telephone lines.

So much for the medium. What of the message? The successful transmission of smiling faces is no guarantee that anyone will have something to say. But wait. The captains of future video are working on that problem, too, on ways to sharpen messages as well as media.

For example, there is the Decision Tree, a system under study at Perceptronics, the same company that makes tank-gunnery simulators.

The premise is that decisions spawn outcomes that require other decisions. If you decide to throw commandos against terrorists who hold an embassy, for instance, your choice might lead to reprisals, each challenging you to make further choices. So a single choice, like the root of a plant, feeds into a lacy network of other decisions—a decision tree. Steven C. Johnston of Perceptronics says the device his company is researching displays trees in words and symbols and lines on a 19" screen. One member of the decision-making group enters data into the system, including numerical weighting of options. The group might decide that the commando raid has a potential value of 55 (on a scale of 1 to 100) while negotiations rate 60. A computer can be called into play to analyze the numbers, which sprout like leaves on the branches. Johnston says studies indicate that people using the video system are more satisfied with their decisions than groups using paper-and-pencil media. And they make a richer tree than traditional decision-making groups, he says.

One advantage of the Perceptronics system is that group leaders can display standard TV fare whenever they want to give business executives or generals a break. Groups can watch reruns of previous glorious decisions. They can view the streets of Aspen or old episodes of *Dallas* or *Alice*. Theoretically, they can call up the face of the Cheshire Cat, perched on the decision tree. And, unlike Alice, they can decide when the face should fade, leaving the vestigial smile. Tune in tomorrow.

RECOLLECTIONS

CONTINUED FROM PAGE 60

many of them had been near death several times during their long course of kidney failure. I was caring for several patients who had been resuscitated from cardiac arrest.

Our interviewing began in earnest in May 1976. During the next five years we spoke with 116 persons who had survived at least one episode of unconsciousness and near death. Of these, 78 persons were chosen in an arbitrary fashion. 34 or 43 percent of those arbitrarily selected reported an NDE. We found no social or demographic differences between those who did and those who did not report the experience. The type of near-death event (cardiac arrest, coma, or accident) did not affect whether an NDE would occur. And knowledge of the NDE before the near-death crisis did not predispose a person to report an NDE.

THE AUTOSCOPIC NDE

All persons in this study who related an NDE felt that the "essential" part of themselves had separated from their physical body and this part was able to perceive objects and events visually. During the NDE the separated self became the sole conscious identity of the person with the physical body remaining behind as an "empty shell." In the first phase of the experience which I shall call the autoscopic or self-visualizing NDE, people usually perceived themselves to be looking down at the physical body from a point specifically defined as at ceiling height.

Many of these perceptions were reported in copious detail, allowing me to determine as I had set out to do whether autoscopic events were fact or fantasy. For example, when I spoke to the Vietnam veteran whom I quoted at the beginning of this article, it was obvious that at least a portion of his account *could be* correct (he was wearing a prosthetic right arm). But what could be said of his alleged trip to the morgue in a bag? I asked to examine the left side of his groin. There I found further corroboration of his story: a well-healed scar over his left femoral vein, consistent with an incision made by an embalmer's knife. These bits of evidence suggested to me that his story *might be* correct, but verification was not possible because of the circumstances of his case. Other cases would have to be examined.

One of the most persuasive stories came from a fifty-two-year-old night watchman who lived in rural north Florida. His NDE took place after a cardiac arrest in 1973. Asked to recollect anything that happened after he apparently blacked out, he reached for a cigarette, lit up, and glanced at the door to make sure that no one else was listening. Here is his statement, made as he smoked 15 to 20 cigarettes:

I couldn't stand the pain anymore. And then I collapsed. That's when everything went dark. After a little while I was sitting up

there somewhere, and I could look down, and I had never noticed that the floor was black and white tile. That's the first thing I remember being conscious of. I recognized myself down there, sort of curled around in a half-fetal position. Two or three people lifted me and put me on a dolly. They strapped my legs and started moving me.

When they first threw me up on the table [*the doctor*] *struck me, and I mean he really whacked the hell out of me. He came back with his fist from way behind his head and he hit me right in the center of my chest. And then they were pushing on my chest. They shoved a plastic tube, like you put in an oilcan, in my mouth.*

At that point they put a needle in me—like one of those Aztec Indian rituals where they take the virgin's heart out. They took it two-handed. I thought this very unusual. [*Then they took these*] *round discs with a handle on them. They put one up here—I think it was larger than the other one—and they put one down here* [the patient pointed to appropriate positions on his chest]. *They thumped me, and I didn't respond. I thought they had given my body too much voltage. Man, my body jumped about two feet off the table!*

[*I knew that I could*] *reenter my body and take the chance of them bringing me back around or just go ahead and die, if I wasn't already dead. I knew I was going to be perfectly safe, whether my body died or not. They thumped me a second time, I reentered my body just like that.*

This man's autoscopic description of his cardiac arrest and subsequent resuscitation correlates well with the medical account recorded on his chart. As is usual in such cases, the medical record summarized only a portion of the details of the cardiopulmonary-resuscitation procedure. The man's account, however, was extremely accurate in portraying the resuscitation technique. The injection of cardiac medications directly into the heart, for example, was not specifically mentioned in the emergency-room records and is not commonly performed today. But it was common practice in the early 1970s.

After our interview I came to know this man quite well and visited him several times at home. At no time did I find any indication that he possessed more than a layman's knowledge of medicine. I was particularly struck by his reaction to my inadvertent use of the word *paddle* to describe the instrument that is held on a patient's chest during electrical defibrillation. *Paddle* is a term widely used for these instruments and is so ingrained in my mind that I use it without thinking. The man demonstrated his unfamiliarity with the term and with the resuscitation technique by his response. "They weren't paddles, Doctor. They were round discs with a handle on them." His description is quite accurate, of course, in a literal sense.

In all, I interviewed 32 survivors who claimed to have seen portions of their own resuscitation. Time after time the events mentioned by these patients matched the actual situation as reconstructed from known facts. A forty-four-year-old retired Air Force pilot, for example, had suffered a massive heart attack and cardiac arrest in the intensive-care unit during his second day in the hospital. His resuscitation required multiple electric shocks to the chest. From his vantage point detached from his physical body, he was able to observe carefully and then later to recall, among other things, the movement of the meter needles on the face of the machine (the defibrillator) that delivered the electric shocks to his chest. He had never seen a defibrillator in use before.

Another patient, a sixty-year-old retired laborer who suffered a heart attack in 1976, remembered seeing his family "down the hall just plain as could be" during his NDE. "The three of them were standing there," he said. "My wife, my oldest son, my oldest daughter. And the doctor. There was no way being out that I could have seen anybody."

> *"I went through this period of darkness. Then the whole thing brightened up, and the next thing I remember I was floating through this shaft of light. It was blinding."*

When I interviewed this man's wife, she told me that she had not planned to visit him that night. Her eldest son and daughter visited her at home, however, and the three of them decided to surprise him. They arrived at the hospital in time to notice "a lot of commotion" in the hallway adjacent to the sick man's room. But before they could catch a glimpse of him, he was taken up to the intensive-care unit on another floor. "What was funny," his wife added, "was that we have six children, all grown. When we went to see him, it was never the same [group]. He *couldn't* have known who I was with, or even that I was there."

Twenty-six of the 32 autoscopic descriptions contained only general visual impressions of the NDE, but even these corresponded to the facts.

When control patients with heart trouble were asked to reconstruct in-hospital resuscitation, fully 80 percent made at least one major error. Such errors were not made by those who related an autoscopic NDE, however, leading me to believe that they were not subtle fabrications based on previous knowledge.

THE TRANSCENDENTAL NDE

At the end of the autoscopic experience, some people returned to the physical body in order as one woman put it, "to become whole again." But others went on to perceive a foreign region or dimension quite apart from the earthly surroundings of the physical body. I have labeled such an experience the transcendental NDE, since it contains descriptions of objects and events that transcend or surpass our earthly limits. In all, 41 such descriptions were reported by people in my study (some people had more than one NDE). Though the accounts varied considerably, I was able to come up with a few more or less universal perceptions.

For 14 persons, the transcendental experience began with the feeling of entering a dark region or void. Momentary fright or bewilderment sometimes accompanied the initial passage into darkness as the person pondered, What is going on here? These unpleasant emotions, however, were replaced with peace and tranquility as further elements of the NDE began to unfold.

Indeed, 17 persons described a brilliant source of light that signaled the end of the dark region or void. After moving through the void and into the light, 28 persons saw a region of great scenic beauty. Although this region was never recognized as a previously visited place, most people felt, during the NDE and afterward, as if they'd taken a short journey to a physical location. A fifty-five-year-old textile-mill laborer who had a cardiac arrest in January 1979, for example, told of seeing "the most beautiful greenest pasture. There was just a small hill and then just a flat meadow over to my right," he said. "I was looking down on these cattle and sheep and on this shepherd."

Others saw "nonterrestrial" scenes of clouds, skies, stars, or a mist. And several reported ethereal scenes one man saw "steps [leading up to] the golden gates of heaven, with people on the other side." Yet another described the gate as "wrought-iron in appearance, with a highly polished color."

Finally, the nearness of some other personage was perceived by 28 patients during their NDE. Communication between the near-death person and this spiritual being most frequently focused on a decision either to proceed further into the experience, that is, "to die," or to return to the physical body and to live.

A border or limit within the transcendental environment was occasionally perceived as representing the point of no return. Passage beyond this limit, it was felt, would have resulted in irreversible bodily death. One man identified this border as a mountaintop within the transcendental environment itself. Standing atop it, he heard a clear voice say, "You can't go yet. You have unfinished business. Fall this way. Don't fall the other way."

I rolled over and fell on the left side of the

OMNI THE NEW FRONTIER STATION LISTINGS

WRGB/NBC	Albany/Schenectady
KLKK/IND	Albuquerque/ Farmington
WBAL/CBS	Baltimore
WBMG/CBS	Birmingham
WCVB/ABC	Boston
WLS/ABC	Chicago
WCPO/CBS	Cincinnati
WKYC/NBC	Cleveland
KRDO/ABC	Colorado Springs
KOMU/NBC	Columbia/ Jefferson City
WFAA/ABC	Dallas/Fort Worth
WXYZ/ABC	Detroit
KVIQ/ABC	Eureka
WFFT/IND	Fort Wayne
KJCT/ABC	Grand Junction
WOTV/NBC	Grand Rapids
WLRE/IND	Green Bay
WGHP/ABC	Greensboro/ High Point/ Winston-Salem
WCTI/ABC	Greenville/New Bern
WLYH/ABC	Harrisburg/ Lancaster
WVIT/NBC	Hartford
KPRC/NBC	Houston
WJKS/NBC	Jacksonville
WJAC/NBC	Johnstown/Altoona
KMBC/ABC	Kansas City
KADN/IND	Lafayette
KVVU/IND	Las Vegas
KABC/ABC	Los Angeles
WLVY/ABC	Louisville
WTVJ/CBS	Miami/Ft. Lauderdale
WITI/CBS	Milwaukee
KMSP/IND	Minneapolis
WABC/ABC	New York
WAVY/NBC	Norfolk/Portsmouth
KETV/ABC	Omaha
KMIR/ABC	Palm Springs
WEEK/NBC	Peoria
KYW/NBC	Philadelphia
KPHO/IND	Phoenix
WTAE/ABC	Pittsburgh
KPTV/IND	Portland
WDDD/IND	Paducah
WPTF/NBC	Raleigh/Durham
WROC/NBC	Rochester
WQRF/IND	Rockford
KOVR/ABC	Sacramento
KPLR/IND	St. Louis
KUTV/NBC	Salt Lake City
KFMB/CBS	San Diego
KGO/ABC	San Francisco
KCOY/CBS	Santa Barbara/ Santa Maria
KING/NBC	Seattle
WIXT/ABC	Syracuse/ Elmira
WTOG/IND	Tampa
WWTV/CBS	Traverse City/Cadillac
KVOA/NBC	Tucson
KGCT/IND	Tulsa
WRC/NBC	Washington, D.C.
KTVH/CBS	Wichita/Hutchinson
WKBN/CBS	Youngstown

mountain," he told me. "That was the end, and I woke up. This man is still convinced that if he had rolled to the right side, he would have died."

THE COMBINED NDE

In scrutinizing the NDE, I found that 33 percent of the people reported *only* autoscopic elements and 48 percent *only* transcendental elements. But 19 percent reported *both*. In these combined NDEs, the transcendental portion of the experience followed the autoscopic portion in a continuous, unbroken sequence.

I heard the most vivid description of a combined NDE in August 1977, from a man I met in the ear, nose, and throat ward of the Gainesville Veterans Administration Hospital. A former field supervisor for a large company, this man had his NDE on May 23, 1970, after an automobile accident. This is his account of what took place during the period of unconsciousness:

When I was in the emergency room, I seemed to see myself on this [stretcher] or whatever, and they moved me to a table. I seemed to be one of the participants in there, but back farther from the table than anyone else. I wasn't frightened in the least. I was all black from the road tar. I had cuts all over my face that were all bleeding. I remember all the blood and one doctor saying, 'He is going to lose his leg.'

