AUGUST 1982

$1.50

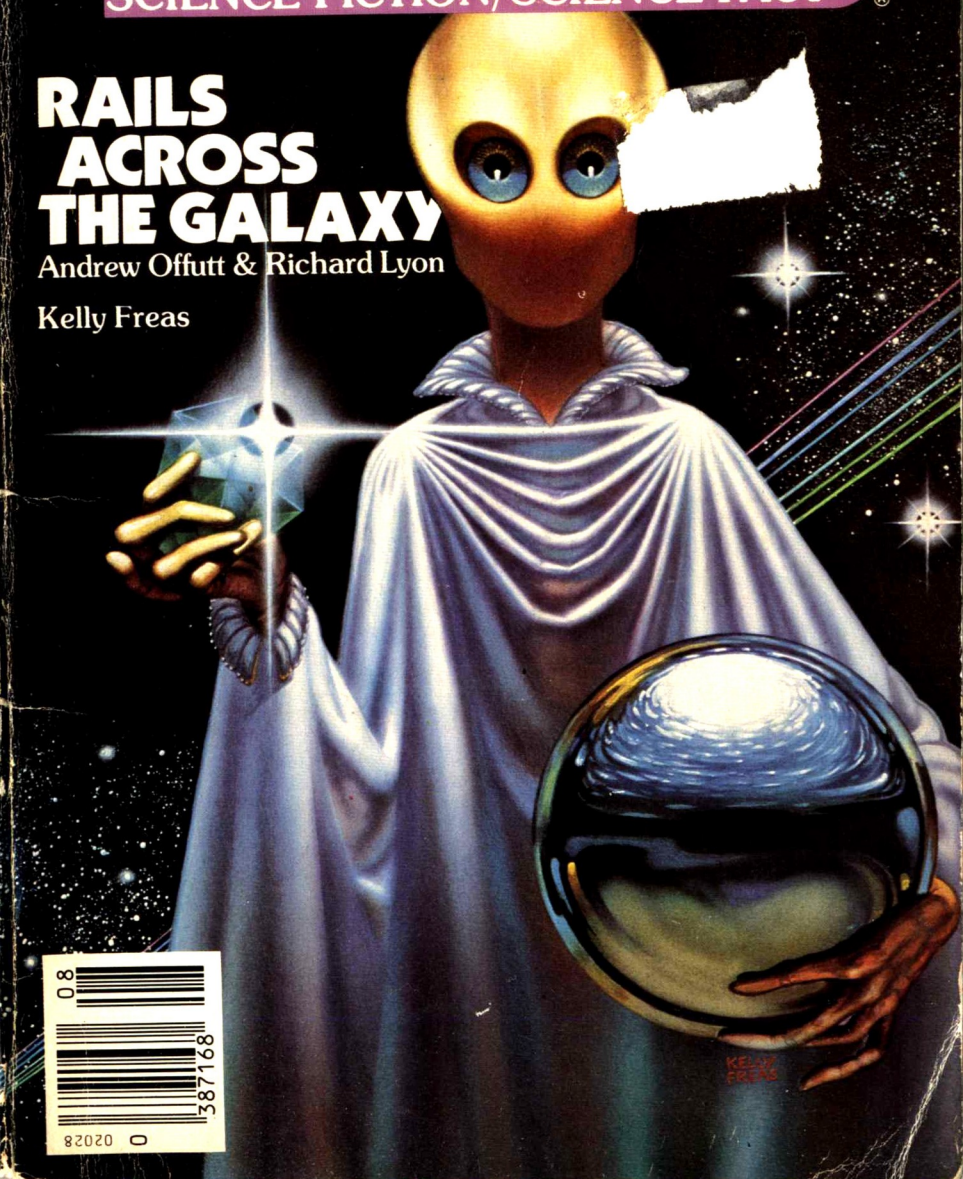
analog

SCIENCE FICTION/SCIENCE FACT®

RAILS ACROSS THE GALAXY

Andrew Offutt & Richard Lyon

Kelly Freas



08
0 387168 02028

Reflections on an education crisis

Several years ago, every schoolhouse in America was haunted by the same question, "Why can't Johnny read?"

Parents from New York to California and teachers from kindergarten to college debated the question with even more passion than they discuss the economy.

They re-examined the lives of children in the home as well as the classroom. They re-evaluated teaching methods. They sought help from anyone and everyone who might make a difference.

Many of the children who had experienced difficulty reading were also frustrated by adding, subtracting and multiplying, but what hit home most dramatically to teachers as well as parents was the unthinkable and tragic plight of a child who couldn't read.

The parents and teachers had cause to be shaken. There is, after all, nothing as crucial to learning as the written word. And if there was a lesson to be learned for all time as a result of that crisis, it may be as simple as this: too many of us take reading for granted.

We tend to think that, somehow, reading will be taught. Somehow, it will be learned. And somehow, children will be motivated to go on reading for the rest of their lives.

But the art of reading is no more automatic than the art of writing. It must be taught, it must be nurtured, and, yes, it must be honored by parents and teachers who never forget its value.

Happily, the evidence of the recent past shows that they haven't forgotten. The National Assessment of Educational Progress has put a new focus on the relationship between effective reading and effective writing. The National Council of Teachers of English has made it clear that reading and writing must be taught in all classes, not English classes alone. And a rise in sheer proficiency isn't the only goal.

The fact is, children are now often assigned reading that their parents weren't expected to tackle until they entered college. And, interestingly enough, some of the books assigned aren't books. They're magazines.

Does it come as a surprise to you that magazines have become such a meaningful tool in so many of our educational systems?

It comes as no surprise to any gifted teacher or any gifted magazine, for they share a vital piece of knowledge. They know what it takes—and what it means—to open the eyes of a child.

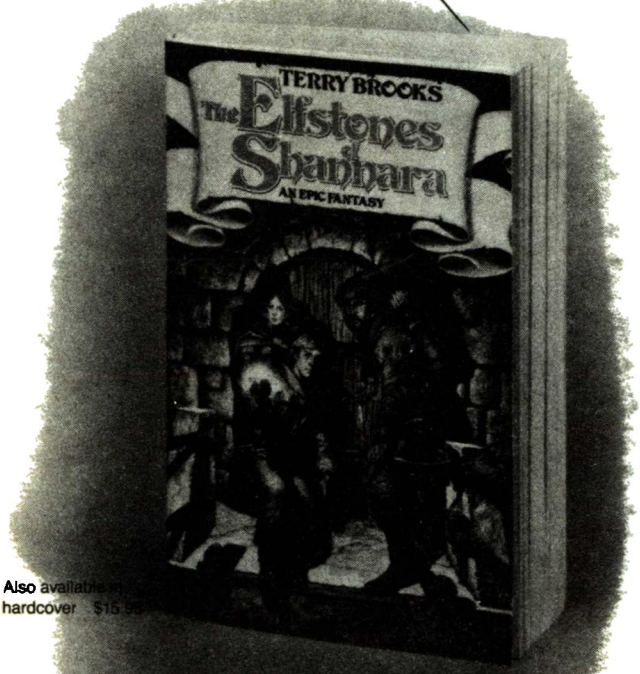
Nothing opens your eyes like a magazine.

This message is one in a series from America's magazines.

After five years, magic has returned to the world.

The eagerly awaited sequel to *The Sword of Shannara*

Once again, Terry Brooks brings you an epic novel of wonder and adventure that, like its predecessor, "goes far beyond the usual fantasy." (—Frank Herbert.) Here are valiant companions—old and new—awesome foes, wonders, romance ... and the ancient mystery of how the Elves survived among the Races of Man.

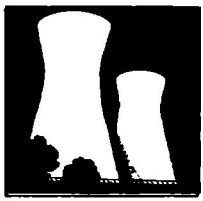


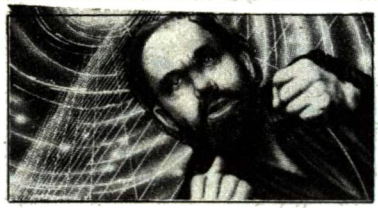
Also available in hardcover $15.95

Now in trade paperback $7.95

DEL REY #1 in Science Fiction and Fantasy
Published by Ballantine Books

analog
SCIENCE FICTION/SCIENCE FACT





Vol. CII, No. 8
August 1982

Next Issue on Sale
July 22, 1982

$16.25 per year in U.S.A.
$1.50 per copy

CONTENTS

Cover by Kelly Freas

Stanley Schmidt, Editor — **Elizabeth Mitchell**, Managing Editor — **Ralph Rubino**, Art Director — **Terri Czeczko**, Art Editor

Analog Science Fiction/Science Fact published 13 times annually by Davis Publications, Inc., at $1.50 a copy. Annual subscription $16.25 in the U.S.A. and possessions, in all other countries $19.75, payable in advance in U.S. funds. First copy of new subscription will be mailed within eight weeks of receipt of order. When reporting change of address allow 6 to 8 weeks and give new address as well as the old address as it appears on the last label. Second-class postage paid at New York, NY, and at additional mailing office. Printed in U.S.A. All submissions must be accompanied by stamped self-addressed envelope; the Publisher assumes no responsibility for unsolicited manuscripts or artwork.

Postmaster: SEND FORM 3579 to ANALOG SCIENCE FICTION/SCIENCE FACT, P.O. BOX 1936, MARION, OH 43306.
Editorial and Advertising, Analog, Science Fiction/Science Fact, 380 Lexington Avenue, New York, NY 10017
Subscriptions: Analog, Science Fiction/Science Fact, P.O. Box 1936, Marion, OH 43305 ISSN 0161-9388

Editorial by Stanley Schmidt

THE NAME OF THE GAME

In John Patrick's play *The Teahouse of the August Moon*, Captain Fisby of the U.S. Army of Occupation in Okinawa after World War II is assigned to the village of Tobiki "to teach the natives democracy and make them self-supporting." In a later scene he is trying to explain to his commander, Colonel Purdy, why his efforts have produced a teahouse, a school for geisha girls, and a wholesale liquor business. Each new detail he reveals raises the Colonel's blood pressure a few points, but the last straw is when Fisby says that the liquor profits have been banked in Seattle—in Fisby's personal account, Purdy quickly assumes.

"I haven't touched a cent for myself, sir," Fisby explains in self-defense. "It's been deposited in the name of the Tobiki Cooperative. The whole village are equal partners. Share and share alike."

"That's *Communism!*" Purdy explodes.

And Fisby asks, "Is it?"

In this little episode are two neat examples of the common human failing of reacting to words rather than to the realities behind them. Fisby, presumably, was exposed to as much anti-Communist propaganda as any young American of the Fifties, but to him it was just a word. He probably shared many of the culturally inculcated attitudes toward "communism"—yet he could establish a "communistic" setup in an Okinawan village without batting an eye, because it seemed appropriate to the circumstances and he never made the connection with The Dreaded Word until it was pointed out to him. Purdy recognized the connection at once, but his reaction was not a reasoned analysis of what was really going on, but a conditioned reflex triggered by The Word.*

I don't know whether there is a Russian play parallelling *The Teahouse of the August Moon*, but I have no doubt whatever that there are Russian counterparts of Fisby and Purdy. The word they react to is different, of course, but the reaction is the same—and the understanding, I suspect, just as limited.

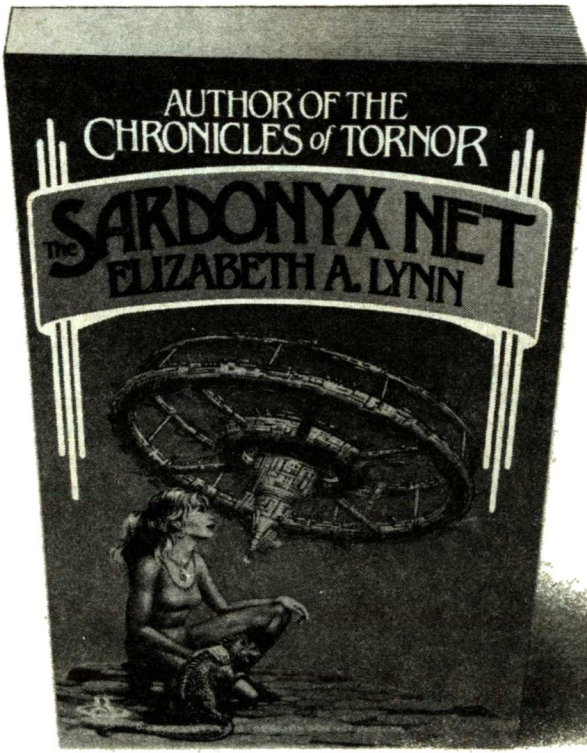
The name of the game, it seems, often matters far more to people than the game itself.

Alfred Korzybski made essentially the same observation quite a while ago;

**I almost said a "knee-jerk reaction," but that phrase has itself become such a common knee-jerk reaction to things people disagree with that I prefer to avoid it.*

"Quite simply the best science fiction story I have read this year!"

—*John Varley, author of* TITAN



Journey with Elizabeth A. Lynn to a far future universe ruled with slavery and drugs. Join Starcaptain Dana Ikoro as he discovers rebellion, the highest form of love.

Following Lynn's brilliant successes in A DIFFERENT LIGHT and THE CHRONICLES OF TORNOR, THE SARDONYX NET heralds the return of a science fiction superstar...

"A likely award contender...in the best tradition of the field." ***—Publishers Weekly***

"One of the best plotted stories...an excellent novel!" ***—Locus***

"It's about time for a NEBULA for this woman!" ***—John Varley***

Now at bookstores everywhere! $2.75

Berkley Books, 200 Madison Avenue, N.Y., N.Y. 10016

it was one of the cornerstones of "general semantics." "The map is not the territory," Korzybski warned. "The symbol is not the reality."

Yet people keep reacting as if they were.

General semantics attracted considerable notice among the readers of *Analog*'s predecessor, *Astounding*, when A. E. van Vogt's *The World of Ā* appeared here. It didn't attract much attention among the general population, and interest in Korzybski's theories has largely faded. In many circles, general semantics has been written off as a "fad and/or fallacy." The reason may well lie in Korzybski's own principal book, *Science and Sanity*. When I read it, many years ago, I found it at least ponderous and overweight, and a good deal of the content seemed pretentious and probably silly. Yet embedded in all that were several very simple, very profound, very *useful* observations which people need to be reminded of periodically, whether or not they associate them with Korzybski.

This is one of them.

Reacting to names rather than realities runs very deep. My opening example was political, but others are easy to find in nearly any field. A few months ago I mentioned that people find "canyons" beautiful and "strip mines" ugly—even if they are visually indistinguishable. Several years ago *Astounding* published a story called "Despoilers of the Golden Empire," by David Gordon—obviously a swashbuckling tale of one world conquering another, except that when you reached the end you discovered it was about something quite different from what you had assumed all the way through. But there was no trickery or deceit involved beyond using different names for things than those commonly used in the story's context, and then letting the reader go his own merry way in constructing his own (wrong) context. The deceptive words

STANLEY SCHMIDT . . . . . Editor
ELIZABETH MITCHELL . . . . . Managing Editor
RALPH RUBINO . . . . . Art Director
TERRI CZECZKO . . . . . Art Editor
WILLIAM F. BATTISTA . . . . . Advertising Director
CARL BARTEE . . . . . Production Director
CAROLE DIXON . . . . . Production Manager
IRIS TEMPLE . . . . . Director, Subsidiary Rights
BARBARA BAZYN . . . . . Manager, Contracts & Permissions
ROBERT CASTARDI . . . . . Circulation Director, Retail Marketing
ALAN INGLIS . . . . . Circulation Director, Subscriptions
LAYNE LAYTON . . . . . Promotion Manager
ROSE WAYNER . . . . . Classified Ad Director

JOEL DAVIS
President & Publisher

LEONARD F. PINTO
Vice President &
General Manager

CAROLE DOLPH GROSS
Vice President
Marketing & Editorial

LEONARD H. HABAS
Vice President
Circulation

FRED EDINGER
Vice President
Finance

"Folks say he's got the quickest flick in these parts."

used throughout the story were not *wrong*—they were just not the ones expected. Any thing or action can be described in many different ways, and people react differently to each of them.

You still doubt? Then next time you're entertaining a very special guest, offer him or her a dinner featuring "a piece of a dead cow covered with fungus" and see what kind of reaction you get. I suspect you'll do better with "a thick, juicy steak broiled just the way you like it and smothered in mushrooms."

Politics and its relatives remain, for most people, one of the most important areas in which reactions are to words rather than facts. Salesmanship, diplomacy, and electioneering (in their more honest forms) consist largely of expressing things in terms which inspire more trust or desire (or provoke less hostility) than others which mean the same thing. Every government practices activities which would be intolerable if practiced by private individuals; they are made palatable by giving them special names like conscription and taxation.

Why does all this matter? Because no matter how much people react to words rather than realities, *realities are what act on them*.

A reaction appropriate to a reality which influences your life is more likely to help you than a reaction to a verbal description which may have little to do with the reality. This is true whether the lack of correspondence is due to the emotional connotations of the words chosen, or to the fact that the reality and the word have diverged. (The word "liberal," for example, nearly reversed its meaning over a period of a few decades.)

I can easily imagine a government which professes the highest ideals (however you may define them), yet in practice does all manner of things which are contrary to those ideals. In fact, I have often had cause to suspect that the more a group *talks* about how idealistic it is, the more likely it is that something shady is going on under the table. Most populations have been conditioned to regard a certain nominal form of government (such as Democracy) as Good, and one or more others (such as Communism or Fascism) as Evil. As long as there is enough talk to sustain their faith that theirs is the Good kind, its leaders can *do* pretty much as they please.

Actually, in terms of its effects on the people living under it, what a government (or any other body) *calls* itself is far less important than what it *does*. I can easily imagine a state which calls itself a democratic republic but in practice is more socialistic—or vice versa. In practice, what an organization does is likely to have less to do with what it calls itself than with who's running it. Sufficiently capable and conscientious individuals can make virtually *any* system work. Inept, misguided, or nasty ones can make any system fail—or pervert it so that it works against the things it was established to protect. I can even conceive of a dictatorship which, with the right dictator, would be more beneficial to its subjects than a nominal democracy with a great constitution on paper and the wrong people

in office. (I was not always able to do this; the fact that I can now is probably a result of having been logically forced into a fictional situation in which such a thing seemed inevitable. And I should probably add that I don't know of any real person I'd be willing to trust with the job.)

For similar reasons, and much closer to home, it's a good idea to remember that, no matter how nice it may sound (or does it?), we do *not* have "a government of laws and not of men." We have a government of *both*, interacting and constantly changing. Probably a majority of U.S. citizens who place much value on environmental protection are disturbed by the present Department of the Interior and the new directions in which it's moving, but environmental organizations trying to fight the new trend are divided on how to do it. Some say replace the Secretary of the Interior; others say attack the policies, not the man. An effective strategy, I suspect, will have to do both—because the man has a lot to do with how the Department implements *whatever* policies it claims to have.

In these pages in the past I have spoken of language as a valuable tool which I would like to see used more and better. But I have also mentioned repeatedly that every tool has limits, and it is important to understand what they are to use it effectively. Language is a tool—it is the oldest software technology, antedating what we now think of as information-processing hardware by many thousands of years. Somewhat as a lever lets us move something requiring a large force by applying a small one, the tool of language facilitates thought by letting us manipulate symbols instead of realities.

But we need to remind ourselves periodically that the symbol can never *be* the reality, and ultimately the reality is what matters. ■

● ...We need more and better technology, and we need to be far more highly selective about it, and these decisions can no longer be left to scientific, business, or political elites. The risks and the gains in powerful technologies are too important to be left to those elites. Now, it is easy to say that but very hard to come up with practical procedures for giving people a voice in the selection of their own future. If major technological decisions continue to be made in the way they have been made in the past, it's a living hypocrisy, and a dangerous one.

Alvin Toffler


USA

Part One of Three Parts

Andrew Offutt & Richard Lyon

RAILS ACROSS THE GALAXY

The aliens are coming—riding
an interstellar vehicle
no one on Earth
could have predicted.
All aboard!

1: Straight Line in the Sky

At 0920 on the morning of July 8, 1853, Commodore Matthew Perry sailed the United States Pacific Fleet into Tokyo Bay. Until that moment Japan had been isolated, a micro-world unto itself. Its people gave no heed to the outside and never dreamed that anyone possessed the awesome weapons they now faced. It was more than a rude awakening, although no American guns were fired. The cultural shock of the uninvited visit toppled the Shogun and his entire class. It destroyed classic Japanese culture and transformed the island nation in ways previously inconceivable.

At 0300 on the morning of June 1, 1996, my left lower molar started to buzz. I clicked my wristwatch, ending the buzz and the awful tickle. I spoke into the watch.

"Hello, Mother."

(No, that isn't code. My mother is Gertrude Eisenstein Quinan, semi-retired master spy,and charter member in the league of smother-loving Jewish mothers. Well, everyone has problems.)

"Son, were you sound asleep?"

"Yes Mother, I was."

"That's a good boy, getting his sleep."

"Mother—you didn't buzz my tooth to wake me up at three in the morning to find out if I've been asleep?"

"Of course not. This is business. There is something you must do, son."

"As son or as "

"A good agent," she said, quoting herself, "stands a better chance of learning—and living—with the teeth to-

gether and the ears clear of wax." While I gritted my teeth, she went on. "Now it's cold and wet out, Irving, so wear your scarf and put on your rubbers. You won't need your Baretta, so take it. Just in case. You might wear your new holster."

I'm probably the only spy in the world with a fast-draw holster his mother knitted for him. I sighed. Mother loves the spy business, and I am what is called unusually perceptive. Still ! Harvard is expensive, but there has *got* to be a better way to work my way through than as a CIA agent-in-place!

I said, "All right, Mother. What am I to do?"

Her voice shifted into Business-comma-Agency. "Son, for the past two hours there's been unusually heavy phone traffic among several observatories in Russia and China. Obviously their astronomers have seen something most disturbing or at least exciting, and no one ever thought to bug the phones of *observatories!* Now it does *appear*, however, that all this activity was triggered by a telephone call from Professor Berson of Harvard Observatory."

"So you want me to blip up there and see what's chucking?"

"Yes dear, and do try to cool it with the slang. Now remember that mama loves you and it is not a nice night, and so you must be very careful."

I debated whether to say "Check, double-oh eight," or "Yess, Mo-therr," doing a voice, and while I was debating Mother clicked off. I sighed—and moved. At least I didn't have to worry about my roommate; she was out tonight, at some Big Meeting or other. Or

make that "they was out tonight," as she'd probably prefer.

I dressed rapidly, not forgetting rubbers and a six-foot scarf, and thinking about my big mission on a night a dog shouldn't go out into.

"It does *appear*," my mother had said. Uh-huh. When my mother says something "appears" to be so, or such-and-so, the chances of her being wrong are roughly equivalent to those of striking oil on Pineapple Street in Brooklyn. Or a 50% across-the-board tax cut. In that one phrase my mother told me that a shade over one hundred seventy-three billion dollars of tax-bought equipment and humanpower had scrambled, flurried, tracked, monitored, tapped, telemetered, cross-tracked and -checked, computerized, accessed, tested out and re-tested, comsat-confirmed and eyeball-confirmed to within three one-hundredths of a decimal point of 100%.

It *appeared* that a telephone call from Professor Berson of our little out-of-date observatory had touched off a lot of observatory-to-observatory chatter. So that was the case. Mother probably also knew what color socks Berson was wearing, as well as just what snackies he had in his desk drawer.

Scarf tucked up from the sprocket chain, I was soon pedaling my old bike up the hill to Harvard. The left pedal was squeaking again and the ratchet made revolting dog-vomiting sounds.

Every year I ask the Agency to get me a new bike. Every year they won't. There was a time when being a spy was fairly glamorous, but those days are long gone. I cling to the romantic Baretta because that was Bond's gun, and he saved the world and got laid a lot.

It would be nice to save the world, I thought, pedaling squeakily.

The world could use it, too.

My country has been running in place for too many decades. The supply of energy and other resources gets tighter and tighter. We've been doing beautifully in the area of technical/technological progress, but that hasn't stopped the definite decline in the standard of living, however slow its downward pace. Agricultural land, for instance, is far too precious to use even for such non-food crops as cotton. "Fortunately" chemical engineers devised a way to make a cotton-imitating fabric out of sanitary waste.

The resultant clothing looks and feels like well, I don't like it.

A lot of luxuries are gone, things like air conditioning in the summer and heat in the winter. And I'm not the only one riding an old bicycle.

Still, this is the U.S. of A. The situation in such places as Mexico and India and others is grim. The explosively growing population crashed into the limited food supply and well, maybe the best analogy is a shipwreck. If you picture the Mexicans as people swimming around in a cold and stormy ocean, the U.S. is a lifeboat—full to capacity. The ISP (for Immigration Service Police) is charged with keeping drowning Mexicans out of the boat. What the ISP does is necessary, we all know. But still

When the Indians try to sneak into the USSR, the Russians just shoot them. Bang, bang, you're dead! That makes my country superior, and yet somehow the Soviet way seems cleaner than what the ISP does.

Thank Buddha we in the CIA don't have to do that sort of thing!

Of course, our part in fighting the Cold War is bad enough. In the Good Old Days we and KGB had no trouble believing that we were killing each other in an incalculably important ideological conflict. Nowadays it's just a commercial rivalry: how many cubic meters of Russian natural gas does a U.S. bushel of wheat buy!

One reason our country is still on a more or less even keel is that we're still using a lot of resources.

Such things as the mid-Atlantic chromium ore that isn't legally ours to take. As a result, about 20% of the GNP is based on illegal activity—which I'm not even supposed to know about. The U.S. has to keep two sets of books! The Economic Data Bank at Harvard hoards a secret section in which the second, accurate (and horribly dangerous!) set of ledgers is kept. Those "ledgers," of course, exist only as a computer memory. My major responsibility here at Harvard is guarding those books, which I am supposed to believe are really secret data on UFOs and possible ET-for-ExtraTerrestrial activity. They should have made up a cover lie that wasn't so enticing to me! The UFO concept was so provocative that I applied my loving and beloved knowledge of electronics and computers to "read the books."

Now I could be called the Man Who Knew Too Much. (Oops—make that present tense—please!)

Merciful Buddha and Moses too, I even know the truth about Mafia Oil Inc.

Obviously I am being very, very careful to be sure that no one knows I know. Sure, I could blackmail someone into a new bike and maybe even one of those vocaprogrammable shirt-pocket calculators only the government can afford —and sudden death that even at my tender age would be diagnosed as a heart attack. Worse still, they could do to me what they do to the Mexican immigrants. None of the several save-the-Mexicans groups would help *me!*

I probably should have stayed in astronaut's training. It's tough being older and knowing so much more than most of my fellow students. Especially Sonya. I need to talk myself out of my feelings for her. Maybe graduation will do it, in a couple of weeks. I'll go one way and she'll go another—radically!

That's the state of the world and me; the state of Professor Berson was that he was in his office. Yes, at zero-three-thirty.

As I reached the doorway, he was shouting into his telephone in a pretty poor imitation of Russian. After a moment he slapped the phone's off-button as if it were a wasp, made an exasperated noise, and turned to me.

I was wearing my special hat that gets me into ball games and concerts and the like, and I made sure he saw the PRESS card laminated to it before I took it off. Being on the Harvard *Crimson* staff gets me into more places than just ball games, and provides a fine cover for being unduly nosy. I made a try at smoothing my hair, which is sort of '60s rad-style: it likes to do its own thing.

"Professor Berson, I'm Irving Quinan, reporter for the *Crimson*. There's a rumor that you've made a sensational discovery." (Yes, I had decided on an odd

approach for a member of the Agency: direct.)

Daniel S.P. Berson is a thin, white-haired person as full of nervous energy as a six-month-old otterhound. When he first saw me, his hound-lined face showed annoyance at being distracted. I said my piece, tried to look fresh and innocent and un-stupid, and watched him consider. For a moment. Then words came pouring out of him in an excited babble.

I had already actuated my camera, which was recording every word he said. Probably I wouldn't need pictures, but if I wanted to I could take them with my tape recorder.

"Yes that's true," he said, without pause for the verbal punctuation we all provide, "but it's a maddening situation I can't find out what I've discovered it's not like the old days I tell you!" He had to pause for breath, and while I was mentally arranging that babble of words into statements, he went on.

"Back then astronomers cooperated! Courtesy seems to have gone out with proper grammar. But see for yourself Quinine." At least he gave it the British pronunciation. "Last night I photographed an occultation and got these. You have any scientific background or are you just another English major?"

He handed me a stack of glass photographic plates. That was my introduction to the whole wild adventure: that feeling of weight in my hastily extended hands. I had no idea just how weighty it was.

I should have appreciated it—it beats the weightlessness that was soon to become a part of my life!

Judging by his manner, the astronomer would probably go stonewall if I failed to discover something remarkable about these pictures. I stared, concentrating on concentrating, trying to study. Though I am admittedly just incredibly bright, astronomy is not one of my several fields of expertise. The stars on those plates looked like stars, which didn't help. I didn't know one stellar object from another. Certainly I wasn't considering getting near any but the nice smallish one we call Sol. There was the moon, too—ours. It looked okay to me. There was nothing else, but I hung in, refusing to reach for the panic button. A shame that each picture was scratched. Each had a single line running straight across— Wait!

The streak on each plate wasn't a scratch at all.

Perfectly straight, it was a line of exposed grains of silver. It wasn't on the same place on every plate, either. The thing was fixed. That is, it was a line that was motionless with respect to the stars, not the glass. That meant

"This line is this a real celestial object?"

"Phenomenon. Say phenomenon, Quineen. It couldn't be an object." Berson's smile was wry. "Nothing resembles a great discovery more than a simple mistake. Still, I do have some corroboration. An amateur astronomer called me to report that he had observed a burning *green* line in the sky. Sounds like a crank I know but the coordinates fit." He gestured at the photoplates in my hands. "By the time I realized that the line is to be taken seriously, we were no longer in a position to see it."

"Name's Quinan, sir. But, Professor—?"

"Don't interrupt Quinlan—odd, you don't look Irish—and stop calling me 'Professor'! That always sounds like one of those old movies. You may call me 'Doctor Berson,' my boy."

Gosh-wow, I thought, while Berson went right on:

"I called Professor Ting at Peking Observatory. He promised to call back too. But now he and every other astronomer in that part of the world seem to be busy talking with one another. Those phones are busier than a student assistant when the Dean's around."

I considered. "Sir might I
I swallowed hard and my Doctorwho scarf bobbed. My gaze was on his phone, which was beige plass and (simulated) copper. "Doctor Berson: I speak fluent Russian and three Chinese dialects. Why don't I try my luck for you, with your phone."

He stared, and must have seen a larcenous fleck in my eye. "I believe this is when I am supposed to say 'This is highly irregular, young *person!*' Well, shaft that! You're the one wrote the *Crimson* article last year explaining all those damned Russian names and nicknames, aren't you! First time I ever really understood what that interminable maniac Tolstoy was blithering about. *Quinlan?*"

"It's Quinan, Pro—Doctor Berson," I said, and spelled it. "My mother's Jewish, American-style, and my father seems to have been Tibetan."

"Well, you don't look like either of those, either. But now I think on it, I do believe you're the one whose IQ made such a flap around here, too, awhile back. Odd that no one ever wrote *you* up. Hmmm. Are you planning some illegal act with my telephone?"

"Uh, well, sir, I "

Berson smiled happily and treated his hands to a brief brisk rub-together. "I certainly cannot be a party to that. Suppose I go find us some coffee. It must be past midnight! May take awhile." He headed for the door, smiling, glancing from me to the phone to me. "*Tibetan!*" he said, shaking his head, and I was alone.

Smiling happily, I advanced on his phone—rubbing my hands together. I was delighted to be alone, with his tacit permission. Any phone freak knows how to button into the overseas line without getting an operator and I had already proven that I could warp the Harvard Computer System right into CIA Central, which fact if known would surely get me unmanned at the very least. I plopped down into the chair before Berson's fine telephonic systemry. How lovely to see that he did not bother with the vision type! They're not going nearly so well as Ma Bell and Alex Raymond and GenTel expected, anyhow.

I went direct to London, dodged around through some local exchanges to cover my tracks, then zipped to Norway, to Finland, and thence to Moskva —straight into Headquarters, KGB. That was simple, and fun. Now came the tricky part. Only a few days ago I had learned that the KGB's Colonel Chegvintsev liked to spend his evenings with one Olga Grensky. That temptress was built just the way Chegvintsev likes 'em—like a twelve-year-old. Since he naturally wants to appear to be on duty when he isn't, the clever dog has ar-

ranged to have his calls transferred to Grensky's apartment.

I asked KGB HQ for Yuri Dmitrievich, as if I knew the man, rather than for "Colonel Chegvintsev." That made me sound more important, first-naming him.

When the transfer relays started to click, I whistled and punched. That left me on the KGB switchboard as an outgoing call. Someday *Komitet Gosudarstvennoy Bezopasnosti* is going to find out that a third of its phone bill is CIA usage, and be worse than mad!

Punching and whistling, I sent along the codes for the Novosibirski Observatory. That number, along with a person's name, was right there on Berson's (messy!) notepad. I heard a brief nascent buzz and then the KGB override cut through and I was speaking to one of the astronomers. I gave her a blast of officious Russian in a pretentious voice.

"Thiss iss General Zabivvvkin, Committee for State Security. I interrupt your phone call on a matter of State urgency. I musst speak to the scientisst in charge; Selyutin, please."

"Comrade Professor Selyutin is on holiday. I am Doctor Balachov, his chief assistant . sir."

"A physician?"

"No no, my General. I am—"

"We are not on campuss, *Comrade* Balachova, and your academic degree iss not germane. Now: What have you seen? We know the Amerykans are most excited indeed. Does it pose any threat to the security of the Soviet Union?" I spoke as urgently and coldly as I could, in that soft liquid language.

"There is no security threat, Comrade General. It may well be that we will all die in ten weeks, but there is no danger."

"Explain, Comrade Balachova," I said, keeping my voice icy. A KGB agent would remember a name once heard just as CIA does; it's part of both our training. Too, a person likes to hear their own name, as Sonya illiterately says. And it might scare Balachova into telling me more.

"KGB need not be concerned other than as citizens, Comrade General. There is nothing to be done. Either we are going to run into it, or we won't. If not, we will pass close by, and see the greatest astronomical show since Creation. If we do, the Earth will be cut up like a potato."

"*Gospozha Balachova*: there are no shows to be seen from the bottom of a salt mine. Either you are overexcited or you are playing with me. Explain what has been seen, simply and clearly."

After a pause, Balachova spoke briskly. "I apologize, *Gospodin General!* I am indeed overwrought. What we have seen is a straight line. In space. This line is at present ninety million kilometers from the Earth—and approaching. That portion of the line observable by us is *Tcheteerye teesyatcha myllyon kilometres* long."

Four billion kilometers! I was staggered, and let "General Zabivkin" be. "That is impossible!"

"*Mnye otchen zshal*, my General

I must tell you that four billion kilometers is merely the limit of our telescope's vision. We believe that the line must be vastly longer than that. Comrade General."

Smug dam' telescope-peeper! Despite the "I am very sorry," she sounded

proud of the information, which was both godawful and incredible. This time I replied as if trying very hard to be patient under the weight of all the medals doubtless jingling on my chest.

"What I meant by 'impossible' is that no physical object can be so long."

"Ah! I see that you have scientific backgrounding, Comrade General. You are correct: the line in space cannot be a physical object. We are seeing the patently impossible."

"I would suspect wodka, Comrade, except that I know that the Amerykans are also excited. Seeing the impossible, presumably. *What is it?*"

"My General, the physicists have a saying: If you hit anything hard enough and fast enough, it will lase."

"Laze?"

"Lase, as in laser. Consider: no event is more violent than a stellar explosion, and there has been speculation in the technical journals that certain types of nova explosion could cause laser oscillation. We have known for decades that stars can act as masers. General . what we are seeing must be a beam of light from a laser star. Surely only that is possible."

Her pause told me that Balachova had forgotten "my" name, or never caught it. Fine! Meanwhile, I sat slumped and wide of eye, trying to digest those astonishing words without Di-Gel or a Selenium tab. I wet my lips, thinking at a rate approaching *c*. Though it was a bit out of character for a KGB general to ask an intelligent question, I had to risk it.

"Comrade our best antimissile lasers cannot project a tight beam more than a few thousand kilometers. You are surely familiar with the diffraction limit. How can this laser star of yours project a tight beam at a distance of what? Many light years, you are supposing?"

"A most discerning question, Comrade General. The laser star produces light of far greater intensity than any human-made laser—so intense that it causes the effect called self-focusing. This is not easy to explain, but—"

"Then don't bother just now. Why is this beam of light a danger to us?"

"Comrade General, the light beam is motionless in space. Our world is not. Perhaps our orbit will carry us through the beam; perhaps we shall only come close to it. Our data are not accurate enough for us to make a judgment as to which, in this case. At present."

She was getting herself together and it was about time I got off. "Why should a little light be a menace to our planet?"

"Comrade General, the theory of self-focusing is well understood. It is a phenomenon that can occur only at extreme optical power density—much more power than the total output of our sun. Against such power our little planet is only a cloud of mist."

Or a ball of cheese, I mused, and pondered in silence for a moment. Then, "I see. Very well, Comrade Balachova: you will continue your observations and report them through regular channels. You will also forget that this conversation ever occurred. You do not, Comrade, wish to be involved with my Committee."

I broke connection with a finger and sat, blinking. This was definitely a time for a cigaret. Cholston grass or expensive Turkish, or what was that other stuff called, the real stuff grass? I

don't smoke. Cropland is 'way too valuable for the growing of tobacco, despite those outraged Kentuckians, and too many people have told me that Cholston does *not* taste like the real thing for me to bother. As to the street value of a pack of real cigarets Lord!

I wondered idly if General Zabivkin smoked and mostly I wondered what in hell was going on out in space. Clearly this was a large and squirmy can of worms. As CIA a-in-p, I had no need to worry about that. As a guy who'd like very much to live past ten or so weeks, I had plenty of reason to be concerned. My *assignment* was merely to find out what was happening and report back.

Best complete that first, while Doctor Berson pretended to be busy chasing down coffee so as to avoid knowledge that another bright student was ripping off the phone company. In my case, it was the KGB I had ripped, but

I activated the phone and started to punch. Instead, just to stay in practice, I whistled the number of my CIA section head.

Charlie Wonkers muttered something obscure about it being four in the morning and I replied that I had evidence that the world might end in ten or so weeks. He seemed to waken.

While I told the story as clearly as I could—a bit more directly and clearly than I'd gained it from Balachova's sexy contralto—Charlie kept mumbling, "Yeah, really, right," the same way he does when he's dozing at staff meetings. I finished my explanation. And waited.

At last Charlie mumbled, "This's a NASA problem, dammit, not one for the Agency," and the phartte buttoned off on me.