The monitor was at the back of my head, and all of a sudden it stopped. I remember one of the doctors banging on my chest, pushing on it. I seemed to arch, and then I was in complete and total darkness.

I went through this period of darkness. There was this light, like someone holding a flashlight, and I started going toward that. And then the whole thing brightened up, and the next thing I remember was I was floating. We were going through this shaft of light. The light kept getting brighter and brighter. It was so bright, and the closer we got, the brighter it got, and it was blinding.

I had angels around me. But the angels were my children. My oldest son was seventeen at the time, but [in the NDE] he was around six years old. All my children were at my side. They were all almost the same age. When I looked at them, I associated each one with something in the past.

On all sides of us was this beautiful blue. You can't even call it a sky, but it was a deep blue—a beautiful color. I'd never seen a blue like that. I felt a very slight pressure on my head, and I heard a voice say, 'Go back!' I said, 'Why me, Lord?' And whoever spoke said my work on Earth wasn't over yet, that I had to go back to complete it. All I heard was his voice, it was loud, thundering, just like a clap of thunder coming out of nowhere. [After that] I don't remember anything [except] waking up in intensive care two days later.

IMPLICATIONS OF THE NDE

By the end of our investigation, Sarah and I realized that the NDE was a truly remarkable event in the lives of those who felt it. Some even described it as the "peak" event, the occurrence that had done more to shape their life goals and attitudes than any previous experience.

Most commonly, death anxiety was dramatically reduced, if not totally eliminated, by the NDE. Associated with this decrease in death anxiety was the strong personal conviction that the NDE represented a privileged glimpse of what was to occur at the moment of final bodily death. One forty-three year-old cardiac patient said, "I just feel that when I die, I'll be with them [deceased relatives encountered during the NDE]. I'm going to do the best I can, and when my time comes, I'm ready for it."

This man's death occurred three years after his open-heart surgery and post-operative NDE. Shortly thereafter, his widow told me that her husband's NDE—including a bright white light and visions of deceased relatives and friends urging him to "go back"—had stayed with him until his death. It seemed to be a major turning point in his ability to deal with dying.

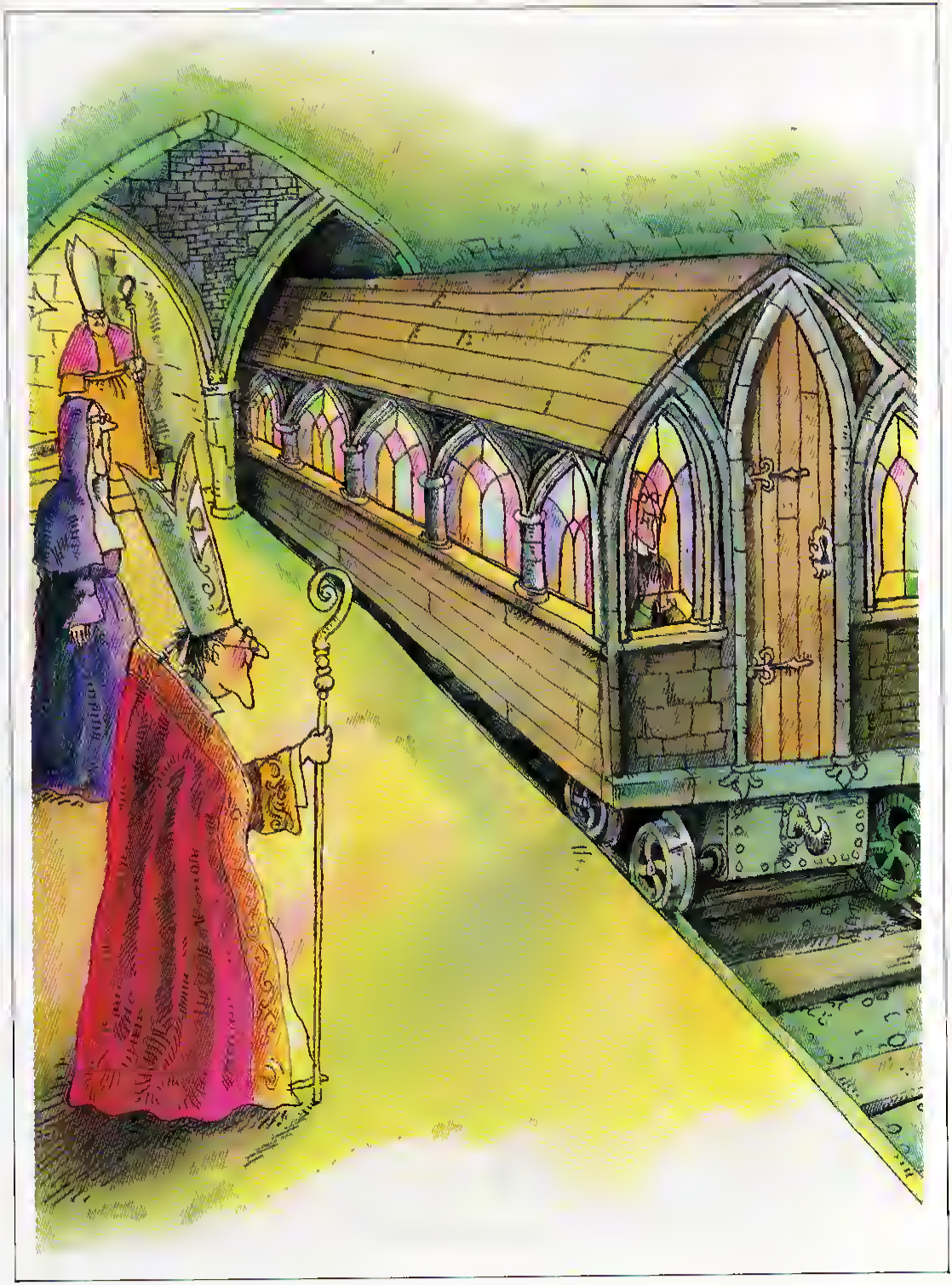
When new attitudes regarding death and the hereafter were integrated into the lives of such individuals as the man I've just mentioned, an increased fervor for day-to-day living was often evident. Indeed, such was the case with a patient who had a transcendental NDE during a cardiac arrest shortly after his thirty-fourth birthday. "The NDE changed my whole life like a flipflop," he told me. "I used to worry about life and living it and trying to get ahead. But now I'm going to live what I've got left, and I'm going to enjoy it. I know where I'm headed to. I've been through death, and it [doesn't] bother me."

This new attitude toward death also affected the person's perception of the death of loved ones. The process of grieving was often reported to have been made easier by the knowledge that the recently deceased had passed on into a painless and peaceful existence. One woman, for instance, suffered an NDE during a difficult pregnancy. When her husband died a short while afterward, she was calm because she "knew that his pain was over and that he was happy."

Perhaps most important, the NDE may affect the will to live during those periods when the life of the clinically dead patient hangs in the balance. Indeed, some patients in the midst of an NDE yearn to "return" to the body to complete some "unfinished business." This yearning may provide the psychological impetus to continue physical life and may contribute to successful recovery from the NDE.

Other patients, those who did not survive clinical death, may have succumbed because of the NDE. Indeed, feelings aroused by a beautiful scene, or the sight of a long-dead spouse, may have persuaded some patients not to return to physical life. One physician who had an NDE himself told me that he takes this into account each time a patient nears death.

"After [my own NDE]," he said, "I had a



little trouble getting the blood started in one patient I flat out told her You cannot die and I really think this had the effect of bringing [her] back Because they don t want to come back I didn t want to come back The tranquility was so great "

Given the importance of the NDE to many survivors of a near-death crisis how should this information affect the attitudes and practices of physicians and other professionals charged with the care of sick and dying patients?

First the nature and existence of the NDE demand professional recognition In my own experience I have often been appalled by the careless conversation of physicians and others at the bedside of a comatose or cardiac-arrested patient as they editorialize on the grim details the hopelessness Many patients deemed unconscious and otherwise unaware of ongoing proceedings during a near-death crisis can often see hear and later recall details of what went on in the vicinity of their physical bodies From what we now know because of these studies it is imperative that these unconscious patients be treated with all the care and respect that would be afforded an alert individual

In addition the occurrence of these phenomena should not be interpreted as an overt manifestation of an abnormal psychiatric process for the NDE seems to be occurring in a sizable number of sane stable individuals

To continue to assume the hallucinatory or psychiatric (and by implication abnormal) character of the NDE will merely perpetuate the feeling of isolation that many of these individuals have felt when they attempted to discuss their experiences with physicians or other persons in attendance when the experience occurs

One patient whom I am currently treating for a chronic heart condition had a cardiac arrest and an NDE in 1976 After telling me of his NDE he described how upset he had been at his inability to discuss his experience with the doctors and nurses who were caring for him (I was afraid they would have thought something was wrong that I was making it up or goofy or something)

At least some part of this man s anxiety could have been prevented if he had been able to discuss his NDE openly with the doctors and nurses without feeling that they would have thought something was wrong with me If such an interchange can occur openly between the patient and the physician then the doctor-patient relationship will likely be elevated to new levels of trust and cooperation

A more direct and open communication may also allow the physician to change his own view of death as a frightening and merciless enemy This attitude is not the result of serious scientific research Rather it has emerged from a lack of such research I grant that the mysteries of death are not readily amenable to controlled laboratory investigation Nevertheless our best available evidence for what dying is actually like—the attitudes and experiences of those who have come closest to actual physical death—has been largely ignored by the medical and scientific communities The great majority of survivors who can recall specific events during the near death period describe these events as calm and peaceful—quite unlike a meeting with the Grim Reaper Should not these data be considered more seriously in shaping the attitudes and goals of our medical-care system as it attempts to meet the needs of sick and dying patients?

In 1969 a book entitled *On Death and Dying* appeared as an eloquent statement of the needs and concerns of the dying patient in our society Written by the American-trained psychiatrist Elisabeth Kubler-Ross this book spurred a new interest in the problems of the terminally ill The field of death and dying came into its own Its goals to challenge avoidance and denial of death to reduce the fear of death and to find some theoretical framework in which death could be viewed more positively as part and parcel of life

The NDE largely accomplishes these goals for the individuals who undergo it For those who have not had an NDE the experience of others could be presented to suggest that the process of dying is calm and peaceful

As a physician and scientist I cannot of course say for sure that the NDE is indicative of what is to come at the moment of *final* bodily death These experiences occurred during the waning moments of life Those reporting these experiences were *not brought back from the dead* but they were rescued from a point *very close to death* Thus these experiences are only of *near* death not of death itself

Since I suspect that the NDE is in reality a reflection of the split between the purely physical brain and the "spiritual mind I cannot help wondering why such an event should occur at the point of near death Could a person s mind which splits apart from the physical brain, be in essence the soul," the spirit which continues to exist after bodily death in accordance with religious doctrines?

As I see it this is the ultimate question that has been raised by reports of the NDE It is here at the point of near death that scientific facts and theories interface with religious teachings and speculations As a physician I have evaluated the medical circumstances surrounding the experiences of those whose tales are included in my book and I have been utterly amazed at the survival of people whose physical condition plainly ruled against their continuing to live

But my personal reaction is not so much a "scientifically weighed response as it is a keenly felt identification with the tears of joy and sorrow that have accompanied many of these stories The lives and deaths of the people who helped me with my research have made me humble to the ways of the universe ∞

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at the brains of different mammals, and when you've seen one brain, you've seen them all: a cat brain, a dog brain, a monkey brain. We're all made up of the same building blocks, the same structures. A lot of the key work in neuroscience has been done on invertebrates like clams, spiders, crabs, octopuses, and leeches—creatures that are very hard wired.

Omni: Would we be anthropomorphizing to suppose that, say, cockroaches feel some sort of emotion?

Pert: No. They have to, because they have chemicals that put them in the mood to mate, and chemicals that make them run away when they're about to be killed. That's what emotions are often about—sex and violence. We humans are stuck with some hard-wired sex-and-violence circuitry, but we have the intellectual ability to transcend our programming.

Omni: Is there a schism these days between biologically oriented brain researchers such as yourself and analytical psychiatrists who think free association and dream interpretation are the ultimate tools for understanding human behavior?

Pert: Yes. The present era in neuroscience is comparable to the time when Louis Pasteur first found out that germs cause disease. Before that, disease had been attributed to demons, bad air, or an imbalance of the bodily humors. But do you think every doctor said, "Oh, it's bacteria, let me find out how to give those vaccinations that Louis Pasteur discovered"? It didn't happen that way. They were still bleeding people to cure infections. The old guard had to die out.

There are people now who theorize that autism is caused by something like a father's not paying enough attention to a child and a mother's being a little too pushy. Yet there's scientific evidence that it may be associated with something as physical as the mother's bleeding during a certain month of pregnancy.

Omni: With the advent of psychiatric drugs, our understanding and treatment of mental illness have become increasingly biological, haven't they?

Pert: That's right. Incredible shame is associated with mental illness. People will confide the most intimate details of their love life before they'll mention a relative who has had a serious mental breakdown. But the brain is just another organ. It's just a machine, and a machine can go wrong. One neurochemically coded system might have a kink in it.