Well, I had done it to Balachova. (My mother still says, "Hang up," along with the completely outofit "It's your nickel." It's weird to hear her applying to the phone the accepted phrase of the American Psybehaviorialistic Association for "mental oddity or fixation," and some people think she's referring to the metal, element number 28. Yes, yes, I have sense enough to know that *a* nickel used to be the smallest part of the dollar, rather than a dime. Besides, I asked Mother long ago what she was talking about, I even know that a cup of coffee hasn't always been 90 cents—unless you're someplace expensive.)

I sat feeling like a white sock in a sales meeting. There was no one else I could call, legally or otherwise. Taught to be aware of territory by a mother whose chair was Her Chair, I vacated Doctor Berson's. Standing there giving myself a hickey on my inner lip, I was interrupted by an unwonted mental picture. Again I saw some old duffer at a service station in the Hitchcock movie *The Birds*. "It's the end of the world," that doke kept saying conversationally, maybe ten times in two minutes, while four-and-twenty blackbirds totaled the station.

I banished *that* from my mind!

Now

Now I had a final exam at 0900, which was less than five hours away, and that was plenty to worry about. But no. I had to be a CIA agent-in-place to please my mom, who conceived me 'way up in the airless mountains of Tibet and is convinced that I'm the reincar-

nation of a Martian born a thousand-plus years ago and to pay my way through the overmonied Establishment's overpriced Establishment School. So now I also had to cope with the (probable) End of the World.

Unworthy thought: *Well, if it's to be the End of the World, at least* surely *I'll finally make it with Sonya!*

The mind was definitely bent (leftward) but *God, that body!*

2: Make That Six Lines!

With excellent Hitchcockian timing, Professor Daniel Berson came otter-hounding back into his office. Cool as a professional waiter who hadn't spilled a drop since the quake of '91, he bore two mugs of fiercely black coffee while moving at about 35 kph.

The coffee turned out to be fierce, too. I fought back while raw caffeine screamed all my nerves awake. I also bracked Berson in on what I'd learned, without saying how I had learned it.

"Wonderful, wonderful! I have always known that if only I remained here long enough I'd find a competent student on this campus!" Beaming, he practically trotted over for a swift peek through the telescope view onscreen, as if Harvard and the Line in Space might somehow have got themselves online. Practically dancing and surely wagging the vestigial stump at his coccyx, he swung back to me.

"Wonderful! My boy my boy—you've no idea how lucky we are!"

You're right, I thought morosely, and took another hit of Berson Black.

"We have been given a ringside seat," he enthused. "A perfect opportunity to study this marvelous and to our knowledge unprecedented phenomenon."

Berson is one of those strangies who still knows the singular of both "phenomena" and "media" and says the whole word. I wasn't in the mood for handing out medals. "But—it might kill all of us! The whole human race! The *planet*—"

"Nonsense, Quinan. *Quinan!?* This is obviously a short-lived phenomenon. You'll see. This will be no more than the latest Great New Star which television discovers. Too much concentrated energy for it to last ten days, let alone ten weeks! Far too much!" Beaming, he sipped coffee. "Quinan. Quinan. Ervin?"

"Irving," I said absently and spelled it automatically, thinking: if he was right that there was no real danger; the only problem was the making of a suitable public announcement. One that would prevent panic rather than cause it. I looked at Berson and concentrated on being Earnest, Convincing Young Man. Competent, even.

"Doctor Berson as I told you, I'm a reporter for the *Crimson*. You have made a sensational discovery and I want to print your story. I'm going to get the *Crimson* editor out of bed. We'll have your story in this morning's edition!"

While I punched the number, Berson's face looked as if he was about to go nova. I had said the magic word. "Your" story.

The editor didn't answer his phone.

The assistant editor didn't answer his phone.

Neither did any others on the staff. Then I remembered: Wellesley! The staff and a mob of others had gone off to Wellesley in another of those ever-popular revivals of what people think the '50s were about. (No one ever tries to recapture the charm of John Foster Brinkmanship Dulles or the Golfing President, I've noticed.) Back in the '50s, male college students went on "panty raids." These involved breaking into what they then called "girls' " dormitories and stealing underpants out of dresser drawers. Or clamoring under windows until the "girls" tossed down those pre-pantyhose items. My classmates at Harvard were reviving the practice tonight, leading the world "as usual," as they see it.

Of course in this daynage, undergarments would be acquired in a much more direct manner. Forget the dresser drawers and go straight for the drawers.

With the forlorn hope that someone might be in the *Crimson*'s printing room, I went for it. My punching finger was getting tired. The phone's ring was, thank Buddha, answered at once.

"On!"

I knew a sinking feeling when I heard that excited voice spitting the "hello" word that had replaced "Yes" a few years back. It was my roommate. True, I was in coma for Sonya's soma—which Social Anth teaches was "warm for her form" in the '50s—but Sonya's *psyche!* My beloved Rebel For Any Cause was about thirty years out of synch.

My sinking feeling became a stone that went straight to the bottom when I heard the wicked glee in her voice: "Forget it, lover. We already *have* a big, big, BIG extremely important story."

"T'riff. Isn't there room in the paper for two stories, Sonya?" (She likes to hear her name.)

"Nope. *I* could care more if you want to report the Second Coming or the End of the World, lover. *This* issue of the *Crimson* is absolutely *full*. *Our* story is going to raise the consciousness of every woman on the East Coast, from the age of thirteen to ninety-*three!*"

This from the woman who tried to get the ancient name of Harvard's ancient newspaper changed because it ended, according to her, in a sexist word! "Let me guess," I said, sighing. "There was a, uh, underpants raid earlier tonight but WAH pulled a counter-raid?"

"You got it, lover. *You-are-bracked-in*. Right now three *hun*dred *males* are walking home from Wellesley without their *outer* pants! And it wasn't just Women at Harvard! Every single *person* did their parts! Women of *Wellesley* participated too!"

"Wow," I said without fervor. The bottom of the ocean had opened and my sinking feeling went through.

"With *gusto!*" Sonya was crowing on. "I got *glorious* full-color pictures of *everything*, *everybody* doing their individual things—along with a nice pair of jeans. And lover, they'll ALL be in this morning's *Crimson*!"

I assumed she meant the pictures, not the jeans, and that "they" was plural this time. I sighed again. Good for Crim's son, I murmured, but not loud

enough for quotation marks or Sonya's ears.

"Sonya, you keep calling me lover," I heard me unworthily saying. "Yet we haven't—" I couldn't help sounding hopeful, but I broke off the whine. Dear Buddha's Consciousness, but she's beautiful! "—haven't had any sort of meaningful relationship," I lamed it, using her language. Sex isn't a four-letter word, it's a 22-letter phrase.

"And whose fault is *that*, Irvie Quinan? You refuse to *pick*et, or *pro*test, or sit-in, *or* join the UL-UV Action Committee with every single *per*son doing their part, or do *anything* to improve the world. A woman has their pride! How can a woman like myself have a meanrel with *anyone* who refuses to do their *anything* to provide a validly meaningful socio-political *foundation* for their relationship with myself? All *you* ever try to do is jump my soma!"

I spent two seconds trying to imagine the CIA's reaction to my(self's) joining the Ultra-Left Ultra-Violent Action Committee, and I decided to stand up to her, for once. God, how I'd prefer lying down with, under, or on her. But I knew that Sonya was ready to button me off.

"Sonya—it IS the Second Coming! Her name is Jesa Crista!" And I buttoned off—an instant after I heard her do it, dammit.

For a moment I felt very tired. Having a beautiful blonde—oops; blonde with an "e" is strictly noun-female, and to Sonya that's terribly sexist—for a roommate had promised to be heaven. So far it definitely hadn't worked out. And damn, damn, Sonya is beautiful. And just extraordinarily somastructured! She doesn't know I am a CIA agent, and part of our problem is that she wants very much to be a KGB agent! Despite Sonya's diligent efforts on its behalf, KGB consistently refuses to put a (very) young and (very) blond, very female American (not very) on the payroll. Sheer stinginess.

My eyes narrowed as I began plotting, thinking about a personal call from Comrade General Zabivkin to one Sonya Laskowski, asking her to obtain first-hand information on the sexual habits and practices of one Irving Quinan

A little semi-polite noise from Professor Berson disrupted that sweet gamic phantasy and reminded me that I had things to do.

I did: this time I called Carlton Sinclair, science editor at *The New York Times*. He answered, sounding alert, and I started to tell my tale.

"Mister Quinan," he interrupted, "I have a firm rule about people who call with gloriously important stories at oh-four-thirty."

"Uh—yes?"

"It had better be good."

"It is! Professor Berson—"

"Mis-ter Quinan?"

"Sir? Mister Sinclair?"

"Let me make this very clear. As I recall, you have applied for a position on the *Times*?"

"Right!" In a month I'd be graduating, and a job on *The New York Times* would be a perfect cover. Wonkers was enthusiastic about it. He said his boss was, too. But Carlton Sinclair was definitely no doke.

"Well, Quinan, depending on your Important Story right now, either you

just landed the job or your career in journalism just ended. Now let's hear it.''

I told Sinclair about the straight line in the sky.

''Interesting,'' he said slowly. ''I have two questions. First, space is empty; there's nothing to scatter light. How can this alleged beam of light be visible? Second, you speak of self-focusing. True, when a very powerful beam of light passes through a crystal, it can change the dielectric constant of the crystal and so focus itself. But there's no way light can change the properties of empty space! Self-focusing in vacuum is a contradiction in terminology.''

This was nutty. The Line was there, and I hadn't put it there, and yet I was supposed to explain it. I'd cut Balachova off before she could really brack me in on the information he demanded. I thought—fast. Two major things my mother has taught me: ''The Agency always tried to get me to carry a short ton of equipment and gadgets, but I remain convinced it's safer to trust to my own wits—and if necessary, the old pistol. And Irving, you have more wits even than I!'' and ''When you don't know the answer, son, the best course is to give *an* answer, rapidly and with glowing confidence. I call that Senatizing.''

I Senatized.

''I'm sorry, Mr. Sinclair,'' I said, with glowing confidence. ''Light can change the properties of empty space simply by filling it. Suppose you had a beam of light with the same density of mass energy as a stream of water. Palpably, such a beam would have a dielectric constant very different from empty space. Light—''

''Quinan, I hear you. But stop spouting clichés and look up words such as 'palpably'; it does not mean obviously or manifestly. Lord, that sounds like Washington officialese talk!''

In that case, I thought, I'd never use it again and I was being sloppy. ''Palpably'' is a favored CIA word. ''Such a beam of light would manifestly have—''

''I heard you, Quinan, I heard you! But that doesn't explain oh self—''

He trailed off, and I grinned. Sinclair was chewing on it!

I added, ''Light would be trapped in such a beam, the way light can be trapped in a stream of water.''

''But the *power* that would require '' he broke off and I waited while his psychewheels turned. ''I see '' he said slowly. ''This is an incredible astronomical event. The managing editor will raise hell, but this is going on the front page. Thank you, Quinan. When you're ready to report for work, call me.''

''I will! Meanwhile, I'll see what else I can find out.''

''Good boy—uh, person. Wait! One thing: I assume the light beam is visible because of photon-photon self-scattering?''

No dummy, Carlton Sinclair! ''That's oversimplified, Mr. Sinclair, but one has to assume it's substantially correct.''

''Umm. Well, again, thank you. Good n—morning.''

I punched off. Professor Berson poured us both another cup of Old Tarpit.

"Young man—Irving—you've managed very well. Very well indeed. You are gaining the job you want and I am at last gaining fame—or at least notoriety!"

An honest man, I thought, and said, "You don't sound too happy about it, Doctor Berson."

"Perhaps we'd better go back to 'Professor'; that does impress the TV people, and they will soon be here! Hmm, better see about a navy blue suit. Irving, you're right. I photographed an astronomical event, but I didn't *see* it. This phenomenon can't last long, and the world turns slowly. Most likely by the time Harvard is in a position to see the Line in the Sky, it will be gone. The European astronomers, the Asians

they're lucky. They witnessed it; probably no American will have a chance."

At that instant it hit me. What my boss had meant when he mentioned NASA! Wonkers *had* been listening!

"No—Professor Berson! There is one American observatory that can see the light right now—Space Station *Kennedy*!"

He laughed gently. "No, young man, they call *Kennedy* an observatory, but there aren't any real astronomers up there. It's an open secret that *Kennedy* is a CIA spy satellite."

"Uh—well, I've got a cousin working up there, and he assures me that's a false rumor."

"A cousin? In the space station?"

"Yes! Sir. Why don't I call him?"

Berson was doubtful, excited, hopeful, and quite surprised when my call went through without difficulty. It wasn't exactly instantaneous, naturally.

"This is Irving Quinan," I said. "I'd like to speak with my cousin, Harold Tyler."

Beat, beat "This is Harold, Irving. How are you—I heard Aunt Kate had her gall bladder removed."

"No, she still has her gall bladder but they removed a stone big as an egg," I said, completing the identification code: all us CIAs are cousins. "Look, Harold, I'm at Harvard Observatory with Professor Daniel Berson. He has just observed a great big line, all the way across the—"

He must have begun interrupting with "observed." Harold said, "We know. We've been looking at it for some time. Matter of fact, there's a question we'd like to ask Professor Berson."

I glanced at Berson, and flipped on the phone's speaker. "Go ahead, Cousin Harold. Doctor Berson is listening."

Beat, beat "Doctor Berson, can you suggest any explanation for this phenomenon?"

Berson parroted what the Russian had told me. God, but we Americans are brilliant scientists! Then, "Now as to explanations. I can think of several, uh, Harold. For example, a pulse of laser light could be formed during the final stages of a pulsar's evolution. If ." Berson paused to collect words.

"Professor, as you must know, the *Kennedy*'s 'scope has a far greater resolution than any ground-based instrument. What you at Harvard see as a single line is palpably a *set* of *six* lines. Each is at the corner of an exactly regular hexagon. With that additional in-

formation, can you suggest an explanation?''

Harold and I listened to a long and prodigiously expensive silence, while Berson's forehead imitated a bloodhound's.

''No,'' he at last admitted. ''There is no way in which a natural stellar event could produce a regular pattern of closely spaced lines.''

Beat, beat ''That's what we are seeing, Professor Berson.''

Again Berson shook his head slowly and reluctantly. ''Then you are not looking at a natural phenomenon, but something created by intelligent beings.''

3: Prophet of Doom

During the following week I endured and stumbled through several exams while days slipped past in a confused blur. Sinclair did indeed get ''my'' story onto the front page of the *Times*, but only as a small item. Most of the paper's front page that day was taken up with the news that the sewer workers' strike was over and that New Yorkers could flush again.

Events in space continued without regard for human folly. The discovery was made: Earth was on a collision course with the matched set of six (6) (VI) laser beams—which were precisely equidistant. Impact would be only a glancing one which would, incidentally, slice off China. Before that grim news was made public and some picknose could make a remark about the precision of laser surgery, it was outdated.

The laser beams moved, minutely. Just enough so that Earth would miss them.

Now that sextet of beams of coherent light posed no immediate danger except to Earthside scientific coherency. Their mystery deepened.

The NASA probe en route to Mars was diverted to flyby the phenomenon. The pictures it sent back are being kept a dark secret, as I dictate this into my camera. Obviously those laser beams are for something. And palpably, I mean obviously, they are Doing Something. Thirty hours after their first appearance, three of the six light beams vanished. So did several opinionaters and two opinionmakers, whose explanations became thus instantly precluded, not to mention foolish. Maybe being nonplussed provided a sort of plus; I aced my Advanced Russian exam.

Confusion approached that of the scene under an overturned log—and then someone discovered that all six beams were still there!

Out with New York's sewage went the theory that the beams were three pairs: three were still green light, while the other trio had gone far ultraviolet. (Someone on a teleshow tried to explain that by using the word ''recession'' several times, and the Dow-Jones promptly dropped seven points. The word ''recedence'' was promptly born.) The second set of three shifted slowly, meanwhile, through the near UV, the violet, the blue and so on until they had returned to their original green.

The guys in the Physics Department have been working round the clock on

the properties of high power density self-focused light, and these events gave them something to explain. 'Cording to them, if there are two wavelengths in a self-focused beam only the lower power wavelength undergoes self scattering. Thus what really happened was that all six green beams of light were always still there. Three kept their normal appearance and three disappeared because ultraviolet light was being added to them. As the UV shifted back into the green, the beams regained their normal appearance.

While I could not imagine the purpose behind such events, I was sure there must be one. And I missed acing Computational Physics by one question. Or one answer, rather.

It's it's as if a giant has written across our sky in letters we just can't read. If that's poetry or almost, this isn't: It's as if our world is an anthill beside a railroad track. Here we are scuttling and scurrying and opining and guessing, and there it is, representing powers vast beyond our antsy comprehension.

That is the world's problem. My own problem is that right in the middle of cramming for an extremely tough exam schedule I got a coded communication from my mostly invisible employer. It was an assignment that made me groan. I was to "ascertain the opinion of Doctor Lawford Sloan as to the probabpu effect on human society of contact with a more advanced alien civilization."

I assumed that "probabpu" would have been "probable" if the encoder hadn't doked up. It happens even in Competence Is All (important), as some insiders think CIA stands for. Sometimes I think we should put quotation marks around the middle word of CIA—"Intelligence"—as in Postal "Service."

Lawford Sloan! At first I was tempted to fake it. Save myself a couple of precious exam-week hours by inventing a convincing Sloanish opinion/incantation and reporting same. While I was pretty certain of getting away with that kind of ploy with this kind of man, I decided to continue being a reg'lar guy. On my old bicycle I set off pedaling for Memorial Chapel. (Scarf yes; rubbers no; squeaks *si*.)

Though I couldn't say why, I had a strong feeling that this one was important.

Sloan's is a strange presence for the Establishment's Establishment School for the perpetuation of the Establishment. For the past decade or two the Reverend Mister Lawford Sloan, D.D., has used MemChap as his command post in a no-letup no-quarter verbal war against the Establishment. The Old Boy culture didn't try to get him canned or silenced. I think they loved him, because they were sure he'd have no lasting effect. In a host of issues and causes—everything from the Dolphin Civil Rights Movements to the Revision of the Rape Laws, from the demand for congressional support for "they" as second person singular and "phey" as plural, to the Annexation of Canada—in all these ole Lawless Sloan had been the intellectuals' rabble rouser. The Man Who in any situation could be relied upon to provide a cogent, brainy-sounding and well-thought-through reason for immediate panic.

When I found him in his study, Sloan

smiled warmly. "Irving, Congratulations!" he declaimed, from the diaphragm. "I Understand that you have Gained an Excellent Position with *The New York Times*!"

"Yes sir," I answered cheerfully, "and you are my first assignment. As you probably know, the *Times* maintains extensive background files, facts, and expert opinions on an enormous range of subjects." I drew breath to wow him. "Since, Doctor Sloan, you are one of the Foremost Scholars in the study of Human Society, a national resource, we, the *Times* and I, would like to know what, in your judgment, might happen to our world when, or if, sir, we contact a more advanced Alien Civilization?"

"Ah," said he, "spec-ulation on EI for Extraterrestrial Intelligence." His laughter was gentle and hearty. "Irving, as a reporter you must learn to check your subject's biograph before you go to interview them."

I thought rapidly and zipped the ball back to his large pale hands. "Actually I did hear that one of your early Crusades had something to do with contact with EI, but, well, I didn't believe it."

"Oh? Why Not?" Magnificent telecommentator use of diaphragm!

"Ahh I'd suppose because you are a social activist and I couldn't imagine your being involved with such a highly theoretical subject."

Shaking his head with a little sigh, the theological theoretician replied in manner world-weary: "Ah, it is probably because of Such Attitudes that we had such limited Success."

While I stared at him in manner puzzled, he gestured at a large overstuffed brown leather chair. "Sit down and help yourself to the coffee."

As I took Harvard's Chair of Religion, the reverend Mister Sloan stuffed his pipe with grass. Kentucky Blue laced with corn silk, or so I guessed from the pungent aroma it gave off. Flash of greenly sick sixth-grade boys all over the Midwest and South.

"Are you sorry the Gov'ment outlawed tobacco, Doctor Sloan?"

"There wasn't any Choice," he replied between contemplative puffs. "In a Starving World we have a Moral Duty not to waste Agricultural land on non-food crops."

Abruptly I remembered. The Tobacco Prohibition had been another of Sloan's early crusades. Lawford Sloan had been a thorn in the Establishment's side—and achieved fame—because he had a talent for seeing the unpleasant truth that everyone else cheerfully ignored.

Lawford wanted to know about the line in the sky. Once I'd told him as much as had been in the newspapers, he puffed forth a cloud of poison gas and rumbled (diaphragmatically): "Hopefully this will be a False Alarm like the others. Real Contact with an Extra-terrest-rial Intellll-igence would be a Disaster."

"Oh?"

"There have been two Inn-cidents. When Pulsars were first discovered, some Astronn-omers thought the radio sig-nals they emitted might be Messages from some Galactic Civil-izationnn. The other occurred at the beginning of Project—Ozma, I believe it was called. The astronomers began a Systematic Search for ra-dio-o signals from, ahh,

ET civilizations. No sooner had they begun than they Detected Signals Which were obviously Pro-duced by some form of Intelligent Life coming to Earth from Outer Space.''

''That's incredible! You have got to be kidding—sir!''

''It is a Fact.'' He took a luxurious puff and continued. ''Of course, it is also True that the signals had Originally been Generated on Earth by the United States Ar-my. They were returning from Outer Space after reflec-ting off the moon.''

''Then the signals weren't being produced by an intelligent form of life, after all!''

''Many people share your view of the Ar-my, Irvinnng, but *I* consider it uncharitable.'' While I looked a shade nonplussed, Sloan smiled. ''You'd be surprised how many people I catch with that old chest-nut, Irving. The Seer-ious Aspect, however, was that after the original Project Ozma showed negative results, NASA wished to carry forth a more Ambitious Pro-gram. It was one that Probably would have been Crowned with Success. Inasmuch as listening to their radio signals would evenn-tually have led to full-scale Contact, a Disaster Without Equal, naturally I Launched A Crusade to—''

''Wait,'' I callously and undiaphragmatically interrupted. ''Why must contact be bad? Might not the Aliens be benign?''

''Sup-pose Irvinng,'' his diaphragm replied, ''that you are an American Indian of the 17th century. After a week of Privation And Danger, you Succeed At Last in killing a buffalo. After you have Eaten Your Fill, what do you do with the remainder of the meat?''

I had an uncomfortable feeling that the answer to this seemingly pointless question was vitally important. Oh, it didn't matter what I said in reply. But the answer, the unpleasant truth Sloan would soon show me—that would make a great difference to all our world.

''Since it's perishable,'' I replied slowly, ''I can't keep it. Can't sell it. My fellow Indians don't have any money, don't even know what money is. Guess I have to give it away.''

Puffing poisonous black smoke like a volcano, Sloan gave me a that's-a-bright-boy smile. ''Correct,'' he said, with smooth smugness. ''Now consider the Implications. A Great Plains Indian, a nomad who lived by following the Migration of the buffalo Herds, can't accumulate more possessions than he can carry. So Naturally he gave away anything he didn't immediately Need. A Stranger to Greed, such concepts as property and Wealth were completely foreign to his experience.''

''Wait,'' I protested. ''Aren't you laying it on a bit thick?''

''Just the opposite, my dear person. I'm talking about Attitudes taught from earliest childhood by every aspect of the surrounding Cul-ture. For Example, you cannot get Sioux children to play base-ball. Oh, they will Throw the Ball and use the bat to hit it, but they will not Compete. Instead they will ask, 'What Are Runs and Why Should we desire more of them than the other Team?' As chil-drenn, you and I did not ask such awkward ques-tionns, because we In-*stinc*-tively Knew that it didn't

matter! The Act of getting More than the other guy was Basically Good!''

I sat blinking watering eyes, hoping Smokestack Sloan wouldn't notice. But maybe he did, and thought I was emotionally af-FEC-ted.

''Do you see what I am Getting At, Irving? As far as the Amerinds were concerned, there was not and could not Be such a thing as a 'benign' white man. The Amerind's Ethic, the Basis of his Whole Life, was open-handed Generosity to members of his tribe and violence toward Outsiders whereas the white man's So-ciety was based on Ee-c'nomic Commm-petition, something the Amerinnnd could not understand. Manifestly there is no Common Standard of Fair Play. When the Indian was Generous the white man Took Advantage of what he regarded as Improvidence. When the Amerind used Violence, the whites refused to play the Role of Honorable En-emiees. Instead they met bows and arrows with rifles.'' Pause for drama and puff:

''It was a Classic inevitable Dis-aster, and if ever we humans meet a more advanced A-lien Civ-ilizAtion, we shall be in the same position as the Great Plains Indians. The culture of the A-liennns will make demannds of us that are Ut-terly beyonnd our understanding.

''With the Best Intenntions in the U-niverrse, Irving, they will destroy us.''

4: A Potentially Final Exam

My exams were over—or so I thought. As it turned out later, the worst was yet to come, but at the time Sonya and I decided to go on a picnic. She had been unusually friendly lately and if I played my walnettoes right maybe I could get lucky. Oh the *soma* of that person.

We bought sandwiches at Elsie's and I dropped a couple of kilobucks for a liter of beer. My soaring hope was that this large investment would be repaid. Not in kind, but kindly.

A major problem was where to go. It was a fantastically beautiful day and I knew the parks would be crammed with people. Scarcely room to sit and eat, let alone what I had in mind. After some discussion, my blond and I mounted our untrusty bicycles and squeaked out to this place I know. Marvelous. Perfect. Rolling grassy hills, flowers in profusion, and absolute privacy. Not a soul except us two. We played silly games, ate those large delicious sandwiches, slowly enjoyed our beer, and with an utterly comfortable just-right feeling of tiredness, sat down together behind one of the tombstones.

A lovely, lovely place, Mount Bethel Cemetery.

Thinking salaciously of dessert, I was moving closer to Sonya when she gazed at me from those deep blue eyes and spoke. ''Irving we're friends, aren't we? And friends do each other favors, don't they?''

''Yeah,'' I breathed eagerly, reaching for her favors.

''Good, because I need a favor. A large one.''

''A large one. Yesss.''

''*Irv-inng!*''

Since she had clutched my hand, things might be going better than her tone made it seem. Cautiously I said, ''What is it, Sonya?''

"My friend Beth Rodrigues has disappeared. I'm afraid she's an Illegal and the ImSerPol got her. I've *got* to know, Irving. You've never said much *about* your mother, but I know she's some kind of high gov'ment official. Could she "

Abruptly I had the feeling of taking a bath in ice cubes. In extreme shock I blurted, "Sonya, you don't know what you're asking. A person can get into trouble for knowing things he's not supposed to—more trouble than ."

"COWARD!" As she slapped my face, she continued screaming, "I SHOULD HAVE KNOWN YOU'D BE AFRAID! WELL LET ME TELL YOU—I'M GOING TO FIND OUT WHAT HAPPENED TO BETH AND I'M GOING TO DO SOMETHING ABOUT ITTT!"

Before I could respond she was running away and I couldn't follow because my tooth was buzzing. My upper right molar. That's the alarm at the Data Bank. Probably just another Zen-blasted false alarm.

Still, if it weren't, if someone was trying to tap the Bank, to extract the secret of Mafia Oil

As swiftly as I could I was on my bike and pedaling furiously for Harvard.

Traffic was light, all the lights were green, and I only had to climb a couple of hills. I was getting all the breaks, but I'd been too far away to start with. Much too far. If something big went down and it came out that I was away from my duty post improperly—I was beginning to sweat. Squeak-pedaling for dear life. If I got in trouble it would be worse than punishment. Mother would fix everything—and then spend the next century rubbing it in.

I went roaring off the road and over the campus lawn like Evel Knievel after his third resurrection. Ahead was Computer Control Central and the lawn sprinklers were off! They were the main Telltales and even a false alarm should have set them off!

What the Nixontapes was going on? If the Computer hadn't sent the alarm, then someone else had, someone who wanted me to come rushing here.

A man and woman were walking toward me from opposite directions, their pace calm and deliberate. Since I had a bicycle and a good twenty-meter lead, theoretically I could escape. Something about them made me decide I wouldn't be wise to try.

"Hello," the woman called. She was fortyish, hard and competent-looking, and wore a bulky brown leather purse. Those things are designed to allow the fast-drawing of a concealed pistol. "Irving," she continued, "I'm your cousin Mary."

"And," the man added, "I'm Sam."

After we discussed our aunt's gall bladder, Sam spoke most seriously from his coonhound face. "Irving, there's evidence that indicates you're a security leak."

"Then give me a polygraph test," I replied, as calmly as I could. Meanwhile my heart stopped.

"Under the CIA Reorganization and Reform Act you cannot be compelled to take a polygraph test." With a face like that, Sam should have been selling Hush Puppies.

"Uh-huh, and that same act gives me

the right to clear myself by insisting on a test. Boy do I insist."

I've often wondered what happens to the guys who don't insist on their right to be tested. They just aren't around. The phrase is "No Longer With the Agency." Or anywhere else. My hope was and is that I'll never find out what happens to them.

Mary and Sam acted as if I was a long-lost friend from whom they couldn't bear to be separated. They escorted me to the Apex Funeral Parlor. Back during that era called Prohibition, Apex was a speakeasy. Now it's a CIA safehouse.

Safe! Unfortunately I was very definitely not the one who was safe. Properly used, the biopolygraph is a detector not of lies but of guilty knowledge. If you put arsenic in your uncle's chicken soup, you're apt to have a different emotional response to queries involving chicken or arsenic than to questions about cyanide or chocolate cake.

Problem is, I've the misfortune to be a walking warehouse of guilty secrets. Things like the fact there's a CIA operation, code-named Mafia Oil, whose submarine station is pulling oil from under Saudi Arabia. I'm not supposed to know about such things and if it comes out that I do, I'll likely wind up as cold as Sonya's friend Beth.

There wasn't any way I could forget all that stuff short of grabbing a gun and giving myself a fast prefrontal lobo. As Sam strapped me into the machine I was sweating blood—literally; maybe a tenth of a cc on my forehead. Very high blood pressure. Mother says I should eat a low-salt diet, but there wouldn't be anything Mother can do about this mess.

Sam and Mary saw the blood and didn't give a Zen-blast. Something in their manner, however, said that they knew they'd caught a very guilty, couldn't-keep-his-fingers-out-of-the-cookie-jar doke. As Sam's dead flat voice read out the control questions, I knew how the whole thing was going to come out.

Halfway through the control questions Sam stopped and cursed under his breath. Aloud he said, "Kid, according to these readings you feel guilty about damnear everything!"

From the side Mary added drily, "If you knew his mother, you wouldn't be surprised by that."

"Yeah," Sam snapped, "but how am I supposed to get a level? These tests don't mean anything, you know, unless we measure how he responds to questions that don't "

A sudden inspiration pounced into my brain. "I should," I said, in what I hoped was a tone of calm authority, "warn you two about something. Probably should have mentioned it sooner. What with my mother and all, I know a number of things that are classified 'way above your levels. Unless you want to learn things that will get you in trouble, you'd best limit the control questions to ancient history."

In a voice heavy with suspicion Sam demanded, "Did you murder Julius Caesar?"

After that I breathed considerably easier. I'd bluffed them some, enough so that they didn't dare go fishing in my assorted guilts. That meant I was safe unless the crime I was suspected of resembled one I'd committed.

When he was finally satisfied with the level established by the control ques-

tions, Sam gave me a nasty smile. He asked, "What's the longest railroad?"

In wide-eyed innocence I told him, "The Trans-Siberian, of course."

"Name the fastest train."

"The Japanese Bullet."

They continued with that kind of question. Nearly every one of them somehow was related to railroads, railroading, or trains. That went on—and on—until at last they were convinced of my ignorance. Sam unstrapped me.

"All right, kid, come back here tomorrow for a briefing. Meanwhile—get lost."

I shrugged. "Okay."

Mary gave me a puzzled look. "Aren't you going to demand an explanation?"

"Nope. You wouldn't give me one, and besides, from the questions you've asked it's obvious what's going on."

They were staring at me as I walked away.

I hadn't the faintest what was happening, but the lie made me feel good because it made them feel uncomfortable.

That night I received a phone call from Carlton Sinclair.

"Mister Quinan, I want to check some things with you. In your employment application you stated that you're in excellent health. In fact, you once considered becoming an astronaut and passed the physical exam?"

"That's true, but I didn't get any further than the exam. They weren't taking males just then, or whites either."

"But in your application to the *Times*," Sinclair protested, "you stated that you're non-Anglo! The *Times* does have to fill its ethnic quotas and "

"Both," I assured him, "are true. My background is a little complex. Mixed parents, you see."

There was an awkward pause while Sinclair waited for me to explain further. I, however, wasn't about to tell him I was the offspring of a New York Jewish CIAer and a Buddhist Tibetan Freedom-Fighter.*

"All right," Sinclair at last said, "I take it then that if it became possible, you would be willing to go into space for *The New York Times*?"

Clunk! "Sure, but what's going on?"

"Only the biggest story since Gutenberg invented mobile type."

Or since some government sociologoyoyo decided that ethnic category was more important than ability, I thought, but the bitterness didn't last. I was working to bring down my elation at Sinclair's apparent plans for me. A Harvard-graduated, CIA-employed, *Times*-supposedly-employed male Jewish Buddhist New York Tibetan into space as an astronaut, huh? *Very* far out!

"You," Sinclair was saying, "are the only *Times* reporter with astronaut qualifications, so you're going to win the lottery and be the only reporter on the scene of an event that will reshape the world!"

" 'Triff. What event?"

"Unfortunately, I can't discuss that. Goodbye, Quinan, and good luck!"

I pondered. A minute or so later I remembered to punch off the phone.

A few of the pieces fit together. Often it isn't practical for one reporter from every newspaper and wire service to attend an event. A lottery is held and

**For details of Irving's birth, see "The City of Ul Chalan,"* Analog *July 1973.*

one lucky newsperson goes on behalf of all. Sometimes such lotteries are honest and genuine, and sometimes they're payoffs. *New York Times* payoffs usually come from the State Department. This time, I would win as State's payment to too-smart Carlton Sinclair for his silence.

Fine—but what was he being so closemouthed about? What did the CIA suspect me of telling Sinclair?

Some great event in outer space —involving a *railroad*?

Next day at noon I went to the safehouse. There I discovered that apparently every agent in the Boston area was being pulled in for this briefing. I noted only normal minimum security. Before entering the auditorium, I reached into a bag and drew out the first mask I touched. Mickey Mouse. The guy ahead of me drew Donald Duck. The woman behind me got Pluto. Dog, not planet.

True, an auditorium full of characters from Disneyland looks foolish. But see, it just wouldn't do to have such a chamber full of secret agents sitting around with their naked faces showing, for any-

one to photograph. Present were all three nephews, Huey, Dewey, and Louie.

The speaker was a man of erect military bearing who doubtless did not welcome wearing the spotted clown outfit. In a crisp voice he said, "You are summoned here to view photographs sent back by the NASA probe."

He pressed a button and on the screen behind him appeared the picture. Black sky. Diamond-hard stars—and six lines

of green fire stretching back to infinity. Just before the lines vanished, a blur interfered. In the next picture the blur had become a long chain of dark cylinders riding forward within the six light beams. I heard muttering around me and I continued to stare silently at the screen.

The third picture was taken from a different direction, looking back from sunward. The cylinders appeared as brightly shining metal, their surfaces covered with irregular pockmarks. The end of each cylinder was rounded. Otherwise all were featureless and ugly.

Just—metal cylinders, running along laser beams toward Earth

The last picture showed the cylinders only as a blur again. But now it was clear that they were no longer within the lightbeams.

Again the crisp military voice: "You see the crisis. Someone has built an interstellar railroad right through our Solar System. On a—"

"Wait a minute," someone called. (Who knows Huey from Dewey?) "Let us try to *assimilate* that. *A railroad*. In *space!* Into *our* system!"

"God! Even Larry Niven never mentioned a *train!*"

Though the clown mask with its rubberized grin hid all expression, I couldn't help imagining that the stiff military man within was frowning intensely at all this chatter.

"Yes: a Train. A laser-railed railway passing right through our System. As I was saying: On a superficial level, it's obvious how the thing works. The track is a set of six lines of laser light. Three go one way and three the other. The train works like a cable car; it accelerates by reflecting light in one set of lines, decelerates by reflecting the other.

That accounts for the color changes we've observed."

"Vun moment," Porky Pig said, in an accent as thick as Bavarian chocolate. "Vot you are saying iss sscientific nonsentz. To account ffor se color changes as Döppler shifts vouldt mean sat se reflecting body vas traffeling at a large ffraction of se felocity of light. It vouldt haff to haff a kinetic enerchy eqval to many times its rest mass. Such an amount of enerchy iss vast beyont gomprehension."

"Yes, it is." Our teacher the clown paused dramatically; nicely done. "And that is the point. Any method of interstellar travel requires the employment of a great deal of enerch—pardon me, energy. This laser railroad system has the advantage of being *conservative*: the train takes huge energy out of one set of lightbeams when it accelerates, but returns it it all when it decelerates."

"Sat is efen vorser nonsentz! Like a rocket, se Train vould use vast enerchy both to agzelerate unt to zlow down."

"No no," Clown declared, "that's a misconception. You're confusing the two different kinds of transportation system. There are those that run on thermodynamically irreversible principles and those that run on reversible principles. Maybe some of you have heard the old Carson joke about a group of Latin Americans who met in New York and went for a drive in their new car? By the time they reached the Jersey Turnpike they had naturally switched to Spanish. As he reached toward the pushbutton transmission, the driver said, '¡*Y ahora Rápidamente*!' "

When the rather brief spate of laughter—our clown was no clown and hadn't told it as well as the ancient Johnny Carson—subsided, our instructor went on with measured seriousness.

"I need not tell you what magnificently unpleasant consequences pushing *R* at high speed has for a gasoline-fueled vehicle! One thing does *not* happen: the engine does *not* suck in exhaust gas and return gasoline to the fuel tank!"

I grinned. Our clown was *not* a clown. He knew what he was talking about.

"That's because the gasoline engine is a totally irreversible device," he said. "On the other hand, an electric motor is quite reversible, even at speed. Throw an electric car into reverse at high speed and the motor is driven *backwards*. That causes it to act as a generator and recharge its batteries. Yes, really. Some models of electricar let you stop at red lights by going into reverse. If you want a simpler example of a reversible transportation system, take the cable cars of San Francisco. The cable does work on the car to haul it uphill—and on the way down it's the car that does work on the cable. On average there are as many ups as downs, right? So if you have a flywheel to store energy, the cable doesn't have to do any work to get the car up and down the hills of 'Frisco. It labors only to overcome frictional losses."

Clown paused, probably looking significantly at us. "Now. With all that as background, will you grant me that the doppler shift reflection of light by a moving mirror is a reversible process?"

It was a rhetorical query. I couldn't help admiring the way this ridiculously attired and masked man handled a complex technical question. Our clown was no clown. The Air Force has been get-

ting some really fine people since it started using Kimball Kinnison in its recruiting ads.

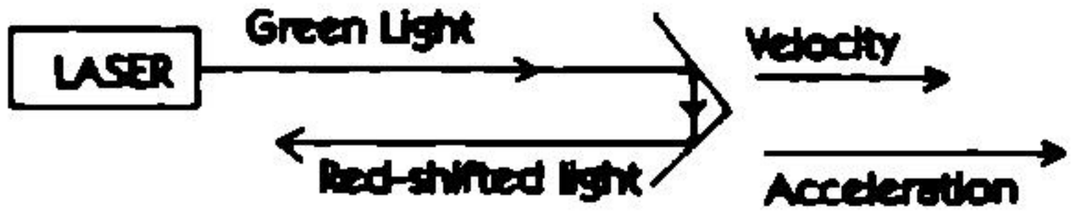
"Vell," Porky Pig re-began, "I am sinking of se t'ermodynamic derifation of se black body radiation law. Vun aszumes a cylinder mit a perfectly tight frictionless piston, both cylinder unt piston being perfectly revlectif. Ven se cylinder slides in, it does verk against se photons of se black body radiation unt sey are Döppler shifted to shorter vafelengths. Eisser vay, delta S iss zero. *Ja*, Döppler shift reflection iss refersible."

The rest of the group was looking as confused as we did in old vanBalt's course in Thermo 101. The only part of that course I understood was the Pinkertonian statement of the Second Law, which is carved on the latrine wall: "It is impossible to shove shit up a horse's ass while producing no other effect except taking oats out of its mouth."

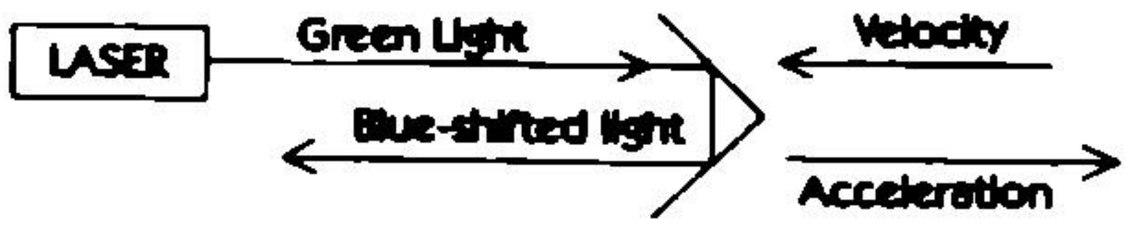
Recognizing the problem, Clown spoke to the room at large.

"Let me give you an oversimplified description," he said, and turning to the white wall he took out a marking pen and began drawing. I had a fleeting thought that the wall had better be of the washable variety.

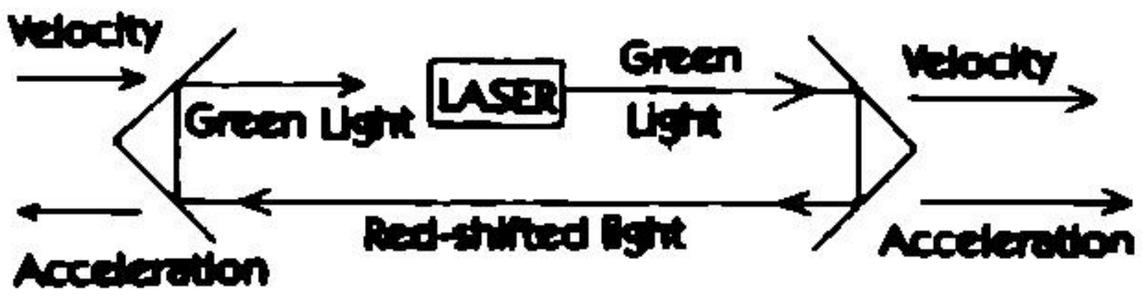
"Just imagine the train as a pair of mirrors, like this."



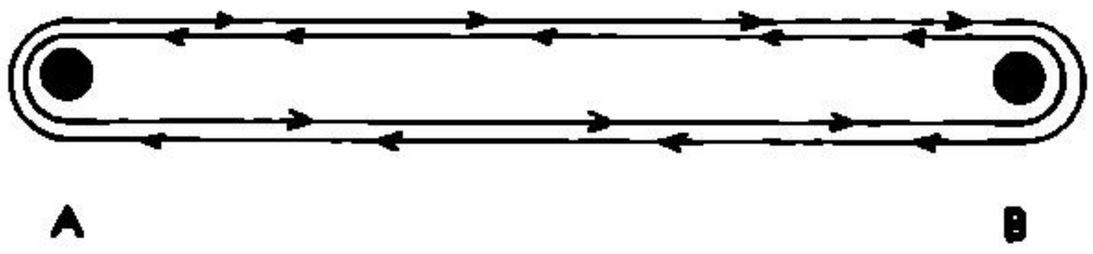
"It accelerates away from a laser by reflecting light back at the laser. That red-shifts the photons in the beam of laser light; takes energy out of them. On the other hand " He drew swiftly.



"When the train is moving *toward* a laser, it again reflects the light back toward the laser, but that decelerates the mirrors and blue-shifts the light. You see? What we're doing now is taking kinetic energy away from the train and putting it into the laser beam."

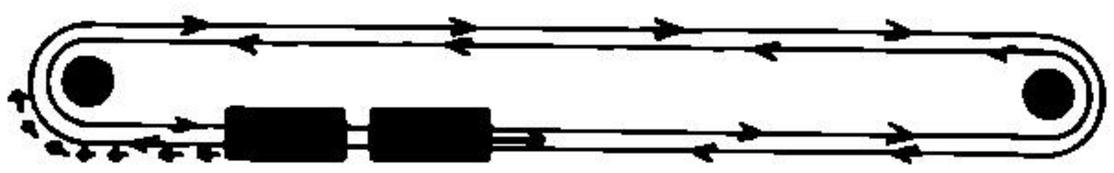


"Suppose a more complex situation. Two trains, one incoming and one departing. The outbound train decelerates, taking energy out of the laser beam and red-shifting it while the incoming train decelerates, putting energy back into the beam and blue-shifting it back to the original green. You see? From that, let's consider an ultra-simple version of the Galactic Railroad. Merely a system for getting from Planet A to Planet B, right? You have to assume that each planet is fairly near a black hole, like this "



"For this simple railroad," he explained, "we have two beams, rings of coherent light without beginning or end. One travels clockwise around the black holes, with the other traveling counterclockwise. Never mind how such a set of light rings could be set in place. The important point is that beams of self-focused light are stable. Once estab-

lished, then, the rings would be perfectly durable structures. Now a star train travels the short distance from Planet A to the light rails and, uh, gets on them. You see? It accelerates by reflecting light out of the counterclockwise band and into the clockwise one, like—well, since I only have this black pen, I'll show the red-shifted light as a dashed line, with simple blocks for the train ''



We stared, impressed, visualizing the train moving east while it sent red-shifted light west and around the horn.

"The train travels one way round at almost the speed of light while the red-shifted light goes the other way around at that speed. Thus, as the train is approaching the part of the light-rails near Planet B, the red-shifted light has come round the other way to meet it. That means the train can decelerate by reflecting the red-shifted light out of the clockwise band into the counterclockwise band, blue-shifting it back to the original color. That puts everything back the way it was. We've traveled from Planet A to B without any net expenditure of energy."

"God," someone nearby muttered, "damn."

I seconded that sentiment, silently.

Not everyone was so impressed. "But," Porky Pig squealed, "sis is sstill impossible! No mirrors couldt vit'standt se power densities involfed! Besides, mit Döppler shift isn't a simple constant. Iss a vunction of felocity."

Our brilliant clown shrugged. "Instead of mirrors they could use optical wavelength linear induction motors. You see? By playing games with the EM field inside the motor, they'd get a constant-independent-of-velocity doppler shift. Of course, from what we see of the Railroad they don't do things that way. Must have some more elegant methods. But that's all details. The important thing is that I've shown the Galactic Railroad can exist because it doesn't violate any fundamental scientific principle."

"Sis iss still nonsentz. You are merely replacing scientific impossibilities mit engineering impossibilities."

Porky, I thought, is one of those guys to whom science is a haven, like a monastery. He accepts the premise that all the answers are known and constant, and likes living in that secure warmth. Speculation is as alien to him as it is to a religious fundamentalist. I shook my head and sighed. My own brain was jumping up and down, clapping its hands.

Our instructor was more patient and equable than I could have been:

"Sure, but you've got to remember who we're dealing with. There's a simple statistical argument showing that if we aren't the only civilization in the Galaxy, then the Others will be *billions* of years ahead of us. Look, try asking the next ten people you see to tell you what a slide rule is. Or was. A slipstick. Try wondering how many engineers in 1950 or so could conceive of a calculator—on a wristwatch or pen! Air travel was considered impossible even *after* the first flights! You see? We can be reasonably sure that these Others, these

Railroaders if you will, won't be able to non-conserve mass-energy or momentum, or break the Second Law of Thermo, or travel faster than light. But that must be considered the only limit. In terms of engineering they will be

godlike!"

It was a good word. Most of us had been listening with something approaching religious awe. With precious little to go on, Intelligence and Analysis had brilliantly unraveled the secrets of the Universe!

The woman behind me had a more practical viewpoint: "Have we any indication as to whether these godlike beings are peaceful or warlike?"

"No."

That one-word answer was followed by a painful silence during which we thought about it while trying not to think about it.

At last the clown-disguised general continued. "The pictures you've seen are all the information we have. For what it's worth, I'd say that anyone who rides on razor blades can't be very aggressive. The beams of laser light they're riding would destroy any solid matter they contact. Obviously they know this, and you will recall that the lines *were* on convergence course with Earth, before they shifted."

Beside me, Pluto asked, "Then how is it possible for the train to travel along the laser beams?"

"We don't know. So far, the best scientific opinion is that it's done the same way porcupines make love. Verry carefully."

Something a bit deeper was bothering me. I raised my hand and received a nod of acknowledgment and invitation.

"That last photo showed the train as having left the tracks," I pointed out. "Is that what this meeting is about? Are They coming to Earth?"

The clown nodded with enough enthusiasm to indicate that he'd been waiting for that question. "Yes! We have three weeks to ready our world to receive visitors. If there are no more questions, I'll give each of you your assignment."

No questions followed that clear invitation to hush—just a lot of muttering that, all together, was a loud mutter. Meeting adjourned. Disneyland dispersed.

As I was leaving I heard Daffy Duck ask the clown, "General, how do I go about shredding the wall?"

"What?!?"

"They're non-washable, sir. If we paint them, all this highly classified information you've written on 'em will be there under the paint and regs clearly call for shredding that kind of information, whether it's structural like a wall or not. I'd just like to know how I'm supposed to effect the shredding. Sir."

I didn't turn around.

As soon as I was away from the safehouse, I broke the seal on my orders and opened them. Inside nestled several pieces of paper. The one on top bore a single line of computer-typed code, and right then I was too excited to remember my own code. That one line would be my orders, the role I would play in the great (and terrible?) day that was coming.

The next item was a check, payable to me. That was quite a surprise. It was

a large check that had to be six months' pay. Still frowning, I inspected the next enclosure, a clearance form. (See the big secretive CIA man walking down the street inspecting one item after another from his bag, like a kid who's just blown the whole five birthday bucks on six or seven candy bars and can't wait to get home before fondling his treasure!)

By that time I had calmed a little, or something had happened; I was able to interpret the code on the clearance form. It advised that I had been under suspicion because I was associated with a singular piece of good luck, which in this business is always assumed to be a trap or result of a leak or chicanery unto treachery, and to be investigated. I'd been investigated. I was fully cleared. The Agency commended me on my reports and for zeal and efficiency on past assignments.

And pays me off, I thought, turning back to my orders. Yes, I could translate easily now; in entirety: YOU WILL WATCH THE 1900 NEWS, ALONE.

The last piece of paper I had almost missed. It was a pink slip. I wished I'd missed it altogether. In lieu of notice I was herewith presented with six months' pay. Good luck. Effective at 1830 tonight, I was No Longer With The Agency. That was like a gut-punch five minutes after an expense-account dinner.

I kept fighting despair and thoughts of injustice by telling myself that all this madness would surely make some sense once I'd seen the seven o'clock news.

Maybe I *wasn't* fired? Maybe I was fired, but ?

The waiting was torture. I'd have preferred the Chinese Water Torture, which would at least have given me something else to think about.

Seeking something else to think about, I went over to the *Crimson* office, where the last issue of the school year was being made up. Helping out killed time. I did love one most interesting news item: Doctor Lawford Sloan, Harvard University Chaplain, had canceled his summer plans and would soon depart for a lecture tour of Australia. Lovely. Even though he might well be right, the U.S. certainly didn't need the kind of well-reasoned panic Ole Lawless would generate. Now, just before ã crisis, he was off on a well-paid lecture tour that would keep him in the Australian Outback for the duration.

Well, maybe he'd improve his tennis game.

It was good to know that my fellow agents were doing their jobs, getting the world ready for Visitors. God! the adventures some of them would be having! During the Chinese Civil War a deranged admiral escaped in their only nuclear submarine. He's still at the bottom of the sea, occasionally sending up absurd demands. Since his nuclear missiles are probably still potent, the whole world has humored him. We've also humored the insane dictator of a Caribbean island. Though he relies chiefly on voodoo, he also has a couple of nuke missiles.

These and a host of other menaces were being neutralized by my fellow CIAs. In countless dire perils *they* were playing their parts in the greatest event in history, while *I* who'd been there at the start was sidelined! Out of it! Zenblast it, it was as bad as living with

Sonya Laskowski's incredible soma and not getting to lay her!

I was to watch the news alone. When I left *Crimson* make-up, Sonya was still there, lecturing some poor dog while she munched away at a pizza out of a big white box marked with a circle K: I went home (or "home," as I hadn't yet moved out of my school-year room), snarled at the pair of male jeans—not mine—hanging on the doorknob, and realized it was 1830 hours. I was almost a graduate—and out of work, fired effective this instant.

No no, I was an employee of *The New York Times*. Or about to be. Now it was still a half hour until the news, and I knew that each of those thirty minutes would be an hour long.

I started cleaning up the place. It needed it. I'm not big on housekeeping and Sonya thinks it's obscene. For a woman, I mean. Besides, the work would kill time and keep me busy enough to stay warm. (The dorm had heat only from 2000 to 2200 and even this tiny energy consumption by us Harvards provokes the envy/anger of the locals—who have to make do with still less.) Under my bed I found a two-year-old copy of *Playperson* and a couple of socks of the same vintage. They didn't match. After throwing the latter into my drawer, I put away the jeans Sonya'd taken off some poor would-be-underpants-raider a couple of weeks ago, and sprawled on my bed to leaf through the other.

As I reached toward my reading lamp, my fingers touched the switch and I froze in heart-stopped horror. Sonya was always running our electricity ration down to almost nothing—what if she hadn't left me enough to watch the all-important TV news?

To my relief the electricity meter, though down, wasn't dangerously close to Out. Good. I hated having to bypass the thing since there'd be the very Nixon to pay if I ever got caught.

I jittered until the old set came on like dawn anywhere except Mandalay: slow and gray. Since I hadn't been told which channel to watch, it was obvious what was going to happen. I tuned NBC, which came in best on that set. The newscast was just beginning. Three minutes in, the expected interruption came. We viewers were asked to stand by for an Important Message from the President of the United States (who has learned better than to interrupt prime-time sitcoms or the New Thing: Westerns).

President Fairborne appeared. He smiled. I saw that he was trying to radiate confidence while looking just a bit haggard. Presidents do suffer from using second-rate cosmeticians and not importing them from Hollywood! He began: I sat and kept my fingernails away from my mouth.

"My fellow Americans. I come to you tonight with great news. An event will soon occur that is unprecedented in human history.

"Basically the only parallel is the arrival of Marco Polo in China."

(I wondered how long it had taken Fairborne's speech writers to come up with that comparison. Marco Polo in China is the only case in which two totally different cultures met and neither was destroyed.)

"Even as I speak to you, the Soviet First Secretary, the Prime Minister of

the United Kingdom, the Premier of Italy, and the King of United Eire; all this planet's heads of state; are addressing their people. As you know, a strange phenomena has appeared in our heavens.''

Fairborne told the story rapidly, concluding with the photos I had seen this afternoon.

''Fortunately, we may be confident that our Visitors are not invaders. Basically their spacecraft are exactly that: vessels for travel through space. These photographs have been extensively studied by Our Pentagon's photo interpretation experts, and I am assured that the Visitors' ships do *not* have rocket engines. Nor do they possess any means by which they could land or take off from our beloved Earth. It is now evident that they basically expect us to meet them halfway. They will basically park, as it were, in an orbit above the Earth, and we will go out to meet and trade with them.''

Fairborne glanced back toward the giant portrait of Lincoln behind him.

''Our Martyred President once said, 'The precedents of the tranquil past are inadequate to the stormy present. As our case is new so we must think anew and act anew.' That, my fellow Americans, is basically true of our present situation. It would be disaster were the nations of this world to compete with one another, offering the wealth of Earth to our Visitors at bargain rates.''

I watched the flash of the famous smile, of which every president has one.

''Accordingly, the United States and the Soviet Union will introduce a joint resolution at tomorrow's meeting of the United Nations. Basically this resolution will call for all trading with the Visitors to be controlled by the U.N. Any unauthorized contact with the Visitors will be forbidden on pain of nuclear sanctions. The General Assembly will possess the ultimate authority to approve any transaction with the Visitors, while the United States and the Soviet Union will act jointly as negotiators with our Visitors.

''I do not need to tell you that these will basically be the most important and difficult negotiations in history. The American team will be headed by Secretary of State Windhorn and will include suitable experts from within and outside the State Department. For security reasons, there will be present also a military expert from the Defense Intelligence Agency. Other than that, this will be in entirety a State Department exercise.''

Fairborne went on to say nothing for several (basically) inspirational moments before he broke for questions from the White House press corps. Two of the questions were most personally interesting.

''Mr. President, the C.I.A.,'' this fellow said, carefully pronouncing each initial as a separate entity, ''has been called this nation's invisible government. But from your description they will not even be represented in the First Contact Astronaut Team.''

''This is correct. Obviously the agency is basically not delighted, but I have given strict orders, and I represent this nation's *visible* government.''

After the laughter, UPI identified herself. ''What about press representation?''

"Oh, we didn't forget you! The First Contact Team will include one American reporter, chosen by lottery, and one from *Pravda*."

"My god." That voice, I eventually realized, came from my own open mouth, which remained open.

I was in semi-shock after the president's speech, while a group of dark-suited "experts" sought importance by speculating as to what the Visitors might be. They had only one fact to go on, really: from the observed color changes of the light rails, it could be calculated that the Star Train had decelerated *at* 320g on entering our solar system.

Three hundred twenty times Earth's gravity! What kind of creatures could withstand such extreme acceleration/deceleration? Jellyfish? A creature that lived in water and was uniformly the same density as water, one dark-suit wisely pointed out, would be immune to acceleration.

Yeah, maybe.

Or maybe life cannot travel between the stars, among the suns. Perhaps only machines have the requisite strength for such mighty voyages through and across the parsec abyss. Or again—maybe the Aliens traveled in suspended animation, hurtling across the interstellar void while frozen hard as a TV dinner. Or maybe

Maybe a dozen other wonders; strange wonders.

There was one interesting discussion between Carl Sagan and NBC's ancient frozen-faced anchor woman, who can now smile thanks to a triumph of special effects systemry.

Sagan: "What we're now seeing is

proof of something I discussed in several of my books. The Galaxy as a whole is civilized. This Railroad, which They have been building for mill-ions of years, spans our Island Universe like a great spider web."

She: "B*u*t haven't you contradicted yourself? On the one hand you say the building of the Railroad has been going on for a terribly long tieem. B*u*t on the other hand the Railroad has appeared instantly in our skyee."

He: "Ahh, we must consider lightspeed. Whatever incredibly mighty engine the Galactics use to lay the lightrails, it must travel only at a speed slightly less than light. Since the Galaxy is twenty-five thousand lightyears across, laying the rails of light takes mill-ions of years. The rails, however, are visible only by photon-scattering, a weak process. With our best telescopes we can see only five bill-ion kilomeeters of the track. They could lay that much in less than five hours."

She: "B*u*t—"

The newscast was made to last until 2000 hours for the sake of regularly scheduled dreck, at which time my phone burred. I glanced at it, switched off the TV and the popular "A Family Has Their Days," and picked up the phone. I has my days, too.

The New York Times, I was unastonished to hear, had won the lottery and designated me as its Outer Space Correspondent.

By 2113 I was on a plane for Houston to begin astronaut training. The plane reservation had been made long before.

TO BE CONTINUED

Jay Kay Klein's biolog

Andrew J. Offutt

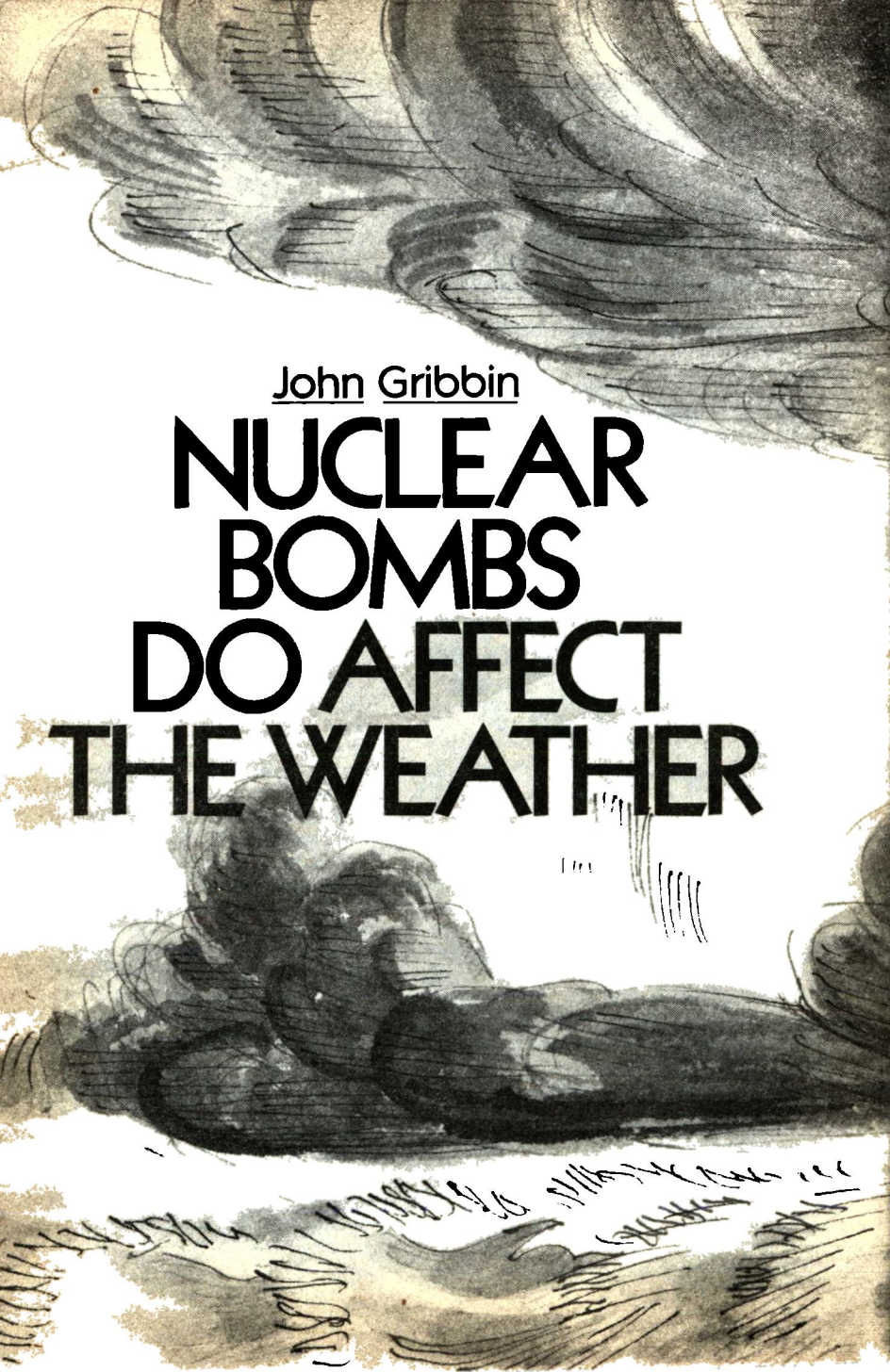
Andrew J. Offutt is one of nature's rare creations: a person who bubbles over with fun, good humor, and enthusiasm for the enjoyment of each day. A life-long resident of Kentucky, Andy has named his home—a huge brick structure miles from even a small town, set on 3½ acres in the Daniel Boone National Forest area of the Cumberland Mountain foothills—"The Funny Farm."

Not unnaturally, science fiction fans are especially fond of writers who are outgoing, good-natured, and possessed of a quick wit. The result, at this writing, is Andy's having been guest of honor at 51 science fiction conventions. He was Master of Ceremonies at the award banquet for the 1974 World Science Fiction Convention and later performed the same function for a World Fantasy Convention.

Andy writes both science fiction and fantasy, often in collaboration with Richard K. Lyon, a research chemist. Strangely enough, the two first met *after* they'd written and sold the first of their four novels. The scientist half of the team brims with ideas, while Andy provides the torrent of well-modulated words that frames an imaginative setting—as might be expected of someone whose studies lie in English, linguistics, psychology, and history.

He started writing at age eight and never stopped. For a while, he tried conventional means of livelihood: salesman for the Foods Division of Proctor & Gamble, salesman of life and hospitalization insurance, and even boss of three insurance agencies in three cities. When he found himself writing more and more frantically to "get away" from the business world, he turned full-time writer and for the past ten years has been able to work happily at what used to be his major hobbies: writing and talking. His first science fiction story appeared in a now-defunct magazine, with a first *Analog* appearance in October 1974. Andy served two terms as president of the Science Fiction Writers of America and is currently the "science fiction and fantasy department" of the *Writers' Digest* Criticism Service.

A prolific writer, Andy has several more novels coming off his typewriter. The most recently published is *Web of the Spider*, with Richard Lyon, from Timescape Books.


John Gribbin
NUCLEAR BOMBS DO AFFECT THE WEATHER


Weather interactions are by no means simple, but...if aerosol bug bombs can break down the ozone layer, what might something more potent do?
Leo Summers

Readers with long memories may recall that, back in the early '60s, a run of bad weather coincided with the peak of nuclear bomb testing in the atmosphere by the superpowers. Ordinary people were quick to suspect a link; professional meteorologists were equally quick to dismiss this as an old wives' tale, pointing out that a typical hurricane incorporates far more energy than a handful of nuclear bombs, and that therefore the energy released in nuclear explosions couldn't possibly upset the workings of the weather machine.

That opinion became enshrined in the textbooks, and has been handed down as the received wisdom to a new generation of meteorologists, while the signing of the partial test ban treaty and subsequent shortage of atmospheric nuclear explosions (except for a few by France and China) meant that there was no opportunity in the 1970s to check out the received wisdom by monitoring events in the atmosphere. But the textbook view began to look a little suspect when atmospheric scientists started to be concerned about the possible effects on the ozone layer, and thereby on the overall workings of the atmosphere, of the release of propellants (fluorocarbons) from spray cans and nitrogen oxides from the exhausts of high-flying supersonic aircraft. Most of the headlines generated by the doomsday brigade concerned the scare that weakening the ozone layer might increase the incidence of skin cancer by allowing more solar ultraviolet radiation through to the ground.

But relatively unsung calculations published in various specialist journals focused on the related problem that, since the absorption of solar UV in the stratosphere accounts for about two percent of incoming solar energy, a dramatic change in ozone concentration might have a significant effect on the weather—one percent more or less energy getting through the stratosphere to the troposphere, the weather layer of the atmosphere, could change mean temperatures by a degree or so centigrade. Now, twenty years after those old wives' tales were dismissed so scornfully by the meteorological establishment, two Soviet scientists have put two and two together and come up with a startling conclusion. If nuclear bomb tests disrupted the chemical balance of the stratosphere, they could indeed have had a pronounced influence on the weather on Earth. The amount of energy released has no relevance to the calculation, just as the amount of energy involved in releasing sprays from aerosol cans is irrelevant to the ozone debate. What matters is the effect on the way the stratosphere absorbs energy from the Sun.

The new calculations, from Professor K.Ya. Kondratyev, of the Main Geophysical Observatory in Leningrad, and Dr. G. A. Nikolsky, of Leningrad University, hark back to a study they carried out in the late 1960s, using a series of balloon flights to make measurements of the radiation coming in from the Sun high above the troposphere, within the stratosphere itself. The instruments carried on these unmanned balloons to altitudes of 30 to 35 km showed a small but significant variation in the heat received from year to year. It looked at the time as if the

Sun's output might actually be varying by one or two percent over the course of its roughly eleven-year-long cycle of activity (the sunspot cycle), and these observations confirmed other observations made from the ground. Such changes in the amount of heat received at the Earth from the Sun would be sufficient to account for the changes between the severe cold of the Little Ice Age, in the late 17th century, and the relative warmth of the mid-20th century. And, indeed, the Sun was known to have been very quiet, showing little in the way of sunspots or other signs of activity, during the Little Ice Age.

Climatologists were delighted by the balloon evidence, but astronomers were amazed at the suggestion that the Sun could be a variable star flickering by as much as two percent on a timescale of decades and centuries—all their theories said this was impossible. So it was the turn of the astronomers to be delighted, and the climatologists to be baffled, when measurements from the satellites Nimbus-6 and Nimbus-7 showed in the late 1970s that the Sun's output, measured from outside the Earth's atmosphere altogether, varies by no more than a few tenths of a percent. If the measurements at balloon altitudes show a one or two percent variation in heat received, that can be only because even the tenuous atmosphere remaining above 30 km is not only absorbing significant amounts of the incoming radiation, but different amounts of radiation (heat) at different times. What could be the basis of this variable absorption of energy in the stratosphere?

By the time they were faced with this dilemma, Kondratyev and Nikolsky had the benefit of all the studies of tropospheric chemistry carried out in the 1970s in the wake of the ozone scare. The most relevant ones seemed to be those relating to the nitrogen oxides produced by SST exhausts and also produced in large quantities by nuclear explosions. Calculations made in the early 1970s had shown that large quantities of these oxides—collectively dubbed NO_x—are injected into the stratosphere by the rising fireball of a nuclear explosion. One effect of NO_x in the stratosphere is to absorb solar energy as the molecules take part in a series of photochemical reactions which, among other things, break down ozone in the stratosphere into ordinary di-atomic molecular oxygen. Could this effect alone account for the cooling of the northern hemisphere in the early 1960s? According to the latest calculations from the Soviet team, the answer is "yes."

The fireball from an atmospheric nuclear explosion reaches 35-45 km into the atmosphere, penetrating just the region of interest. Each megaton (Mt) equivalent of explosion produces about 10^{32} molecules of NO_x (1 followed by 32 zeroes), and in the months before the atmospheric test ban treaty came into force in 1963, 340 Mt of nuclear weapons were exploded in the atmosphere, generating 5×10^{34} molecules, or 1½ million tons, of nitrogen oxides in the stratosphere. But this was only the grand finale of a decade of nuclear weapons testing, and Kondratyev and Nikolsky calculate that by 1963 the total burden in the stratosphere due to all the bombs tested in the 1950s and early 1960s

amounted to the equivalent of 980 Mt exploded in one year. Each square centimeter of the Earth between 25°N and 85°N carried, by the end of 1963, a burden of 10^{17} molecules of NO_x in the air above it, sufficient to reduce the flux of incoming solar energy at balloon altitudes (the top of the troposphere) by 2½ percent.

All this fits in neatly with the balloon observations in the 1960s, which show increasing solar flux from 1964 to the end of the decade. It seems it was just a coincidence that the Sun's activity was also increasing at that time, peaking out in 1969. And the pattern also fits the way the weather changed over the same period.

Taking the northern hemisphere as a whole, the winter for 1962-3 was 0.4°C colder than the average for the preceding two decades, while rocket observations showed that the stratospheric temperature in 1963-4 was 6°C greater than the average for the next 12 years. Solar energy absorbed in the stratosphere cannot reach the ground, so this pattern of warm stratosphere/cold troposphere exactly fits the model of energy absorption by bomb NO_x. And in the years following 1963, while the troposphere warmed, the temperature in the stratosphere at altitudes between 46 and 55 km fell at all latitudes in the northern hemisphere.

The meteorologists have not, as yet, exactly fallen with cries of delight upon this new theory linking nuclear explosions and the weather. This may be partly because of the source of the work, which has not yet been formally published in the West, and partly because by now "everybody knows" that nuclear bombs don't affect the weather. But the implications extend far outside the field of meteorology, for as Kondratyev and Nikolsky point out, it is simple to extend their calculation to predict the effect on global climate of an all-out nuclear exchange—at atomic war. In such a situation, there would be a decrease in global mean temperatures of between 5 and 10°C, conceivably sufficient to initiate a new Ice Age, and certainly enough to produce disastrous consequences for the economic and agricultural activies of any survivors.

At present, the Russians are investigating the intriguing possibility that a related mechanism may, after all, explain the apparent links between solar activity and the weather. Particles penetrating the stratosphere from space —cosmic rays—can also produce nitrogen oxides which effectively absorb solar heat, and when the Sun is quiet—as in the Little Ice Age—the absence of a strong solar wind blowing out into space leaves the field free for cosmic rays to plough into the atmosphere and do their worst. The story is far from being told yet. But here and now the main value of the work so far may be as input to the calculations of the generals and politicians. No matter how good your first or second strike capability may be, no matter how effective your anti-missile systems and your underground bunkers, how can anyone "win" a war if the result is the creation of Ice Age conditions on Earth? ■

Dr. John Gribbin is a freelance writer based in England. His latest book, Future Weather, *is published in 1982 by Delacorte.*

It's Your Life. Run It!

On Running & Fitness Day.

Take Charge of Your Life!

Join hundreds of thousands of Americans in a nationwide celebration of running and the fun of exercise. Make a personal commitment to a healthful and high-quality lifestyle today. Be part of Running & Fitness Day events in your community on October 9.

Fitness is the right choice for everyone. . .from the youngest family member to the oldest, for people of all levels of interest and ability, and from all walks of life.

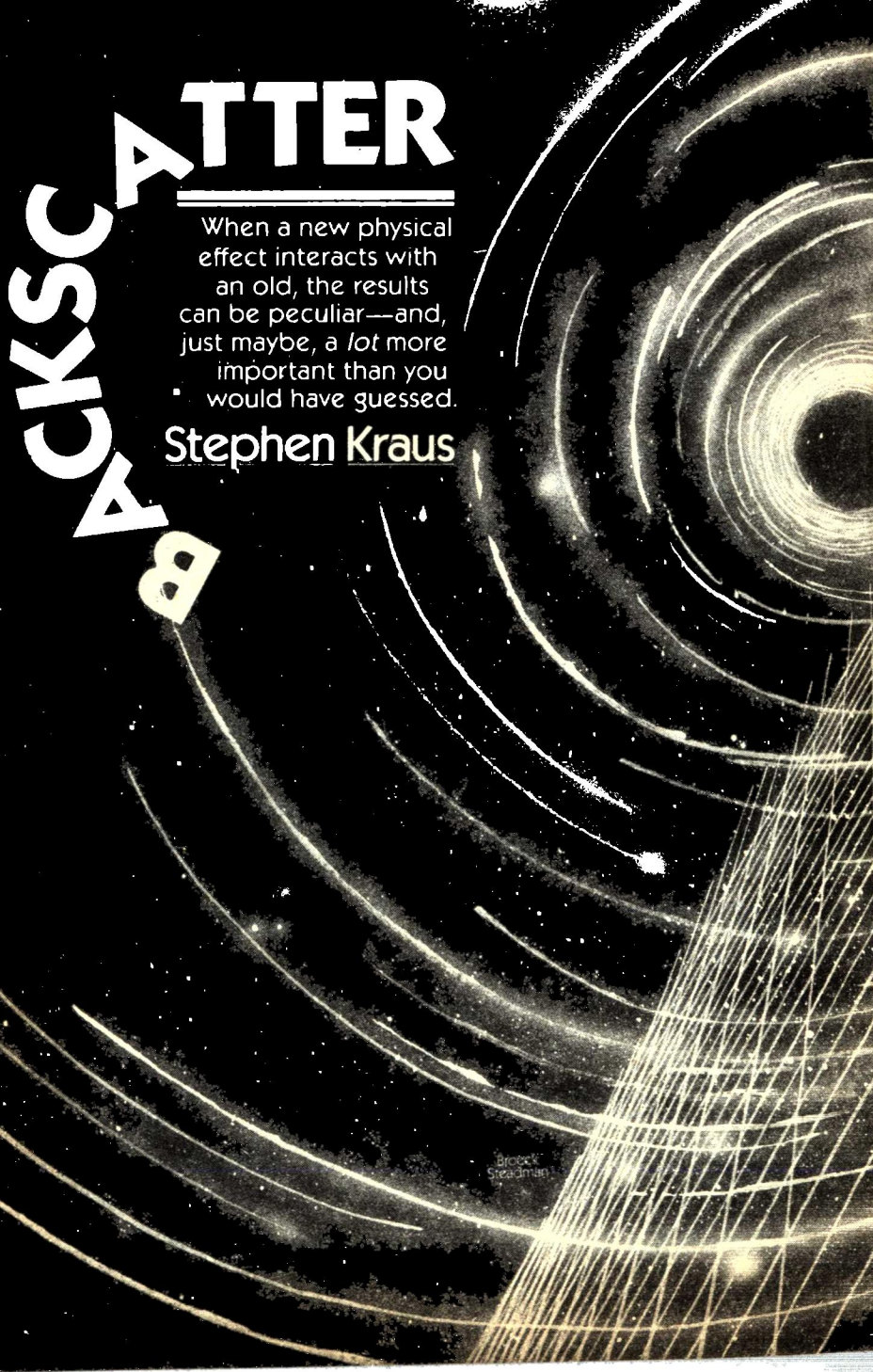
For more information about Running & Fitness Day events in your area, write or call the American Running & Fitness Association, 2420 K Street, N.W., Washington, D.C. 20037, (202) 965-3430.