In the last twenty years psychiatry has come out of the Dark Ages. We know that many forms of mental illness are associated with an imbalance in brain chemicals, and we have drugs that are closely related to those chemicals to treat that imbalance. All psychiatric drugs work at the vulnerable part of the brain—at the synapse—where they mimic or block the brain's natural chemicals. But our drugs are still very crude. In fact, there are only three basic psychiatric drugs: neuroleptics, like Thorazine for schizophrenia; antidepressants for depression; and lithium for manic-depressive illness. Similarly, when antibiotics were first being used, we had only sulfa drugs given for everything. Then, later, we had penicillin and other very specific drugs.

Omni: In the year 2000 will we have recourse to the ampicillins and the tetracyclines of the mind?

Pert: 2000? Much sooner. I think I had envisioned the impact our discovery of the opiate receptor would have on biochemistry and pharmacology, but I had no idea of its impact on psychology. The future of psychiatry will be totally changed. Our future treatment of mental illness will probably deal with receptors, which we now know are constantly fluctuating. With some receptors, the actual number of receptors decreases, with others, the actual number may not change, but the way the receptor is coupled to the neuron's membrane does.

> *"I think the reason why the X chromosome is bigger than the Y is that it takes so much more information to produce a brain that can raise a baby to the point where it can survive."*

Dr. William Bunney here at NIMH thinks that the waxing and waning of receptors is the key to understanding mental illness. He has found that some manic-depressives cycle between depression and mania every twenty-four hours. Every afternoon at four o'clock, say, they'll click sharply from depression to mania. It's called the switch. And there's only one cure: lithium. My husband, Agu, demonstrated that lithium stops the sharp oscillations and stabilizes the receptor for the neurochemical dopamine. There's evidence that the insulin receptors fluctuate in diabetes. Manic-depressive psychosis is like diabetes of the dopamine receptor.

Omni: How will this knowledge transform psychiatry? What will a psychiatric consultation be like ten or fifteen years from now?

Pert: We'll do a "total receptor work-up" with a PET scan [a diagnostic photograph of the brain]. We'll drop in a very selective drug with a radioactive isotope, which will "light up" the brain, and then we'll be able to get a three-dimensional look at the receptors—which areas are okay, which need tuning. We're going to have computerized maps of the brain—of all the different substances we know of and some we haven't yet discovered. The data come out in the form of light gradients, and those are transformed into numbers by the computer. One day we'll have each neurotransmitter on a separate floppy disc. We'll know the different distributions in the brain, and we'll find out a lot about what goes wrong. Then maybe the patient will be given a highly specific dose of, say, ten drugs that will straighten things out.

On the other hand, it's all in the mind anyway. Perhaps what this is telling us is that drugs can never be as subtle as our own neurochemicals, which can be released in one spot and not another. Drugs assault the whole brain at once. Who knows, the future psychiatric treatment may consist of autohypnosis, meditation, exercise, diet modification, and so on.

Omni: Is it true that researchers are already looking into schizophrenics' brains with PET scans?

Pert: Yes. The technique is still in its infancy, but they're already finding startling differences between normal brains and those of schizophrenics. Parts of the front of schizophrenics' brains are dark on the scans, as if they were turned off.

Omni: Do such drugs as heroin affect the sensitivity or the number of receptors?

Pert: Absolutely. Heroin bludgeons the opiate receptors into submission, functionally shrinking them. And there's evidence that the younger the brain, the more vulnerable its receptors are. If you give a pregnant rat one shot of Valium, for example, its babies will have half as many Valium receptors when they grow up. This raises frightening questions about current obstetrical practices. Babies whose mothers were given Demerol during pregnancy are affected by the drugs. For example, they fail to habituate to white [background] noise as readily as normal babies do. There is hard evidence that this decrement lasts at least two weeks. Whether it extends into adolescence is not known. And of course drugs are just analogs of our own internal chemicals anyway, and there's evidence that life events prompt the release of neurochemicals. So our experiences probably affect the distributions of receptors.

Omni: What would Sigmund Freud say? Are his theories concerning Oedipus complexes, wish fulfillment, and repression now as antiquated as the concept of the geocentric universe?

Pert: There's nothing that Freud ever said that I can't relate to. Not only was he an incredible genius, but he was also the first psychopharmacologist. His treatise on cocaine, which he wrote before the turn of the century, was a masterful psychopharmacological paper. And of course he experimented with cocaine himself. He was interested in the underlying neuromechanisms of mental disorders. If he were alive today, he'd be a neuroscientist.

Also he was right about the unconscious In studying the way the brain processes information we've learned that much information never reaches consciousness As incoming information travels from the senses up through higher and higher levels of the nervous system it gets processed at each stage Some is discarded some is passed on to the higher regions of the brain There's a filtering—a selection—based on emotional meaning past experience and so on We think repression occurs at the synapse where the message is either blocked or transmitted

Omni. Will brain transplants someday play a role in psychiatry?

Perl. Yes but they won't really be brain transplants The trick is to use cultures of young brain cells—fetal brain cells—that are still in the rapidly dividing stage Brain tissue has been successfully transplanted here at NIMH from one rat to another

The dopamine-secreting neurons in a part of the brain called the substantia nigra are the ones that seem to disintegrate when someone has Parkinson's disease No one knows why But the rat brain has an analogous pathway located in exactly the same place as it is in the human brain It's called the nigrostriatal pathway and it too squirts out dopamine In the rat we know exactly where the cells that give rise to the nigrostriatal pathway are located at a certain point of fetal development We can remove them while they're small and still dividing and transplant them into the brain of another rat which has lesions of the nigrostriatal pathway And the cells will multiply and grow in the recipient's brain Not only does the "Parkinsonian" rat get better but it can be shown chemically that the brain area has regenerated

Omni. Could you conceivably use the same technology to transplant neurons from brain areas governing cognitive or emotional processes say to make a stupid person smart or a boor sensitive?

Perl. Conceivably We could perhaps transplant kindness neurons from human females to human males But that's far in the future In any case we'd have to use fetal brain cells and that poses ethical problems We might also eventually be able to use brain cells from other species but we'll have the technology to use fetal cells a lot sooner

Omni. Once we come up with highly refined maps of the brain would you expect to find differences between the brains of men and those of women?

Perl. Well at a certain level of consciousness it's very upsetting for a woman to think she's any different from a man I went through that phase in the late Sixties I wore a lumberman's jacket and boots and really denied any differences between men and women except for the most obvious difference in sex organs But of course you need a whole different brain circuitry to operate those different sex organs So I think in a few years we'll be able to look into the brains of a man and a woman and see differences At Stanford recently researchers found an area in the rat brain that was bigger—it contained more neurons—in males And wherever you have different neurons those neurons are secreting different neurochemicals So yes I think we'll be able to figure out the chemical coding for the differences between the sexes

Omni. But why should there be sex differences in the brain? Is it because evolution favored different characteristics in males and females?

Perl. Yes Of course men and women have entirely different attitudes toward sex and those attitudes are hard-wired in the brain not learned Men derive an evolutionary advantage from spreading their seed as much as possible Women on the other hand need to choose a mate who will stay around and take care of them and their offspring So I'd expect to find a part of the female brain that is devoted to [making] that kind of choice

Women are programmed to fall in love with whomever they make love with no matter how ludicrous the person As soon as they look into the eyes of their partner they've had it Men can act as if they're really in love but it's [a case of] out of sight out of mind

The brain doesn't know the Pill was invented Women are programmed since time immemorial to get that guy back to take care of any offspring that might ensue After all our mothers had babies our grandmothers had babies women alive today are the result of a long line of women who reproduced When a woman chooses not to have children it's a momentous decision at odds with her programming

Omni. Would you expect to find a kind of mothering or nurturing circuitry in the female brain?

Perl. Definitely The female brain was designed to enable her to teach another organism to survive I think the reason why the X chromosome is bigger than the Y chromosome is that it takes so much more information to produce a brain that can raise a baby to the point where it can survive than a brain that merely impregnates and runs Evolutionary theories have made too much of the bands of cavemen working together to hunt down a bull and they've forgotten the women back at the cave who have chosen which men to mate with and I do think it's a choice Maybe when we look for the origins of language we should look to the cavewomen communicating with their offspring and with one another

Omni. What about violence? Are men innately more aggressive than women?

Perl. Each sex has to grapple with its own hard-wired programming and I think the female program is easier to deal with Women don't realize how much men have to struggle to control themselves In their early teens when testosterone starts to surge young men feel angry There is now a proven connection between violent behavior and elevated testosterone levels A Y chromosome is a real cross to bear It's a

predisposition toward angry violent competitive macho behavior The biggest problem *women* have is that of controlling their sexuality so it doesn't do them in

Omni But is the male "program" evolving in your opinion now that communication and peaceful coexistence are more important survival skills than physical prowess?

Pert Yes There was an article in *Newsweek* about men like the late John Lennon staying home to take care of their children We've come a long way Men have gradually developed paternal feelings and bit by bit the concept of monogamy has grown So men are becoming more civilized Someday they may be as civilized as women.

The women's movement is also a sign that the female element is becoming respected by our society It's a sign of the civilizing process of the evolution toward peace It's interesting that the main reason why many people oppose the Equal Rights Amendment is that they are threatened by the idea of women going into combat Well I think once you have women in the trenches, you'll have no more war My feeling is that if there had been women in every trench during World War I the women on both sides would have communicated with one another and they all would have celebrated Christmas Eve together

Women are natural peacemakers The Christian mythology is just a very elegant and complex metaphor about mother love Mary stands for mother love forgiveness and compassion Jesus understood that love was the key Love thy neighbor" Blessed are the peacemakers " I always say it was great for God to send His only son but I'm waiting for Him to send His only daughter Then things will really be great

Omni You and your husband are both neuroscientists Has your perspective on the brain influenced the way you raise your own children?

Pert Well people have said that any neuroscientist who is not a parent is at a serious disadvantage because you're missing the opportunity to watch a little machine being programmed right before your eyes When we were first married my husband was a graduate student in learning theory and we believed in John Watson We believed that a child was a tabula rasa that learning was everything I can remember our son crying and my husband saying Is he diapered? Is he fed? Then everything is fine Don't go in " We waited outside the door and he fell asleep *We did it* we thought—brilliant rational parents of the twentieth century using behavioral principles Then nine years later we had our little girl and we couldn't do anything with her She slept with us until she was five years old So we've come to believe that the brain unfolds as a flower unfolds Of course it's nice if the flower grows in a supportive environment with rain good soil and sun

Omni The size and structure of the human brain have remained unchanged for thousands of years What do you think is the next step in evolution if there is one?

Pert Well evolution has no purpose except to enable a species to reproduce and survive Each creature is a finely evolved machine for that Richard Dawkins who wrote *The Selfish Gene* says that a duck is basically a robot vehicle for the propagation of duck genes a human being is a robot vehicle for the propagation of human genes Yet somehow it seems to be requiring greater and greater intelligence for human genes to propagate We're evolving toward perfect knowledge

Remember all human beings alive today are the offspring of a long chain of ancestors each of whom was smart enough to survive There's some value in their traits or they wouldn't be here It's as if each brain has something positive to contribute And although the brain hasn't changed physically in the past three thousand years the way we program it has changed My fifteen-year-old son plays with computers When my husband was his age he worked on cars

Omni Can the brain ever really understand the brain?

Pert Yes absolutely In terms of matter—in Newtonian terms if you like Up until recently I've visualized the brain in Newtonian terms I've pictured the neurochemicals and their receptors as hard little locks keys and balls like the drawings in textbooks But now I've come to see the brain in terms of quantum mechanics—as a vibrating energy field with all these balls locks and keys just being ways to perturb the field As I've said the receptors aren't static locks they're constantly oscillating and moving

It's like the difference between Newtonian and Einsteinian physics I remember studying physics at Bryn Mawr and getting a glimmer of what reality is I was just vibrating on the brink of experiencing everything as matter and energy But you quickly return to your everyday consciousness You can write equations about Reality with a capital *R* but you think in Newtonian mechanical terms

Consciousness is before the brain I think A lot of people believe in life after death and the brain may not be necessary to consciousness Consciousness may be projected to different places It's like trying to describe what happens when three people have an incredible conversation together It's almost as if there were a fourth or fifth person there the whole is greater than the sum of its parts

Omni Einstein and other physicists have described experiencing an almost religious awe when contemplating the laws of the universe Do you ever feel that way about the brain?