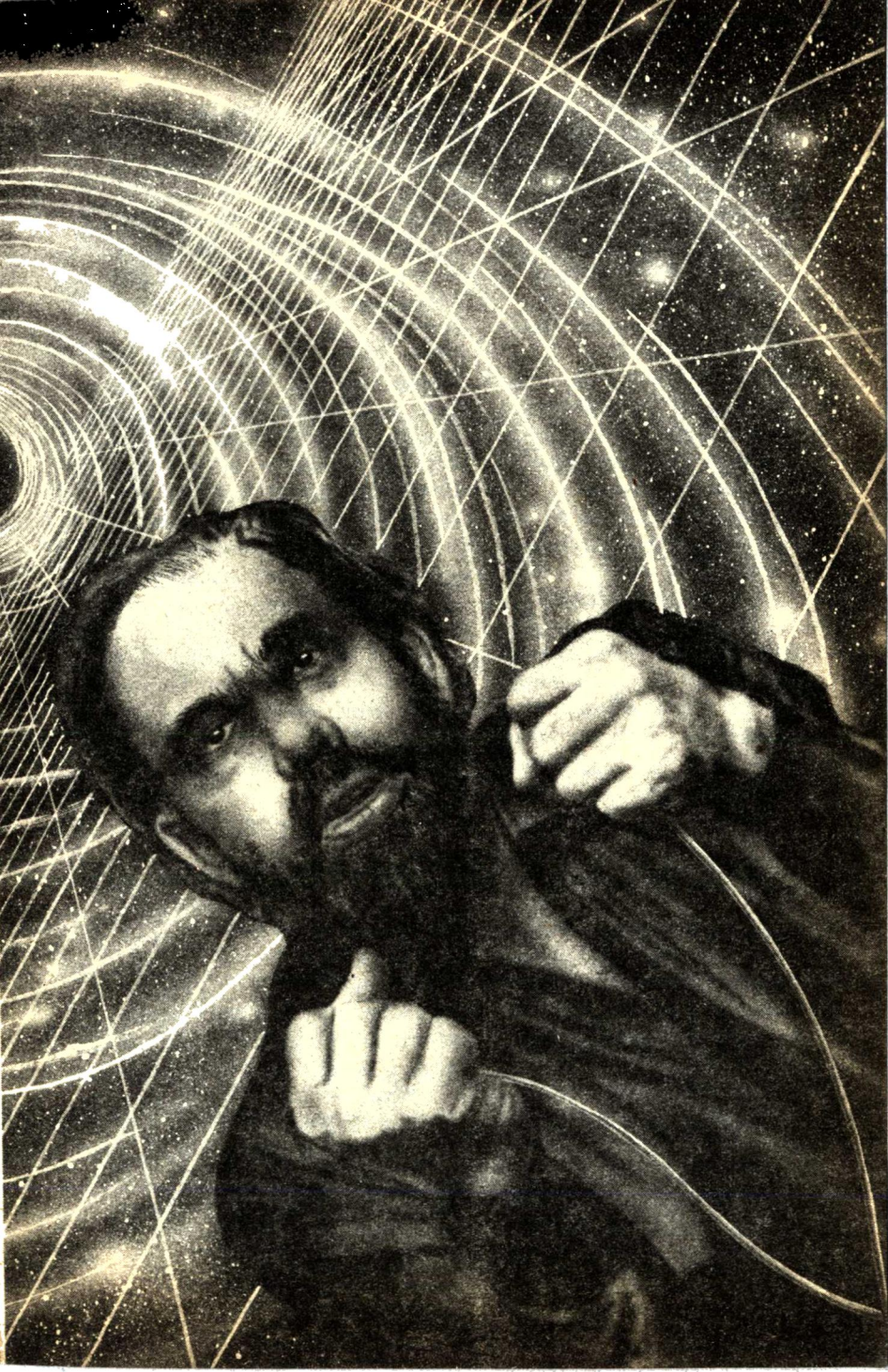
Running & Fitness Day, October 9, 1982

BACKSCATTER

When a new physical effect interacts with an old, the results can be peculiar—and, just maybe, a *lot* more important than you would have guessed.

Stephen Kraus





If you'd walked in just then you might have noticed me heading back toward the bar from the phone booth, having already forgotten exactly why she had said she couldn't make it that evening (something about her cat?); followed every inch of the way by an ungainly, impossibly raucous fly, circling and intoning some lunatic fly-prayer for better luck in its next incarnation.

Double scotches followed on my return. The fly stayed. I took ineffectual swipes at it between gulps, staring at our grim reflections in the mirror behind the bar in an effort to confuse it.

After a while the fellow on my left cleared his throat. "There's something I've observed about flies," he said. "They take off almost backwards."

I looked up, blackly. He was fortyish, nondescriptly dressed, stocky and balding. Competent in a quiet, morose way: the fellow you'd give the ball to on a third-and-one. I hadn't even noticed him come in.

"If you sneak up on them from behind you cut off their angle of retreat. May I?"

"Be my guest," I said. "It's not my fly."

His hand blurred, swift and efficient, rattling whisky glasses. The resulting black-and-silver corpse dropped straight to the floor. We drank in silence for some time after that; solemnly, I felt, in memory of the fly.

Eventually, I figured, what the hell. "Haven't seen you here before, new in town?"

His residential status turned out to be more complicated than I could have imagined. I did learn, however, that he was blessed with a red Subaru wagon, a new sheepskin jacket, and the last name of Rogers. He, in turn, got to hear most of my problems.

At some point during the trouble-litany, he developed a consuming interest in the bottom of his glass. Eventually I shut up and let him say what was on his mind.

"Do I seem irrational or mentally unstable in any way?" he asked. Which wasn't at all what I was expecting. It occurred to me that no one had ever asked my opinion on that particular matter before, though, as it happened, part of my multifaceted career since I left the aircraft industry had been spent as an orderly in a state mental hospital.

"No," I said, evenly. "Why do you ask?"

He gave me an odd look. "Just checking. I'm never sure how I appear to other people. Are you in a hurry?"

"Not at all."

He did some more staring into the bottom of his glass. "Would you believe me if I told you that I'm going to be an astronaut?"

I looked at him more carefully. A loner: lines worn deep into a melancholy smile, hands that had never asked for help from anybody. Not really my idea of an astronaut. "I'd have to say you looked a little old, but I don't know." And if it hadn't been such a long day I might have shut my mouth at that point. What I said was: "How far away would the horizon be if you were in orbit, say, two hundred kilometers high?"

He looked up from his drink and gave me a grin that went from one side of his head to the other.

"It's equal to the square-root of the product of the observer's height above the surface with the radius of the Earth, or proportional to it, anyway; there might be a factor of two in there. Hold on." He pulled out a pen and set to work on a corner of a cocktail napkin. "Right, square-root of two, neglecting the cross-term let's see about 1590 kilometers."

"Looks right." It did actually. This was getting interesting. "Tell me about the largest asteroid."

"Ceres. Diameter circa 1,025 kilometers; 2.77 astronomical units from the Sun, average; carbonaceous composition. Never been there myself. They tell me it looks like a rock."

I also know when to give up. "All right, you're an astronaut."

"Not am, will be. Or even less accurately, was. I'm a time traveller as well; the tenses get confusing."

My eyebrows arched skeptically. "Really? What time do you come from?"

"I left home, that is to say Earth, in the year 2352."

"No kidding. Have any good stock tips?"

He looked deadly serious. "Don't buy IBM. Everything they make will be obsolete inside of fifty years. I'm not going to say why."

"Just tell me that the aluminum siding business is safe for a few more months."

"Aluminum siding?"

"I sell aluminum siding, yes. I used to be an aerospace engineer in Seattle. Now I live out here and sell aluminum siding."

His face turned disturbingly unexpressive. "Any chance of getting your old job back? I understand things have gotten better."

"I'm doing all right here."

He shrugged. "Perhaps an ex-aerospace engineer would be interested in how my spaceship drive worked?"

"He'd be fascinated."

"Okay. How's your special relativity?"

"Haven't had much use for it lately."

"You must remember this, though." He drew a set of cartesian coordinates and labeled the x-axis DISTANCE and the y-axis TIME. "Let's say that the origin is this bar, right now." He put his pen on the intersection of the two axes. "We're just sitting here, but time is chugging along at its usual rate—nothing we can do about that. So our trajectory in space-time is a straight line, right along the time axis." The pen moved steadily upwards as he talked. "No problem there. If we went for a walk at a constant velocity, we'd be making a slight angle with respect to the time axis—because we'd be moving in space as well as time, right?—the faster we go, the greater the angle.

"Now I'm going to mark off the time axis in units of seconds and the distance axis in units of *light-seconds*. That way a light ray's trajectory makes a forty-five degree angle to both axes. It's moving one light-second per second, which is as fast as you can go—almost." His fingers moved deftly, sure of their responsibilities.

"The next step is to spin the forty-five degree path around the time axis, making what's called a light cone. It's a lovely, bittersweet concept, that cone. No matter what you do, your future-self

is trapped inside forever; no escape, no hope.''

It was starting to come back. ''Sure. Because you'd have to move faster than the speed of light to get out. That's for a two-dimensional world, isn't it? In three-dimensional space the cone is really a sphere.''

''Exactly. A sphere expanding at three-times-ten-to-the-tenth centimeters per second, and you have to imagine the time axis going off into the fourth dimension. But I can't draw all that on a napkin.'' He looked annoyed.

''Whatever.''

''Yeah. Well, there's a past light cone too, extending below the distance axis. That one's even grimmer—not only have you been stuck inside ever since you started growing vertebrae, but everything that's affected you, ever, happened in there too. And it's too late to get out, of course.'' He smiled for the second time that evening; nice even rows of teeth. ''Unless you have a ship like mine.''

''Your ship goes faster than the speed of light, then? I thought it traveled in time.''

''It does both. It has to. Otherwise you've got problems. You can't just back up in time and stay in the same place. What does that mean, anyway? If you start here, the Earth rotates; go back six hours and you're going to end up as shark food, right? Plus the Earth goes around the Sun, the continents drift, the Sun moves through the galaxy. What does 'the same place' mean?''

I admitted, complacently, that I'd never given it much thought.

''You never had to design a faster-than-light drive. And of course there's the problem of your machine going back in time and landing on your grandfather, age six, on its arrival. What happens then?''

Hmmm. ''But aren't you here four hundred years early or something?''

''I was getting to that.''

Both our glasses were empty. I was pleased to note that the fact had escaped my attention for at least two or three minutes. I motioned to the bartender.

''*The way to travel in time is to also travel in space*. As long as you're moving faster than light there are never any paradoxes. You're confused. Your eyebrows are very articulate.''

Articulate eyebrows. Terrific.

''It's simple. Fly off at twice the speed of light, but backwards in time—let's say you gain one year for every three light-years you travel. All right? But after three years you run into a meteor—makes a big hole in your ship. You manage to get to the comm laser before you pass out and get off a message to yourself back on Earth (you're not due to take off for another year, remember)—something to the effect that it would be a good idea to stay home. Very heroic, but it doesn't do you a bit of good. You're three light-years away so your laser message won't reach Earth until two years after you've left.''

He made a tragic gesture with his non-drinking hand.

''Got all that?''

''I think so. It's the same thing if I fly let's see, west, faster than the Earth spins; leave New York at noon, get to L.A. at eleven A.M., say. It's only eleven local time though—I couldn't

call myself at the airport in New York before I took off.''

He regarded me for a second with another of his strange expressions—one I generously took to indicate new and profound respect for my reasoning abilities. Gears spun briefly. ''Good. Notice that the direction's critical—your analogy doesn't work if you fly to Montreal. Time has its up- and down-stream directions too. In Einsteinian space the time-reversing directions are along the downward geodesics.''

''Naturally.''

''I was going to explain that.'' He drummed his fingers on the bar. ''Okay. Stretch out a rubber sheet parallel to the floor and drop a grapefruit on it—know this one?''

I didn't.

''The grapefruit deforms the sheet in the same way that a massive object deforms the space around it. Put a marble nearby and it rolls toward the grapefruit—gravity. Simple. Kick it sideways hard enough and it goes into orbit. The most downhill trajectory is the magic direction: the Path, as the physicists referred to it. Go off that way and you can really make time, so to speak.''

''Except that you'd plow straight into the ground,'' I objected mildly.

''Yes, well, you've got to get far enough away from the Earth's potential well first—the Sun's, too. Then the general curvature of the universe takes over.''

''Which way is that?''

He thought for a bit, then pointed to a spot on the ceiling just in front of the men's room. ''Since you asked.

''All you need is an engine that exploits the time-directionality.''

''Your engine?''

''Right.''

''Uses tachyons, I'll bet.''

His voice made sounds like rusty ball bearings. ''No, as a matter of fact, it uses antimatter; stored as a plasma swimming around in a magnetic bottle. Tachyons don't exist.''

Oh.

''Actually, the principle behind the antimatter field engine is going to come out pretty soon—buried in a particle physics paper in an Indian journal. Took the engineers more than a hundred years to dig it up and turn it into an engine. It was called the Cayley drive by then.''

''Cayley wrote the paper?''

''He owned the company.''

It was the first thing he'd said that I believed.

''Anyway, if you point your Cayley drive in that direction,'' he indicated the ceiling again, ''you'll be on the most time-reversing trajectory in space-time: just a hair outside the past light-cone, following a light ray traveling in the same direction, but backwards in time. And if you head back on that trajectory, you'll be paddling upstream timewise —essentially following the same light-ray back into the present, so that you'll arrive at nearly the same time you left.''

paddling upstream timewise

I ran that back and forth inside my head a few times.

''You're confused again. Don't worry about it. You don't really want to take the Path anyway—it's only a touch faster than light. The trick is to follow the distance axis; that way you can travel a finite distance in zero time —infinite velocity. What's more, there's

a whole plane of directions you can do that in."

I looked dubiously at his diagram, which by this time resembled so much chickenwire. "If you say so."

"Right. You can't do that either, of course; you can never find exactly the right vector. Uncertainty principle. But you can get pretty close. The Cayley engines we e all optimized that way."

He leaned back and contemplated his straight bourbon, dark eyes staring pensively from his broad, homely face. He looked, I realized, just like a man who was about to tell a long story.

"When I was born there had been three Cayley engines built, all more than a century earlier. The first was designed for unmanned testing. The Flight Technology people spent a year and a half connecting up subsystems and monitoring the strange electromagnetic fields it was all producing. Finally they pointed the active section the hell away from them and turned it on. Everybody expected it to glow pink and explode. But it didn't. It disappeared right on schedule. There was quite a party, I understand."

"I'll bet." I believed that part too.

"That was so encouraging they built a bigger engine and put it inside a one-man scout ship, or sort of around it actually. They were using similar ships in the asteroid belt at the time, I believe. This one had chemical fuel rockets that could be used on a planet with Earth gravity and soft landing equipment in addition to the regular fusion drive."

"Why did it need a fusion drive? To get away from the Sun?"

"Right, and to steer it—I should have explained that earlier. Whichever direction the Cayley drive is pointed in when you start it up, that's the way it goes. The fuel usage is fixed by the local geometry and the mass inside the field. Trivial to control; just keep the antimatter flowing in at the right rate. It's the navigation that's tricky—the stars Doppler up at you awfully fast. The only thing to do sometimes is shut down and figure out where you are, then adjust the course and re-engage. The computer can handle most of that, but you do it anyway to feel useful.

"You can imagine how excited everyone was back then—especially when you consider the condition of the Earth at the time. Goddamn mess. Nitrous oxide instead of air, sludge for groundwater. People suddenly started seeing space colonization as some sort of salvation."

"Weren't the asteroids settled? I thought you said something about them."

"Sure, but they couldn't support much of a population. There just weren't enough asteroids of chondritic composition."

"What are those?"

"Asteroids with hydrated minerals to extract water from, and hydrogen for fuel and organic compounds you can turn into mulch to grow plants in. And you need big self-contained life-support systems and lots of spare parts, too. Very expensive.

"Mostly, though, I don't think many people found the asteroid prospect very attractive. Space colonization to them meant an Earth-like world rolling beneath a bucolic yellow sun—you know, mist-shrouded cliffs and primeval forest, vaguely Triassic fauna."

That, I had to admit, sounded about right.

"And of course that's the picture they paraded in front of the government whenever the project started running low on funds. The scout was supposed to go off and find a place like that, then come back and tell everybody about it.

"The ship was named the *Isis* by its first pilot, Ahmed Salaam, a delicate-looking Egyptian engineer with a taste for filthy black cigars (the cabin still smelled of them a hundred years later). He crawled into the scout one November about 2240 and took off amid general adulation, optimism, and so forth. The scientists were sweating mortar fragments. No one had any idea what effect a Cayley drive would have on a living organism—one theory had it that the poor fellow was going to come back turned inside out."

"He didn't, I take it."

"No. He accelerated out to the orbit of Neptune, turned on the drive, and that was the last anyone heard from him for almost eight years.

"People were beginning to forget the whole project when he turned up somewhere around Jupiter. Radio messages went back and forth maddeningly slowly for a few weeks. Yes, everything had worked perfectly. He'd stayed on the high-density plane that took him toward the galactic center and followed a more roundabout path back. He beamed back data on particle fluxes and variable stars, synchrotron sources and so on. The astrophysicists were rapturous. Beyond that he wouldn't say a word. New planets had to wait until after the confetti."

"Bad news?"

"Yes and no. There were plenty of planets out there, and a fair number were within the right range of mass and distance from the right kind of sun. But the funny thing was that they all had methane-ammonia atmospheres. For three hundred light-years in any direction, Earth seemed to be the only nitrogen-oxygen real estate going. Sounds a little strange, doesn't it? But never mind, there were lots of explanations.

"Poor Salaam, though. No one had much use for him after that. But the environmental engineers figured, a little wistfully, that it wasn't such a big problem. All you have to do is introduce a lot of blue-green algae into the oceans, discourage anything that wants to kill it off, and eventually you get nice, breathable air."

"How long does that take?"

"Several thousand years, I'm afraid. In the meantime the colonists have to live under glass like so many roast pheasants. But that's not so bad, really. There is an indigenous atmosphere, even if it's the wrong one; and there's water and gravity and the temperature is tolerable. Still, the colonists could count on a couple of hundred generations in a very restrictive environment.

"But things were pretty desperate by that time; people were about ready to try anything. Somehow the government managed to build a huge Cayley engine out in Earth orbit, and a ship with a life-support system for two thousand people, and algae tanks and all the rest. That took more than forty years. Construction got hung up and side-tracked and cost-overrunned about ten thousand times. At one point all the antimatter

got put into bombs. Almost got used, too.''

''How do you make antimatter?''

''Same way you do now. Accelerate electrons in an electric field, slam them into a target of some sort, put the shower of particles that comes out through a magnetic field; pick out the positrons by which way they bend. Simple. Just takes a while. The project got to be something of an institution, like building pyramids.

''Meanwhile, they studied Salaam's reports and picked out a particularly pleasant-looking planet in orbit around α-Aurigae, about forty-five light-years from here, and a crew of two thousand brilliant, gregarious Greek gods from something like a hundred million applicants. They didn't have a clue what to train them for, of course, so they just kept them busy somehow until the ship was ready to go. That was in 2287, May 12—Frontier Day thereafter. Banks closed, fireworks.

''I was about fifteen when the first messages should have arrived from α-Aurigae. The trip itself was only supposed to take a few months, but there was no way to align the comm laser until planetfall. We'd have to wait forty-five years after that for messages to arrive. Then the ship would come back for another load of colonists a short time later—as soon as the colony could generate enough antimatter.

''We didn't hear a damned thing. Not then, not for five more years after that. We were all pretty depressed. Two thousand people! —Not to mention a century of research and God knows how many billions of dollars. But it was more than that. For a lot of us the *Frontier* had seemed the only hope we had. There'd been endless political troubles in the intervening years. Food shortages were the real problem, although that wasn't obvious at the time. The populations with the worst deficiencies were too apathetic to do any harm, of course, but we were getting a hard time from everyone who figured they'd be next. We were in the process of wiping them out while I was growing up.''

''Good for us.''

''Yeah. But space travel had gone belly-up in the meantime—no interplanetary flights to speak of, the belt colonies failing one by one. The scout ship was supposed to have flown half a dozen missions by then. In fact, everybody had more or less forgotten how it worked. We had to set up a lab straight out of scratch to relearn relativity engineering.''

''Where did you get the money?''

''From a few rich old codgers who still had some emotion tied up in space flight after all those years. Bitter bunch of old guys. They were all sure we were playing them for suckers.'' He chuckled. ''Looks like they were right, too. But you couldn't have told us that in the beginning.

''We completely rebuilt the scout—it was quite an antique by that time—made fuel, recalculated trajectories, went over and over the old data. That last part took ten years. I was deputy director of the project by the time we were finished. I was also chosen to be the first person to fly the scout in almost a century.''

I raised an eyebrow. ''Congratulations.''

''Thanks. I was scared witless. I understood the physics and engineering

and the routine hazards of spaceflight —none of which inspired much confidence—and I *didn't* know what had happened to the *Frontier*.

"But I got off all right. The launching was a quiet affair. The public had gotten over its optimism about the space program by then." He shrugged. "About pretty much everything else too. You can hardly blame them.

"For me, though We'd been working double shifts for months; exhilaration tempered by exhaustion, all suspended temporarily so I could concentrate on everything I was supposed to be keeping track of for the launch. I never had a chance to consider what we'd actually accomplished until I was looking down on Earth.

"The first part was easy. I was well above the plane of the ecliptic on the way out, and once I got used to how hard and bright the stars were, there wasn't that much to see. I spent most of my time checking out the Cayley drive, dreading the day I'd actually have to turn it on. In the end, though, there wasn't anything else to do but sit there and press the button.

"It wasn't until much later that I had time to look at the stars.

"Where the drive tail arched out behind me there was nothing at all, just uniform tar-darkness. But ahead! The stars became glowing colored swords, invisible as they drew alongside the ship, blazing feathery lines Dopplering through the visible as they converged on my path vector. Salaam had described all this, of course, and the effect had even been predicted before the first flight. But really seeing it " His voice dropped to a whisper; I had to lean closer to hear him. "Imagine the first lungfish, dragging itself onto the mud of the world, seeing the sky—knowing that he'd been blind before, that his world ended in mirrored prison walls; feeling the sunlight on his slippery skin "

He seemed to see his mirror-self across the bar for the first time. His words trailed off. "What happened?" I asked.

The mirror released him. "I hadn't

I flew the same path as the *Frontier* initially—to see if I could find out what had happened to it. We all felt we owed them that much.

"Just after I'd turned on the drive

everything seemed to be working fine; I'd dropped back into normal space once to check my trajectory, then gone another three light-years or so when I suddenly felt a tangential acceleration. That can't happen under a Cayley drive. I mean it just *can't*—the ship's mass is essentially infinite.

"The next thing I remember is being in the control room, looking at the stars. They weren't glowing colored daggers any more; just little white spots, just stars. I was back in normal space.

"Most of the instruments seemed to be working, but the readings didn't make any sense. There was no anti-matter reaction mass left in the drive chamber, none in the fuel bottles "

I could see the muscles in his face tighten.

"When I finally thought to check my position with the navigational computer, it said I was very nearly where I was supposed to be when the drive stopped—about three light-years from

Earth, moving a tenth of the speed of light diagonally away from it. That tangential component of my velocity didn't make sense either. My engineer's mind rebelled. I had to make some sort of irrevocable, life-or-death decision as to what to do next, and I didn't have a single item of useful data to make it with.

"Think about it. Running on straight fusion power, it would have taken me a hundred years, ship's time, to get to α-Aurigae—assuming the fusion drive was still working. And I had to bet that there'd be a colony waiting to receive me when I got there, because I didn't have any way of surviving on an ammonia-methane world if there wasn't. No thanks. Or I could fly around on my own until I ran out of recyclable food and water (or died), without being able to count on ever finding a place to land "

"Or you could return to Earth."

He smiled. "Or I could return to Earth, yes. I had enough fuel to get back pretty quickly and still have some hope of giving the whole thing another shot someday. But it all depended on the fusion drive being operational. It wasn't, as it turned out. Several of the parts had gotten bent in thoroughly unlikely ways. But it was repairable, more or less. I tinkered around for a couple of weeks until I got it running to about sixty percent of specs, which I figured was good enough."

The bartender was hovering around us. Rogers noticed, too. "When's closing time?" he asked.

I watched the fog gathering around the windows and gave an anticipatory shiver. "Not for a couple of hours yet."

The bartender drifted away as some new customers sat down in a booth behind us.

"Good. Where was I?"

"Coming back here."

"Right. I figured that I could accelerate at 1.2 Gs all the way without blowing out the drive and still have almost half my fuel left over in case they didn't want me back. I'd hit six tenths of the speed of light at turnaround. Five years, ship's time. Five years in a space the size of a walk-in closet." He exhaled quietly. "Imagine.

"But there wasn't any help for it. Staying sane got to be a sort of occupation. I set up schedules and purposely broke them when I felt too regimented. I learned every idiosyncracy of my ship's Go program. I had to work harder than I expected to keep in condition in the heavy gravity. Even so there was no way to stay busy all the time. Some days I found myself just staring at the stars for hours. It always started with my wondering just what in hell had gone wrong.

"I didn't have enough information. That was the worst of it. I went over the recordings every day for three years. I took apart what was left of the drive maybe five dozen times. Not a clue

no fuel, the parts sheared all to hell you wouldn't believe what they looked like." His hands traced hopeless bent shapes.

"Finally I arrived at the edge of the solar system. I saw a comet, wandered away from the Sun, dark and irregular, coasting towards the center of the galaxy; moving so slowly I couldn't even calculate its trajectory. It felt like an old friend.

"And the Sun grew brighter. Eventually my telescope could resolve some planets. They weren't where they were supposed to be."

He looked up. "Act more surprised. A planet's orbit is one of the more predictable things in life, right? Something you can depend on; something you can project a thousand years into the future. I picked them out one by one as I got closer. All wrong. I let my computer figure it out. I'd arrived 382 years early.

"That's when I knew what had happened to the ship."

He let me wonder for a second.

"I'd hit a singularity."

"You mean a black hole?"

"A black hole, yes. A very small one."

"I figured one of those was going to show up sooner or later."

"You'd be surprised—their density in this region is pretty high. And you don't have to get very close before they grab you, of course. Still, it was astonishingly bad luck. We hadn't even considered the possibility.

"I worked on the math for two months while the computer was matching orbits with Earth. Everything I could calculate checked out for a singularity of about six thousand Earth masses. Neat as a raindrop."

"Aren't things supposed to disappear forever into black holes that size?"

"Not objects inside a Cayley field, God bless it. The local spacetime in the field is stretched out in a way that exactly cancels tidal forces. But all my fuel got used up doing that in a matter of a few minutes—minutes, ship's time. In the ergosphere of the black hole, that translated into centuries. Normally you'd go forward in time, of course, but not in a Cayley field. That's what tipped me off in the first place. Antimatter is like normal matter that travels backwards in time—that's how it's treated in quantum mechanics.

"So I turned up in the twentieth century, whipped around into a different trajectory and having moved a negligible distance in space during the process. The black hole managed to be somewhere else when I reappeared, by the way. I'm still not too clear on that one."

He signaled for another drink. "Now, I suppose I should have been glad to be alive after all that, but the fact was I was still in one hell of an awkward position."

"I can appreciate that," I said. Indeed I could. I'd never thought about it before, but a genuine UFO landing on Earth *circa* 1980 seemed more likely to start a nuclear war than anything else.

"How could you possibly get close without being detected? We have all those spy satellites and radar networks and whatever."

"Yes, I know. I'd checked up on possible detection devices of this period in my ship's library. I even built a passive radar detector. But I came in over the south pole and kept out of everybody's range, so I could have saved myself the trouble. Basically, my trajectory didn't look anything like a missile's. I acted more like a re-entering piece of space debris. There's a lot of that nobody bothers to keep track of.

"But I stayed in orbit for a long time just the same; monitoring radio broadcasts so I could practice my twentieth-century English, studying the local his-

tory, contemplating all that blue roundness down there."

Fresh drinks arrived along with a curious look from the bartender. Rogers shrugged.

"Eventually, it got so I couldn't stand the looking any more—not to mention almost six years without a decent cup of coffee or anything but my own reflection in the mirror. So one cloudy evening I just did it. I picked the largest town I could find with a big chunk of wilderness right behind it. Still, with the parachutes and attitude jets, it was taking a chance. Apparently no one saw me."

"And if anyone had?"

"I'd have blown myself to bits. Very small bits."

Oh.

"The landing wasn't very artistic, I'm afraid. I crashed through some trees and wound up in a gully, tilted halfway over. I tore open the hatch without even thinking. Fresh air after five years! Grass, birds! I ate wild blackberries for the first time in my life. I can't think of anything else I've done that stands up to that first evening. It occurred to me right away that if I ever had to make an emergency take-off—I'd have to use the fusion drive—it would incinerate that whole section of woods. I couldn't do that.

"Anyway, practical considerations caught up with me soon enough."

"I'll bet. What did you do for food and clothing?"

"The ship takes care of the food, of course."

"Oh, right."

"My plastic coveralls weren't too outlandish. I wore them into town one night and stole a few things from a clothes line. I put them back later—they didn't fit too well anyway. I picked up odd jobs for a while; worked in a shirt factory part-time. Not having any expenses to speak of makes it easy to save money." He lifted his glass. "My ship's kitchen, however, does not provide alcohol. I've spent five years thinking about what I'd like to do to whoever was responsible for that particular omission.

"I've become assimilated little by little. I should have my high school equivalency diploma in a couple of months." He took out his wallet. "I've got a Social Security card and a driver's license. Nobody's likely to question my citizenship."

Sure enough, the license had been issued only a few weeks ago—even the wallet looked new. None of which could be considered dramatic proof of his story. "What are you planning to do," I asked, "now that you're more or less settled? Any strange compulsions to kill your grandparents?"

That got one of his odd looks. "My grandparents won't be born for another two hundred years. I suppose I could murder one of my great-great-great grandfathers, if I knew who any of them were. Rogers is a pretty common name."

"I was speaking in the abstract."

"Yes. Well, I've been wondering about that myself. I don't think I could do anything that would make me suddenly vanish or destroy the future. I really don't. When you've been swallowed by a singularity, you don't necessarily come out in the same place you went in—maybe not even the same universe. The physical constants can be

different on the other side; time can run the wrong way. Perhaps I've simply arrived in a universe that has me and my ship in it four hundred years too soon. Imagine setting a clock back four centuries and starting it running again."

"How about conservation of mass? This universe has an extra spaceship in it."

"I didn't say I could explain everything."

I looked at my watch with some reluctance. I was going to have to be getting home soon. "There's one thing I don't understand," I said. And I'd been putting this one off all night. "If you've taken all this trouble to remain anonymous, why are you talking to me? I could go to the authorities (I'm not sure which ones, actually) or the TV networks "

"But you won't."

"Why not?"

"Because you haven't believed a word I've said."

My fingers closed on the bar rail. He had me. And I couldn't even remember when it had happened: when I'd stopped being the aloof man-about-town and he the entertaining huckster, ready with his pitch the moment my guard came down; when I'd started wanting to believe him. I sighed. None of it made any difference. I couldn't let him make a fool out of me. "You could take me to your ship," I said.

A wind had come up, dissipating some of the fog, but it still clung in patches to the hills and treetops. The temperature was dropping by the minute. "This is ridiculous," I said, more or less to myself.

"What?" Rogers shouted, over the wind.

"Never mind."

"Not too much farther. Over that hill well, you can't really see it yet."

I couldn't see anything yet. I kept stumbling into stream beds and gullies and thorny undergrowth. I could barely keep up with Rogers, who was obviously in much better physical condition than I was (the high ship's gravity, I reminded myself). Branches swept against my face. On the bright side, I thought, I could probably discount the possibility that he was up to anything unpleasant. Why take me this far? And the bartender could identify both of us in any case. We'd been there for hours.

We circled a hill then dipped into some heavy foliage. After a few minutes he said: "Here."

"Where?"

"Here. The entrance is directly beneath my left toe. Stay put for a minute. I'll disable the airlock so you can go straight through after I'm inside."

He vanished, followed by the sounds of clanging machinery. Gradually, a bright yellow light outlined an elliptical doorway. The hair on my neck stood straight up. "Come on in," he said.

I crawled down toward the light. The outer door whirred shut as I stepped into the cabin. My eyes refused to see anything for a few seconds until they'd adjusted to the pervasive yellow brightness of the interior. Then my body snapped upright. I was inside a spaceship.

There's no mistaking the real thing. Clouds of instruments, obvious modi-

fications everywhere, equipment removed and new panels added on wherever they'd fit. Part of the strangeness, I realized, came from the overall design—the interior had been rigged as much for free fall as for gravity. My eyes flew everywhere: to the worn crash couch and the instrument consoles stenciled with jumbled acronyms, to the airlock at the far end and the silvery pressure suit lashed to the ceiling

Rogers grinned at me from across the cabin.

"Can I get you a drink?"

My eyes were still circling.

"I haven't much variety, I'm afraid."

"A drink. Sure, whatever you have."

He poured whisky from a plastic jug into two very ordinary tumblers. I'd half expected squeeze bulbs. "What do you think?"

Too many things were happening at once. I staggered against a shelf of some sort and sat down on the edge. Exercise equipment hung from the wall beneath my feet. Directly across from me was an engraving of a thin woman wearing strange clothing (his wife?). "I still don't understand why you brought me here," I said.

"Too much to drink, I suppose. Mostly I needed somebody to help me make a decision."

"What decision?"

"To destroy her."

"Her? The ship? The *Isis?* How—"

"What else can I do? It'll be deer season in another month. Somebody is bound to stumble across me. What do you suppose your world would do with a working fusion engine?"

"It's your world, too."

"I know. Believe me, I've had plenty of time to think about this. There's no way I could restart an entire spaceflight industry. It would require technology I'm completely incompetent to redevelop—even assuming I can trust your government to let me do so without interference, and there's no hope of that. I had enough trouble with my own people. I can't even chance disabling the drive—there might very easily be engineers around smart enough to fix it. In any case, the C.I.A., or whoever, would make my life so miserable I might be tempted to say the hell with it and explain it to them anyway. A drive like that would give any country a lopsided advantage over everybody else. They'd be fools not to make use of it."

He paced and gestured in a space not meant to accommodate either. The air, I noticed for the first time, had a slight metallic taste.

"I'm doing well enough now to move into town. I'll get an engineering job somewhere. I should have done it weeks ago. Now that you've been here I can't afford to put it off any longer."

"That's not true." I'd never spoken so earnestly in my life. "I wouldn't say a word if it meant saving your ship. Please—"

His voice rang with sudden emotion. "Do you think I like the idea? I spent twenty years of my life on this project. Six months ago the *Isis* was almost the only home I could remember." His arms tried to encircle the ship's interior. "This life-support system probably represents the end of interstellar space flight for all of mankind. I don't see how the world I came from will be able to tool up for it again for five hundred years. Maybe never. *But I don't have*

a choice. If I let this ship fall into the hands of your government, I could be responsible for the deaths of half a billion people. You were worried about how my presence three centuries early could change future history? Think about that!''

He let his arms fall to his sides, his body sagging inward against the responsibility. ''Look, it's too late for you to go back tonight. I've got some foam pads and insulation you can sleep on. Tomorrow morning I'll show you the engine.''

My car was where I'd left it, on the side of the road, near the woods. I gave Rogers a lift back to town—he wanted to check something or other at the public library.

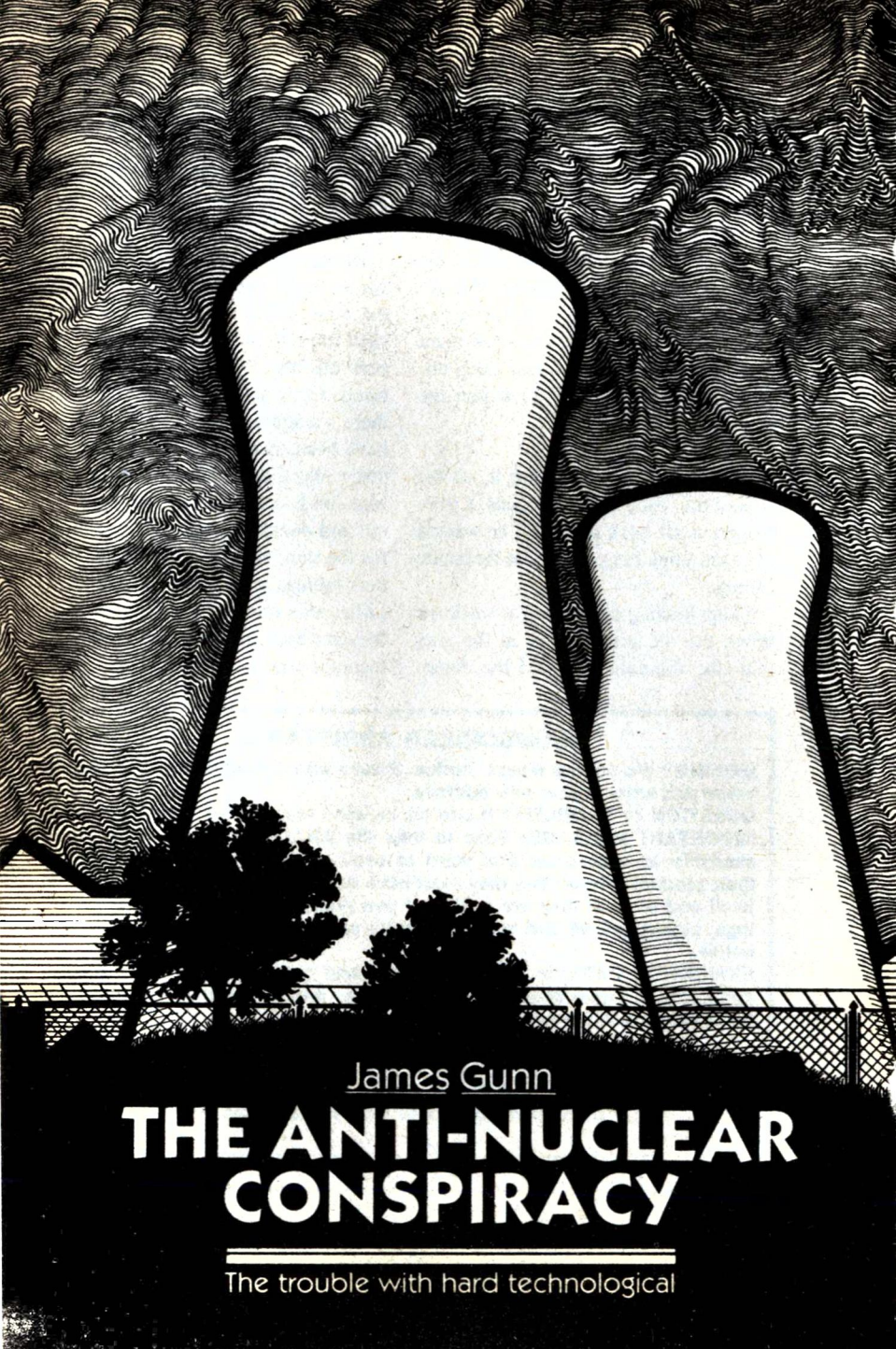
I kept looking over at him as we drove down the old gravel road, at the man with the thinning hair and the denim shirt who'd been a relativity engineer in the twenty-fourth century.

''You never told me what happened to the *Frontier*,'' I said.

''I thought you'd figured that out for yourself.''

''Sorry.''

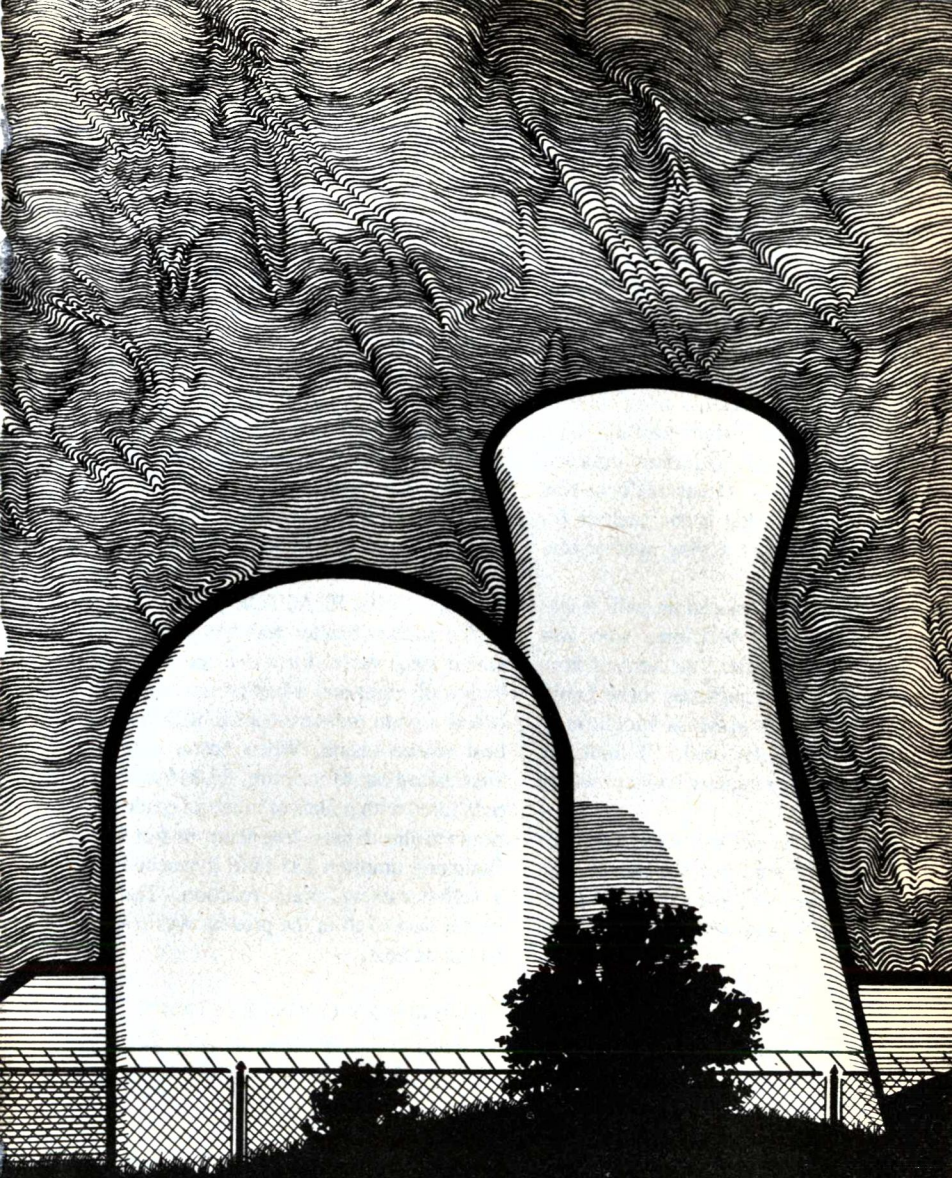
He shrugged. ''Something else for you to think about. The *Frontier* took the same path I did, right? So it must have run into the same singularity. Except that the *Frontier* had a thousand times *Isis*'s mass of antimatter, and there's a square law operating. They'd have been translated over three billion years into the past. One of those geniuses on board must have figured it all out and decided to take the ship home, for the same reasons I did. Quite a job, that—things would have looked pretty different in three billion B.C. And when they got back, they found an ammonia-methane world, of course. '' ■



James Gunn

THE ANTI-NUCLEAR CONSPIRACY

The trouble with hard technological



decisions is that the variables
are not determined solely by physical considerations.
People—on both
sides of the controversy, and
often out of sight—affect them, too.

THE INVESTIGATION

Sheridan Williams was a nuclear physicist who had become a private consultant when he realized that the big need of nuclear energy was not basic research but public confidence.

He was a tall, lean man who looked a bit like Basil Rathbone playing Sherlock Holmes. Williams did nothing to discourage the comparison. In fact, he did serve as a detective from time to time, mostly in matters dealing with nuclear accidents, radiation injuries, and waste disposal. Occasionally he was called upon in other areas, such as forensic medicine involving nuclear materials.

In this case, he placed the call. It was to Senator John McClure, who was called by his enemies "the Senator from the NRC," or sometimes more familiarly as "Critical-Mass McClure."

"John," Williams said, "I think we should expect a nuclear incident within a month."

McClure did not ask why. Williams was an old friend and a frequent ally, and McClure had come to trust his judgment. "What can we do about it?" he asked.

"Alert the NRC and then the FBI," Williams said. "They can alert the plants, increase surveillance, inspections, and so forth. You can say you received an anonymous tip."

"Is that you? Anonymous?"

"For now. I'd have you make a public announcement to scare off the whoever or whatever, but it's only a hunch. Even if it's right, they'd only wait for another occasion. Maybe afterward you can hire me as a consultant to find out the facts."

"You're that certain?"

"Nothing's certain. But the film seems like too good a chance to pass up. "

THE INCIDENT

The film entitled "Power Play" opened twenty-two days before the incident. Unlike a similar film, "The China Syndrome," it involved a complete core meltdown. The reviews generally were favorable, and the lines outside the 667 theaters in which it was showing, apparently of people eager to see their fears made visual, were long. The critics called it "a nuclear thriller" and said it was good entertainment.

THE REACTOR

The nuclear reactor was housed in a sealed steel vessel forty-one feet high with walls eight-and-a-half inches thick. It was a giant pressure-cooker with the heat source inside. When boron rods were raised out of the core, 36,816 fuel rods filled with pellets of uranium oxide began to absorb more free neutrons from fissioning uranium 235 until it reached a self-sustaining chain reaction. The matter destroyed in the process was released as heat.

IMAGINARY CONVERSATIONS

"The film has been out for more than three weeks. The timing is slipping away from us."

"It will happen soon."

"Soon, soon. That's all we've been hearing from you for the past two weeks. Listen! We've gone to a lot of effort and a lot of people have put their lives and careers in jeopardy to set this up. If the timing gets screwed up, it'll all be for nothing!"

"Listen to the news tomorrow morning."

THE INVESTIGATION

The telephone rang in the Senator's private office. McClure grabbed it. "Sheridan here," Williams said. "I'm here in the compound. You've heard what happened?"

"Only the first announcement. How did it start?"

"Somebody—nobody knows who—was fooling around with the feedwater system controls. Whatever he did tripped the feedwater pumps off the line."

THE INCIDENT

The incident started at 2:33 in the morning. The lobster shift was on duty. A nuclear generating plant never shuts down except for emergency or repairs, but the normal rhythms of life never can be reversed completely and people's alertness and reactions are at a low ebb. Besides, the rest of the nation was asleep and could not affect the outcome. In any case, most of the damage was done in the first few minutes.

It began no differently from any other minor malfunction. A pump kicked off in the secondary loop that carried superheated water from the heat exchanger to the turbine. This was identical with the Three Mile Island incident, but here the two scenarios began to diverge. The turbine shut off automatically.

The reactor tried to shut itself down, but the boron control rods that were supposed to drop into the core, absorbing the neutrons that fueled the chain reaction, stuck in the raised position for precious seconds while the temperature of the reactor's primary water loop, normally at 582° Fahrenheit, climbed rapidly and the pressure, normally at 2,155 pounds per square inch, increased alarmingly.

One gauge reported that the control rods had dropped into place; another, that registered correctly, was obscured by a tag hanging from a switch directly above it. Only the alertness of the junior operator noticed it in time to pull the manual control.

A siren whooping in the control room did nothing to ease the alarm of the two inexperienced men in charge of a runaway reactor.

THE REACTOR

The heat released by the destruction of minute quantities of matter was absorbed by the water in the primary water loop that circulated through the steel reactor vessel and between the fuel rods. The primary water loop carried the heat to the steam generator. All this was still within the containment dome, 190 feet high and 140 feet across with walls of concrete four feet thick over a shell of carbonized steel.

IMAGINARY CONVERSATIONS

Telephone call from a pay telephone in the nuclear generator compound: "Mama has indigestion."

THE INVESTIGATION

The living room of Senator McClure in Georgetown was comfortable but not lavish. The ice in the glass he held tinkled against the sides as his hand shook in sympathy with his head. "You're the nuclear expert," he said with rare im-

patience. "Why didn't the automatic procedures work?"

"The secondary water loop has three auxiliary pumps," Williams explained. "Any one of them is sufficient to take over for the main pump in case of failure or other interruption. They were all shut down for a routine check. The same thing happened at TMI; only in this case it was three weeks before, rather than two days. They had never been turned back on. If they had been in working order, the only effect of the main pump kicking off would have been a red light on the control panel and a small repair job or replacement the next day."

THE INCIDENT

The two operators in the control room were faced with a situation they had been prepared for since Three Mile Island, but they had faced its reality only in their worst nightmares. They pushed and pulled some fifty buttons and levers in fifteen seconds.

The pressure in the primary water loop opened a relief valve and pushed water into the quench tank. Instead of closing once the pressure had dropped, the valve stuck open. Thousands of gallons of contaminated water overflowed the quench tank, just as at TMI. Water pressure fell off rapidly. An emergency cooling system kicked in. More water was injected into the loop and, in turn, flooded through the valve and out of the quench tank. By now tens of thousands, perhaps hundreds of thousands, of gallons of water contaminated with xenon and krypton gases were on the containment structure floor.

The water level in the steel reactor vessel may have fallen low enough to uncover the core, already damaged perhaps by the failure of the boron control rods to drop immediately. The heat may have increased enough to burst the zirconium cladding of some fuel rods.

Six feet of radioactive water flooded the containment floor, clouds of radioactive steam billowed to the roof, and gamma radiation was shining directly through the walls.

IMAGINARY CONVERSATIONS

"Now we've got to hit everything hard. All at the same time. Television, newspapers, rallies, everything! The activists will spring to action without any prompting, but we can't leave anything to chance. The rally is ready to go. The radiation experts are monitoring releases. Everybody go!"

THE INVESTIGATION

The hearing room was dark with walnut panels and rails and tables; even the television lights could not brighten it, though they dazzled the eyes of the witnesses and the spectators behind them. Most of the spectators were vocally anti-nuclear; they had waited in line since well before dawn. They applauded the statements they liked and hooted the statements they did not agree with, in spite of frequent warnings from the chairman. Their responses had a measurable effect upon the television audience.

"In light of the recent accident record in nuclear generation plants," Senator McClure asked, "can you give me any reasons why the NRC should not shut them all down?"

Cheers came from the audience.

"Were they accidents?" Williams asked.

Jeers and catcalls.

"What do you mean?"

"I ask you to consider the auxiliary feedwater system that was shut down three weeks before the accident, the control rods that mysteriously did not drop into the core, the tag hanging from a switch just above the one warning light that revealed the true state of affairs, a stuck relief valve, operator errors, a hydrogen explosion in the first few hours that went unnoticed though registered by a recording gauge."

"What are you suggesting?"

"Either an incredible series of adverse coincidences combined with stupidity"—cries of "Yes! Yes!"—"or deliberate sabotage." Boos and hisses.

THE REACTOR

The secondary water loop carried the steam from the steam generator outside the containment dome to the turbine. After the steam had driven the turbine, it was condensed by cooling water from the nearby river and returned inside the containment dome to the steam generator. The cooling water went to the massive, flared cooling towers, which loomed over the whole reactor complex like an innocent symbol.

THE INCIDENT

When the emergency core-cooling system was turned off by an operator who thought the emergency was over, a sump pump on the floor of the containment structure automatically started up. Such automatic responses had been corrected after TMI, but some repairman had restored the system to its original state.

Thousands of gallons of water polluted with xenon and krypton were pumped out of the containment building into tanks in an auxiliary building never intended to contain high-intensity radiation. At least one of the tanks overflowed onto the floor, and radioactivity released from the water shot up through a vent stack as steam and gases.

The entire sequence of events happened in less time than they took to describe. Five minutes had elapsed since the feedwater pump had tripped off. Even this soon, however, the possible seriousness of the incident was apparent; the lesson of TMI had been learned. The gauges were going in the wrong direction; the core temperature was going up and the radiation level was rising. The senior operator on duty called the chief electrical engineer.

He drove two miles to the plant, pinned on a yellow dosimeter radiation gauge and a blue ID, and put on protective overalls, yellow disposable boots, and a hard hat. By the time he arrived in the control room twenty more minutes had passed. A line of green lights told him that the control rods were in place, but the radiation gauges told another story: levels were many times higher than normal.

Core meltdown was a possibility—the so-called China syndrome in which the molten core might melt its way through the many feet of reinforced concrete in the containment building floor and through the earth below until it reached China on the other side of the world. It was only a metaphor—a sort of mod-

ern bogeyman—but it frightened many people.

THE REACTOR

The control room of the nuclear reactor plant was a many-faceted, multi-angled array of gauges, lights, and graphic displays of many kinds. Below them, on a slanted panel, was a forest of switches. The whole thing was many times more complicated than an airliner cockpit. Two men, seated at a long desk facing the panels or roaming in front of them, were in charge of the chained beast. Most of the task of controlling the fission reaction, the exchange of heat, the production of electricity, was performed by computer, but in an emergency the operators had to react.

IMAGINARY CONVERSATIONS

"One question: Is there going to be a meltdown?"

"What kind of question is that? Do you realize what would happen if there were a meltdown?"

"There'd be no question then of shutting down the plants!"

"But the casualties! Jesus, God! Nobody ever said anything about a meltdown!"

"Better a few lives now than a lot of lives later on."

THE INVESTIGATION

The hearing was in its ninth day. The technical experts had presented their reports and answered questions. Now it was the turn of those who had viewpoints and opinions. One of them was Richard Zenith, the consumer advocate. The audience loved him.

"Let's shut down all the nuclear generating plants! Now!" he said. He spoke in exclamation points. "First TMI and now this! Either one could have been a catastrophe that wiped out an entire state. What are we waiting for? Sooner or later it's going to happen and then everything is going to be shut down. But it will be too late to save the people who will be killed and the tens of thousands who will be waiting to die!"

That drew tumultuous applause. Even the chairman's gavel could not quiet it for ten minutes, and Zenith's answer to Senator McClure's question, "What will we do for power?"—"Conservation, Senator, conservation, and if that isn't enough a simpler lifestyle"—went mostly unheard.

Asa Isaacs, on the other hand, was greeted with the respect due the famous science popularizer, but the audience stirred uneasily during his remarks. "I'm not certain we should be putting so much of our resources into fission rather than into alternative methods of producing energy," he said, "but one odd thing strikes me about all this: what kind of catastrophe is it when nobody gets hurt? We kill fifty thousand people a year in automobile accidents, and nobody calls that a catastrophe. Nobody demands that automobiles be shut down.

"And one more thing: a lot of people are saying that the scientists were wrong; the scientists said that the chances against a nuclear accident were prohibitive—and look what happened! What I want to know is: how come nobody says that the opponents of nuclear power, who said that a nuclear accident would wipe out a state the size of Pennsylvania—who said that we are likely to have a core meltdown, a China syndrome,

and thousands of people would be killed—how come nobody says that they were wrong, that the nuclear accident was controlled in spite of a strange combination of failures and mistakes that nobody could anticipate?''

THE INCIDENT

The hydrogen bubble was anticipated. Unlike TMI, where the release of hydrogen from the hot core had been a surprise, this time the crew was ready with emergency measures to pump the hydrogen to a protected recombiner in the auxiliary building where it was combined with oxygen to form steam and pumped back into the containment structure.

Slowly the work went forward to reduce the heat of the core to a complete cooldown.

THE REACTOR

A nuclear fission plant is inherently dangerous. Radiation and high temperatures are involved and either can get out of control at any moment. Nevertheless, the production of energy by nuclear fission is surrounded by sophisticated safeguards, and no member of the public ever has been killed as the result of an accident in a nuclear plant. Theoretically and in actuality, it is the safest method of producing power available. Oil-carrying ships can burn and sink—and have. Gas can explode or poison—and has. Coal damages the lungs of miners; coal trains leave the tracks or run into people, houses, and automobiles. Burning any of them produces carbon dioxide, fumes, or radioactivity.

IMAGINARY CONVERSATIONS

''Except for the fact that it was held to another TMI affair, except for the fact that we didn't get a meltdown, it was a most satisfactory accident. I don't see how they can avoid shutting them all down now.''

''A meltdown, a meltdown! When we were first talking about this it was always referred to as an incident. An incident! That's harmless, right? Afterwards there's nothing but meltdown! Sometimes I think you guys must be working for the Soviet Union.''

''We're just as patriotic Americans as anybody. More! We're willing to put our lives on the line to save this country from a nuclear catastrophe in the future.''

THE INVESTIGATION

They were seated in the window booth of the saloon nearest the nuclear generating plant. If they turned they could see the flared towers of the plant against the reddening evening sky. The local residents had not all returned from their first, impulsive flight, and only a couple other patrons were in the place, but they spoke in low voices anyway.

The hearings were over, but not all the questions had been answered.

''Was it sabotage, Sher?'' McClure asked.

''Hard to say,'' Williams answered. His Holmesian face lengthened. ''It feels like sabotage, the evidence suggests sabotage, but we can't put our finger on anything or anybody. Yet. If it's a conspiracy, it's tightly organized.''

McClure noticed the forgotten beer in front of him and took a sip. ''You

said evidence. What evidence do we have?''

''Secondary stuff: the incidence of actual sabotage elsewhere, observed, confessed; and the combination of failures and mistakes that virtually defy statistical probability.''

''What about Murphy's Law?''

''What about Occam's razor?''

''What's that?''

''It's a principle of vital importance in the philosophy of science. It says that of two possible explanations the one requiring the fewer or simpler assumptions is more likely to be correct—in this case, a deliberate effort to create an accident.''

McClure made rings on the table from the moisture that had condensed on the side of his glass and run down the sides. ''Who would do such a thing?''

''Ordinary Americans like you and me, John. People so certain of the supreme rightness of their beliefs that they will do almost anything to achieve the ends they want: the shutting down of the nuclear-energy system. They know that the investment is so substantial that they can't succeed by words alone. They need proof of the inherent unreliability of the nuclear power plants.''

''Are you including in that,'' McClure asked, ''all the men and women who have publicly advocated shutting down the nuclear industry? Are you saying that they would not hesitate to commit sabotage that might kill thousands of their fellow citizens? I don't believe that, and I don't believe any such conspiracy would hang together.''

''Not at all,'' Williams said. ''People of good will can differ on this matter just like any other. In fact, those who are loudest in demanding a shutdown of the industry probably are not part of any conspiracy. The conspirators would be pleased to sit behind the scenes and see their work carried on by public figures; that might even be part of their plan.''

''Who would they need to make such a conspiracy work?'' McClure asked. ''Control room personnel?'' He leaned forward and drew question marks in each of the circles on the table.

Williams shook his head. ''Not necessary. But maybe a key figure or two in the operation. I suspect that sympathizers are at work in many aspects of the atomic industry, however: installing bolts improperly, constructing faulty valves, building imperfections into plants.''

McClure wiped the table clean with a swipe of his hand. ''Doesn't all that sound unlikely to you?''

''We've had public instances,'' Williams said, ''of nuclear engineers who have deserted the industry to make public statements about dangers, even employees who have confessed to sabotage because they thought security arrangements were inadequate. Others may have stayed behind to do their duty, as they saw it, from within.''

''That's a pretty black picture.''

Williams took a big drink from his glass of beer. ''It's happened before. In the theft of atomic bomb secrets by the Soviets. In the anti-Vietnam protests.''

''How do we expose this conspiracy?'' McClure asked.

''That may not be the right question.''

''What do you mean?''

Williams turned to look out the win-

dow, where the cooling towers were looming like prehistoric menhirs against the sunset. "We live in a world dependent on technology; dependent, even, on high technology. There's no way we can get around that; there's no way of going back. But in any civilization, technological or not, there are pessimists and optimists. It doesn't depend on the facts, just on individual temperament. In our case, they're technological pessimists and technological optimists. The optimists think we can solve our problems, and the pessimists think the problems are basically unsolvable. Nobody knows who is right. Even reality will be no help: if the optimists prevail and provide no solutions, it may be because they lacked the necessary support, and if the pessimists prevail, failure is predetermined—we'll never know if the problems could have been solved."

McClure put both his hands around his glass as if to cool them. "Then there's no way of making a reasonable decision?"

"I didn't say that—just that the ultimate basis for action is faith, or predisposition. Those who are most passionate about their beliefs will act to see them implemented into policy. Perhaps they have."

McClure drained his glass in two convulsive swallows. "A while back," he said, "you said we had no evidence yet. What did you mean by that?"

Williams stared moodily at his hands folded in front of him. "I'm not sure you want me to come up with proof about a conspiracy that might divide this nation in half. The optimists would believe it and find their enthusiasms rein-

forced. The pessimists would think the optimists have concocted the whole thing, like the Reichstag fire, and they would redouble their efforts. As a matter of fact, I have had feelers from three or four people who claim to know something, or have been part of something. They may be neurotics or publicity seekers. But one or more of them might be real. I'm not sure I should follow them up."

They sat silently for a moment staring out the window. McClure broke the silence. "If such a conspiracy exists and it is willing to act as if a state of war exists and all is fair, if it can infiltrate our atomic industry and atomic plants at will, do we have any choice but to shut down the whole business?"

"Give up?" Williams asked. "That's the decision you'll have to make. It's a political decision. But people are going to die if you shut down the nuclear plants, too. Not directly, but through power shortages and failures and loss of jobs. People will die of cold and hunger and disease as surely as if they were poisoned by radioactivity."

"Then, for God's sake," McClure asked, "what do we do?"

Williams shook his head. "I know what my decision would be, and I know what the conspirators' would be. But the difference is that you will have to accept the consequences. Sure, we can follow up our investigations—quietly—tighten up things, weed out a few saboteurs, but know that we can never get them all. We can never be entirely safe. The conspirators and the public opponents of nuclear power have no way of accepting responsibility if they are wrong. You and the industry—you're up there with your necks out. You will have to make the decision."

They both stared out the window. The sun had set, and the cooling towers were fading out like a vision that might not return with the morning light. They were dead and the power they once had symbolized was dead. It might be a long, cold night.■

To In Times Come

● Our September issue features a pair of items which were not *intended* as a pair, but happened to fall into the same issue and complement each other rather nicely. Vincent Di Fate's cover is for Charles Sheffield's novelette "The Manna Hunt," another adventure of Jeanie Roker and McAndrews of "inertialess" drive fame. This time their mission is one of search and rescue and the object of their search is an earlier expedition with a very peculiar mission indeed—a quest for food among the debris on the farthest fringes of the Solar System. It may seem an unlikely place to look, but already there's evidence that the idea is not as far-fetched as it sounds.

Our fact article is on a somewhat related theme but much closer to home. "Exploring the Asteroids," by Joel Davis (no relation to our esteemed publisher), deals with the practicalities of how we might start getting useful materials—not food, but a good many other things—from the asteroids in the relatively near future.

And, of course, we'll have Part II of *Rails Across the Galaxy*, by Andrew Offutt and Richard Lyon.

The Alternate View

THE GAMBLERS

Jerry Pournelle

This year's meeting of the American Association for the Advancement of Science featured as keynote speaker Dr. George A. Keyworth, Science Advisor to President Reagan.

Much of what Dr. Keyworth said made sense. We must, he said, cut back; be selective. The days of "As long as you're up, get me a grant" are over. We shall rigorously pursue excellence—

I'd have been more impressed if he hadn't, in the same speech, made it pretty clear that they're cutting back the planetary exploration program. If you want excellence, what's better?

He did announce that they've no intention of saving money by turning off the Deep Space Net; they'll be listening to Voyager when it gets to Uranus. The rest of the planetary program, however, is in trouble.

So is space investment. The Citizen's Advisory Council has shown that every year for a decade we have seriously underestimated the requirements for capability to put payloads in orbit. This includes *all* requirements: civil, scientific, environmental (such as weather and pollution monitoring), and communications. Yet with all the evidence staring them in the face, the administration has not made any commitment to great expansion of our space access capability.

That's the space front. We're not doing so much on the rest of the high technology front, either. Why?

One problem, I think, is that we have so many economists pretending they know something. Perhaps one or two do. Perhaps. But no two of them seem to make the same recommendations, and most of them ignore what seems so obvious that I suppose you have to earn a Ph.D. before you can't see it.

I once heard John Kenneth Galbraith and Arthur Laffer, the champions of liberal and conservative economics, debate for a full two hours on the subject of why the '60s were so good and the '70s so bad; and in all that time, neither mentioned the words "research," "development," "space," or "technology."

Yet it seems clear: if you've got to spend more than you make, you'd better do some investing, and fast. You might also want to gamble.

If a family can see that over the next five years they've no choice but to spend money that won't be coming in, they've got some decisions to make. Perhaps a second job, or a new source of income; but suppose there aren't any?

Sell something? But if there's nothing to sell? Cut expenses? Perhaps, although if the expenses are *taxes* that's not going to work either. And govern-

ments, it seems, *can't* cut expenses. Reagan's "cuts" were only a slowdown of increases; the 1983 budget is considerably larger (in real dollars) than was the 1982 budget. So while we talk of budget cuts, we don't mean it, and I don't suppose we ever will.

Then what's left? In the case of a family, it's obvious. Speculative investments. If you're going to go broke anyway, take a high flyer and the worst that happens is you're bankrupt sooner; at best you make enough to keep going.

Return now to the U.S.: we have an aging work force. It is absolutely predictable that in a few years there are going to be more people retired and fewer able to work; and somebody's got to support the retired. They're voters, you know, and they'll be organized.

Project this scenario ahead twenty years and you can scare yourself; yet I think of no single institution, none whatever, that can and will do anything about it. All parts of our government operate on a much shorter time frame. If we had one hereditary house in Congress—heresy as it is to say—we'd at least have an institution that worried about the next decade, since its members would know they'd still be there to face the problems. They might also be concerned about their children. But we have no such institution in government, and now that the family has become relatively unimportant we don't have many private ones to look that far ahead either.

Does this mean we're doomed?

I don't know. It's sure a hell of a challenge.

How, then, can we prevent our children from cursing our memory?

The best way, it seems to me, is investment: to do what Keyworth said the administration wants to do, but do it in a big way. Look: we're facing bankruptcy. They keep projecting federal deficits larger than the whole budget was during the Johnson administration. The remedy, some say, is to raise taxes, but we all know that's asinine. All higher taxes do is stimulate people to spend effort on tax avoidance rather than wealth creation. Right now we have teams of the brightest people in the nation working for the IRS, and other equally competent teams working for their victims; the vectorial sum of their activity is zero. How is the Republic well served by this?

No: if we're headed for bankruptcy, we'd as well be hung for sheep as lambs. You're going to have deficits? Pity; but if so, take some of it and invest. Back long shots. Like space industries. Lunar colonies. Heave money at the universities. Change tax laws to provide really heavy incentives for industry to do basic R&D.

What you're praying for is a breakthrough: some way to change the very rules of the game. That's happened often enough in history, although seldom in response to deliberate stimulation; but what the hell, we're desperate, or should be.

And I mean that: we should be in a state of near panic just now. How can you look into the future and be anything but scared? The work force gets older. Our machines get older. Our taxes get higher, and our savings get lower. More and more people become concerned

with "survival"; the underground economy is the only thing that's booming (and what a marvelous thing that is! We get surgeons out painting their own houses, because it's cheaper than hiring it done. A real accomplishment). We ought to be scared stiff.

Now maybe, just maybe, my colleague Harry Stine is right: that without any government investments the capital for space development will be forthcoming from the private sector; the Third Industrial Revolution will proceed apace, without stimulation from Washington. Maybe. I hope so. But I don't see many signs of it.

Here is a question for the Ph.D. Qualifying Examinations in Management Science:

The aliens have landed, and they are every bit as powerful as we imagined. The guards we place around them are merely to keep them from being annoyed. They spend a few weeks studying us; then their leader makes an offer.

"We will make you wealthy," it says. "Wealth beyond the dreams of avarice, sufficient wealth that every child, woman, and man on Earth will have the equivalent of a million dollars. Each of you will have perfect health for five hundred years, after which you will have a quick and painless death. No senility and no lingering illnesses."

They mean it, too. Assume further that we have ways to verify this, perhaps by direct communication with the Galactic Federation. They can give us wealth, health, and longevity. They will also be able to exact the price, and we won't be able to fudge on it. They always do what they say.

"Knowledge too," they offer. "We will tell you everything you want to know about the Cosmos. How stars work, and where the solar neutrinos have gone, and if the universe is open or closed, and how many elementary particles there are (you'll be surprised at the answer)."

"What's the price?" we ask.

"We want your solar system. But we're in no hurry at all to collect it. All this we do for you; but after 1,000 years exactly, every human will be born sterile."

QUESTION: Should we accept or reject that offer? Use cost-benefit ratio theory to justify your answer.

The interesting part is not that everyone I know believes we ought to reject the offer, but that current management theory provides no reason why we should—at least I've seen none.

Current management theory doesn't give any good reasons for investing in space. Investments that don't mature for twenty years simply don't figure in Return on Investment (ROI) and Position in the Industry (PII) charts; while ten-year-maturity investments are hedged about with all sorts of caveats.

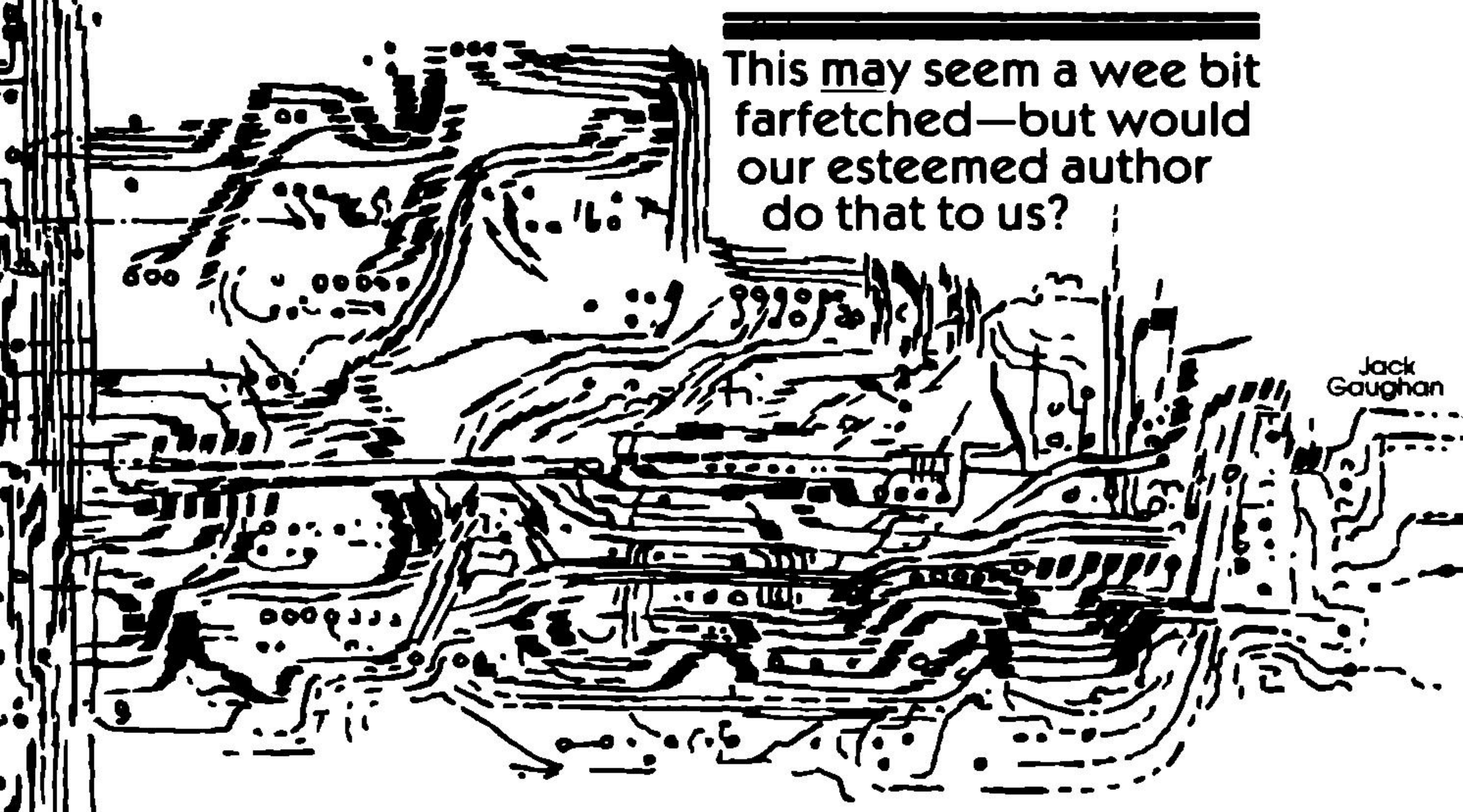
Looking out for the long-term good ("To promote the general welfare, and insure the blessings of liberty to ourselves and our posterity") must be the province of government, because no manager who does that will long keep his job in industry. Managers are trained to look at not just the bottom line on the annual report, but at *quarterly* earnings. The modern corporate notion of long-range planning is to look ahead two years.

(please turn to page 131)

THE DIGITAL DICTATOR

Ian Stewart

This may seem a wee bit farfetched—but would our esteemed author do that to us?



"Artificial Intelligence!" said Oliver Gurney scathingly. "Now *there* is a waste of time and money if ever I—"

"Oh, I don't know," I said. "There's been some very impressive work—"

"In some very narrow and artificial settings. 'Fetch me the yellow cube', when the room only has ten objects in it and only two are cubes. Ordering meals in imaginary restaurants. Character recognition from a limited fount. Syntax-restricted—"

"Yes, Oliver, but even those are very difficult to accomplish. Not that I know anything about computers, mind you, but even I can see the problems. Perspective, for one. What if your yellow cube is partly hidden behind another one?"

"Don't get me wrong," said Oliver. "Yes please, Janice, two more pints. I never said anything about it being *easy*. All I said was, it's pointless."

Janice is one of the barmaids in the *Tall Ship*, an unusually pleasant pub in Upton Stourby, just outside Bristol. It's the kind of pub that you can go to to have the kind of conversation that Olly and I were having, if you see what I mean. Far-ranging, iconoclastic; probing the world's preconceptions—at least, that's what it feels like at the time. It's probably the effect of the beer.

"Take this beer, now—" said Oliver.

"I was just going to."

"Don't interrupt. You could put a lot of effort into teaching a machine to drink beer. *That's* not an easy problem, either, especially if you want it to assess the clarity of the brew, the texture of the head, the quality of the malt, the precise strain of hops used to achieve the right *bite*; or to detect whether it was mass-produced in stainless-steel vats or—" (lovingly) "—fermented to maturity in rich oaken casks by craftsmen—"

"Assuming they ever *do* that. I reckon they just add tannin."

"Not the breweries *I* give my custom to. I check them out in person." He probably does, too. "But, if you *could* teach a machine to do all that—how would it advance the human race?"

"It would save *you* time and effort, for a— OK,OK, I take the point. But is that a valid analogy?"

"Certainly. I could give you a dozen examples. The Artificial Intelligentsia have lost sight of the problem; they think it's making the machine do tricks that counts."

I attended to my beer, which was superb: on that, Olly and I could agree. That's one reason why I like to get together with him when I'm passing through; he knows the area like a book, and that book lists all the good pubs.

I've known Oliver since we were teenagers. These days he works on advanced technology for Decal Electronics, while I try to *sell* advanced technology to the medical profession, a task not made easier by the government cutting funding for the NHS

but that's by the by. The *Tall Ship* is our current favourite—its range of beverages is matched only by its range of clientele. To our left, an earnest young man in a leather coat was explaining to an elegant blonde how to clean oiled-up sparkplugs; to our right, two rubicund farmers were arguing the merits of a subsidy for treating something called bumblefoot.

"Anyway," I said, "I thought the main motivation behind AI was to gain insight into the workings of the brain."

"Hmp," said Olly skeptically. "Oh, *some* insight, I suppose. But evolution is a terrible opportunist. If it can cannibalize existing components, or make one structure perform several tasks, it will. That produces the *damnedest* designs."

Oliver is rather like a rusty tap. It takes quite an effort to turn the flow on—but once it *is* on, it's almost impossible to turn it off again. "Look," he said, "let me give you a simple analogy. Imagine an evolving house. One day, the bedroom decides it would be nice to have a door to block up the hole that you enter it by, so it evolves one. What do the other rooms do?"

"They evolve doors too," I said.

"Ah. In a *designed* system, maybe. In an evolved one, they'll just as likely come up with the door-sharing mechanism that transports the door round the house to whichever rooms needs it. And once the transporter has evolved, the house may discover that it functions pretty well with only one window and one ceiling. You get some sort of dynamic entity, constantly reshuffling itself into the currently desirable form.

"After all," he went on, "look at genetics. Overlapping genes; genes that come in several pieces—damn it, over-

lapping genetic *codes!* It's a designer's nightmare! Sure, it all *works*—thanks to a billion years of R&D. But do you really think that a *designed* system can mimic that kind of structure? Never! What you need is something more direct, some kind of short-cut. I'm doing some very interesting work at Decal Labs. It's called—'' he broke off.

''Yes?'' I encouraged. He looked around guiltily, and leaned closer in a conspiratorial whisper. ''GUM,'' he said.

''Oh.''

''Generation of Universal Models,'' he explained. ''It builds a kind of computer simulation of a human personality. We call it a *persona*.''

''Clever,'' I said. ''The Latin for 'mask.' ''

''Is it? I thought it was something in psychology. No matter. What's in a name?''

''Names aside, what's in a persona? Why do you want one?''

''Applications all over the place. Like politics: simulate your opponent and predict his reactions. Market research: assemble a representative set of personae—hey presto, a tame Electronic Gallup Poll. Cheap, too, once the groundwork is done.''

''I'm beginning to see the possibilities. Oliver, is this a *wise* move? The abuses—''

''Abuses schmooses. If fire were to be invented now, nobody would dare use it because of the dangerous side effects.''

''Joan of Arc might have been pleased by that.''

''Red herring.''

''More like roast Frog. How does this simulation work?''

''Don't know.''

''What? How can you possibly develop a process you don't understand?''

''And there you go, falling into the same trap as the Artificial Intelligentsia. Jonathan, my lad, there is scarcely a technological process in existence that we *do* understand. We're just a bunch of clever monkeys who've learned a few tricks to get hold of bigger bananas. We don't really know how *any* of them work.