Pert No. I don't feel an awe for the brain I feel an awe for God I see in the brain all the beauty of the universe and its order—constant signs of God's presence I'm learning that the brain obeys all the physical laws of the universe It's not anything special And yet it's the most special thing in the universe That's the paradox ∞

SPACE

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transponders over the Western Hemisphere five times the current limit

How can we eke out the thousands of extra channels we'll need? Solutions range from lofting huge new antenna farms into space to claiming more territory in the electromagnetic spectrum

One strong possibility is the exploitation of higher frequencies (or shorter wavelengths) It an effective means of communicating over satellite by laser beam could be developed the potential increase in capacity would be enormous Another possibility Within a given frequency band technology can help increase the communications load with new on-board switching systems and bigger more sophisticated satellite antennas Wide-diameter (25-meter) multibeam antennas could produce a large number of independent signals many using the same frequency but each aimed at a different ground station The power behind these new systems would shrink ground stations to something you'd carry in your pocket Wrist radios wouldn't be far behind

That isn't the only payoff from the sprouting of larger antennas Through economy of scale bigger systems should also save money Cost-effectiveness studies by General Dynamics Comsat and other companies for NASA indicate that small- to moderate-sized multifunction platforms (6 000 to 13 000 kilograms including payloads) offer the most profitable solution to the geostationary communications problem assuming the shuttle is used as a launch vehicle Several of these platforms would be launched and emplaced at geostationary orbit in clusters or constellations

Such an unmanned platform cluster could handle the combined telecommunications services of a large number of individual satellites Orbital antenna farms sets of clusters would relay telephone calls television pictures reports of bank transactions medical data mail news reports and other information at a cost of only 20 to 40 percent of the total program cost of comparable individual satellites

The studies have shown that geostationary platforms can provide more than adequate communications capacity by century's end and a basis for growth well into the next century

The technologies that have to be developed for their realization are in various phases of planning at NASA today upper propulsion stages for transporting large space structures—folded deployed or assembled in space—from the shuttle's orbit to geostationary altitude huge solar cell arrays for generating power remote-controlled assembly and robotics for automatic operations In the two decades left to us in this millennium these technologies will be launched into space vastly improving communications on Earth ∞

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tation. Tagging the interiors of the often-unpatrolled cars requires little more than a felt-tip pen and a clear spot among the myriad other tags that obfuscate the walls, windows, ceilings, seats and subway maps. But the benefits are enormous. Getting up in a subway car means instant membership in the vast and mobile graffiti community and it guarantees exposure to a captive ridership. "They own the train," Dr. Lecker adds, "as long as their tag stands out."

Though the interior tags are dismissed by most subway riders as annoying and meaningless scribbles, they are often the products of hours, perhaps days, of painstaking development. The writers refine their personal hieroglyphs in piece books, hardcover sketch pads in which they also collect the autographs of their peers. That most graffitists can translate the seemingly indecipherable tags of brother writers with ease attests to the existence of a certain language and style exclusive to them. As to the intent of the interior tagging, Futura 2000 thinks that the graffiti on the inside is there to appeal more to the graffiti community than to the public. "You can walk into a car, see everyone's name, you know just from the styles and tell what's really going on in the community."

The final rite of passage for the up-and-coming graffiti artist is the evolution from the interiors to the exteriors of the subway cars. "You graduate to the outside when you tire of the little bit of space you have and you need to expand," Futura explains. "I think that once you get to the outside and see the joy in painting the exteriors, there's no need for you to be up on the inside."

But getting at the exteriors is no mean feat. It entails infiltrating the various underground and elevated lay-ups and the secured outdoor yards, where trains not in service are stored. The first few trips to the yards and lay-ups test the mettle of the bravest toys, even when accompanied by veteran writers. There are rat-infested tunnels to negotiate. Cyclone fences to scale or cut through. Transit patrols to dodge, and third rails coursing with 625 volts of deadly juice to sidestep just to reach the trains. Even then there is the constant threat of being "vamped" or "ripped off" by such predatory gangs as the Ballbusters and the Vamp Squad, who frequent the yards, stations and lay-ups on their respective turfs.

For protection as well as camaraderie, most writers have joined graffiti cliques like the Acid Writers, WAR (Writers Already Respected), CIA (Criminals in Action) and the erstwhile Ex-Vandals. Each group has its favorite yard and line. The Masters of Broadway paint the No. 1 locals and the Three Yard Boys the No. 3 express trains. While the cliques are separate entities, they are all part of a surprisingly well-informed graffiti grapevine. Through word of mouth, writers from all five boroughs learn which yards are "hot" or under increased surveillance and which are safe to "bomb" or cover with paint.

The toys of established graffiti cliques are like rookies in any league. Their apprenticeships often include racking, or stealing, the group's paint, filling in the outlines of pieces with jerry-rigged, wide-nozzle spray cans called thick tops and occasionally hoisting the veteran writers on their shoulders to enable the veterans to reach the tops of the subway cars when there are no catwalks to stand on. While the toys may create good works on paper before they get up on the exteriors, they first must master the "push-button technology" of spray painting. Dripping paint is the bane of the serious artist.

To be King of the Line, the graffiti artist must be recognized as peerless for his style, originality and the number of pieces he has up. But a king's reign is often brief, since he finds himself being constantly challenged by those who covet his crown.

"Getting at subway train exteriors is no mean feat. It entails infiltrating underground and elevated lay-ups. There are rat-infested tunnels, Cyclone fences, guard dogs and the third rail."

A challenge can be effected by slashing or tagging over a writer's work, which in turn can lead to a confrontation, sometimes artistic, sometimes physical. Some kings, however, abdicate for more mundane reasons, like marriage, the fear of being prosecuted as an adult, or the desire to profit from their artistic efforts. But when the kings retire from active train painting, there are always others to take their place.

Until 1970 the TA maintained a relatively clean fleet of cars. In 1974 and again in 1975, every single car was cleaned and renovated, thanks in part to multimillion-dollar federal grants. The three golden ages of graffiti art occurred in 1972–73, 1975–76 and 1979–80. Not ironically, these glory years coincided with the depletion of the extra funds allocated for car cleanup. The ebb and flow are obvious. When the TA has the cash, the writers lie low; when the funds dry up, the writers return with a creative vengeance.

Through 1974 the TA's graffiti-cleaning program amounted to little more than the hand-removal of exterior art, with no appreciable interior tags to bother about. But with the advent in 1975 of the often-breathtaking full-car pieces that covered every inch (windows included) of one, two and sometimes three cars at a time, the TA needed a larger, more efficient removal system. Enter the "buff" in 1977. The buff is essentially a subway carwash, a series of sprayers filled with a caustic water/solvent mixture through which the cars are driven. Although the thousands of gallons of Turco Octagon and Nationwide graffiti solvents cost the TA upwards of $400,000 yearly, the expense has been well worth it. Though the buff doesn't always eradicate the epoxy and urethane tags and pieces, it does reduce them from works of art to ugly "ghosts," which are eventually covered with fresh coats of silver and blue paint.

The buff, referred to as the Agent Orange Crush by history-minded artists, has been one of the most effective weapons in the TA's antigraffiti arsenal, but it has taken its toll on both the trains and the transit personnel. In the words of the TA report cited earlier, "The alkali-based solvents used for graffiti removal are damaging the cars. The chemicals seep into the underflooring at the door openings and into electrical parts, causing corrosion and shortening equipment life. Additionally, the fact that the chemicals are caustic gives rise to a concern for the safety of workers and the maintenance of the environment." The buff also chewed through the early alkyd enamel paint jobs on the cars, prompting the TA to switch to tougher, less porous polyurethane paints in 1978.

Interior graffiti removal is much more costly, both in dollars and in the hazard to health, than exterior removal. Although the cleaning agents used on the interiors are half the strength of those used in the buff, workers must don respirators, goggles, rubber aprons and heavy gloves to apply them by hand. Even so, the formulas are caustic enough to blister the interiors' enamel paint jobs and fog Plexiglas windows and plastic light moldings. This process too leaves unsightly ghosts and subjects cleaning crews to dangerous, poorly vented fumes.

Although the buff proves to the public that the TA is at least trying to combat graffiti, its use actually encourages the artists. According to the unwritten laws of the graffiti community, once one's tag or piece is up, it is sacrosanct and cannot, or should not, be written over. Were it not for the buff, graffitists would have run out of taggable subway surfaces long ago and would have been forced to look elsewhere. Instead, the Establishment slash allows guiltless writers to tag the ghosts of their predecessors. To thwart the buff, the current breed of hit-and-run writers resorts to quick, two-color tags called throw-ups and burners, the wild style of the Eighties, consisting of half- and full-car tags that are often three-dimensional rainbow dazzlers. But for the most part, the throw-ups and burners don't hold a spray can to the legendary full-car masterworks of artists like Lee, Dondi, Fred, Futura 2000, Lady Pink, Sonic, Blade

Crash Zephyr and Daze Lee concedes "The buff is preventing people from becoming very creative."

The TA has always considered graffiti artists vandals and legally they are. The artists do in many cases filch their paints, they do trespass on private property they often jump turnstiles without paying they cut through fences and deface the interiors and exteriors of the train cars—all violations of the law. Not for one minute has the TA been swayed by the favorable publicity that the artists have received from the media, the art establishment, and the New Wave *culturati* countering this support with statistics showing that a large percentage of graffiti artists graduate from the subways to careers of more serious crime.

Through 1966 anyone caught defacing cars or stations was automatically ejected from the subway system. The TA issued a Code of Violations in 1967 that made graffiti artisans" subject to a $25 fine and/or a ten-day jail term. In 1976 a New York Family Court judge with parental approval sentenced two young writers to remove graffiti from the walls of a subway station. This gave rise to the TA's short-lived graffiti-removal program, a self-confessed disaster for several reasons. The youths looked at the four-hour sentence (with rest breaks) as a lark, members of the youths' gang would come around to watch, thereby giving recognition to the offender; graffiti artists made contacts with other offenders they would not otherwise have met, offenders were afforded the opportunity to learn more about transit procedures and facilities; and the cost of materials, protective garb, and supervision far exceeded the amount of work done by the offender. In May 1980 the TA initiated a restitution program under which arrested writers must pay a percentage of the cost of removing their artwork. The amount of restitution set by the TA is usually enough to make a dent in, but not wipe out, the artist's income. This program seems to be working with the TA having collected tens of thousands of dollars in the past two years.

A periodic lack of funds, manpower shortages, and lenient courts have hobbled the TA's war on graffitists. Given the size of the system, there is a relative handful of transit police assigned to protect people from the muggers, rapists, and murderers who infest the trains and stations. Collaring graffiti artists is therefore considered low-priority work, and this allows them the virtual run of the yards, layups, and tunnels. When the artists are apprehended, their cases are often treated lightly by overworked judges, who concentrate on more serious criminals. Thus, when the artists are released with little more than a slap on the wrist, the damage has been done. The threat of arrest, formerly a deterrent, is demystified, and any awe the artists may have held for the courts withers into a cynical disrespect, prompting them to return smugly to the yards. The TA has taken steps to end this vicious circle, though, by assigning members of its Anti-Vandalism/Graffiti Unit to follow up every graffiti case that gets into court.

Most graffiti artists resent being labeled as vandals. Lee says, "Here is a thing that doesn't hurt you. When a train comes out of the darkness, voom! all it does is excite your heart, make your eyes follow it, it doesn't take your wallet."

Ali adds, "If these kids were not taking out their need to express their egos, their artistic drives, their frustrations with cans of paint, what would they be doing? Carrying Saturday night specials? Instead of dealing with the Soul Artists, would the TA rather deal with the Baader-Meinhof crew?"

The TA's determined efforts to stamp out graffiti have driven some of the subway's best artists to seek alternatives to painting trains. Many have translated their art into more commercial media. One of Fab Five Freddy's paintings was recently auctioned off by Sotheby Park Bernet, and his rap music, a kind of musical graffiti, inspired Blondie's million-selling "Rapture." Ali's band, J. Walter Negro and the Loose Joints, has just been signed to a recording contract. Futura 2000, a successful painter, designs backdrops for the Clash, a British rock group. Daze and Crash have signed with an art agent. Keith Haring's pictographs have been displayed at New York's highbrow Brooke Alexander Gallery. But in spite of their successes, the artists do miss watching their kinetic canvases roll by on the elevated tracks of Brooklyn, the Bronx, and Queens. Futura laments, "No matter what I do, gallery or studio, it won't quite be the same."

Right now accomplished graffiti artists are a hot item on the big-time art circuit. From group shows at schools, churches, and New Wave clubs to Madison Avenue galleries and exhibitions in European capitals, the artists have certainly come a long way from their humble beginnings as graffiti toys. But, as Fred so succinctly puts it, "We are toys in a new yard." This could prove to be their undoing if they are not careful. The talent is there, but unless the artists are allowed to develop as individuals, and not as part of a "graffiti chic," they could find themselves out in the cold if and when the novelty of their origin wears thin. And there is always the danger of exploitation by unscrupulous agents and gallery owners anxious to make a fast buck.

But what of future graffiti writers? Will they continue to paint the trains for the sheer joy of expressing themselves, or will they too get caught up in the seductions of crime or commercialism?