''This one is a very old trick indeed. Use the original to build up a simulation, without knowing the detailed mechanics. Like a photograph. The camera doesn't work by analysing a scene into 'this is a tree, this is a cow,' and then assembling a photograph from a library of trees and cows: it just goes 'whammo' and gives you a copy that doesn't even *care* how the scene splits up. And GUM is simply a universal version of that idea.

''But that's only half of it. The other part is—'' The pub lights flashed on and off: closing time. ''I'll tell you in the car,'' said Oliver.

I drove, and Oliver talked.

''The other piece of the picture,'' he said, ''is MM.''

''Mmm?'' I said unthinkingly.

''No, it's pronounced 'em-em.' ''

''Oliver, I was merely making noises of encouragement.''

''Oh. Anyway, with MM we can do the most *amazing*—''

''Oliver: *what is MM?*''

''Mitochondrial Memory,'' he said, in the same tone of voice that you would use to explain to a four-year-old that,

in houses with central heating, Santa Claus comes through the *pipes*. I turned left, toward Wotton under Edge, and promptly got stuck behind a tractor hauling what without doubt was the filthiest piece of farm machinery I have ever seen. Ropy rivulets of thick ooze dripped from it on every side. It was hard to tell in the headlights what colour it was, but it was the sort of ooze that could *only* be a bilious green.

"You've heard of Debbitch's work, of course," said Olly.

"*Prudence* Debbitch? The woman who did those awful things to flatworms?"

"The very same. There was earlier work too, but it was inconclusive. Pru Debbitch did the definitive experiments. She confirmed that memory can function on a *cellular* level. Remember that cell biology course we took?"

"Sure do. Emily Costain was quite a dish. Remember how she used to snap the chalk between her teeth? I nearly had an—"

"I refer to the course *content*, not your adolescent fantasizing about the instructor. Specifically, I refer to the *mitochondrion*."

"Ah. Those things that look like—" I tried to sketch in the air, and nearly went into the hedge. "But I thought the word was *mitochondria*."

"That's the plural. But it isn't."

I can't stand Oliver when he's obscure. "What isn't?"

"The mitochondrion isn't. All the old textbooks talk of it in the plural, because pictures of cells show *dozens* of the things. But actually, there's only one."

"You mean biologists can't even *count*? I agree they're not renowned for their numeracy, but—"

"No, no. The trouble is, those pictures are *sections*. The mitochondrion is a single tree-like structure, and those things in the electron micrographs are cuts through different branches. Pru assembled about fifty thousand sections by computer, and found they all linked up in the large. One single dirty great convoluted mother of a thing."

The tractor turned off into a farmyard. I swear the sign read HANNIBAL FARM. Maybe they bred elephants; maybe *that* explained the state of the machinery. It's amazing how much unjustified conjecture you can squeeze out of a single capsule of fact. I put my foot down and the car gathered speed, narrowly missing a sauntering hedgehog.

"So," Olly continued, "Pru asked herself what it was *for*. The conventional wisdom has it that they're little cellular powerhouses. But the conventional wisdom also has it that there are hundreds of them in every cell, so it's not very trustworthy. In fact, it's wrong."

"Naturally. So what *is* the mitochondrion?"

"A brain."

"That's ridiculous!"

"Not really," said Oliver. The M4 motorway passed beneath us, the traffic an apparent crossbreed of glowworms and soldier ants; suddenly it was gone, replaced by the silhouette of a ruined windmill. We turned right to avoid Mangotsfield—it has three Watneys' pubs in the space of a hundred yards, and Oliver gets attacks of the shudders if we go through it. "A cell is a complicated organism: it needs its own control circuitry. And that, my lad, is the

mitochondrion.

"But what *is* ridiculous, on the face of it, is that these little cellular brainlets contain more-or-less accurate copies of the individual's *real* brain. I don't mean organically; I mean what you might call the informatic content."

"Not me, Olly. I hate buzzwords. And it simply doesn't make sense. Why would we have bothered to evolve such a complex structure as the brain if you can do the same job with a mitochondrion?"

Olly raised his eyes toward Heaven. From my position in the driving seat, I couldn't actually *see* this; but when Oliver Gurney starts to get exasperated you can *feel* a definite aura. Could be pheromones, I suppose; or possibly the amateur-dramatics sighs that emanate from somewhere deep within his reverberant frame. "I didn't *say* that it could do the same job as a brain, Johnny. I said it could hold a coarse duplicate of the information that the brain stores. The mitochondrion is just a passive storage device; it doesn't have any information-*processing* capability. So we had to evolve a brain."

"That may explain the brain; but now I don't see why we evolved the *mitochondrion*."

More pheromonious sighs. "Confound it, Johnny, I've just *explained* to you about the design of evolved systems! The mitochondrion evolved *first*. When the brain came along, it naturally took over; but the mitochondria were still useful to it, so it built them in to the system as some kind of long-term storage buffer. And before you protest about *that*, let me remind you that on orthodox theories, nobody has the foggiest idea where or how the brain stores its memories. Why *not* in the mitochondria of brain-cells?"

"But there can't possibly be enough capacity to store information in one mitochondrion!"

"Oh God. Jonathan, my son, has no one ever told you that one single cell stores enough information to specify the entire organism? I'm sure your mother would explain all about it if you asked her kindly enough; after all you're a big boy now and—"

"That's different, Olly, and you know it! A sperm cell carries genetic information, yes. It specifies the adult, yes. But *not in detail*."

"Maybe not. But one single cell's DNA contains as much information as a million pages of a book."

That got home. I said, weakly, "Huh?"

"A million pages, Johnny. If a cell was the size of a potato, its DNA would form a thread several *miles* long."

I began to believe that a cell might indeed be capable of many things that science is still unaware of. But I still wasn't convinced about mitochondrial memory.

"OK, Olly, I might just be persuaded that *brain* cells' mitochondria could be used for storing data. But, unless I misunderstand you, you're claiming that *all* mitochondria are. And I don't see how that can be."

Our country lane merged with a major road, and I eased into the flow of traffic. Oliver turned in his seat to face me. "Ah," he said in great satisfaction. "Progress. If you can swallow brain cells' mitochondria, Johnny, you're almost there. Because the mitochondria

in the other cells have the same structure—right?"

"I suppose. I'm no biologist."

"I wouldn't dream of making such an accusation. Now, the process whereby the brain shoves information into mitochondria might very well be intended only to shove it into brain cells. *But*, what with the nervous system being all connected up, and running through the entire body, the other cells get in on the act as innocent bystanders, so to speak."

"Well . . . I'd be more convinced if you could show me some evidence of this information transfer. "

"But that's simplicity itself! The transfer takes place while the individual is asleep. In fact, that's *why* the brain changes its state; it's why sleep is necessary. A waking brain is too busy to oversee the information-flow to the mitochondria."

"Fine. And can you prove this process actually takes place?"

"Jonathan: have you ever asked yourself what *dreaming* is for? That's the information flow. The bits of the conscious brain that remain perceive it, but of course it's coded differently and they get a garbled and confused version. Dreams are always muddled, aren't they?"

"I cannot deny it."

"Good!"

"But I'm still not convinced."

"You'll see."

A sports car cut in sharply ahead of me and I had to brake faster than I prefer. I said, "See what, Olly?"

"See how we can reconstruct a personality from the mitochondrial memory."

"Oh, come now. This is just too much."

He gripped my arm earnestly, and we narrowly avoided attempting to climb a lamppost. "It *works*, Johnny. Really. The cellular memory system isn't too detailed, but if you superimpose the contents of hundreds of different cells you get an approximation to the actual personality. A coarse persona. That's what GUM does. You see, the brain content is kind of spread around the body cells, lots of redundancy, that sort of thing. All you need is a couple of pseudofourier transforms and—"

"All I need is a good night's sleep, Olly."

"Don't be obtuse. What I'm saying is that we can reconstruct a personality inside a computer! Using just a few thousand cells! Dead ones, even! It only takes seventeen hours, if you've got a decent sample of cell-tissue. And you get a *persona* accurate up to the time that the cells in question died!"

It sounded fantastic. In the original sense of the word. I didn't believe it, and I told him so. After all, he'd had seven pints of strong ale—that was why I was doing the driving. The argument got quite heated, and it was still going on when we got to his flat, just off Whiteladies Road.

It stopped while Olly was making coffee in the kitchen. I flopped into a chair. There was a pile of books on the floor beside me, and I picked up the top one: it proved to be William Shirer's *The Rise and Fall of the Third Reich*. Olly returned bearing mugs; I put the book on the arm of the chair.

"All right, Skeptical Enquirer!" he said. "I'll prove it to you. You name

the subject, and I'll produce his persona."

"I assume you need someone living."

"No—just so long as I can get a cell sample."

"Smashing. That widens the field. I propose you construct a persona of—" I cast wildly about for an idea. I'd drunk a glass or so beyond my usual, and was having trouble making a selection. I looked at the book, and inspiration struck. I tapped at the cover. "This chap," I said.

"Jeez, Johnny, that's a hard one. I don't know whether I can get the samples. Nuremberg, maybe. Wasn't his body burned?"

"Eh? William Shirer?"

"No! Adolf Hitler!"

"Hang on, Olly, I didn't mean—"

"By God! You aren't going to wriggle out of it now! Damn you, Jonathan: if you *want* Adolf, I'll *get* you Adolf if it's the last thing I do!"

I started to say, "But I *don't* want

" But by then, Oliver had stormed out of the room and was dialling the International Operator for a call to Nuremberg.

The *Tall Ship* was a bit more crowded than usual, but we managed to find a couple of seats in a relatively quiet corner.

"I need this," said Oliver, tilting his mug. "I've had a busy week. All your fault. It's not easy to get hold of cell tissue from someone who died nearly forty years ago."

"Did you?"

"Well. I tried several dead ends. Finally I tracked down a certain Fräulein Anna Klopp, now living in Northern France, near Metz."

I shifted uncomfortably on my seat —there was a nail in it. "Who is Anna Klopp? Hitler's ex-mistress?"

"You ignoramus. That was Eva Braun. Unless you count Geli Raubal or Sigrid von Lappus or—"

"Stop showing off."

"Well, even you should be able to count. Anna Klopp is twenty-nine."

"Oh."

"It was her father I was really after. Alfred Klopp, born in Munich in 1903. But he died, two years ago. Anna is his only living relative apart from a couple of second cousins in Australia and the U.S. Have another?" He fought his way to the bar and reappeared triumphantly, bearing two mugs.

"So who is Alfred Klopp?"

"He was Hitler's barber between April 1942 and his death in 1945. The Führer liked to have a regular barber, one he could really trust. A lot of people would have enjoyed putting a razor to Adolf's throat. What I was after, regarding Alfred Klopp, was a bit of a dead end too."

He grinned a self-satisfied smile, but for once I was quick on the uptake. "Aha!" I said. "And this Klopp bloke kept a few locks of Hitler's hair, as a souvenir?"

Olly's face fell. "You guessed."

"Nonsense. I don't even believe you; it's too perfect."

"Nonetheless, it's true. Klopp *had* salted away a few locks of *Führerhaar*, and Anna had kept them as interesting historical relics. It was easy enough to persuade her to sell me a few hairs. Old Alfred had even labelled the boxes—and

the most modern one was dated April 23rd 1945."

"That's significant?"

"Adolf died only a week later. There should be a pretty complete set of memories."

"You don't *really* intend to—"

"Old son, it's been tested several times now. But you come to our Bristol labs on Wednesday week, and see for yourself. You know the way."

I sure do. That was where Oliver built his reduplicating Engine—and very nearly destroyed the civilized world.

It was not a promising omen.

Tuesday found me in London at one of the big teaching hospitals, trying to flog a digital hormone balance monitor to a hard-faced lady surgeon who insisted on being called "Mister" rather than "Doctor"—an old medical tradition but one which I felt she must have misunderstood somewhere along the line.

Next morning I spent half the journey from Victoria to Bristol Parkway boning up on Hitler's life from the *Rise and Fall*—until it occurred to me that the whole exercise was pointless.

My difficulty was that I had to distinguish between (a) the persona of Adolf Hitler, transferred from his cell-tissue into a machine; and (b) a *fake* persona of Hitler, created by Oliver Gurney in order to fool me. Now: any information on Hitler that is public, Olly can feed into a computer more easily than I can remember it. The entire *Rise and Fall*, for starters.

On the other hand, any information that is *not* publicly available—I can't check. "Adolf Hitler, what is your favourite dessert?" "Black Forest Gateau." Who knows?

Still, maybe Olly would make a hash of the fakery. It was worth playing along, just to find out.

When I arrived, he got down to business at once, tapping around on the keys like an arthropodal Chopin. He kept getting laconic or incomprehensible messages in reply, like 'FLOPDISK UNDUMP KK DOWN' and '::' I never have got the hang of computers.

Finally Oliver seemed satisfied. "Adolf should be out of cold storage and on the discs now," he said. "Ask him some questions."

"In English?"

"Of course."

"But Hitler was a German."

Olly sighed. "There's a translator in the interface. Didn't you notice me calling the Anglo-Deutsch transmat from Sonybank?"

"Old lad, I wouldn't have noticed if you'd ordered poached egg on toast and two coffees. But I'll take your word for it."

I still have the hardcopy of that session. It goes like this.

U/@$$ddddddddd::

U# 4433-75-OG SESS 145.3.11.82

STATUS OPDISK OK / CRAM OK - PDINTF OK - QWME FK

REMEMBER PAPER COSTS MONEY AND WASTES TREES: USE HARDCOPY ONLY WHEN STRICTLY NECESSARY (MELVYN H. WARPLE, DEPARTMENTAL ECONOMIES OFFICER)

RUN.

FILE HITPERS/GARGOL PRESENT::

Q.

"Your turn," said Olly. "Ask him something."

I suddenly felt foolish. All I could think of was:

IS ANYBODY THERE?

Nothing happened. "Hit RETURN," snarled Olly. I did. What came out was:

ŏoooooooooooooooo
oooooooooooooooo
oooooooooooooooo
oooooooooooooooo
oooooooooooooooo

and it went on saying "Oooo!" like that for several pages before Olly shoved me aside and stopped it.

"Funny," he said. "It shouldn't do that."

He tried various things. I assumed none of them was effective, because he started muttering under his breath about how it was working perfectly yesterday evening and why the bloody hell wasn't it working *now*.

"Nice try, Olly."

"Eh? What are you on about?"

"I'm not fooled. You couldn't get it to work, so you set this little charade up to fool me. But it doesn't."

"You idiot, Johnny! I wish I *had*. But it *was* working yesterday. This is serious; I've got to find out what's happened." He returned to the keyboard: not so much Chopin now, more like Hindemith. I swear he called up a program named *PANICBUTTON*. Then he just sat there with his eyes glued to the screen. After about three minutes I started to ask something, but he snapped at me to keep quiet. Two minutes after that the message NO TRACE appeared on the screen.

"Oh my God," said Olly. "He's escaped."

"What? How can a computer program *escape?*"

"He was stored on an optical flop-disc. He was there yesterday; now it's nothing but zeroes."

"Wiped?"

"No, it was a read-only disc."

"So someone took the disc, and left you with a blank one instead."

"No, this is the disc all right. He's *escaped*, I tell you. You don't realise what the computer network is like nowadays! It's all one big circuit, hooked up by telephone, satellite, undersea cable, microwave our machine is a QCQ-995, but for extra memory it has a dial-up facility to the National Computer Centre at Nottingham. *We* don't decide when to use that: the machine itself does. And the NCC has a dozen or more machines, all interfaced—and *they* can call on a hundred or more other national centres, through the International Computer Network INTERCOM. The big Cray-5 at MIT; the parallel processor at Canberra; the Kyoto Shufflebug: even the Communist Bloc, thanks to the Geneva protocols of 1981—the Khrustetor-1812 in Moscow, the OBMAN in Novosibirsk

"Nobody really knows any more how the whole set-up knits together. A lot of it is self-regulating; not even the manufacturers understand how it really works any more. If a sentient data-string got into the world network, it would have an awfully big choice of places to hide.

"*And* it could do a lot of damage."

I still didn't believe him. I said, "And how did our sentient data-string get away? I wasn't aware that Adolf Hitler was much into computer programming."

"As yet, I have no idea. But you have to realise that the computer network is a fairly natural environment for a data-string, and a sentient one might learn to make use of it quite rapidly. I recall one remark about Hitler from the *Rise and Fall:* he was always quick to turn a situation to his advantage."

And I remembered another. A week before his suicide, Hitler was on the verge of madness.

By the following morning, Oliver reckoned he had traced what he still maintained was a digital Adolf Hitler to a public-key cryptogram in Lausanne. Here, the wily dictator had encoded himself, and transmitted the result —somewhere. Swiss security being tight as ever (especially regarding dictators), Olly lost the trail. But that didn't stop him from searching.

Even though I continued to treat the whole thing as a joke, Oliver phoned me every evening with the latest "evidence" that Adolf was amok in the world's microchips. Like:

●The entire tax records of the Argentine government, from 1950 to 1973, were wiped by "machine error."

●A nuclear power plant near Hebron nearly suffered a meltdown. All electronic safeties failed simultaneously, and a supervisor shut it down manually.

●Files on seven thousand West German policemen vanished for two days. They turned up in a disc store used by the BBC's Ceefax system.

●A French computer "mislaid" key components of a NATO strategic assessment.

●The Brazilians found that their population data had been scrambled.

●The confidential business records of five U.S. congressmen representing the "Jewish Lobby" were accidentally released to the press by a Washington databank.

●Breaches of security in the Ukrainian wing of the Politburo were rumoured.

●A dozen obsolescent but still operative Minuteman missiles were found to have been erroneously targeted on Tel-Aviv.

"Evidently," said Oliver, "there's a lot of antisemitic activity in the computer network, coupled with actions that could be construed as pro-Nazi. That missile incident worries me a lot. What if the bugger penetrates NORAD? He could start World War III! Pick up where he left off."

Some of the things Olly swore proved there was a Führer in the works were less than convincing. There was, for instance, an automated factory in Gamaliel, Kentucky, that was designed to produce guttering—but inexplicably began to fabricate hot cross buns, having managed to get itself supplied with flour instead of aluminum powder from an equally automated warehouse. It happens all the time.

"Hitler?" I said incredulously.

"Sure. Mind you, he's got his programming fouled up—a syntactic spoonerism."

"Huh?"

"Buns before gutter," said Olly. I suppose it was a joke.

Then there was the message he found on his VDU one morning:

THIS TIME IT WILL LAST
A THOUSAND YEARS—A.H.

Some wag in Decal Labs, no doubt. But poor Olly couldn't see that.

What finally spurred me to action was when he reported that a North Korean textile factory had received a fake order for two million shirts. Colour: brown. I still didn't believe Olly's story—but it convinced me that *he* did, and I began to fear for his sanity.

"Oliver," I said, "why not set a persona to catch a persona?"

"Eh?"

"I believe there's some kind of Nazi-hunting organization in existence. Why not feed *them* into the network?"

He mulled it over. Finally he said, "No, won't work. It would take them too long to learn the ropes."

"Hitler managed it."

"Not really. He just picked up the general gist. Nothing fancy. To hide in a jungle is easy. To track down a fugitive there needs real skills. Now, a team of *experts* "

"Who?" I asked.

"Me," he said.

"Oliver, I know you're not exactly sylph-like, but not even you amount to a *team!*"

"No," he said carefully, in the manner of one sipping the product of a hitherto untried brewery. "But a thousand copies of me would."

One persona of Oliver Gurney takes seventeen hours to make. But one thousand take only thirty hours longer: it takes no more than two minutes to copy the data-string. Olly started to rig the equipment.

"Oliver," I said, "don't you feel a little strange, making a thousand copies of yourself?"

"I suppose I do feel a bit of a clone." He waited until I made the ritual response. "No, not much. They aren' *me* . just simulations."

"Easy to say. But *I'd* feel unsettled by it."

"You sure of that?"

"Of course!"

"Oh," he said. "That's a pity. E how do you feel right now?"

"Fine. Why?"

He held up a disc-pack. "Meet you *alter ego*."

"You *what?*"

"I knocked up a persona of you las week, using some beard-clippings from your electric razor. Didn't you notice?"

"No, of course not!"

"Then *I* won't notice 1K of me, wil I? Stop being silly." He turned his back and fiddled with some lengths of wire a manic maypole dancer without his pole.

Eventually I plucked up the courage to ask whether it was *really* a persona of me. He shrugged. "No. But it *could* have been."

"Oliver, have you really thought this thing through properly? If you can simulate a man's personality surreptitiously, like that—it's the most dangerous invention *ever*. All the worst features of voodoo, for starters: possess any part of a man's body, and you own his soul!"

He shrugged again. "Maybe you'r right. How many brilliant scientific advances have been ruined by human nature? But right now our job is to get Adolf back. *After* that, I'll rethink the wisdom of it all. Deal?"

"Deal."

He plugged the flopdisc into its slot

Motors whirred. A thousand Oliver Gurneys began slipping stealthily into the world computer network.

It occurred to me that the cure could be worse than the disease.

But the Gurney Batallion, at least, was well disciplined. Every few minutes, one or another of them would make a report. After a lengthy series of dead ends, the trail freshened. The electronic Olivers were learning their trade. I could see them in my mind, a whole host of them, led by an electronic Fagin, all singing "you gotta pick a socket or two-oo " Forgive me. It was a stressful time.

A horrible thought stuck me.

"Olly: what's to stop *Hitler* making copies of himself?"

"Nothing."

"I don't like to hear that."

"Ignorance is only bliss for the unimaginative. It's true, like it or not. *But*—he won't."

"Why not?"

"Too egocentric. He wouldn't tolerate the competition. He always wanted to run everything himself. Damn nearly did, at the end."

"But surely it would make good sense to have at least *one* duplicate hidden away somewhere safe! Somewhere he could keep it under control!"

Oliver shoved another disc-pack under my nose. "Suppose this really was a persona of you," he said quietly, "and I was just about to blow your head off with a shotgun. It would make you feel so much happier that a copy was still in existence, wouldn't it?"

"Well no."

"Quite. You've got to think about these things from the *inside*, Johnny. A copy of you would look just the same, to *me;* but it wouldn't *feel* the same to you. And old Adolf is after power for *himself*, not for a copy! Anyway, he wouldn't be certain of controlling an independent duplicate. Did I mention that he escaped from a read-only disc? There should have been a copy left behind—damn it, that's what 'read-only' *means*—but there wasn't. There wasn't, because Adolf lives inside the hardware, and he can manipulate it in ways that aren't accessible from outside. It was jolly clever how he got away. Let me tell you about it, you'll be fascinated—"

"No thanks, Olly. You know I can't tell a Stack from a Buffer. But, granting he won't allow copies—isn't there some way he could jazz himself up a bit into some kind of multiple unit with built-in redundancy, and spread himself around the system?"

Oliver chuckled—the effect resembles a blancmange with a two-stroke engine. "*I* could do it. But not Adolf. Not till he's learned a lot more about computers. It's another case of real expertise rather than native wit. No, Johnny; I reckon I've got a good feel for how our fugitive operates; and my bones tell me there is only one Hitler in the World Network."

I hoped Olly's bones were in good working order.

We waited.

More reports. Curious patterns.

A puzzle to unravel.

"Johnny: why should Adolf be so interested in St. Stephen's Hospital?"

I thought hard. I'd been there a few times. "I don't know. It's a small, high-quality teaching hospital, especially strong in neurophysiology. Apart from

that, nothing special." But it seemed to me that there was something else, something I'd read recently. The newspaper? I found yesterday's *Guardian* under a pile of unwashed socks and began turning pages.

"If I were Adolf, what would I want most?" mused Oliver. "Power? Naturally. But how satisfying would power be to a disembodied intelligence? A dis-em— Johnny! That's it! Oh my dear God!"

"That's *what?*" I said, irritated. I hadn't been listening.

"A *body!* He's going to feed his persona into somebody else's brain. A personality-transplant!"

I found the article I'd been looking for. I said, "Is that feasible, Olly?"

"I reckon so. You'd get the new persona superimposed on the old habits. So he'd move and speak just as before; but he'd *think* Adolf Hitler. You could do a kind of inverted GUM transplant provided there was a good conductive channel to the brain of the recipient. The cerebral cortex would be best."

I slapped the *Guardian* down under Olly's nose. "Well, if he *is* aiming for a transplant, he's aiming high." The headline read: CHECK-UP FOR PM. The first paragraph:

Security at St. Stephen's Hospital, Greenwich was stepped up today in readiness for the visit next week by the Prime Minister for her annual medical examination. For the first time this will include a complete brain-scan, using the new Digital Encephalotomogram manufactured by Decal Laboratories.

I read it out to Olly. He said, "If so, old Adolf's picked a toughie. She's as bad as he is."

"Be serious, Oliver!" It was getting to me, now. I think I'd started to believe the whole ridiculous tale.

"I am," he said plaintively. I threw the paper at his head.

"Olly? *Could* Adolf insert himself into our beloved leaderene's brain by way of Decal's encephalowhatsigram? As I recall from the glossy bumf, it gets 3-D excitation-inhibition patterns out of the brain waveforms using induction circuitry. Could he get *in* that way?"

Olly disappeared, returning with a heap of engineering drawings. After ten minutes or so, he looked up. "Probably."

"Olly, we've got to stop him!"

"I suppose so," said Oliver gloomily. "I'm not really sure we'd notice the difference. But—damn it, if anyone's going to subvert democracy in this country, I'd rather it was someone *British!*" Olly's patriotism takes curious forms.

We began to cook up a plan.

As we drove past St. Stephen's in Olly's battered old Mini-Metro, we could see the visible signs of a security blitz. The police were all over the place. Oliver turned left at the traffic-lights, on to Gresham Avenue. Half a mile further on, he parked the car in a side street. We got out, and continued walking *away* from St. Stephen's.

We wouldn't have stood a dog's chance of getting past the security at the hospital.

And it wouldn't have helped if we had.

Instead, our objective was an undistinguished little building near the Deptford cattle market. Paint was peeling

from the wooden plaque, which read: NHS DATA CENTRE, DEPTFORD.

Olly had explained it this way.

"What we have to do is intercept Adolf on his way in. He's got to come through the INTERCOM network, and make the connection with the computer that drives the St. Stephen's encephalotomogram. The Deptford Centre is the only link between the two. So that's where we'll cut him off."

"But won't there be security checks there too?" I objected.

"Something perfunctory, possibly. But even in these days of electronic surveillance, the security boys still tend to think only about physical contact. Or maybe the idea of a computer-assisted long-range assassin frightens them so much they prefer not to even think about it."

"Sounds far-fetched to me," I said.

"Not so. Oh, you'd need to set it up in advance; but you could manage. For instance, I could fix up your phone with a nice charge of plastic explosive hidden in the handset. Then, say a year later, I could ring you up; make sure I had the right person; send the detonation-code down the wire; blow your head off."

"Yug."

"And that's a pretty crude example," said Olly. "Of course, they check all official phones regularly, just in case."

I dropped the subject, glad that it wasn't *me* in charge of the safety of an unpopular politician.

Oliver was right. He posed as a maintenance man: his Decal Labs pass got him through the front door without trouble. I had arranged an appointment with a buyer of surgical instruments in a connecting building, and arrived an hour early. From there, Olly's pass got us both into the computer room, which was manned by two bored assistants. Olly soon had a disc-store stripped down, and its entrails spread as if to observe the omens. Come the morning tea-break, and we were left on our own.

Olly had rigged up a little device to intercept incoming data from INTERCOM and transmit it on a tight radio-beam to a receiver in the car, a mile or so away. I was carrying it among my samples; though my only real contribution was to keep a look-out.

It only took five minutes to fit it. Soon after, one of the operators came back. I chatted to her while Olly reassembled the disc-store; and then, unhurriedly, we left. Olly headed for the car; I headed for my appointment. I was soon busy trying to sell a new bonded-polymer scalpel, but all the time I was thinking about Olly. Would the plan work? I was so distracted, I nearly cut my finger off.

The buyer was so impressed by the wound, she bought five hundred.

Finally I got away. Two Daimlers and a Rolls drove past as I walked back along Gresham Avenue. The whole thing was beginning to feel improbable again. Even so, my pulse was jumping by the time I got to where Olly had parked the car. Even more so when I noticed he had forgotten to feed the parking-meter.

He was sitting inside with a box on his lap, like a cross between a pocket TV and a cassette recorder. It was plugged into the car's radio aerial.

I got in beside him.

"Well?" I said.

He nodded. "Very well. I had a

dozen of my personae keeping an eye on Adolf as he approached. Shepherding the poor sod right into the trap. He never suspected a thing. The moment he stuck his nose inside the Data Centre my little device grabbed hold of it, and flung him over the ether to me." He held up a cassette. It said "*Boots*" on the box. "Here he is."

I had never entirely grasped this aspect of the operation, and I was just going to ask Olly to explain when I spotted a traffic-warden approaching. We eased out into the traffic. Then I *did* ask.

"The only *certain* way to eliminate a sentient data-string," he said— in the voice of a world expert on such matters— " is to record it, making a *unique* copy, and to *physically* destroy the recording. It is crucial to keep well away from any electrical devices that run off the mains: it might escape again. In fact, I had the devil's own job devising a foolproof radio-link. I wouldn't dare to try demagnetizing this tape, for instance—Adolf might induce himself into the demagnetizer, nip off into the electrical mains, and be in business again. That's why I used a car: it's electrically isolated." He smirked. "But he's on this tape now, and nowhere else. No question."

"What next?"

"We destroy the tape, non-electrically."

"How?" I asked.

"Put it in the gas-oven and burn it," said Oliver.

It has always seemed to me that his next remark was in execrable taste, and I blush to recount it. But historical accuracy demands that it be placed on record. He said:

"After all, it's poetic justice, isn't it?"

When it was all over, my doubts slowly surfaced again.

Had we *really* saved the world from a resurrected Adolf Hitler? Stopped him from taking control of the mind of the British Prime Minister? Saved The World For Democracy?

Or was it all a figment of Oliver Gurney's alcohol-sodden imagination?

I couldn't decide.

But there is one final piece of what *might* be evidence.

Some days after the Destruction Of The Tape, and after Olly had nipped back into the Data Centre and retrieved his little gadget, unseen, it occurred to me that—on Oliver's theories—there were still a thousand Oliver Gurneys on the loose. I asked what he was going to do about them. He said, "Nothing."

"Why not?"

"They won't do any harm. They're *happy* in there. Anyway, it would be too much like suicide. Or, at least, like killing my own kids. Leave the poor Ollies to their fun, Jonathan!"

"I thought you didn't mind that kind of thing," I said. "You called me 'silly' for thinking like that!"

"Hell, I've kind of got *used* to being multiplexed! Oliver Boswell Gurney, the world's first digital superclone! But—one thing I *do* concede: GUM is too dangerous to give to the world. I've scrapped it." Which was a fair trade, so I stopped wondering about those wandering Ollies. Even forgot they were ever there—assuming that they *were*.

Until I heard the story of the Old Stone Fort beer factory.

Seems there's this beer plant near McMinnville, Tennessee. Fully automated. No human workers at all, save one supervisor. Not so long after Oliver had laid Adolf to rest, the supervisor telephoned his bosses in great dismay, claiming he couldn't get into the factory. *That* at least was true: in fact, the security systems were so good that nobody else could get in either. They still haven't.

And it's still working.

It's even taking delivery of raw materials—from another equally fully automated warehouse.

Nobody can stop the process. The factory computer, and the one in the warehouse, refuse to talk about it. Those are pretty autonomous gadgets: the factory can even repair, or rearrange, its own machinery.

Since then, that beer factory has taken delivery of sufficient raw materials to produce enough beer to fill it three times over. Except that absolutely nothing has come out of it.

Nobody knows why—or how. Nobody knows what's going on at all. Except, perhaps, me. I have a wild theory. After all, I was there when Oliver first discussed the problem.

You see, I keep getting a mental picture of a thousand Oliver Gurneys

and an enormous beer-drinking machine. ■

● Anger cannot win; it cannot even think clearly.

Dwight D. Eisenhower

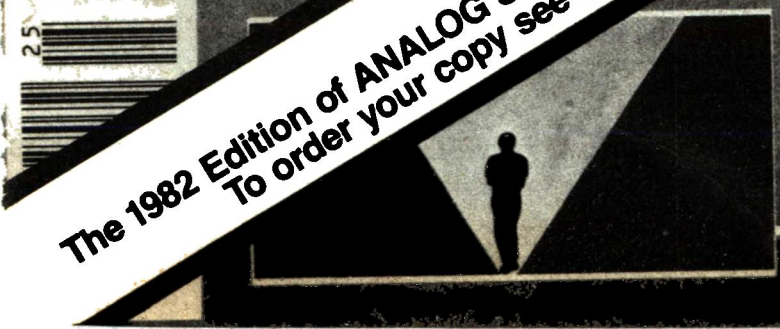
$2.95

analog
ANTHOLOGY #2

READERS' CHOICE

EDITED BY STANLEY SCHMIDT

JOHN W. CAMPBELL, JR. • ORSON SCOTT CARD
L. SPRAGUE DE CAMP • LESTER DEL REY • RAYMOND Z. GALLUN
TOM GODWIN • ROBERT A. HEINLEIN • ERIC FRANK RUSSE
CLIFFORD D. SIMAK • JOAN D. VINGE • ROGER ZEL

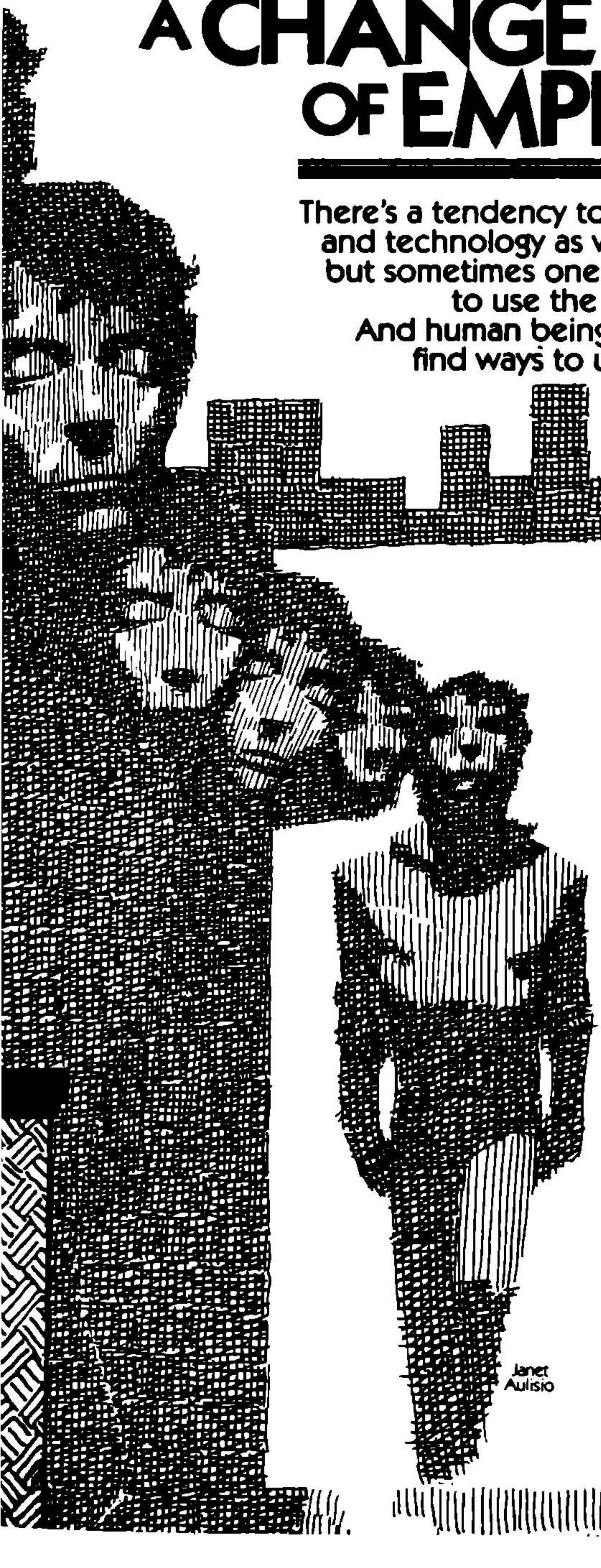



THE NEW
SUFI
BENTZ
C.M.

A CHANGE OF EMPLOYMENT

Ray Brown

There's a tendency to think of religion
and technology as very separate—
but sometimes one can find a way
to use the other.
And human beings can always
find ways to use both.



Janet Aulisio

A pack of ragged children followed Flaherty across the Strombron and down the Stora Nygaten toward the Reformed Sufi Meditation Center, begging with petulant shrillness. The only change in their cries was the forced laughter they squeezed out at the sight of an old woman carrying a slop pail across the street to a two-by-one-meter colored poster—the single cheerful spot in the long row of grimy walls. Flaherty couldn't read Swedish, but he'd seen the poster before in other languages: a young couple viewed from the back, staring across a field to a virgin forest. The text said:

LIVE!
on Procyon V
(come to the Outworlds)

The old lady started at the top and carefully, deliberately, poured the pail's contents over the poster until the whole thing was dripping with brown slime. She glared at Flaherty self-righteously.

Flaherty walked on and the children resumed their begging. He tried to ignore them and their reminder of the ugly poverty all around him, but there was really no place where he could focus his attention on anything else. Even the sky above was a dingy gray, like the soot-covered buildings that framed it.

While staring at the sky he bumped into a large packing crate covered with tarpaper, sitting in the middle of the sidewalk. He walked around the open side and saw an old man sitting wrapped in a shocking-pink blanket, surrounded by litter—an alcohol burner, some dented pots. He grabbed Flaherty's pant leg, then snatched his hand back and spoke to him in English, saying, "Surely you can spare something!"

"I'm out of work myself," Flaherty said, and rushed on, wondering what it would be like to live in a box. There were many such homes in Stockholm.

He walked faster as the rain started up again—a cold misty drizzle. It was turning winter. *It's worse than Calcutta,* he thought. At least you could stay warm in Calcutta. What did the street people do here when the freeze came? Maybe they just died. Maybe he'd find out the hard way.

The Meditation Center was easy to spot—an old stone house newly painted white. He could see the shiny dark glass of the Transmat building rising over the roof. As he stopped, the children crowded around him, hands outstretched. He cursed and ran through the clean enamelled door, slamming it behind him. It was almost as cold inside as out, but at least it was dry. Immediately to his right was another door marked "Reading Room." He walked in, turning his back to the stares of a couple of stern-faced women, and nosed along a high bookshelf. At the far end of the shelf was the window, and the Transmat building.

Transmat, Inc. and the Reformed Sufi Movement, he thought, seeing the familiar logos for each imprinted on the backs of his eyelids. They went together. Wherever you found a Transmat branch, there was a Meditation Center not far away. Reformed Sufism was an American import, a product of the Magickal tradition, and thus offensive to many Europeans on two counts. Even so, it was now a company requirement—you had to be a Reformed Sufi to work for them. That had got them into trouble here, but they hadn't abandoned it.

Two years before, Transmat decided that opening their new research center in Stockholm would be a general benefit to mankind and a wonderful publicity move. They had predicted that the new employment they'd generate would lift the city out of its sixty-year-old depression. The whole thing had backfired, though, because of the Sufi rule. Most Swedes refused to work for them. The ignorant Nordic savages wouldn't even pretend to change religions, not even to end starvation. He'd heard recently that back home in Columbus more than half the population now at least claimed to be RS.

But Transmat had never opened anything there but a one-booth station. There was no justice.

He checked his watch. Still two hours before his appointment: plenty of time to do a little reviewing. But if the books on the high shelf were in any order, it wasn't alphabetical. And the few in English were all thick, forbidding, leatherbound monsters, mostly with one-word titles like "Ignorance," "Integration," and "Continuity."

He'd thought to work backwards from the index of such a book, to impress them at his job interview with catch-phrases that would imply deep study of some such abstruse area, but now he thought better of it. The thing to do was to play it safe—he wouldn't control the interview and they might ask him about anything. He clomped across the hardwood floor to a bookcase which held one shelf of green-bound books, one of black, and one of white. The *Koran*, the *Holy Bible*, and *The New Sufi*, by Isaac Bentz, C.M.

He snatched an English copy of *The New Sufi* out of the shelf and plopped into a nearby chair, flipping pages furiously, trying to memorize all the important passages in less than two hours, his face frozen into the wide-eyed, gored-bull look it got whenever he tried to force himself to concentrate. *Why the hell*, he thought, *didn't I review all this two weeks ago when I got notice of this interview in Lübeck?*

He ground his teeth and widened his eyes still further as he tried to stuff a crucial passage into his brain:

"*The quantization of time, now widely accepted by physicists as factual* (Horseshit, he thought) *is but a new insight into a long-known truth: the continual destruction and recreation of the universe. For, in the 'space between' each of these quantized 'instants' the universe and all in it, even ourselves, are not. Yet those Sufis who are far advanced in the firmness of the integration of their souls know that something lasts through these in-between spaces. And even those of us who have not yet developed souls can, with a little reflection, see that our continuing consciousness, through this continual destruction and recreation, is evidence of the seed of the soul*

Christ on a crutch, he thought. Five years ago nobody had ever heard of these guys. Now the best guessers guessed that they were the third-biggest religion on Earth, and the biggest off it.

It almost made you think there was something behind it.

But, he told himself, what was really behind it was Transmat, Inc.

One half of his mind thought about

that, instead of the text. The other half of his mind also skipped the text—it was busy cursing the first half for not studying. Something like this happened whenever he tried to force himself to concentrate. Maybe, he thought, he should start coming to these meditation centers more often. A little *pranayama* and *dharana* might do him some good.

The real secret of Transmat's success, he thought, was the cost of space travel. Pushing near light-speed was the only way to take any advantage of the time-contracting effect, and the cost of that was so high it gave even the treasurers of big governments nightmares.

When the first transmats (that misleading name!) went into operation the process cost a little over $16 per gram—very expensive, but dirt cheap compared to conventional space travel. They flew installations to all the colonized solar systems, and from then on, businessmen sent all supplies by transmat.

But there was an understandable reluctance to use the machine oneself.

Unfortunately, it takes people to operate a business. As Transmat perfected its machines the price dropped, and when it hit somewhere around $6 per gram comptrollers started telling their bosses that it was insane to go on transporting field reps (not comptrollers) in spaceships.

Now the price was less than 50¢ per gram. *Somewhere in this last big drop came a point,* he thought, *where if I'd had the capital I could have made millions by using the transmat personally—if the term "I" would have had any meaning after I used it.*

He leafed through the book more slowly. Men will always find a way to reconcile their beliefs to their immediate interests, he reasoned. A strictly small-time religion, which had barely kept going for twenty years before the invention of the transmat, had provided the answer.

"The seed of the soul survives all, for it is only the information of which you consist. *Therefore, do not despair because of age or a 'dark past.' You can grow that seed into whatever you wish* ."

A shadow fell across the page.

He looked up. A tall, fair-haired man in a white suit stood before him, smiling in an odd, quirky way.

"Mr. Jack Flaherty?"

"That's me."

"I am Carl Mixter of Transmat, Inc. and the Reformed Sufi Church. You show an unusual degree of dedication, sir. Not many would be able to concentrate on the words of the Celestial Master before an important job interview." The smile became even quirkier.

Transmat! Flaherty thought, shocked. They were on to him. That ended any chance he had of impressing them as a good RS. And he thought, *save a place in that crate for me, old man.*

Carl Mixter gestured toward the door, asked, "Will you come with me, sir?" and strode away without looking back to see if Flaherty followed.

Flaherty did follow: up the uncarpeted steps at the end of the harshly lit hall, up two flights to a cold room with only a mirror, two chairs, and a table. On the table was a folder which bore Flaherty's name. They sat.

"Well," said Mixter, in a disorienting turnaround of Flaherty's own

thoughts, "I see you're on to us." He pointed at Jack's hand.

Flaherty looked down at his fist, clenched tight around *The New Sufi*, surprised. He hadn't been aware of carrying it.

"Pardon me," he said. "I don't quite see your meaning."

Mixter looked disappointed at that. His facial skin seemed, somehow, to grow looser. He opened the folder, squared the papers with his hands, and stared at Flaherty expectantly, ignoring them.

"Pardon me again," Flaherty said, "but this is unexpected uh is this my interview?"

"Sure. Didn't they tell you at Transmat? You're not going to be working as an electrician. We want you for the same group I'm in: Church Liaison Operations." His eyes narrowed. "They did send you here, didn't they?"

"I never got to the Transmat Building. I stopped here first."

Mixter sighed. "That explains why you were here so early. You're not of the Church, but you didn't want us to know that, right?"

Flaherty stood up. "I'll leave, if you like," he said stiffly.

"Sit," Mixter said, waving Flaherty back into his seat. "Ordinarily, that would keep you out of the department, but in this case well, as Isaac Bentz once said, the true test of Reformed Sufihood is whether you're willing to say you *are* one." He looked at the top paper of his pile and said, "You've never travelled by transmat, have you." It was not a question.

"No, I could never afford it."

"If you could afford it, would you?"

"Yes."

"That's good," Mixter said slowly, "because you'll be required to travel by transmat as part of your job." He smiled. "You're sure of your answer?" He leaned over the table, hands clenched.

Flaherty's stomach did flip-flops. He pressed his body back into his chair, trapped between fear of the transmat and fear of dying in Stockholm. "No," he said, finally.

Mixter relaxed a little. "We've goth started off on the wrong foot. Why don't we try being completely honest with each other. Believe me, if you want the job you're already hired, but you've got to understand a few things. Your old employer was Korngold Industries in Lübeck. Do you know our connection with Korngold?"

"They developed the PK Link that made the transmat possible in the first place. Mass and energy are bound by the speed of light, but information is a negative-entropy thing "

" 'Not subject to this cosmic mockery of man's ambition,' " Mixter finished with the air of quoting someone. "Then you know our clout with Korngold is enough to have you fired at our request."

So that was it! He'd wondered about it for all the months he'd watched his savings dwindle. Because he was an alien in Schleswig-Holstein, Korngold didn't have to give him a reason.

"Why?" he cried aloud.

"We need you badly. And we're willing to pay a bundle. But you'll have to travel by transmat. There's $60,000 in it for you, for only a few minutes' work."

"There's nothing in it for me if I'm dead."

Mixter's face flushed with anger. "That's superstitious shit."

"I haven't said no," said Flaherty, "but I do know how the transmat works, after all. Your company's very name for it is a lie. It doesn't transmit matter, it transmits information. You get into a booth and you're scanned for the most probable state and position of the sub-atomic particles that make you up, and that scanning process *destroys* that arrangement of particles—vaporizes you. A new body is assembled at the receiving booth out of new matter. But the person who entered the first booth is dead."

"How many of the atoms that you were born with are in you now?" Mixter asked, and then, before Jack could answer, he yelled, "Damned few, if any! Does that make you a different person? And anyway, from instant to instant you're continually being destroyed and recreated. Do you think you have a new soul each instant?"

"I don't know what to think."

Mixter snatched the book out of Flaherty's hands. "You really should sit down and read this cover-to-cover sometime," he said. "Anyway, here's the job." He slapped the book on the table and opened it to the frontispiece—a photograph of Isaac Bentz, C.M.

"You look exactly like Him," Mixter said, a touch of awe in his voice. "You sound like him, too. You're perfect."

"You want me to impersonate him?"

Mixter nodded.

Flaherty took the book and walked to the mirror, held it up beside his face. He saw two flat-nosed, square-chinned men with curly black hair and deep eyes, but "Hey, we don't look *that* much alike, do we?"

"Take my word for it, to anyone but you, you do. You mean to tell me nobody's ever pointed out the resemblance before?"

"I guess they did, at one time. But Bentz has been in that retreat of his for the past four years—hasn't been in the news much."

"He hasn't been on Earth at all," Mixter said. "He's actually been on a Korngold-owned liner going at near-lightspeed to Alpha Centauri IV. He just landed—that's information form our own, private PK Link. We would like to have it thought that he went there by transmat."

"You mean the Celestial Master himself is afraid to use the transmat?"

"Nothing of the sort," Mixter said with the calm assurance of deep religious conviction. "He simply chose to go by liner. However, there are certain parties who would love to put that interpretation on it—which is why we'd like you to impersonate him."

"Doesn't it make *you* wonder, a little?"

"He is the Celestial Master. There's no point in questioning what He chooses to do," Mixter said stiffly. "Do you want the job?"

"I'm not sure. Can I think it over?"

"You're scheduled to leave the day after tomorrow, so you'll have to do all your thinking in a day." He stood up and handed Flaherty a card. "My number is on that. And—it's painful to me to have to remind you of this, but we know you haven't enough money to leave Sweden, and if you get a job in

Stockholm with someone besides Transmat, it'll be a miracle. And remember that you're being watched, if you have any ideas about going to the press with this. You can keep that book. You should check out Bentz's biography, too. In the little time you have, you'll need them to rightly consider the fullness of this change in your life "

Flaherty took the cheapest available single in the New Grand Hotel and locked himself in with his two books and a basket of cheese and bread. He ate and read and filled his bed with crumbs, occasionally peering over his book and out the room's one window to the ruins of the National Museum below and the dirty waters of the Strommen. It was growing dark already and the scene outside was unlit. Lights were urgently needed on the travelled streets at night—not enough money to light even an historical ruin.

Even when he could see nothing, he kept raising his head to stare at the square of black. Reading Bentz was a kind of torture. Not because of his awkward, plodding prose—indeed, the book wasn't all like that. Whole long sections were wild, beautiful poetry; others were strangely amusing, delicately constructed shaggy-dog stories. Read in context, even the plodding parts were interesting. No, the torture was in the fact that Flaherty was coming to respect Bentz.

". *old Sufi, new Sufi, what purpose is served by such distinctions? Perhaps we should call those who mock me the old and those who say they're Reformed Sufis the new—how else to tell? And those who ignore the whole silly squabble are just Sufis—the best of all. But I have made it impossible for these latter to exist. I am the rock that splits the path.*

The Sufis who mock me are right, always hitting the target. Only it's the wrong target. True, each church organizes its mysticism and so mars and corrupts the vision that gave it impetus. But this "church" is different. As you are a new Sufi by saying you are, the church is your tool, to be what you must have it be

Any man, Flaherty thought, who's like me—who's had a religious expe-rience, gone to a church to have a community to share it with, and there had it knocked out of his head—must find hope in these words.

The wild horse starves and the draught horse eats full. In fulfilling the purpose of another, you might *be acting in your own best interests, too. But unless you find that purpose, you will always be the tool of another. The difference between your cooperation with and exploitation by another may be nearly invisible—something only to be found in your soul. The sooner you grow yourself one, the sooner you'll be free.*

The book moved him, touched him in some deep place he hadn't known existed before.

The biography, too, showed a man unaffected by derision and praise—a man who scarcely seemed aware of them. Yes, and a truly penetrating intellect—there were many reasons to respect Bentz.

And that only made things worse. If a man such as he were afraid to travel by transmat

They hadn't given him much time to decide. On purpose, no doubt.

He'd have to assume he had at least a small soul, since there was no time, now, for working at growing one. Transplanting himself to an Outworld with $60,000 worth of fertilizer was certainly a worthwhile Purpose, even if it did incidentally serve another's.

On the Outworlds there was room to maneuver. On Earth, there was nowhere to escape to. He'd tried to escape, running from the military dictatorship hiding under the name of democracy back home to the oligarchy hiding under the name of democracy in Lübeck to the utter mess here in Sweden: what could very possibly be at the end of the road for the rest of Earth. And always, to earn one's living was to collaborate with the oppressors—even farmers, janitors, couldn't escape it. But on the sparsely settled Outworlds, where a man could always say to hell with society and move out to the Frontier, society couldn't afford to be very oppressive.

What waited for him on Earth was Stockholm: snow and slow starvation. If the RS were right, there was everything to be gained by taking that trip. If they were wrong at least it would be a quick, clean death.

He pulled Mixter's card from his shirt pocket.

His picture, above the name *Isaac Bentz*, was in Stockholm's kleenex newspaper over the story of how he'd left his retreat inspired to go Out There where Reformed Sufism was really booming, stopping over in Stockholm to inspire his demoralized mission. They'd given him a necklace with a gizmo built in the pendant to fool voice analyzers and he'd addressed a convocation of Adepts, reading a prepared text. He'd held a press conference, making a few cryptic, carefully rehearsed pronouncements.

At last, he stood inside the Transmat building in a surprisingly long, meandering line of travellers waiting inside the vast basement depot. Two muscular Transmat employees stood on either side of him, and one behind, toting a footlocker full of books and two fat wardrobes. Mixter stood ahead with a sheaf of papers and suspicious, darting eyes. Flaherty was of two minds about his guard. When he'd entered they'd kept a flood of supplicants away from him, along with the potential RS-hating norseman that might be hidden among them. *But is this really in character?* Flaherty asked himself. *All this pushy security? And all these possessions?*

He stared past Mixter up the wavy line of customers. Businessmen could be identified by their lack of baggage and their relative corpulence, and they were in the minority. Most were shabbily dressed emigrants, folks who'd sold everything for the price of a ticket out, and who'd dieted themselves gaunt to cut the cost. "How do there come to be so many of them leaving from infidel Stockholm?" he muttered.

"For the past week we've been delaying all departures to this day, Master," the voice of one of the Transmat giants rumbled, "that there might be many witnesses." Mixter smiled. His men had a knack for saying only what was open to a multitude of interpretations.

The line moved slowly, rhythmically.

They would advance two steps as the party at the head of the line got into the booth. A white-smocked, blank-faced technician with the long, knotted forelock of an Adept would punch a button on a console and the opaque door would slide shut behind the passenger. The technician would push some more buttons and the scanner would buzz, then a *whoosh* could be heard as the vapor was sucked away for use in the receiving booth. Then the racking *klunk* of the air rushing into the vacuum as the door opened. Then, ahead another couple of steps

"Oh, Holy one

The woman in front of Mixter—big, thickboned, and so sanguine Flaherty couldn't tell if she was blushing—was trying to push past, using her one suitcase as a wedge.

"Let her through, Carl," Flaherty said, grinning evilly. Mixter scowled and the three giants crowded closer. As she passed Mixter he mouthed the words "I warned you," silently.

"Holy one," the woman quacked, "forgive me for bothering you, but I couldn't resist this chance to speak to you in person when in only a few minutes we'll be light-years apart. I mean, it's going to be my only chance, probably."

"You shouldn't bother the Master with trivialities, Ma'am," Mixter said softly, apologetically.

"Now, Carl," said Flaherty, "it would be *uncharacteristically* cold and aloof of me to refuse to talk with anybody here, don't you think?"

Mixter twitched with surprise, then nodded at his odd emphasis, looking very unhappy.

The woman stopped a respectful five feet away, but was so tall he still found himself looking up. He felt a little foolish saying, "Where are you going, my child?"

"Epsilon Eridani II," she said. "My husband is already there—he's got a little farm going. I hear the proportion of RS there is higher even than Alpha Centauri." A touch of bitterness crept into her voice as she added, "It'll be a nice change."

"You're a Swede, then?"

She nodded.

"You speak English very well."

"Thank you. I'm a native of Stockholm. When I was a child, there were still a few good schools. But you understand why we had to get out, sir? I mean, it's not the conditions here, and we knew the battle for converts wasn't lost, but—don't take me wrong—I'm afraid it might be many years before we make a real imprint here, and we want children. Who wants to bring them up with all the rejection ." She wound down, head slumping.

"We do what we have to," he said, feeling even more a fool.

It seemed to do the trick, though.

"Thank you, Holy one," she said, her head bouncing back high, "for your patience with me. Is there any chance you'll be transmatting to Epsilon Eridani later, to share with us personally?"

Flaherty began to regret the playful impulse that led him to break with Mixter's instructions. This damned woman was putting him in a more embarrassing position with every word she said. Others came crowding around, wide-eyed, waiting for words of wisdom from the Master's own lips now that the ice was

broken—something to tell their grandchildren about. And he had no idea how to answer her. Presumably one such gamble with exposure of his fear of the Transmat would be enough for Bentz, but Flaherty had no way of knowing for sure. Mixter's eyes sizzled through his poker face.

"I'm afraid I don't have any such plans right now. But the future sometimes holds surprises even for a Celestial Master."

There were respectful chuckles from the crowd and Mixter relaxed a little. To the relief of both men, the crowd started to break up as people realized they had a passable quote for their grandchildren and that the line was still advancing—they risked losing their places in it. Some of them, Flaherty noticed, headed toward the back of the line, seeming glad for a reason to lose their place. The Swedish lady was watching them rather enviously, he thought.

She closed the distance between them and clutched his sleeve.

"Master," she whispered, "I'm still afraid of that machine."

Just then there was another *klunk*. Flaherty jumped with his own fear and covered it by pretending he was trying to snatch his arm away. She let go, croaking, "Forgive me, Master!"

The rhythm was interrupted as they walked many steps toward the booth, filling in the gaps left by those who'd given up their places. When they stopped, Flaherty realized that they were very near—less than ten customers in front of them. The few hangers-on remaining left, trudging to the back of the line.

"I don't blame you," he said. "Living in this city of infidels—no doubt some of their superstition has rubbed off on you. Just remember that as we've been standing here talking you've already been destroyed and recreated more times than you can ever hope to count. Do you feel any different?"

They moved ahead two steps, and two more as she tried to force-feed these words to her heart. She lined her face with concentration, screwed it so tight she looked giddy before she finally said, "Thank you, Master," and moved ahead of Mixter again, stumbling. They took two steps.

Mixter stood close to Flaherty and said, *sotto voce*, "You did well. And a good thing for your bank-account that you did. It was a foolish risk."

Flaherty didn't answer. He was watching the line shrink, watching the door open and close, watching the technician. The technician struck him as inhuman—insect-like. His knotted forelock waved like an antenna as he bent over his console.

The Swedish lady was shoving her suitcase into the booth. She looked back over Mixter's head and smiled at Flaherty, then got in. The door slid shut.

"I've changed my mind," Flaherty said.

"Pardon?"

There was a loud buzz. "Get me out of here gracefully, if you can, but get me out of here. I'm not going through with it."

There was a whoosh. No more nice Swedish lady.

"The hell you're not," hissed Mixter.

The goon on Flaherty's right suddenly grabbed his necklace and tight-

ened it around his throat so he couldn't cry out, all the time maintaining the appearance of struggling to slide the wardrobe over a rough spot in the floor. In other circumstances, Flaherty would have admired the training that went into that. The other goon had his big hand gripping Flaherty's side in such a way that there was excruciating pain if Flaherty moved in any direction but forward. *It must look*, Flaherty thought, *like he's supporting me*. Mixter and the rear goon loaded the baggage.

Then it flashed into Flaherty's mind; *They don't have to reassemble me at the other end!* That wasn't a necessary part of the process. He was a fool not to see it earlier: they could just have Bentz there waiting with copies of the baggage. It could all have been arranged through their private PK Link!

He forced a whisper past the chain that choked him. "This is murder even according to your principles."

An instant later he found himself inside the booth with the door clanging shut behind him. He whirled around to drum on it, to yell for his release, but the door, the booth, the universe dissolved into separate motes of charge and spin and buzzed away.

A fresh wind smacked his face through the open booth door and he blinked his eyes. He still had eyes. They looked out and up to a clear blue sky where white-winged creatures hovered, occasionally swooping down to taste the fruit of yellow-barked trees. Beneath the trees were cheering people—lots of them—and he walked out of the booth waving his arms at them exuberantly. He felt wonderful, overflowing with life, twenty pounds lighter.

He *was* twenty pounds lighter! Alpha Centauri IV pulled at .88 Earth gravity. He jumped higher than he had since his youth, touching the tip of a banner that said, "Greetings, CM fr Allied Octopus Bay RS." A brass band threw itself into a frenzied honking of *L'Homme Arme* and suddenly he was surrounded by people saying "Welcome, Holy One."

As he shook hands he looked over the heads of the crowd, turning a complete circle. He was at the edge of a park—a real park!—apparently in the center of town. The buildings were mostly new and low and all were shiny-clean. It was a clever move on the part of the chamber of commerce, he decided, having Transmat receive here in the middle of a piece of what the posters promised.

And the people all looked clear-eyed and genuinely friendly.

The well-wishers were gradually displaced, though, by white-suited men with knotted forelocks who took him away.

They met in a private suite in the Octopus Bay Hospital done up like an apartment. Bentz sat on a couch before a bulky trapezoidal stand on which rested a thin rectangle that looked a lot like a slate board—the original, crude PK Link. A TV tray loaded with food rested on the couch beside him.

Seeing Bentz in person, Flaherty had to admit the resemblance—if they had parted their hair on opposite sides, it would have been like looking in a mirror. Their white-coated satellites stared at them slack-jawed, obviously overcome with superstitious awe.

"Make yourselves scarce, boys," Isaac Bentz said, annoyance choking him. He waved his hand at them, as if chasing flies.

After they'd left, Bentz asked, "Have you been listening to them? Has everyone been calling you 'Holy one'?"

Flaherty nodded.

Bentz sighed. "A lot can change in four-and-a-half years. When I left Earth, people still used to laugh in my presence. Have a boxfruit?" He nudged a bowl off the serviette on the TV tray.

"No, thank you."

Bentz cracked one open and drank down the pulpy-thick juice, then stared at Flaherty with open, intense fear. "How do you feel?" he asked.

"Better than I've felt in a long time," Flaherty said. "I think it's the lower gravity."

"There's more oxygen in the air here, too," Bentz said. "That helps."

"Ah ."

"Do you feel any different?"

"No. But then, I wouldn't, would I? In either case."

"I don't know."

"This is strange. *I* believe that my soul is the information that makes me up; why don't you?"

"After what you've gone through," Bentz said, "you'd have to believe something like that to keep from going crazy. I got the message on my private PK Link that they had to force you in. What happened to that resistance?"

Flaherty shrugged. "I suppose I should still be angry, but I can see their side. After all, I had agreed to go; I was behaving childishly. And if I want to go back to Earth I always can—although I don't know why anyone in his right mind would want to. You didn't answer my question. Did you notice?"

In a hushed, sad voice, Bentz said, "That's because I'm not sure. I'm afraid I may have been right about the soul—that what I said was the literal truth. And I never intended it that way."

Flaherty was stunned, outraged. He found, to his shock, that he was holding the PK board over Bentz's head, brandishing it like a weapon, growling, "What the hell *did* you intend, then," through clenched teeth.

"Please," Bentz said shakily, "calm down. There shouldn't be anything surprising in this—Sufis have been telling people the same sort of thing for centuries." His voice grew steadier as Flaherty set the board back on its stand.

"The idea," Bentz went on, "is to shake people up, to make them take responsibility for their own spiritual development, to make them *work* at it. It wasn't written lightly—I just didn't foresee this damned machine being invented and creating a need which my book could fill by being taken literally."

"But you said you might have been right."

"It's possible." Bentz smiled for the first time since Flaherty walked into the suite. "Practically everybody who's travelled by transmat says it's so."

"But you're still scared?" Flaherty's anger had drained out of him. He found himself too interested in what Bentz had to say.

"Maybe it's irrational, but I can't control it. You know, the whole Transmat thing took me by surprise. At first I thought it was great—the increase in membership and the appearance, at least, of having all sorts of people really

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
First Class Permit No. 616 Marion, OH

Postage Will be Paid by Addressee

analog
SCIENCE FICTION/SCIENCE FACT
P.O. Box 1936
Marion, OH 43306

listen to me, for a change. But I'd always longed to go to the Outworlds and as I began to get enough money to actually do it, it brought me face to face with my fear. I've had a lot of time to think about this—almost a year of subjective time on the ship out here. I really have been in retreat, meditating. That part wasn't a lie."

"And did you discover anything in your meditations?"

"Yes. For one thing, I discovered that I haven't been meditating as much as I should. But I never had the time. Running a large church is—well—time-consuming. And yet I have to be at the helm. Look at what's happened during my absence. The RS is becoming what the old Sufis said it would—a Church with a capital 'C.' Look at those so-called 'Adepts'!" He snorted disgust, then added, "How do you feel about them?"

"Well," Flaherty said, "they don't seem to be exactly, uh, harmonious with the concepts in *The New Sufi*.

"I'm glad you feel that way," Bentz said, "because I need to get away now and then. I've got to, to keep myself straight. But I've got to be in charge all the time, to keep the church straight. What would you think about substituting for me two or three times an Earth-year? I could make it well worth your while."

"I'm not qualified," Flaherty said. "I don't know enough "

"You'll learn."

and wouldn't I have to remain hidden all the time? I'm not sure I'd want that."

"Three hundred thousand per year," Bentz said.

At that Flaherty was silent a while, watching Bentz, trying to figure out how serious he was.

Bentz broke the silence, saying, "I could make sure your hiding place had whatever you wanted. And, besides, you might not have to stay hidden for so long."

"How would you work that?"

"You might take over for me completely."

"Huh?"

"Oh, I've just been toying with the idea, don't be alarmed. Nothing definite yet—although I did set myself up in this hospital kind of half-thinking about plastic surgery for myself."

"What's the matter with you?"

Bentz took the question literally. "Look," he said, "Earth is finished. It's a corpse, buried under the weight of a million years of needless death and pain, a million years' bad karma—it just doesn't know it's dead, yet. So it's just as many religions have preached: We have to be reborn. People have *got* to get away, and the only method anyone but the very rich can afford is something I, personally, am terrified of. Maybe I'm not fit to lead the emigration."

"So what makes me qualified?"

"You were born looking like me. No makeup to be wiped off, no scars from surgery, or records "

"I'm not joking. You know what I mean."

"OK, if you don't like that—you, at least, are one of those who know they have died and been born again. But the way you happen to look is an important qualification. You come from a Bible background, same as me—ever read the Old Testament?"

"A little."

"Maybe you'll remember that being in the right place at the right time was always one of the most important qualifications for prophethood. Anyway, all I'm asking you to do now is agree to sub for me now and then while I think about the other."

Flaherty snapped his eyes shut—they had grown so wide and unblinking that he'd started to cry. Bentz was serious! He rubbed his eyes and looked again at Bentz fiddling nervously with another boxfruit.

"I'd be crazy not to jump at your proposition," Flaherty said, choosing his words carefully, "but this is a hell of a responsibility you're asking me to take. I'm going to have to think it over for a few days, at least."

"Of course. I don't want to pressure you *too* much. But, please, keep a low profile. I understand live theater is quite popular here. There should be a makeup store . . ."

"Don't worry about that. I'll disguise myself. Another thing—this just seems too good to be true. Maybe I've been contaminated with Earth's rottenness, too, but I can't help being suspicious. As a gesture of good faith, I'd like you to call off your Adepts for a while."

"Don't call them *my* Adepts," Bentz said bitterly.

"And I'd like my $60,000 today, preferably in gold certificates from the intersystem bank."

Bentz pushed himself up from the couch, weighed Flaherty with his eyes, and said, "If you'll take platinum certificates, I'll pay you right now." Flaherty gasped, nodded. Bentz walked to the next room, came back, and handed him six $10,000 notes and a receipt.

As Flaherty signed for the money Bentz said, "While you're thinking it over, try to remember the good that's in the RS: its freedom, the independent effort it can foster. Then think of what a farce it could turn into with someone who's afraid of the transmat at its head."

Flaherty gave him the slip of paper and tucked the money carefully into an inside pocket. "Doesn't it strike you as farcical to substitute an electrician for a Celestial Master?"

"Try reading the story of Moses's recruitment in Exodus. Especially the beginning of Chapter Four. As I've been trying to explain to you, being qualified comes with being chosen."

There were several advantages to using a cheap hotel room, Flaherty decided. For one thing, he was used to them. For another, any overzealous Adepts who ignored Bentz's orders would probably not think of looking there for a man who just got $60,000. And this particular room looked right down on the sign atop the Transmat shed at the edge of the park.

He peered into the closet mirror, applying the last of his makeup, and judged it a good job. His hair was gray, his nose pointier and longer, his cheeks a bit sunken—not only did he look different, but he looked thinner and more typical of the Transmat traveller.

He turned to look through the window, still trembling slightly with the adrenalin left over from his narrow escape, still filled with the exuberance

he'd felt ever since he materialized on this planet. It was a heady mixture.

As he watched the Transmat sign, the numbers in the price indicator flashed downward from 42.2¢ to 42.1¢ per gram. A good omen. He picked up his suitcase and left the room, scrambling the lock on the way out.

Epsilon Eridani was a long way from Octopus Bay as the spaceship flew. He felt confident, as he hopped down the stairs, that Bentz would never attempt such a trip. And with a little plastic surgery on Epsilon Eridani II, that would be the end of that. If Bentz were still determined to retire, he could find himself an actor, or pay someone to get a face-lift.

But Bentz will get over this, he thought. *He feels humiliated at his phobia—but none of us is perfect, and every word he spoke showed that he is a Celestial Master through and through*. He imagined, briefly, a life of pretense and ritual, and shuddered. *And now that I'm out here, free of Earth, why should I trap myself?*

Rebirth. What a wonderful concept! Yes, Bentz was the true seer, for rebirth was exactly what transmatting off Earth to an Outworld was. Flaherty could see the idea spreading from Bentz in a great wave through the RS on all the settled planets.

He reached the lobby, walked to the glass doors, and stopped. The sign across the street flashed again: 42.0¢. That was unusual, for the price to drop .2 cents in a single day. The company must have thought of a new way to save money—maybe some new technology. Someday, even the poorest would be able to afford a trip.

He was tempted to stick around for a while to see if the price fell further, but decided against it. It was too risky, and anyway, even with the cost of the face-lift and the trip, he'd have plenty of money left over. Enough to get started in whatever he chose. If electricians weren't in demand on Epsilon Eridani II, he could always buy a farm. Any work at all was appealing on a free world.

He stepped out the door and took a deep breath of clean, oxygen-rich air: an elixir that charged every nerve of his body with impatience. He raced across the street to die and be reborn again. ■

● Urban planning should be simply part of a much wider approach to the national territory as a whole. In a sense, a national plan is ecology practiced at the country level, a sorting out of habitats and environments, an understanding of special niches, a creative reaction to forces of dynamic change, a rejection of single-thrust development based upon a purely economic calculus, a search for patters which satisfy a wider variety of human needs.

Barbara Ward and Rene Dubos

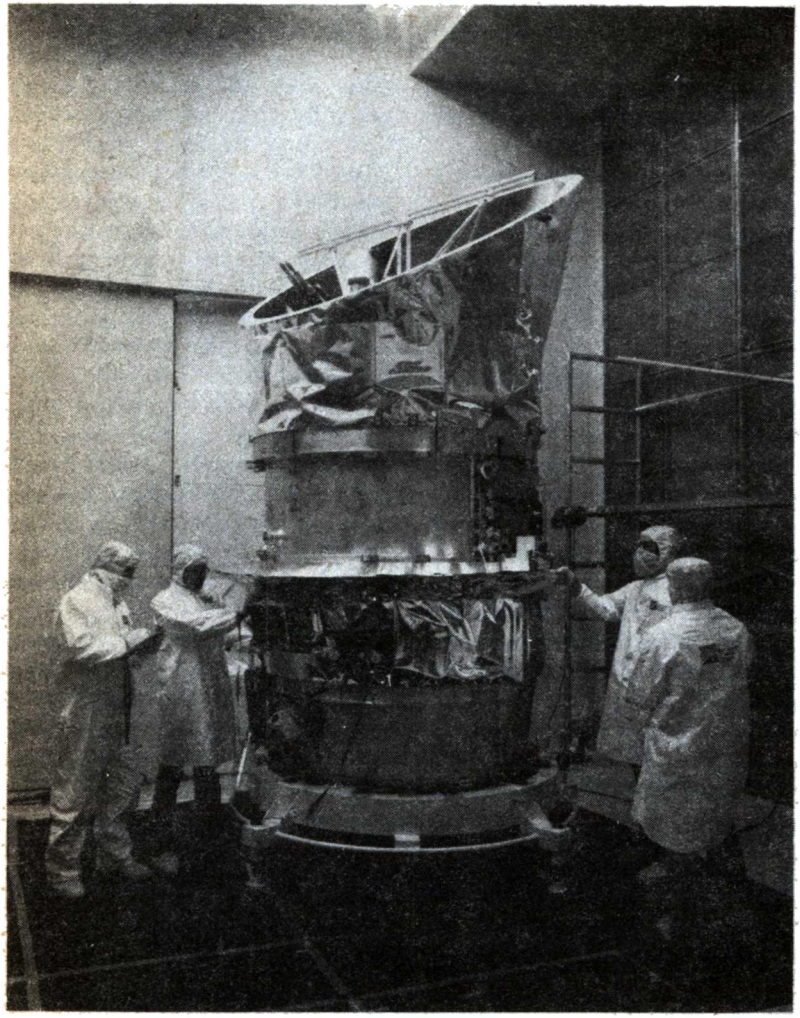


Photo courtesy Ball Aerospace Systems Division

Surgically-garbed Ball Aerospace technicians examine the Infrared Telescope manufactured by their firm for the IRAS (Infrared Astronomical Satellite). This spacecraft is a joint project of the United States, the Netherlands, and the United Kingdom.

Walter B. Hendrickson, Jr.

ORBITING INFRARED TELESCOPE

As anyone who has ever gazed at the stars, even just out of idle curiosity, can tell you, studying astronomy from the bottom of Earth's atmosphere is like trying to look at the outside world through an antique, hand-blown pane of glass with a sun-screen on it. For this reason, astronomers since the beginning have tried to get above as much of the atmosphere as possible. First they ascended to mountain tops, then sent up their instruments in balloons, rockets, and finally spacecraft.

The latest of these is IRAS, for Infrared Astronomical Satellite, scheduled for launch in August 1982. This heat-sensing satellite is a combination of both conventional and unique features. The conventional feature is a 1.5-meter diameter, Cassegrain telescope. In this type of telescope, the concave primary mirror reflects radiation entering the instrument onto a secondary mirror, which in turn reflects the converging rays through a cylindrical opening in the primary mirror, to detectors. Both mirrors are beryllium-polished at room temperature.

The outside of the IRAS is the unique part of the instrument. This comes from the fact that it is obviously easier to feel even faint heat if you are cold. Therefore the IRAS is one of the coldest things around. It is encased in a double-walled Dewar filled with 70 kilograms of super-fluid helium, called helium II, at a temperature of almost absolute zero. The telescope itself is kept at less than 4° Kelvin (-269°C), and the focal plane assembly is kept at 2° K (-272.15° C). Being so cryogenically cold, IRAS has practically no heat of its own to interfere with detecting even the faintest infrared radiations from space.

Helium II has never before been used in space, and it can be tricky to use under any circumstances. For example, it is virtually frictionless—making it the world's best, as well as the world's coldest, lubricant. Fortunately the IRAS has no parts that depend on friction to function. Helium II can also siphon itself from one vessel to another through

a connecting pathway, even under Earth's gravity.

These characteristics of helium II could cause the IRAS problems, since it can seep through even microscopic holes at high speed. This means that the IRAS's manufacturers, Ball Aerospace of Boulder, Colorado, had to be extremely careful that there were absolutely no leaks in the instrument's Dewar jacket. Likewise, NASA and the other agencies handling the IRAS must be even more careful than they are with other delicate instruments.

Caution had to be exercised not only to see that the helium did not leak out of the IRAS, but that outside substances did not leak in. As Peter Waller, a spokesman for NASA's Ames Research Center, explains: "For maximum measuring accuracy, optical mirrors and detectors must be guarded against contamination. During the tests on Earth, the instrument is kept tightly sealed because, with the whole system cooled to near absolute zero, any of the known gases, except helium, would condense and freeze on the vital components. Contamination of just .001 millimeter thick on the optic is enough to cause an incorrect measurement."

While there have been no experiments with helium II in space, other cryogenic liquids have been used in space. These were the liquid hydrogen and liquid oxygen propellents of the Centaur rocket, the S-IVB third stage of the Saturn V, and the Apollo Service Module. These, however, behave more normally than helium II, although they are extremely cold and hydrogen is the lightest thing around. Still, they do give us experience with cryogenic liquids in space. This background gave NASA and Ball Aerospace enough confidence to go ahead with the IRAS project.

On May 8, 1980, Ball Aerospace showed off their super-cold product to the news media for the first time. After the show, the 499-kg telescope was shipped off to the Netherlands. There it was mated to a 335-kg Dutch-built spacecraft. Then the spacecraft was returned to the United States for launching from NASA's Western Test Range at Lompoc, California. A two-stage Delta 3910 launch vehicle was selected to place the IRAS into a sun-synchronous orbit 900 km above the Earth.

In this orbit the satellite would keep itself always at the same angle toward the sun and Earth as it circles the planet once every 100 minutes above the terminator. The satellite will keep its solar cell panels pointed toward the sun, soaking up energy for its instruments while its telescope points away from Earth.

Remaining capped with a helium II-cooled aperture cover for the first two weeks in orbit, the IRAS will be calibrated by its control center in England. For this task, the flight controllers will call on a stimulator, mounted behind the telescope's secondary mirror. Four pairs of infrared sources of varying intensities and two light-emitting diodes make up this stimulator. They shine their radiation onto a spherical mirror which reflects it back through a hole in the telescope's secondary mirror to the detectors mounted behind the primary mirror.

Both infrared and visible light cali-

bration are needed because the IRAS telescope contains four Visible Star Aspect Sensors (VSAS) for aiming the telescope. A news release from Ball Aerospace explains: "The two sets of four silicon photodiodes are placed on either side of the infrared survey array. Any two detectors are selectable at ground command to provide visible star transit measurements. The transit times and star pulse peak amplitudes are transmitted to the on-board computer to give star magnitude and aspect relative to the VSAS reference axes."