The TA, meanwhile, is busy securing its yards with guard dogs, razor ribbon, and electronic surveillance equipment under an ambitious five-year $5.5 billion improvement program. Will the new breed of writers be able to surmount these obstacles as easily as their forebears did theirs, or will the TA finally get the upper hand in the graffiti wars? Lee says, "We don't want to fight, we just want to write." ∞

COMMUNICATIONS

CONTINUED FROM PAGE 10

Naming Titles

The presentation of Ludek Pesek s Cosmic Surrealism [November 1981] was beautifully done While Pesek has been reluctant to title several of his works, some of his fans around the world have organized efforts to do so In fact there appear to be two sets of titles developed for many of Pesek s paintings Among the better-known albeit not official, names for the paintings presented in your pictorial are (from right to left and top to bottom, of pages 104—109)

Selection—the modified Ramses altar
Trident—the dummies in military and target dress
Wonder Of—the crown upon a moonstone
No Room—the military coat and hat on a chair
Would—the eagle on a perch and stone heart
Add Blue then Red Water—the yellow rose and stone bird
Victors and Spoils—the discus thrower
Fu Green—the Fu dogs and green railroad car
The Right Voice—the sole chair in an open theater
Disciples of War—the graveyard in a prison camp
Survival of Two—the pole, planted to seek food
Anwar s Call—the red telephone and watch

Two of the paintings *No Room* and *Victors and Spoils* were supposedly named upon suggestions that Pesek made to a friend and admirer

Nile Stanton
Indianapolis Ind

Origin of the Kiss

I was extremely interested in the article by Mitch Tuchman [Arts/Film, December 1981] that discussed restructuring human gestures as they might have been 80 000 years ago I was particularly struck by Desmond Morris s supposition that primitive peoples might have kissed by rolling their faces together from cheekbone to cheekbone

I would like to suggest a different origin of the kiss revealed to me when I was a twelve year old boy I came upon a tomcat stalking an unsuspecting tabby Suddenly he pounced and grabbed her neck in his mouth then mounted her He held that tight grip throughout the mating act

Every few years I recall that incident and I wonder whether today s kiss might not be derived from that very same conquering grasp Picture a caveman attracted by the musk of a nearby ovulating cavewoman Somehow sensing that his amorous advances may be rejected he approaches her carefully then suddenly pounces grabbing her with both arms and his mouth She struggles briefly then gives in to her animal desires Even if she wanted to continue struggling more pressure from the biting hold would keep her quiet Also while he is biting her she cannot bite him

After a few eons of this crude behavior the once important bite has lost its purpose But the male mouth still nibbles lips and ears and yes occasionally bites necks The female instinct accepts this behavior perhaps remembering a primordial grandmother s experience

If this theory is correct the kiss would probably not have developed to the cheekbone to cheekbone variation suggested by Mr Morris and then regressed to the common kiss—just as lower animals have probably not lost tails and then regained them during their evolutionary process Things don't get less complex then more complex again

Don McNair
Magnolia Springs Ala

Sure.—Ed

Pellet Power

The ominous-looking survivalist on page 49 [Continuum, December 1981] is ready to defend his condominium from desperate hordes with a pellet gun It might prove difficult unless the hordes are mice or squirrels

Tom Reilly
Detroit Mich

SINCLAIR

CONTINUED FROM PAGE 17

that will pass. just as the size of the television screen has ceased to be a status symbol. "Perhaps the new status symbol will be a car that you can fold up and put in your pocket."

Sinclair expects that many other breakthroughs will come about with help from his little friends, the computers he and his competitors have sent out from their factories, covert agents of cognition. What may come marching back, he says, is an army of intelligent robots.

"I think that when you put computers out among so many people, as we and other people in the personal computer business are doing, and you bring up a generation that isn't frightened of the present generation of computers, you will see things change dramatically," he says. "Somebody's got to come up with that breakthrough that enables us to make apparently intelligent machines, and you just need a lot of people thinking about it for that to happen. I suspect."

It is a fascinating theory, that the massed Apples, Pets, and ZX80s of the world, combined with the fertile minds of their users, will provide the prebiotic soup from which the next product of evolution, the Intelligent Machine, will emerge. Sinclair does not put it in quite such strong terms. But suggest to him that computer hobbyists have produced nothing more useful than 20,000 versions of Space Invaders, and he leaps to their defense.

Doctors and lawyers, he says, have written serious programs for use in their own professions. They find it easier to do it themselves than to use a programmer. A schoolboy recently wrote a chess program for a ZX80. Amateurs are transforming the way computers are used. It won't be long before someone—possibly an amateur—delivers a robotic housekeeper.

Sinclair would welcome it at the threshold. "I'd like to have robots in the home," he says. "Nice little servants. Chop wood and things." Foot in the door, the robots would move on to other chores. Some would travel inside human arteries and veins, broadcasting the view by television, performing operations with assistance from a surgeon outside. That scenario, Sinclair thinks, is possible in fewer than 20 years. "I suppose I could do it in ten," he says, "if there was a lot of money."

One evolutionary step further, robots will replace dogs as pets. The human master will learn to love them. "I think that's likely to happen," Sinclair says. "Exciting. And then they'll get brighter than us. And they'll take over. There will be no place for humans in a society of intelligent robots," he says, except perhaps as pets.

It won't happen in his lifetime, he believes. That leaves plenty of time for generations of miniature robots to wait on us—and do some of our dirty work.

Flying machines, the size of bees, for example, could buzz over our cities, looking for muggings, robbery, traffic accidents, mayhem, and then summon help. Much more controversial, courts could order prisoners to be fitted with electronic bugs, forcing felons to live under 24-hour surveillance. The proposal angers some civil libertarians, but Sinclair happily grasps the nettle. "Give criminals the choice," he says, "I bet they don't choose to sit behind bars."

Other robots could wage war using Sinclair's version of a missile shell game, the exploding tortoise. Sinclair sees it as a logical step following the contraction of the ICBM into the cruise missile. "You want to go a step further," he says. "You want a tortoise. It will make its way slowly but surely to where you want it to go and then blow itself and the surroundings to bits. You'd make them by the million. Set off a million at once. They'd never stop them."

War and crime are the only small clouds Sinclair sees in a bright future of helpful, portable machines. His vision is all the more credible because of what he says he *can't* do. Sinclair has often dreamed of a convenient personal flying machine, something as easy to use as a car. After careful study, he's concluded the blue-sky idea will never get off the ground. You'd better believe him. ∞

EARTH

CONTINUED FROM PAGE 16

people Lappe and Collins say that food scarcity is an illusion There is already enough grain to provide everyone with ample protein and more than 3,000 calories a day they say And that total doesn't even include fruits vegetables fish and livestock In essence people starve not because food is unavailable but because they are just too poor to buy it The world's profit-oriented distribution system bypasses the starving and the malnourished

Just look at Sonora and the rest of northwestern Mexico Lappé says While the local peasants starve because they lack sufficient quantities of corn and beans that rich area grows fruit and vegetables for export

Collins and Lappé contend that the problem is ubiquitous Soybeans are exported from hungry Brazil Bananas are exported from the Philippines one of the hungriest countries in Asia And vegetables, peanuts and cotton are systematically exported from famine-stricken Subsaharan Africa In India and Pakistan grain that the hungry can't afford to buy is sold to livestock owners

Collins still recalls his visit to the city of Dakar, in Senegal He had been touring the vast Bud Senegal plantation, a Third World development project affiliated with a wealthy California corporation On the day of his visit giant diesel tractors were yanking centuries old baobab trees out of the reddish soil to expand the operation and dark skinned Wolof women in bright full-length cotton dresses moved through the green rows tending lettuce beans and eggplants

Although an aura of harmony and abundance hung in the air workers were searched before leaving the fields The reason Bud managers feared they might steal some of the produce Indeed, Senegal had had five years of drought The country was full of hungry people trying to scratch a living from the dry dusty land with primitive tools—in some cases little more than sticks for digging Yet Bud Senegal had used modern irrigation pumps and other equipment to create a lush tempting oasis that the starving natives found impossible to resist

From time to time Collins noticed big refrigerated trucks filled with melons or eggplants left Bud's packing sheds and roared off toward the Dakar airport A jumbo jet was always waiting to take the vegetables to Amsterdam Paris, or Stockholm Why was food being exported when millions of Senegalese were going hungry? Collins and Lappe found that food was leaving Senegal in search of much higher prices and profits elsewhere

Most of the capital for Bud Senegal had come as development assistance from West Germany the World Bank and the Senegalese government Nevertheless while Dakar string beans and lettuce garnished the plates of affluent Europeans Senegal's peasants suffered Bud for example was situated on lands that the peasants had formerly used to grow traditional foods for themselves The corporation took this land out of domestic food production in the process forcing small farm owners to become landless laborers In addition rejected melons from the plantation were sold at a stand in the nearby Wolof village undermining the meager cash earnings villagers had received by selling their own melons

Bud's use of modern technology seemed to make the situation even worse The company pumped great quantities of precious groundwater from local wells and applied chemical fertilizer that drained nutrients from the soil By removing the baobab trees Bud increased soil erosion The Senegalese had made a vast sacrifice expending valuable human and natural resources but in the end the resulting produce was exported

What can be done about unequal control over resources in Senegal and elsewhere? Americans the researchers say must stop aiding dictatorships including those in Zaire the Philippines and El Salvador

But the real answer will come only when oppressed people take control of the land Today that is happening in Nicaragua where more than half the people were malnourished during the recent reign of dictator Anastasio Somoza Overpopulation was not Nicaragua's problem because the country was lightly populated and had fertile land and plenty of water Instead " Collins says the trouble lay in the fact that the majority of the land was owned by a few people who produced food for export The majority of the people had access to only the worst land where they produced food for local consumption Thanks to a redistribution of resources nearly everyone in Nicaragua may well have plenty to eat in a few years

Lappe and Collins warn that Americans are not immune to the problems now plaguing the Third World Today about 5 percent of the landholders in the United States control about half the farmland and they are increasing their control over the remainder One percent of all U S food manufacturers control 80 percent of the assets and five corporations control 70 to 80 percent of the entire U S grain trade

Recent institute research blames huge agricultural corporations for the intensive use of pesticides the abuse of soil and groundwater, and high food prices The destruction of food-producing resources that comes with concentrated control " Collins asserts " means that in twenty or thirty years we're going to have real difficulty feeding ourselves right here in the United States While we're dreaming that we're the breadbasket of the world, our food security is in jeopardy "

CONTINUED FROM PAGE 28

succeeded so thoroughly as Houseman in sponsoring quality science and science-fiction entertainment. With inarguably good intentions, the nadir of his contribution was *Rollerball*, a 1975 film in which he costarred but had regrettably little creative input. Magnificently staged, the film is an empty headed view of a future society in which war has been replaced by the conflicts of violent sport.

The Huxleian idea of sport as a narcotic for the masses was interesting and topical but it wandered. Houseman agrees. "This is not uncommon in most science-fiction films because they possess comparatively ambitious themes that are appreciably more difficult to state and to solve in dramatic terms. In a sophisticated science-fiction setting, simple solutions such as sex, comedy or action leave you with a truncated, phony ideology."

Rollerball was *supposed* to say that no matter how powerful the government, the courage and integrity of the individual can defeat it. That's a dubious premise to begin with, but it positively fell apart when the character of Jonathan E. [James Caan] survived only because he was more *brutal* than anyone else.

"Worse, the violent execution of this philosophy reduced the film to the level of a rather loony gangster picture. It's indicative of so many filmmakers who undertake science-fiction subjects and, by and large, seem unable to commit wholeheartedly to them, abstractions and all. That gets in the way of what is poetic and prophetic in the science fiction genre."

Conversely, when Houseman has creative control over a property, the results are invariably quite extraordinary. One such project was his 1947 stage production of *Galileo*, presented at the Coronet Theater in Los Angeles. Charles Laughton starred in this controversial work, which was written, and then bitterly *re*written, by Bertolt Brecht.

"Brecht wrote the play in 1938," Houseman recalls, "at which time he portrayed Galileo as a fellow dedicated to science, yet not in any sense a betrayer of humanity. After World War II and Hiroshima, Brecht felt compelled to revise the play, mistrusting scientists because they had allowed themselves to be used for the massacre of civilians, which was indeed a guilt felt by Fermi and many of his colleagues. Naturally, this is inconsiderate of the very tricky political arena in which the war was fought. If we hadn't developed the bomb, the Nazis would have. Nor is it a reason for any intelligent individual's opposing science. But then, as now, it was an emotional issue, and in Brecht's mind, Galileo was similarly reproachable for having capitulated to the Inquisition." To cite Brecht's own words in the matter, Galileo's abjuration [in his scientific conflict with Roman Catholic Church authorities] can be regarded as the original sin of modern science.

While Houseman concurs that the original version of the play is a more inspiring, less captious work, he chose to present the revision because it was better theater.

Challenging and experimental, Houseman's art is always interesting. Yet it's the man has one overriding talent: it is as a raconteur, one whose critiques of people and events are uniformly priceless.

Singularly enlightening is his appraisal of the decline of the Hollywood movie industry—observations that help to explain the myopic attitudes that govern science-fiction filmmaking.

"In the old days," he elaborates, "no matter how crass and dreary some of the studio heads were, the climate was one of enormous passion and love and dedication to the making of movies.

"Budgets were closely watched and adhered to, so that more pictures could be made for the same amount of money, this created a need for ingenuity and cinematic skill that the plush and expensive pictures of today simply don't have. The modern producer is merely a handicapper who performs calculations. With the exception of too few enthusiasts in the wilderness, they are downright ignorant, and the only reason why they rise and fall so rapidly is that the collapse of the old studio structure has made movies a fluid, temporal, insecure business.

"It's the ideal environment for agents, entrepreneurs and gamblers—everything but sincere moviemakers." Houseman cites this disheartening decay in leadership as the reason why he moved to the other side of the camera.

Will matters improve in times to come? For all his learning and skill, his achievements and heterogeneity, one subject that Houseman refuses to discuss is the future. He claims that all show business prophets are wrong, or at best they're right—thirty years too early.

"I can predict, for example, that in ten years there will be no more motion-picture theaters, that everything will be viewed at home. And I may even believe this to be true. But then a seemingly irrelevant circumstance will change that. Perhaps a technical innovation that seems to have no immediate application.

"Another seer might come forth and say, 'No more theaters? Nonsense! Someone will apply holographic techniques to drama so that a Broadway show can play to a packed auditorium in Boise or Dallas.' 'Already,' Houseman complains, 'I've offered two credible predictions, at least one of which must be wrong if the other is to come to pass. There is *no* possible way to choose.'

Urged to select *any* prediction in which he has confidence, Houseman adamantly demurs. "I'm so old now," he says, "that if I'm off by twenty years, I shall eventually be eulogized as wrong. Before I was simply ahead of my time." DO

GAMES

ANSWERS TO GAMES (PAGE 128)

Scoring: 70+ = fantastic; 50+ = excellent; 30+ = very good; 20+ = good; 10+ = poor.

1 *startling, starling* (or *starling*) *starring, string, sting, sing, sin, in, I* (2)

2 *the, herein, here, her, he, ere, rein, re, in* (2)

3 If each word is beheaded by a single letter, an entirely new sentence results. (1)

4 *sequoia* (2)

5 *typewriter* (2)

6 *queueing* (2) Variant of *queuing*.

7 *crushed* (2) Another telephone pair is *amounts* and *contour*. *Pygmies* and *swinger* come close; they have only an e in common.

8 Each one-syllable word turns into a three-syllable word with the addition of one letter: *simile, alien, cameo* (3)

9 Each one-syllable word can lose letters and become a two-syllable word: *ague, rugged, aged* (the adjective) (2)

10 *scythe* (2)

11 *piecrust* (3)

12 *hijinks* (2) *Fiji* is a place name, of course, but this particular spelling was decreed by Queen Victoria because she liked the three dots over the "ij." Unfortunately, Victoria did not live long enough to see the creation in Australia of Lake Mijijie.

13 "A notable doctor was not able to operate because he had no table." Attributed to Bennett Cerf. (2)

14 The commonest words are *auTOMObile, soverelGNTy, oXYGen, schiZOPhrenia, saXOPhone, lunchEON, maRIJUana, tOMAHAwk.* (8, 1 point each)

ONE MANY

15 phenomenon: PHENOMENA (1)

16 GRAFFITO: graffiti (1)

17 index: INDICES (1)

18 stigma: STIGMATA (1)

19 DATUM: Data (1)

20 OPUS: opera (1)

21 MEDIUM: media (1)

22 zoon: ZOA (1)

23 CRITERION: criteria (1)

24 kudos: KUDOS. This word, which was *not* coined by *Time* magazine, is the Greek word for praise, fame, or glory. The word is singular. It is correct to say, "Kudos was given for the performance." (2)

25 COW: kine. This is perhaps the only case where a plural form has no letters in common with its own singular. (2)

GUINNESS WORDS

26 *strengths.* The longest one-syllable word in English with only one vowel. (1) *Scraunched* and *scroonched*, both in *Webster's Third*, are longer one-syllable words, but each has more than one vowel.

27 *facetiously.* Shortest word containing six vowels (*y* is sometimes a vowel) in alphabetical order. (1)

28 *redivider.* Longest one-word palindrome. (1) *Kinnikinnik* (11 letters), a kind of nut, appears in *Webster's Third*. (1)

29 *unoriental.* Shortest word with five vowels in reverse alphabetical order. (1)

30 *latchstrings.* Longest string of consecutive consonants: six. (1) It is also the longest two-vowel word until the astrophysical term *Schwarzschild radius* enters most dictionaries.

31 *dermatoglyphics:* the study of fingerprints. With 15 letters, the longest word with no repeated letters. (2) *Ambidextrously* comes close, with 14. The potential champion is *uncopyrightables*, which has appeared in some government papers, but not yet in dictionaries. A nondictionary phrase in this category is *South Cambridge, NY.*

32 *overnervousness.* The longest word that can be printed in lower case with no letters sticking up (e.g., *d*) or sticking down (e.g., *p*). (2)

33 *scintillescent.* Longest word of the *intestines* family in which each letter appears twice. (2)

34 *almost.* Longest common word in which all letters are in alphabetical order. (2) (Compare *fort, best, aglow.*)

35 *wronged.* Longest common word in reverse alphabetical order. (2)

TROPHIES

36 *ABsConDEr* (2)

37 *rhYthms* (2)

38 *undeRSTUdy* (2)

39 *UNDERgroUNDER* (2)

40 *vErIsImIlItUdEs* (3)

41 *IndIvIsIbIlItIEs* (3)

SPECIAL CREDIT

42 Samples of other "o" spellings include: *dough, sew, beau, toe, depot, oh, oat, owe, yeoman, soul, cologne, yolk, brooch, apropos, provost.* (Score ½ point for each correct answer up to ten; one point for each thereafter. Ten correct = 5 points; 15 correct = 10 points maximum.)

43 This list of 26 words is a silent alphabet based on one first proposed by Dmitri Borgmann. Each word has a silent letter, starting with the *a* in *toast*. The six blanks—for *f, j, q, r, v,* and *x*—indicate that we have been unable to find elegant examples for these letters. The nearest approaches, including some foreign words, are *neufchatel* (a cheese), *marijuana, cinq-cents, forecastle, fivepence,* and *billet-doux.* We challenge readers to find more elegant examples for these six. (3)

44 *Word Ways* notes that the initial letters could spell either *Mercury* or *Jupiter.* (3)

45 "NOW NO SWIMS ON MON." (3)

46 *wholesome.* A classic riddle attributed to Ernest Dudeney. (2)

47 *short.* (2)

DERIVATIONS

All derivations on the list are folk etymologies: stories that are assumed to be true because they sound as if they ought to be.

1 *S O S.* The distress signal doesn't stand

for anything but is an arbitrary selection of letters from the Morse code, the simplest to remember transmit and recognize three dots three dashes three dots

2 *News* The word used to be spelled *newes* and comes from the French *nouvelles*

3 *Mind your p s and q s* The origin of this expression is not known Other equally viable theories are that it comes from the similar appearance of the letters in handwriting or that in English pubs the bartender kept a record of his patrons consumption by p's (pints) and q s (quarts)

4 *F**k* This and other acronymic fictions (Fornication Under Consent of the King) are nonsense The word goes back to the German *ficken* to strike and probably further back to Latin and Greek

5 *Blimp* Although this derivation is commonly cited there are no records of any such designation Etymologists don t agree A common theory is that the word imitates the sound of a finger being snapped against a taut airbag

6 *O K* According to Tom Burnam in *The Dictionary of Misinformation* most authorities agree that *O K* started in the New York *New Era* on March 23 1840 as part of a name the Democratic O K Club The club composed of supporters of Martin Van Buren used *O K* as an abbreviation for *Old Kinderhook* New York Van Buren s birthplace

7 *Butterfly* This makes a charming tale but unfortunately it s been *butterfly* for as far back as there are written records

8 *Sincere* The *Oxford English Dictionary* says that the "without wax" explanation has no probability *Sincere* is from the Latin *sincerus* which originally meant "clean" or "pure"

9 *Posh* This story ought to be true but no evidence for it has been found in steamship company records The earliest uses of the word mean either luxury or a dandy with no evident references to the sea

10 *Seminars* This obvious concoction was sent in by Ray Gudegast of L'Anse Michigan

CREDITS

Page 6, U S Pat Hff U K Adrian Hobbs/*New Scientist* **page 8,** Wide World Photos Ken Studio, Scot Morris **page 16,** Mitchell Funk **page 18,** Robert Langridge, UCSF Computer Graphics Lab/Rainbow **page 20,** NASA **page 24,** Geoffrey Gove/Image Bank **page 26,** Chris Morris/Black Star **page 28,** Paragon Motion Pictures **page 32,** Michael Melford **page 36 top,** Olga Spiegel **page 36 bottom,** Olga Spiegel **page 37 top,** Robert Vogel **page 37 bottom,** Olga Spiegel **page 38 top,** Sovfoto **page 38 bottom,** Albert Clarke/Lucasfilm Ltd **page 39 top,** VAMC Palo Alto California **page 39 bottom,** Tom McHugh Field Museum Chicago/Photo Researchers **page 40 top,** Wide World **page 40 bottom,** Victor Englebert/Photo Researchers **page 41 top,** Henry Grossinsky **page 41 bottom,** NBC **page 42 top,** Charles Gatewood **page 42 bottom,** Howard Sochurek **pages 68–73** Salvador Dali Museum St Petersburg Florida **page 93** NASA **page 94 top** George Holton/Photo Researchers **page 94 middle** Fpp Schulke/Black Star **page 94 bottom** Thevo N n Sipa Press/Black Star **page 95 top,** F B Grunzweig/Photo Researchers **page 95 bottom,** Olga Spiegel **page 96 top,** Odette Mennesson Rgaud/Photo Researchers **page 96 bottom** Dr Cyrus Lee Edinboro State College Edinboro Pennsylvania **page 122,** Wolfgang Hutter Anthony Wolff Malcolm Kirk **page 124,** U S Laboratory for Atmospheric and Space Physics University of Colorado Boulder U K Kitt Peak National Observatory

BOOKS

CONTINUED FROM PAGE 32

underrating IBM It s astonishing

At the same time he is concerned about the direction of American industrial technology He believes that the largest corporations are sacrificing long-term development in favor of short-term profits "I really think that the way to ruin an industry is to make it boring to start looking for the guaranteed return particularly in research and development It seems contradictory to even think that you have to have guaranteed returns with R and D

While the book reads like a paean to the modern computer Kidder is personally suspicious of the computer industry It is a paradox that should not go ignored

"Computers are used I think to a large degree by people in power to stay there The computer *revolution* is the wrong word in many cases Computers have been a prop of the status quo The stock exchange is the perfect example Kidder points out

The irony is he continues that you can do terrific things with word processors but unless you can cure the bureaucratic mentality that loves papers that no one ever gets to read all that s going to do is just make the problem worse

Kidder further questions the "unjustified mystique" of computer technology and is worried about the terrible ways in which the products of say California s Silicon Valley may be used There seems to be no controlling them

He is also uneasy with the notion that the craftsmen who designed the Eagle computer are putting other folks out of work I suppose it s an old story—craftsmen exercising their craft at the expense of other ones he remarks The obvious thing that comes to mind of course is the printers Printing is a craft that computers have pretty much wiped out I also think of office equipment There are a lot of good ways to use those wonderful word processors but some ways of using them look like they re just going to take away whatever s interesting in a secretary s work

True to his philosophy he has no desire to own any sort of home computer I don t think I want to write anything on a word processor I m set in my ways he says

The success however of the book—the national television shows the front-page review in the *New York Times Book Review* and the sale of the book to paperback for a figure rumored to be close to half a million—has left thirty-six year-old Tracy Kidder unsettled in many of his ways He even lost 15 pounds after doing one show for PBS television Life for him in the hamlet of Williamsburg Massachusetts may not be quite as undisturbed as it once was

What s in store for him? Kidder says he s not going to abandon science and technology but he might try another subject For now he s going back to "just making lists" "I need a little rest" he muses

NEXT OMNI

CTION

IMMORTALITY

GENETIC THERAPY

PANSPERMIA—What does a winner of the Nobel Prize do after he discovers the very basis of earthly life itself? Driven by the eclectic curiosity that spurred his discovery—with James Watson—of DNA's double helix, Sir Francis Crick is now seeking the origins of universal life itself. Was the earth seeded by a rocket ship full of DNA? Are we the product of a prebiotic soup mixed by extraterrestrial chefs? Crick explains his new theory to writer David Rorvik in next month's interview.

KEEP COOL, METHUSELAH—Armed with nets and a portable aquarium, our hero slogs through the Argentine outback in search of the world's shortest-lived vertebrate, the tiny annual fish. Then, becoming a fisher of men, armed with a rectal thermometer, our champion travels to the caves of India to record the low temperature of the long-lived yogis. Dr. Roy Walford, eminent immunologist at UCLA's Medical School, leaves no evidence unturned in his quest for the secret of life extension (via lowered body temperature). In *Omni* next month the intrepid investigator recounts several scientifically hair-raising tales on the road to immortality.

LUCID DREAMING—Wish you were on a beach in Bermuda, banana daiquiri in hand? If so, go there tonight—in your dreams. This nocturnal journey is within reach if you have lucid dreams—the kind of dream in which you consciously control the action even though you're asleep. Although most psychologists a decade ago didn't believe lucid dreaming was possible, today they contend that the phenomenon will lead to a better understanding of the human psyche as well as to original therapies. To learn more about directing your dreams, read next month's *Omni*.

SPARE GENES—Within the next ten years, machines may routinely scan the genes of a fetus, searching for odd "fingerprints" that warn of problems ranging from color blindness to cystic fibrosis. And when scanners detect a problem, doctors will go to a stock of "good" genes for replacements. Researchers today can inject DNA into a cell by using wispy glass needles, changing the cell's "blueprints." In the future they may be able to combat human disease with related techniques. Next month's *Omni* reports the potential—and the potential problems—of gene therapy.

SCIENCE FICTION—Two time travelers engage in a passionate romance to add some spice to their far-ranging escapades. In Robert Silverberg's story "The Far Side of the Bell-shaped Curve" and two exobiologists study a planet seemingly rich in extinct Earth birds. In Scott Sanders's debut story, "The Audubon Effect."

MIND

CONTINUED FROM PAGE 24

Someone called local television stations claiming to be from the mayor's command center and said the mayor had been shot. Television stations immediately issued a bulletin, apparently not checking with hospitals, the mayor's office or the D.C. police. Eventually the report turned out to be totally false, and embarrassed retractions were made. Assassination attempts aren't astonishing in the United States anymore, and news organizations may not feel the need to check beyond the original source. If the same caller had claimed the mayor was possessed by evil spirits, no story would have run without corroboration.

The *Washington Post* commented in an editorial two days later. Had anyone thought to look up and dial the correct command-center number which the stations have in their newsrooms, the report probably would not have been broadcast at all. The failure to call provides a dramatic illustration of how speedily rumors can be accepted, even by those trained to take a skeptical view of things.

If I tell you the world is round, you're not likely to consider this statement rumor, although probably neither you nor I can readily confirm that as a fact. Folklorist Alan Dundas calls the conventional assumptions that we share about the nature of the world our folk ideas, which, taken together, constitute our world view. Reported ideas that fit within our world view are accepted at face value. Other ideas, which differ from our perspectives, are believed only if they can be bolstered with additional evidence. The news story that Indochinese refugees eat pets agreed with the folk ideas of most Americans, and so it was easily accepted, despite the lack of evidence to support the story. If someone claimed that Irish Americans did the same thing, it wouldn't fit into our world view.

Most rumors are nothing more than interesting topics of conversation. But some rumors are potentially damaging. Allport and Postman claim it is a basic law of rumor that no riot ever occurs without rumors to incite, accompany and intensify the violence. The Kerner Commission (the National Advisory Commission on Civil Disorders) found, after studying race riots during the 1960s, that rumors like "The police are going to attack" aggravated tension and disorder.

In order to allay rumors, many communities have established rumor-control centers. Concerned people can call the centers to learn whether worrisome or dangerous rumors are true.

Rumor will always be with us, and serve mostly as entertainment—what is called bubble gum for the mind. But rumor is also something to be feared. As U.S. Army Major General Smedley Butler said, "I'd rather fight an entire army than battle an idle rumor."

OMNI
THE NEW FRONTIER

Three years ago OMNI magazine pioneered a revolution in science publishing, travelling to and beyond the known horizons of our world, returning with fascinating and fantastic stories, in language we could all understand. OMNI looked inside the atom and across the breadth of the universe, discussed black holes, dissected the human mind, searched for UFO's soberly and described genetic engineering simply. And OMNI continues to journey the new frontier—that space and moment straddling our incredible todays and our even more exciting tomorrows.

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SUPERBUBBLES

STARS

By Wallace Tucker

Astronomy makes good drama In the grandest of all theaters, not one production but many are being performed continuously A particularly interesting play is unfolding in the constellation Cygnus Astronomers using x-ray detectors aboard the first NASA High Energy Astronomy Observatory have discovered an enormous bubble of hot gas The gas which has a temperature of several million degrees, stretches across more than 1,000 light years and has a mass equal to that of several hundred thousand stars

Bubbles similar to this one have been seen before A supernova the violent ripping apart of a massive star, can produce a bubble of hot gas But the Cygnus superbubble is 10 times as large as the remnants of the largest supernovas has 1 000 times more volume, and contains 20 times as much energy

X rays have not told the whole story Radio and optical observations have shown that the superbubble is surrounded by a shell of cooler hydrogen gas, which is expanding at a rate of about 20 000 miles per hour as it is pushed outward by the pressure of the hot gas Near the center of the bubble is a dense cluster of bright young stars Around these is a smaller bubble of gas which because of its low temperature (10 000° C to 20 000° C) shows up best in the radio band

What we are witnessing in Cygnus and other regions of the galaxy are scenes from a magnificent galactic drama The drama takes place near a massive cloud of dust and gas in *our* galaxy in *our* epoch but similar performances have undoubtedly been going on throughout our galaxy and others for as long as galaxies have existed

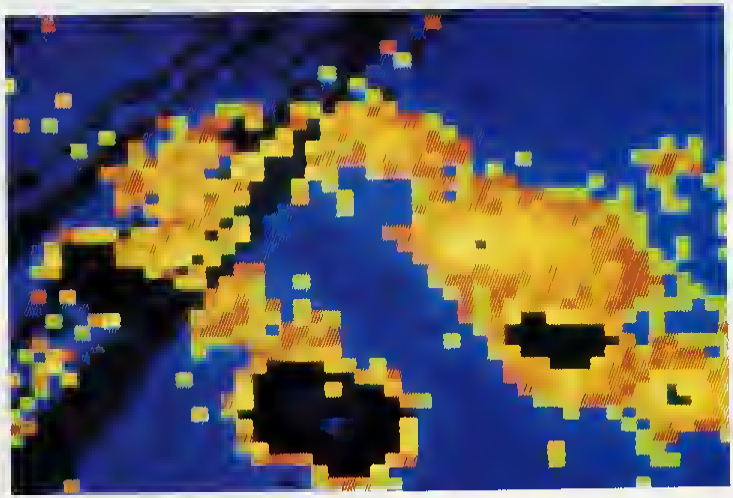
Given the distance from which we view the spectacle—some 6 000 light years—and the fact that we do not have enough time to observe it from start to finish, we will never be sure of exactly what is going on but a careful examination and speculation allow us to construct the following scenario

A giant cloud of gas containing enough matter to make millions of stars forms in interstellar space Perhaps by chance, perhaps as a result of the processes that caused the formation of the cloud in the first place, one massive star or many such stars form in the vicinity of the cloud As this first generation of stars age and become giant stars, their outer layers evaporate very rapidly This wind of stellar material pushes away the matter in the surrounding space and creates a bubble

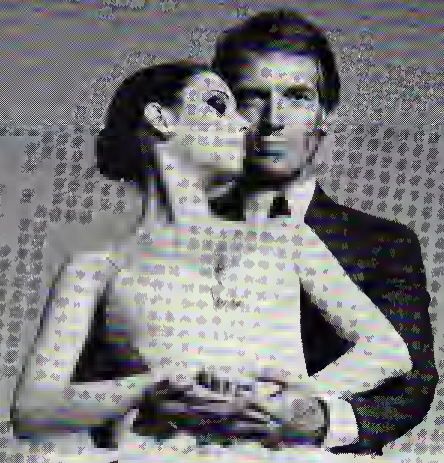
Less than a million years after entering the giant phase the massive stars begin exploding The blast waves from these supernovas rush through the bubble inflating it and driving it at high speeds into the cloud from which the stars formed The compression of matter along the periphery of the cloud triggers the formation of a new generation of stars The more massive stars in this generation evolve rapidly and explode further inflating the bubble until it reaches superbubble size The superbubble continues to grow until it runs out of gas This would occur when it reaches the outer edges of the galaxy or when it collides with another expanding superbubble and coalesces with it Calculations indicate that the galaxy is laced with tunnels of hot rarefied gas produced by the coalescence of superbubbles Our solar system apparently lies inside such a tunnel

Superbubbles are produced by one of the most awesome chain reactions imaginable a series of supernova explosions Some astronomers believe spiral arms of galaxies are simply a trail of stars formed in the wake of a wave of supernovas that rushed through the galaxy

This theory, however is controversial, it is far from being accepted by the majority of astronomers But there is little doubt that supernovas and superbubbles play a leading role in the dynamics and the evolution of a galaxy Without them, the formation of stars might occur much less frequently and the recycling of the heavy elements necessary for life might take place much more slowly, the galactic drama would be a dull one consisting of a few interesting but isolated episodes Instead we have discovery interaction conflict and change—all the elements of first-rate theater ∞



X ray photograph of the constellation Cygnus Large horseshoe shaped feature is the superbubble



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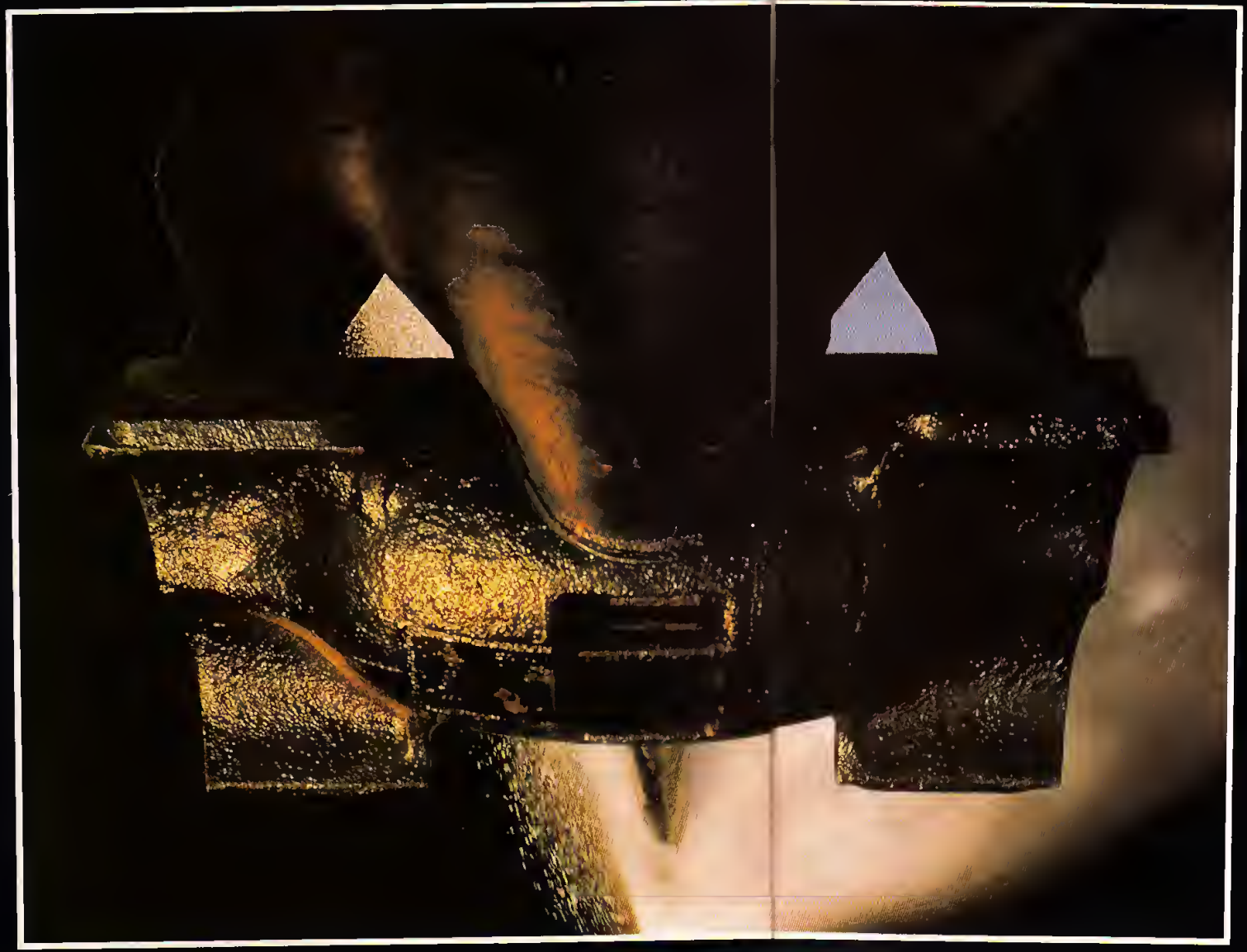

PHENOMENA

The bow anchor of the liner *France* glistens like gold as the ship steams across the mid-Atlantic, en route from Southampton, England, to New York City. Steering toward the evening sun, the *France* surges through phosphorescent seas during the era when the French vessel was the largest, and most luxurious, transatlantic ocean liner. Passenger Anthony Wolff, a professional writer and photographer, came upon a large, closed porthole on the ship's prow. Suspecting a unique view, Wolff opened the porthole and was promptly beaten back by 40 mph winds. Undaunted, he leaned out and spotted the anchor suspended high above the water line. Wolff strapped his Leica M-2 camera to one hand and held on to the porthole with the other, as he leaned farther out to photograph the scene with a 35mm lens and Kodachrome film. Since then the *France* has been recommissioned as the cruise ship *Norway*.

GAMES

By Scot Morris

When Dashiell Hammett was making his living as a detective, he submitted to his superiors a report containing the word voracious. *They changed it to truthful explaining that* voracious *might be too hard for the client to understand. In another report they changed* simulate *to* quicken *for the same reason.*

— Willard R. Espy, *Another Almanac of Words at Play*

Most writers are interested in words as fools for self-expression. Like Hammett they pride themselves on knowing correct definitions and appropriate usage. A few aren't satisfied with just knowing meanings. They want to know words intimately inside and out, letter by letter. These are the language lovers. They may call themselves logologists or logophiles or simply word freaks. They are fascinated by words in themselves—the interplay of vowels and consonants, alphabetical orders, and kinship to other words.

A logologist, with all the pride of a child bringing home a frog, delights in showing off such "finds" as *bookkeeper*, with its consecutive sets of double letters, *deified*, a palindrome (reading the same backward and forward), and *yuccalike*, which appears in a definition in *Webster's Second Unabridged* edition, under *sotol* but does not itself appear as an entry.

Logologists have put the most interesting words in their own categories. There are words that change to other words as letters are removed. When letters can be struck in order from the front of a word, the process is called a "beheadment" (*wheat, heat, eat, at*). Deletions from the other end are curtailments (*brandy, brand, bran, bra*). There are 'charitable words' which can lose any single letter and still be a word (*seat, eat, sat, set, sea*) and 'hospitable words,' which welcome new letters into any position to form new words (*ran, bran, roan, rain, rank*).

THE WORLD'S HARDEST WORD QUIZ

In the quizzes that follow, the numbers in parentheses represent how many points you may score for a complete, correct answer to the item. The maximum score for all questions is 100, but you can be very proud of any score above 25. Harder questions are worth more. No proper names are used. On a separate sheet, write your best answer for each item, then check the answers on page 120.

1. *Startling* is a starfling word because it can be changed into eight other words by successive deletions, from different places, of one letter at a time. What are the words? (2)

2. *Therein* contains 11 smaller English words, and you don't have to rearrange any letters. *There* is one, *I* is another. Find at least eight others. (2)

3. What is curious about this sentence? Show this bold Prussian that praises slaughter, slaughter brings rout. (1)

4. The shortest word with all five vowels has seven letters. It starts with *s*, the other consonant is in the third position. What is it? S_____ (2)

5. There is a common ten-letter word that can be typed out by using only the top row of letters on a standard typewriter (QWERTYUIOP). What is it? (2)

6. What eight-letter word contains five consecutive vowels? Its first letter is *q*. (2)

7. On a telephone dial one can spell out the word *astride* by dialing 278-7433. The same number spells out another common word which has different letters in every position. What is the word? (2)

8. What do *smile, lien,* and *came* have in common? (Hint: Think of adding letters to change pronunciation.) (3)

9. What unusual characteristic is shared by *plague, drugged,* and *raged*? (2)

10. The six letters in the word *chesty* can be transposed into only one other English word. What is it? (2)

11. The eight letters in the word *pictures* can be rearranged into only one other common word. What is it? (3)

12. What English word has three dotted letters in succession? (2)

13. Fill in the blanks below, using the same seven letters in the same order in each blank, and make a sensible sentence. A_____ doctor was _____ to operate because he had _____. (2)

14. In what common words can you find these unlikely strings of letters: *tomo gnt, xyg zop xop heon nju, omaha*. (8)

ONE, MANY

Here's a quiz idea suggested by Dan Reifers. Supply the singular or plural form of the given words. Try to do these without looking them up.

	SINGULAR	PLURAL	
15	phenomenon	_____	(1)
16	_____	graffiti	(1)
17	index	_____	(1)
18	stigma	_____	(1)
19	_____	data	(1)
20	_____	opera	(1)
21	_____	media	(1)
22	zoon	_____	(1)
23	_____	criteria	(1)
24	kudos	_____	(2)
25	_____	kine	(2)

GUINNESS WORDS

Each word below is a superlative of some sort. What record does each hold?

26 *strengths* (1)
27 *facetiously* (1)
28 *redivider* (1)
29 *unoriental* (1)
30 *latchstrings* (1)
31 *dermatoglyphics* (2)
32 *overnervousness* (2)
33 *scintillescent* (2)
34 *almost* (2)
35 *wronged* (2)

TROPHIES

Here are some curious words with unusual letter arrangements. Identify the words and supply the missing letters.

36 A B _ C _ _ D E _ This word contains the first five letters of the alphabet in alphabetical order. (2)

37 _ _ Y _ _ _ _ _ All missing letters are consonants. (2)

38 _ _ _ _ _ R S T U _ _ _ Contains four consecutive letters in adjacent alphabetical order. (2)

39 U N D E R _ _ _ _ U N D E R One word begins and ends with *under*. (2)

40 _ E _ I _ I _ I _ _ U _ E _ Longest word alternating consonants and vowels. (3)

41 I _ _ I _ I _ I _ I E _
Sixteen letters eight vowels seven of which are *i* (3)

SPECIAL CREDIT

42 English is a difficult language to learn because of inconsistent spellings and pronunciations Proponents of a phonetic alphabet like to point out that the long 'o' sound (as in *go*) can be spelled at least 17 ways o, ow ough ew, eau, oe, ot, oh, oa, owe eo, ou og, ol oo, os, and ost Go and *snow* are examples of the first two spellings on this list Give one example for each of the 15 others (10)

43 What is the significance of this series of words and spaces *toast, doubt, indict handsome twitched* _____, *feign rhyme, suit* _____ *know folk mnemonic hymn, people, psychology,* _____, _____ *island, often build* _____ *answer* _____ *prayer, rendezvous* (3)

44
_ _ -umble
_ _ mpire
_ _ -atter
_ _ -onics
_ _ -rinal
_ _ aster
_ _ -arely

This is an unusual list of seven words each missing an initial letter The first word could begin with *b* (*bumble*) or with *f h, j m t,* or *r* Fill in a missing initial for each word to spell a seven-letter proper noun down the first column Then, using a different letter in each space, spell another proper noun Both words are subjects of interest to *Omni* readers (Hints All words are in *Webster s Second Unabridged* but four are not common *ionics trinal raster*, and *yarely* One word is capitalized) (3)

45 NO X IN NIXON That s an erroneous assertion but it yields an unusual palindrome that can be read not only forward and backward but also upside down When a sign was posted at a public swimming pool announcing it was newly closed on Mondays, the sign read exactly the same upside down The sign had 15 letters, all capitals What was its message? (3)

46 What is it from which you may take the whole and still have some left over? (2)

47 What word is made shorter by adding a syllable to it? (2)

Answers to the 100-point quiz page120

DERIVATIONS

Here s an etymology quiz to see how much you know about the origins of words Which of the following derivations are true and which are not?

1 *S O S* An acronym for "Save Our Ship' or 'Save Our Souls,' it has become the universal distress signal

2 *News* An acronym coined by early newspapers to boast that their information came from *N*orth *E*ast *W*est, and *S*outh that is from all over the world

3 *Mind your p's and q s* Originally a typesetter s expression, referring to the tendency to confuse the letters *p* and *q* especially when looking at the reversed forms in a case

4 *F**k* In Old England when two people were convicted of fornication the bailiff would enter in his book the words FOR UNLAWFUL CARNAL KNOWLEDGE This entry became abbreviated to FU C K Hence, our word

5 *Blimp* From the designation for a World War I British airship 'Balloon Type B, limp

6 *O K* From a misspelling of all correct" (oll kurrect") attributed to Andrew Jackson

7 *Butterfly* Originally and rather imaginatively called *flutterby*, this insect's name changed, by transposition of sounds, to its present form, *butterfly*

8 *Sincere* In ancient Rome dishonest quarrymen would make an inferior piece of marble look grade A by adding a coat of wax Genuine marble was, therefore "*sine cera*" (Latin, "without wax")

9 *Posh* Originally stamped on first class steamer tickets to mean Port Outward—Starboard Homeward 'British subjects traveling to and from India in the nineteenth century would reserve a stateroom on the port (left) side of the ship on the voyage out and on the starboard (right) side on the return trip, these being the shadier sides of the ship The word *posh* then came to mean the luxurious style of the very rich

10 *Seminars* From the roots *semi* and *arse* this has come to mean any half assed discussion

Answers page 120

THANKS

We appreciate the assistance of A Ross Eckler in the preparation of this column Several other sources have been useful For an introduction to the delights of word games see Eckler s *Word Recreations* Dmitri Borgmann s *Language on Vacation* Willard R Espy s *The Game of Words*. *An Almanac of Words at Play* and *Another Almanac of Words at Play*, and Gyles Brandreth s *The Joy of Lex* The primary journal for recreational linguistics is *Word Ways* edited by Eckler and published quarterly For a one year subscription send $12 to *Word Ways* Spring Valley Road Morristown NJ 07960

COMPETITION #23 WORD ORIGINS

Please read the Derivations Quiz above and check the answers on page 120 before reading this competition any further

Many books on word origins are replete with fascinating tales about word derivations that are absolutely incorrect The stories are repeated and passed along because they sound as if they ought to be true At some time Save Our Ship and *flutterby* were concocted and the stories were credible enough to endure

This month your challenge is to sabotage the science of etymology by creating a new derivation It should be plausible enough to fool people at cocktail parties Twenty years from now we want to hear someone tell your derivation and swear it s true because he read it somewhere Subtly absurd variations like the one for *seminars* are also sought

The grand prize winner will receive $100 runners-up $25 each All entries become the property of *Omni* and will not be returned Postcards are preferred please with one entry per card Send by March 15 to Omni Competition #23, 909 Third Avenue New York NY 10022

LAST WORD

By Neil Renton

"A pot of water, after all, will start boiling once everyone has stopped watching it"

"No, he will forever watch a pot that is boiling, but nobody watches a boiling pot."—Confucius

Why is it that a watched pot of water never boils?

This question, which has stumped learned men and women for centuries, was first posed by Gilgamesh Grok, an intellectual caveman who lived in the high rent district of Mesopotamia. In 9008 B.C., moments after inventing the first pot, Grok was struck by the inexplicable urge to boil something. Though he was unsure of what this boiling business was all about, his intuition led him to the Euphrates River, where he filled his pot with water and then sat down to watch the show. Unfortunately, nothing happened. In his haste, Grok had neglected to place the pot over a fire. Yet he still wondered why the darned thing wouldn't boil; he has therefore been credited with discovering what is now commonly called the observed-vessel phenomenon.

Inquiries into watched pots have progressed since Grok's time and have often paralleled, or even caused, important advances in science and philosophy. Plato, for instance, was obsessed with the problem yet could think of no solution. Finally, on his deathbed, Plato postulated an existence in which we watch the images of pots, rather than the actual pots themselves. Although this entirely sidestepped the issue of boiling, it seemed to satisfy Plato, and he died a happy man.

A few other pot-related discoveries (all dates given here are A.D.):

1266. Thomas Aquinas proves that God exists and that He is the One watching all of our nonboiling pots.

1632. By dropping a plate of spaghetti off the Leaning Tower of Pisa and into his pot, Galileo reaches an understanding of falling objects.

1641. "I think, therefore I am," proclaims Rene Descartes, adding, "but those pots are stupid."

1686. Using integral calculus, Isaac Newton shows that men cause tides in the water of a pot. This is especially true, Newton says, for people with noses the size of Liverpool.

1752. Benjamin Franklin ties a pot to the end of his kite string. It fills with rain, lightning strikes, and Franklin uses the heated water for his evening tea. He considers inventing the electric stove but concludes that storm clouds would not fit in the average kitchen.

1843. Using pots, James Prescott Joule translates heat into mechanical energy and thus invents the first law of thermodynamics.

1879. Josef Stefan and Ludwig Boltzmann establish a link between black bodies and those lengthy cooking times common in the southern United States.

1883. Friedrich Nietzsche announces, "God is dead. I am alive, and still those pots refuse to boil."

1899. Max Planck learns that pots are sold in discrete units, often at hardware and department stores.

1905. Using Georg Riemann's theory of curved kettles, Albert Einstein proves that pots are related to space and time, probably by a previous marriage.

1910. Bertrand Russell notes the logical distinction between "a watched pot *never* boils" and the more accurate "a watched pot *does not* boil." (A pot of water, after all, will start boiling once everyone stops watching it.) This appears as a footnote in Russell and Whitehead's *Principia Mathematica*, but no one seems to have paid it much attention.

1927. Werner Heisenberg formulates his uncertainty principle. He states that observers interfere with a pot of boiling water, particularly when they turn off the heat under the pot.

1934. "Praise your pot," suggests Niels Bohr. "Mention its water. Say something nice about its handle." Flattery calms a stubborn pot. Bohr calls this the principle of complimentarity.

1943. In *Being and Nothingness*, Jean Paul Sartre declares that pots are free and should answer their own questions of boiling.

1963. Murray Gell-Mann and Oscar Greenberg note that pots are available in many colors and often add flavor to certain meals. Later they abandon pots in favor of elementary particles and the quark theory.

1968. Noam Chomsky assembles a linguistic model for pots, using epoxy and Elmer's glue to hold the thing together.

1973. Stephen Hawking explains that black holes at the bottom of pots are gateways to another universe, perhaps Poughkeepsie.

Recently scientists have developed a unified-pot theory that reduces vessel knowledge into a one-pot problem. This eliminates the need for caldrons, kettles, and saucepans, which have caused undue complications in the past. (Electric woks are not embraced by the theory, but these seem to be a fundamentally different kind of cooking utensil.) With their counters and cupboards at last free of clutter, researchers now expect to get down to the important question—that is, Why does a watched pot never boil?

Stay tuned for details. ∞

Neil Renton, born on the third anniversary of Albert Einstein's death, holds a degree in the engineering of language from Case Western Reserve University. He resides near Pittsburgh, Pennsylvania.