Sixty-two detectors in two redundant clustered modules of detectors make up the infrared array which does the primary research of the mission. These detectors are tuned to four separate bands of infrared radiation. The first of these starts just below the visible light spectrum, ranging from 8 to 15 microns in wavelength. Detectors of silicon and arsenic are used to sense this radiation. The second band goes from 15 to 30 microns in wavelength, and detectors of silicon and antimony are used to measure the radiation.

There is a jump of ten microns to the third band, where detectors of germanium and gallium measure infrared with wavelengths from 40 to 80 microns. Detectors of the same material are used in the fourth band to measure wavelengths from 80 to 120 microns.

Besides the usual backups, special precautions have been taken to make sure that the sensors do not interfere with each other. This is needed because of the sensitivity of the sensors, which can pick up 100 gigawatts per cubic centimeter. To eliminate false readings, the apertures for the sensors are staggered. Filters also keep the sensors of different bands from picking up each other's readings.

Once the IRAS has been properly calibrated, it will blow its top off into space and begin a year-long study of infrared astronomy. The instrument's sun-synchronous orbit puts it in position for giving a new twist to one of the oldest experiments of astronomy: the sky survey. This will take up only about half of the satellite's time. The other half will be spent on studies of interesting objects selected by the British flight controllers. These studies will take up to fifteen minutes each.

Researchers are hoping to find plenty of infrared to study, too, perhaps even more than expected. This would give the universe a much more generous infrared energy budget than currently believed. Big items in this budget are new galaxies and quasars. Certainly, a few quasars would add a lot to the infrared budget, as these seeming points of light actually put out a great deal more energy than an entire galaxy.

Often, some of the quasars put out some of their energy in the form of radio waves. This is why their name is short for either quasi-stellar objects or quasi-stellar radio sources. What IRAS will be looking for is infrared radiation emitted by the quasars between their visible and radio outputs.

Quasars must be quite distant from Earth, judging by their enormous red shift. This is the result of our expanding universe in which every galaxy is moving away from every other. As a result of the Doppler effect, waves of radiation

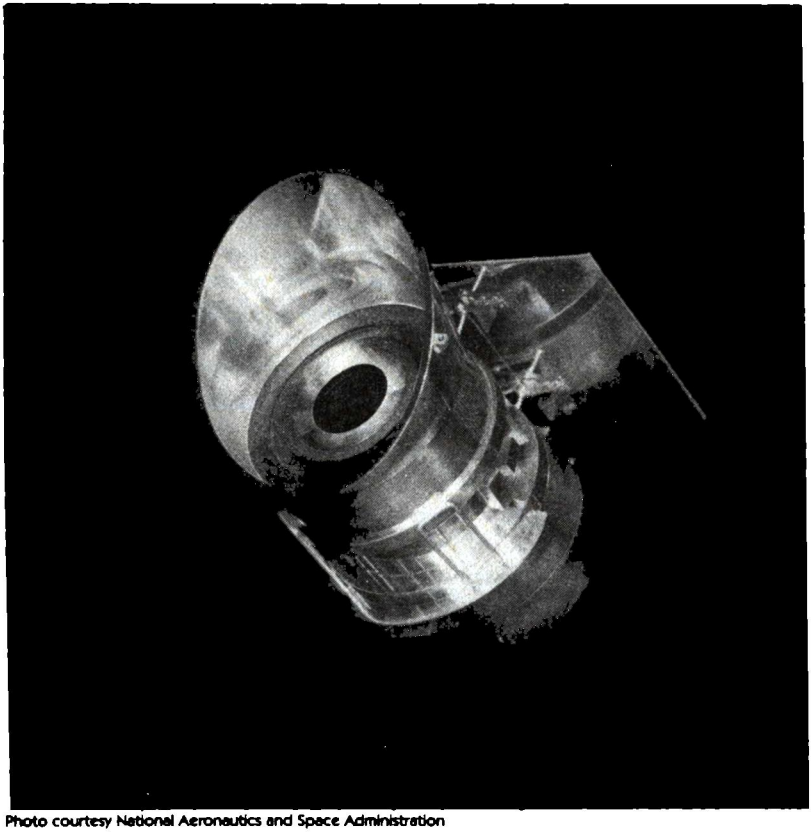


Photo courtesy National Aeronautics and Space Administration

This model of the completed Infrared Astronomical Satellite shows the aperture by which the infrared light enters. Major telescope components are surrounded by a cooling vacuum bottle of superfluid helium. The curved metal collar also is cooled and serves as a sunshade.

streaming from the galaxies shift toward the longer red side of the spectrum.

Waves from the quasars are lengthened from .036 to 4.53 times. This is enough at the longer end of the spectrum for some of the ultraviolet light to become visible. Thus, on the other end of the visible light band some radiation must be stretched from the visible into the infrared region where the IRAS will "see" it.

Hubble's Law says that the faster a distant object moves, the farther away it is. Obeying this law puts the quasars

11 to 12 billion light years from us. This means that the radiations just now reaching Earth left the quasars about the time of the beginning of the universe. Thus, the IRAS may tell us whether the universe started off with a really big bang or not.

Besides quasars, IRAS will be looking into the entire life cycle of stars, from the interstellar clouds in which they are born until their explosive deaths. Beyond the deaths of stars, IRAS will be looking for their mortal remains, whether scattered throughout the universe or condensed into pulsars and black holes.

Indeed, many astronomers think that the quasars may actually be the centers of galaxies far distant even by astronomical standards. They would generate their power with massive stars exploding in supernovae and reducing themselves to pulsars and black holes. Other astronomers think that the quasars may have been ejected from nearby galaxies. To settle this dispute, IRAS will be looking for supernovae, pulsars, and black holes in the quasars.

In our own neighborhood of the Milky Way Galaxy, the IRAS will be peering through the clouds of dust that veil the galactic center, searching for possible black holes.

At first glance, it would seem that finding black holes would be a job for an X-ray-detecting satellite—not that even it could see a black hole directly. When a dying supermassive star becomes a black hole, it digs itself such a deep grave in the form of a gravity well that nothing, not even radiation, escapes. If there is other matter nearby, however, some of it will be sucked into the black hole, heating up and emitting X-rays as it goes.

Such telltale X-rays have already led to the finding of a possible black hole in the constellation Cygnus, called Cyg X-1. The IRAS will be looking for more black holes revealed by the heating that creates the X-rays.

In our own solar system, the IRAS will be looking for new asteroids, newly discovered comets, and possibly even one or more trans-Pluto planets. Pluto itself is an indication of these, as it is a real oddball of the Solar System. It is too small to have caused the perturbations in Neptune's orbit that led to its discovery. Besides, because of Pluto's eccentric orbit and small size, Pluto has been suspected of being a third satellite of Neptune pulled out of orbit by the gravity of some yet-to-be-discovered planet.

In their search for trans-Pluto planets and comets, however, NASA's Ames Research Center may be committing a serious oversight. They are expecting to find most of these objects along the plane of the ecliptic, in which orbit all of the Sun's known planets except Pluto. The trouble is that some asteroids and most comets have orbits steeply inclined to the ecliptic. According to George H. Harper's *Analog* article, "Styx and Stones, and Maybe Charon Too," the trans-Pluto planets may not necessarily orbit near the plane of the ecliptic either.

It should not be too difficult for IRAS to spot any new members of the solar system. As Peter Waller points out: "All of these 'cool' objects are much

more visible in infrared, which is itself 'cool radiation,' compared with the visible light from very hot objects like the stars and Sun.''

Indeed, a trans-Pluto planet would not be just ''cool,'' it would be downright cold, by any standards. There, temperatures would be almost as close to absolute zero as that of the IRAS. Obviously, detecting such faint sources of infrared is one reason for the elaborate cryogenic cooling of the spacecraft. Once such faint objects are found, their membership in the solar system will be verified by their motion, however slight, against the background of stars.

All of these investigations of quasars and black holes and the search for undiscovered members of the Solar System will be performed against IRAS's infrared mapping of the entire sky, and many of them will depend on this mapping. The mapping should include at least a million infrared sources, many of them unseen in the visible and radio wavelengths that penetrate Earth's atmosphere.

Peter Waller speculates that among these new discoveries will be strange, novel kinds of stars and even entire infrared galaxies. It will be difficult, though, for any new stars to be much stranger than the quasars, pulsars, and possible black holes already discovered. Of course, the IRAS will have its work cut out for it just discovering these.

With such possibilities, IRAS may well live up to NASA's expectations of providing some important new contribution to the study of astronomy. That is, provided that its helium II cooling system does not give it problems, and that its flight controllers look in the right place at the right time.■

Metric Mirth

Having trouble keeping your metric prefixes in line? Do your kilos get confused with your centis and your millis change places with decas? There's a place for every prefix and they change names with the powers of ten. To help you keep them in order, the following list uses correct prefixes in some merry metric mnemonics.

10^{18} minations = 1 examination
10^{15} coats = 1 petacoat
10^{12} bulls = 1 terabull
10^{9} lows = 1 gigalow
10^{6} phones = 1 megaphone
2×10^{3} mockingbirds = 2 kilomockingbird
10 cards = 1 decacard
10^{-1} mates = 1 decimate
10^{-2} mentals = 1 centimental
10^{-3} pedes = 1 centipede
10^{-3} ink machines = 1 millink machine
10^{-6} scopes = 1 microscope
10^{-9} goats = 1 nanogoat
10^{-9} nannettes = 1 nanonannette
10^{-12} boos = 1 picoboo
10^{-15} fatales = 1 femtofatale
10^{-18} boys = 1 attoboy

With thanks to *Newscience* and *Youth Science News*, Ontario Science Centre.

the reference library

By Tom Easton

The Pride of Chanur, C.J. Cherryh, DAW, $2.95, 224 pp.
Strength of Stones, G. Bear, Ace, $2.50, 237 pp.
Status Quotient: The Carrier, R.A. Sperry, Avon, $2.50, 253 pp.
Aldair: The Legion of Beasts, N. Barrett, Jr., DAW, $2.25, 174 pp.
The Abyss, J. Cunningham, Wyndham Books, $14.50, 286 pp.
Soldier Boy, M. Shaara, Timescape, $2.50, ? pp.
Blooded on Arachne, M. Bishop, Arkham House, $13.95, 338 pp.
The Language of the Night, by U.K. LeGuin, ed. by S. Wood, Berkley, $2.75, 262 pp.
Seven Tomorrows, P. Hawken, J. Ogilvy, and P Schwartz, Bantam, $6.95, 235 pp.
Confrontation in Space, G. H. Stine, Prentice-Hall, $?, 209 pp.

There are several kinds of science fiction. There are several ways to split the field into kinds, too, but hear me out. I'm really only concerned with one kind at the moment. It includes those stories that try to examine alien psychologies, and it is a praiseworthy, challenging variety of SF, especially when the writer tries to imagine his or her alien from the inside. It is also one of the rarest, perhaps, because of its extreme difficulty. Or perhaps because it appeals to few readers? After all, it is hard to present a truly alien protagonist with whom a human reader can identify, and about whom that reader can give a damn.

I don't think Carolyn Cherryh will want to argue with me when she reads this. I'm leading up, you see, to telling you that she has given us an alien psychology story, and she has done it the hard way, and she has done a grand job. It's **The Pride of Chanur,** whose sole human being we never really get to know. He's there, yes, but he doesn't speak the language(s) and he shows us

little more than a ready intelligence and a very arboreal strength (he stands up to the storm).

The story begins at Meetpoint Station, an interspecies trading post, where Pyanfar Chanur's *Pride of Chanur* is docked. A critter sneaks aboard, hairless and clad only in a ragged loin-wrap. Pyanfar shelters the strange being from the barbarous kif, who claim ownership, begins working on a way to speak with him, learns his species (human) and his name (Tully), and flees in haste when the kif strike to regain him. The rest of the story continues the flight until Pyanfar reaches her homeworld and faces a crisis that is very much related to her biology.

Pyanfar's species is the hani. As with Earthly lions, it is the female hani that bring home the bacon, by going into space as traders. The males stay home as heads of families, facing the challenges of young rivals and being helped by their females. It is such a challenge that threatens all of hani society when Pyanfar reaches home. She must thwart it before she can then mount any defense against the kif.

The hani look rather like lions, with their feline heads and golden manes. The likeness is hard to miss, although Cherryh does not make it too obvious. The "Pride" of the title is never connected explicitly to leonine social groups, and there is a more emotional correlate to mislead. Cherryh deftly understates as she portrays her aliens with her own inimitable skill. The hani are truly alien, for all their Earthly model, and one can indeed identify with them. It is a mark of Cherryh's success that here it is the human who seems the alien, though one gets the feeling that hani and human should get along very well.

But Cherryh has not only done a swell job of alien invention. Tully is also a center of excellence, for his situation rings very true. He and his shipmates were captured by the kif, who killed all but Tully in their effort to learn of Earth. Tully played dumb for them, escaped, found the more sympathetic hani—the only aliens at Meetpoint who laughed—and turned cooperative. At story's end, a foreshadowed *deus ex machina* returns him to his own and promises an era of mutual benefit for humans and hani. Yet Tully is mainly a stimulus for events, not a hero, and the happy ending is none of his devising. He is powerless and desperate among the aliens, and both he and Cherryh know it. It is very much to Cherryh's credit that she refrained from a story of false superheroism of the sort we see too often from other pens.

Need I add that I greatly enjoyed *The Pride of Chanur*? I enjoyed it so much, in fact, that I'm recommending it to my fellow SFWAns as worthy of a Nebula. And I think you will enjoy it too. Buy it!

Something like a century from now, according to Greg Bear, Earth's remnant Jews, Moslems, and Christians will band together and leave for a new world, all their own. There they will build marvelous, half-alive cities programmed both to simulate paradise and to keep out all who do not live up to suitable ideals. Unfortunately the cities soon realize that their builders fail to live up to their own ideals and expel them. Centuries later, when humans have reverted to barbarism and the cities are decaying and dying for loss of their mission, Bear's **Strength of Stones** opens. The lead novelette displays the attitudes of men and city toward each other through the eyes of a robot that thinks itself a man; it was sent forth from the city to seek an accommodation

of ideals and reality. The second novelette, from the first issue of a promising new magazine, *Rigel*, deals with how a fortunate woman redirects a city into a more reasonable path, if one no less idealistic. The third brings back the ghost of the cities' architect to see what has gone wrong and try to fix it; he finds that in previous returns he has tried to set up an escape route, but it has not been used.

Bear's concern is the secular paradise. He offers one version that must truly and inevitably fail. Yet his answer to that failure is no answer at all—a mergence of godhead that surrenders all struggle and challenge as thoroughly as ever did the cities as planned. Either way, he says that paradise equals stasis, the end of all potential. That does not satisfy, just as it has failed to satisfy the centuries' philosophers—"What is paradise?" they ask, and they seem to agree that it must be the endless fulfillment of potential. "What is hell?" Endless frustration of potential, which is more akin to Bear's stasis.

Read the book. Bear is a skilled writer, and his story will give you a good supply of fuel for the fires of argument.

Ralph Sperry's **Status Quotient: The Carrier** is a tedious tale. It is tedious because of its format, a diary, and because its protagonist, one Ancil, is its only real character. He is an immortal "regenerative" who is the sole survivor of his world. All his fellows have killed each other off in an orgy of murder. He fled to his father's mountain estate to establish a homestead based on salvage, a talent for relearning, and the apparent cooperation of nature. Much of the book deals with his learning of the ways of solo survival, alternating with memories of life before the disaster and sketches of previous history. The world, Ath, is a thinly disguised parallel of Earth—the main differences are in names (rabbits become bounders, for instance) and in peopling. Ath is thinly populated, apparently by the descendants of Terran colonists who killed off—or thought they did—the local sentients, the Imitators, a species with the power to cloud men's minds. This power is the key to the book, for it alone lets the ending, a marvel of ambiguity I won't reveal, make sense, and even then it leaves some ambiguities unresolved.

Sperry seems to be offering a judgment on civilization for its treatment of aborigines and other powerless peoples on Earth In that he succeeds well enough, but his book *is* a chore to read. It is plodding and slow, a pace that may suit an immortal's life, but not one that pleases a reader. Give it a miss. You won't miss much.

I thumb back through my files to my column of October 9, 1980, when I reviewed Neal Barrett's *Aldair, Across the Misty Sea*. Now we have **Aldair: The Legion of Beasts.** DAW calls it the end of the series, but the ending is open; there could be more to come. The story: Aldair and his barbarian crew have reached the stars via golden ships left behind when Man left Earth to the intelligences he had engineered from beasts. There they find that Man has fallen sadly, displaced and enslaved by his more miscegenous and Beastly creations, led by a mysterious alien. Aldair successfully rouses Man to fight back and finds a means. Man returns to earth and Aldair turns what should be the final defeat into victory. but though the alien leader dies, his death reveals that there are others out there too.

Are there answers here to the mysteries posed in earlier books of the se-

ries? Not really. We still don't know why Man set up the machines that ruled history for Aldair and his kin. But we do not greatly feel the lack. Barrett ends his story with a blast of action that leaves the reader's ability to question at least momentarily stunned.

So be it. The book is fun, but it does not live up to its predecessors. They were admirable in part because they each ended with a sense of open vistas ahead. This one does not. The others offered more novelty, too, more imaginative creativity. With this one Barrett's creativity seems to have flagged, and he to have settled for a more ordinary story of redemption, not unlike the original Buck Rogers.

Still, Barrett can create wonders, and I look forward to his next. I hope he will in fact leave Aldair alone in favor of something fresh.

Jere Cunningham's **The Abyss** is an abomination. I mean that gently, if not kindly, for the book is easy to read: absorbing in spots, weakly suspenseful, and full of interesting detail. And it is about what happens when the world's deepest coal mine is dug another foot deeper and breaks into Hell. Then, as the saying goes, all Hell breaks loose.

There's even a nod toward SF, in the form of an MIT professor whose hypothesis about "cosmological deviations" got him laughed out of his field and whose son is trying to prove him right.

The story is set in an Appalachian valley town, where the mine in question has been closed for decades. With the energy crisis, though, it is economical to open it again. The valley people welcome it, for it brings jobs and money. Cunningham focuses on these folks, their concerns, their scandals and weaknesses, their relatively few strengths. There is the clinic nurse: lovely, dedicated, and in love with a returned exile clutched at by his dead brother's wife. There are drunks and sadists and moral idiots. There is sex.

There are the mine openers, about whom there is something peculiar from the start. There are odd things half-glimpsed—and here is an inconsistency: if Hell lets out for noon only when the mine is deepened, then why are demons on the scene beforehand? There is water that turns to blood, and odd growths among the brambles, and enough more to make it clear that Revelations was prophecy.

The story is one of reactions to incomprehensible disaster. Most people reveal their evil and wallow in it. A few, the heroes of the tale, grow in their good, though they remain unchurchly human. *But*—the story offers no solution in human or rational terms. It ends when Hell is fully loose and the Earth is doomed, and the good guys are lifted bodily into Heaven.

The book has charms, but it *is* a cheat. I suspect it will sell well among the Moral Majority.

Michael Shaara has been writing SF for the past thirty years or more. He has written other things too, gaining a Pulitzer for *The Killer Angels*. He's good. He shows us how good in **Soldier Boy,** a collection of his work between 1952 and 1976. The best stories here are the title one, from 1953; "Opening Up Slowly" (1973), concerning the psyche of a species that lives in constant fear of meteorites (it is not at all like James White's "The Scourge" in the January issue); "Citizen Jell" (1959), in which an alien retiree on the banned Earth must reveal himself and be retrieved; "The Peeping Tom Patrol" (1958), not sf at all, but an oddity of sexual psychology;

and "Starface" (new here), in which an ultimate in plastic surgery has marvelous effects on personality.

Shaara has a fine command of emotion and sense, and he builds his stories well. If it is possible to criticize him, it is because even his latest stories have a Fifties flavor. That is, they are straightforward, told plainly and clearly, without convolutions and arty ambiguities. And that is no criticism at all, unless you find that flavor simply too, too archaic.

Michael Bishop hasn't been in the business as long as Shaara, and his work doesn't have the Fifties feel—it remains lucid, though often it has a surreal quality that is very rare in Shaara's—but he is also an excellent writer. For proof, see his collection, **Blooded on Arachne.** The title story details the adventures of a sixteen-year-old boy, a future starship captain (I think), who must qualify for his future by visiting Arachne and staining his hands with the blood of the local intelligent spiders. The experience tests endurance and ingenuity—but what the devil does it have to do with star travel? Bishop often irritates in just this way, with just such fundamental irrelevancies. He does it again in "The House of Compassionate Sharers," in which a man rebuilt as a machine must relearn humanity with and as an empath/whore. And again in "Cathadonian Odyssey," in which the Earth becomes a gift of earned hate and unearned love and is destroyed in the process, *sans* all logic. And in "Spacemen and Gypsies," where horsedrawn gypsies flee commissars, go to the moon, and kill two astronauts. And in more.

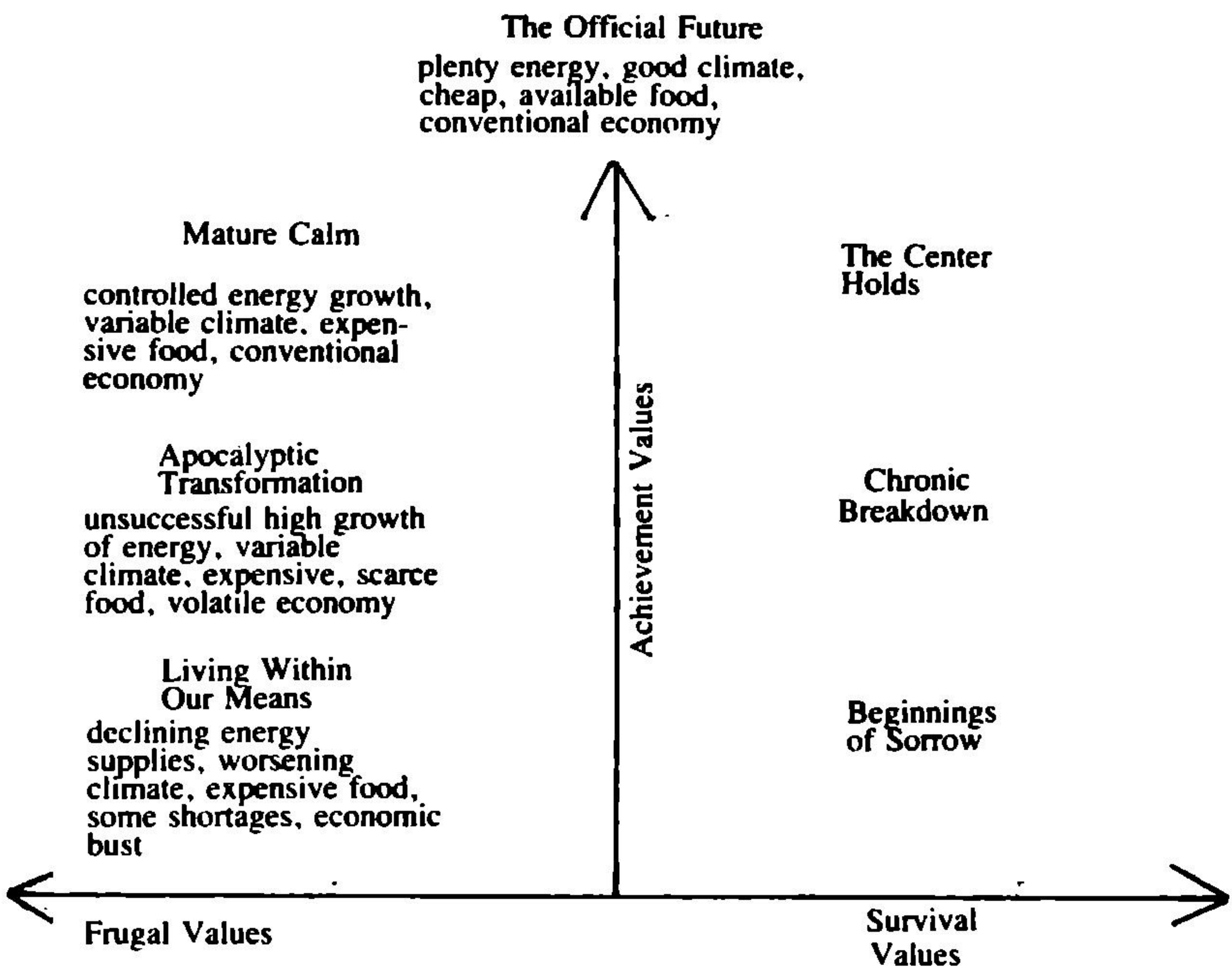
What am I complaining about? It's that touch of surrealism, I suppose: the oddly angled way in which Bishop blends the humanities and the sciences to make his statements. His execution is often faultless, but the stories themselves are *strange*. And that does not invalidate them. Don't get me wrong—I enjoyed them even while irritated, and I fully expect you will, too.

In **The Language of the Night,** Susan Wood has assembled Ursula K. LeGuin's many comments on her work into what may be a most useful text—not on how to write, but on how to be a writer. In the essays reprinted here, LeGuin talks about the place of fantasy in child and adult life, its sources in the unconscious, its connection to experience, and the distinctions between fake and genuine fantasy. Her driving concern is freedom, for herself and her readers, and how it permits and is permitted by fantasy.

It is a fascinating and valuable insight into the mind of one of our more fascinating and valuable authors. Don't miss.

Want to know what the future holds? I can't tell you. Neither can anyone else, in or out of SF. But some people are in the business of laying out possibilities. They work in think tanks such as the Rand and Hudson Institutes. Such as SRI International, once the Stanford Research Institute, three of whose people have created **Seven Tomorrows,** a book of seven sketchy scenarios of the future.

Why seven? They began by identifying five "driving trends" (energy, climate, food, the economy, and values), assigning several options to each, and looking at the resulting matrix of combinations. Seven groups of futures fell out, for which they then developed their scenarios, gave them titles, and arranged them like so along three value



axes (see above). The scenario titles are largely self-explanatory.

It's an intriguing approach. It makes sense. It even includes what I suspect is the most likely future (Mature Calm or The Center Holds). And the authors even offer a Vision for America—they urge cooperation and conservation and the preservation of diversity as they damn all ideologies. They present a program that blends features of Left, Right, and what they call Transformative, but you may know better as Aquarian. They offer the concept of a Voluntary History, emphasizing the crucial role of individual choice, as opposed to "historical forces."

They seem to cover all the bases, all the options: and if some readers object to a certain lack of definiteness, of specific recipes for the future, that is really only appropriate. The future is, after all, unformed and cannot be seen any more clearly than in terms of options, of choices.

My own objection, and that of many *Analog* readers, is that the authors virtually ignore one choice available to us, one that opens a future surpassing even the Official Future for rosiness. And I think you know the one I mean—space industrialization, solar power satellites, lunar and asteroidal minerals, and so on. Let us get our butts off the ground and into space, and the concept of limits becomes laughable. Even climate control becomes a possibility.

Speaking of Voluntary Histories and choice-making—the first step is to get our minds out of the dirt, to look outward. Someone should tell SRI.

And speaking of space industrialization, you all know who the prime exponent of that business is: G. Harry Stine. He shares a column in these

pages, and he's done a number of books since *The Third Industrial Revolution*. The latest extends his consideration of how we will live, work, and get along in space that one too-logical step: to war. It's **Confrontation in Space.**

War in space is inevitable. Given that, Stine says, it behooves us to consider weapons and tactics well in advance. And he does just that, discussing megawatt lasers, particle beam weapons, electromagnetic impulse, buckets of nails, antisatellite missiles, the high ground of geosynchronous orbit, the LaGrangian points, and the Moon, and rules of action and engagement. In the process, he tells us why ground-to-ground nuclear weapons will be obsolete as soon as we're capable of fighting a war in space.

He's comprehensive. He may even be right, provided we come up with nothing *really* new. And he's readable, if you don't insist on a smoothly flowing prose. His reads, in this book, like the jagged, boring schlock that too often passes for technical writing. You wouldn't know he was also a novelist.

Read it for a view of the future that does not come from a ground-hugging SRI team. ■

The Alternate View *(continued from page 83)*

But then politicians who look a generation ahead aren't likely to be rewarded either. Our political system gives jobs for life to judges and low- to medium-level bureaucrats, but never to political leaders or high-level decision-makers; nor indeed do we have much of a mechanism for making long-term plans and carrying them out.

So while I'd like to believe Harry Stine is right, and that the space moguls will come up with the cash, I'm also a bit worried because I don't see many on the horizon.

Which brings me back to the central point: we, the readers of this magazine, are more important than perhaps we think. True, not all of us look ahead to the future: but most of us do, *and we may be most of the people doing that.*

Scary, isn't it?

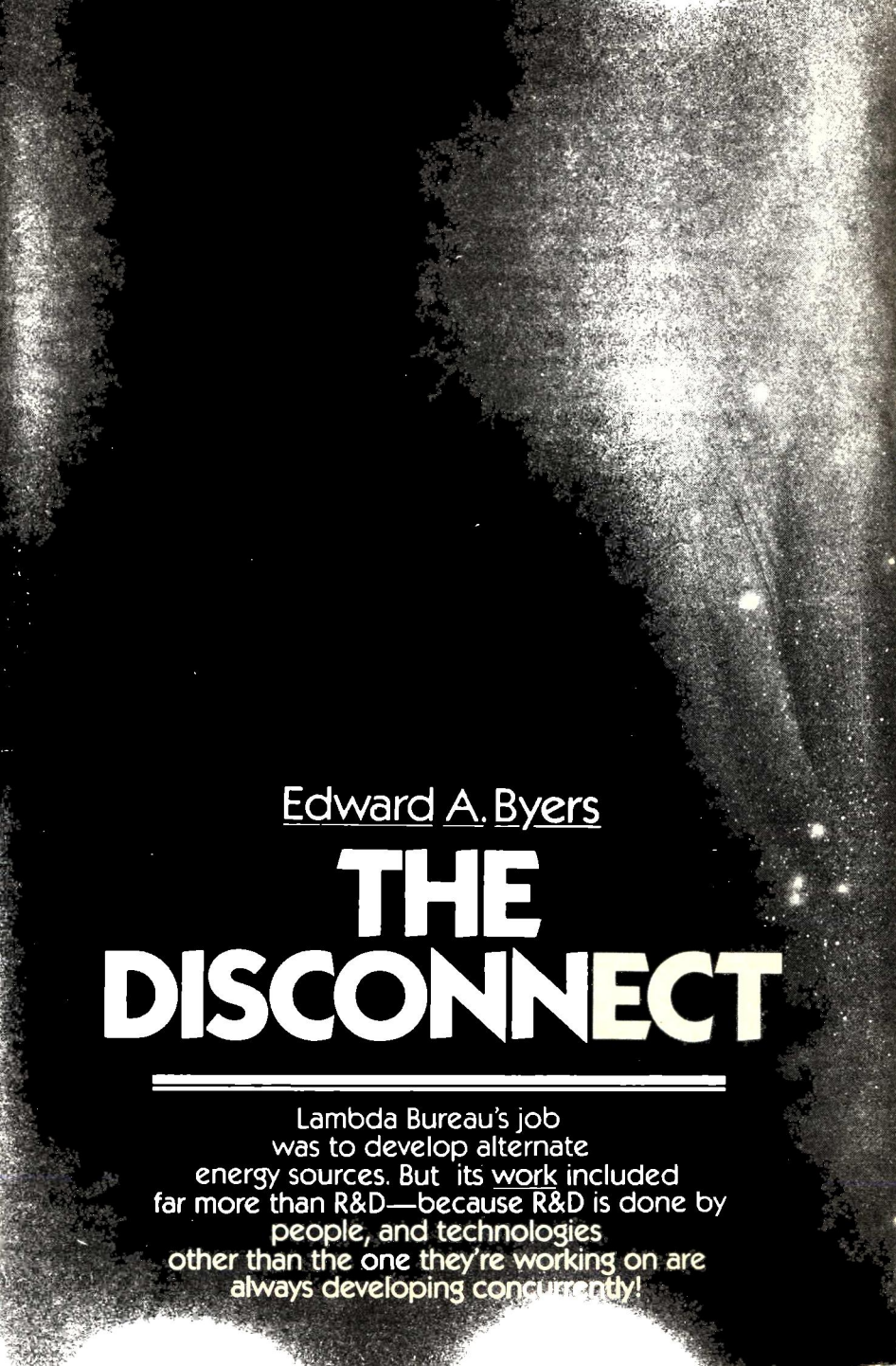
So what can we do?

Alas, nothing I haven't said before; nothing spectacular like marching on Washington. But we do have to organize. (My favorite organization, not surprisingly, is the L-5 Society, 1060 E. Elm, Tucson AZ 85719, $25/year.)

We must, somehow, convince Washington that the future has a real constituency; that we're not just a bunch of mild-mannered nuts out here, but people who are determined; that we can get together and change the results of elections; that space and high technology and investment in the future are issues that really do count, and politicians too blind to see that can be punished.

And, slowly, we are doing that. Not as quickly, not as dramatically as we'd like; but we're getting a hearing.

Our immediate goal is to get into the next State of the Union message. The long-term goal is to get official Washington to understand that, when you're on a binge you can't get out of and facing bankruptcy anyway, flinging a few percent into high-flying investments may be the only way out. It's not that far-out an idea. Anyone can understand it. Except maybe an economist. ■


Edward A. Byers
THE DISCONNECT
Lambda Bureau's job was to develop alternate energy sources. But its work included far more than R&D—because R&D is done by people, and technologies other than the one they're working on are always developing concurrently!


Broeck
Steadman

The picture over Ralph Timmons's desk was that of a buffalo being harried by wolves. *Surrounded. Tired. Flanks heaving and bloodied*

Timmons ran fingers through his bush of sandy hair and straightened his gaunt frame. He well knew the feeling. As head of the Energy Department's Lambda Bureau, he had felt more than once the teeth of wolves. No matter that they walked upright, no matter they smiled as they circled. Timmons ground his teeth almost audibly. With difficulty he shook away the feeling of depression. No time now for self-martyrdom.

He contemplated his desk, with its curiously rounded corners and encapsulated electronic gear. Several lights blinked at him.

Balefully he jabbed one of the offending buttons. "Massey, who's on the hot line?"

Carol Massey glanced down at the array of lights on her own desk and then up at her superior. Her voice was cool and efficient, a tonic to frayed nerves. "Bernard Peterson, Chief. He's threatening to close down *Grüen Drei*."

Timmons groaned.

Grüen Drei —Green Three—was a masterpiece of biological engineering. It was, simply, a method of coaxing hydrogen and oxygen out of a biomass mix. Cheap hydrogen meant added energy for an energy-poor world. It was an elegant solution for inelegant times, and Peterson seemed to be bringing it off. Timmons wanted very much for him to succeed.

"What's his problem?"

Carol Massey shook her head and looked baffled. "For your ears only. He seemed in bad shape, though."

"Drinking?"

"No. Angry as hell!"

Timmons nodded slowly and gave his secretary a wordless stare. He punched through to the hot line. Bernard Peterson, heavy face flushed and runneled with sweat, looked back at him grimly.

He said, his words heavily accented, "Someone killed my son, Ralph." Anguish furrowed his brow, made his jaw muscles knot.

Timmons raised his eyebrows and pursed his lips. He was aware of a slight background hum that pervaded the office. Hot line scramblers. He drummed his fingers on the edge of his desk and counted slowly to five.

Timmons's recollections of Kendall Peterson were not at all flattering. The man was a roué, a womanizer—an *alfie*. Had been. Timmons doubted he'd be greatly missed. Blood, though, was supposed to be thicker than water.

He said, "How did it happen, Bernie?"

"He was beaten to death!" Peterson said vehemently. A swatch of gray hair fell down in front of his eyes and he brushed it back with a quick movement of his hand.

"Where?" Timmons asked.

Peterson snorted. "A hotel room out in Pentucket. One of those places you rent by the hour."

"A liaison," Timmons said.

"Probably." The chemist leaned toward the camera, and Timmons was treated to an enlarged view of his nasal cavities. "I just got a call from the police there. They found the murderer *with* him—a girl named Dani Southland—and they're going to let her go!"

Timmons straightened in his chair.

"Why?"

"How the hell should I know?" Peterson exploded. "They said something about her being white goods. What in the hell is white goods?"

It rang a bell in Timmons's head, but nothing came immediately to mind. He jotted a note for himself. He said, "I'll get some top-rank detectives on it, Bernie. In the meantime why don't you go home, get drunk or something. Leave it to the experts."

Peterson shook his head savagely. "*Nein!* I'm staying right here. And I don't want the police handling this. Christ—they're turning the murderer *loose!*"

Timmons raised his hand preparatory to speaking, but Peterson overrode him.

"I want the Lambda Bureau to get into this. Take it as high as you have to. I want the person who murdered Kendall!" The researcher's voice abruptly broke. He sagged back against his chair.

Timmons tried a smile. "I can't take this out of the police department's hands. I'd have to declare bureaucratic war."

Peterson merely glanced up, but his voice was steely. He said, "I know you, Timmons. You're a tiger—a meat-eater. You have a reputation of getting what you go after. So go after this girl —Southland. Because if you don't "

"If I don't?" Timmons inquired. His eyes narrowed by two microns.

Peterson grunted, then sighed. "I've got only one gun, Ralph. *Grüen Drei*. I'll shut it down. I swear it."

"This close to completion?"

The other nodded. "It would kill me, but I'd do it." He paused, and the two spent several moments staring at each other.

"I'll look into it," Timmons said finally, with just enough coldness to penetrate Peterson's composure. He paused with his finger over the cut-off switch. Then softly, remonstratingly, he said: "Blackmail, Bernie? Who do you think you would be blackmailing?"

The older man looked stricken. His mouth, however, remained firm. He said, "I told you, it would kill me if I had to shut down. But you know me, Ralph. You know I would. Don't call my bluff."

Timmons gave him a tiny smile. "I'll look. I don't guarantee anything." He pushed the switch before Peterson could reply, then sat back in his chair and contemplated the ceiling.

The Lambda Bureau was an extra limb (some said a taloned claw) grown from the body of the Department of Energy. Its mandate was to look for new methods of procuring energy — stopgapping — until fusion generators came on stream and made energy so plentiful its existence was no longer necessary. In the ten years since its creation the fusion mirage had remained just that: a mirage. During those intervening years Timmons had used his position for many things, but never to usurp the power of the police department. He swore and pounded his fist gently against the hard surface of his desk. *Damn that stubborn old fool. And damn, too, his priapismatic offspring!*

Timmons touched one of the buttons.

"Massey!"

"Yes, sir?"

"What are 'white goods'?"

"Bed linens?" Carol Massey queried back promptly. "Dress shirts?" She looked at him with questioning eyes. "I don't know. Give me a context."

Timmons grunted. "The context is a person."

"You hit a blank. White slavery, maybe. I'll look it up." She was gone from the screen for less than a minute. She would be, Timmons knew, punching through to the big computer in the basement.

"Got it," she said, and Timmons wondered for the ten-thousandth time how he managed before Carol Massey had stepped in and become his extra set of eyes and ears, as well as sounding board. Besides all that, she was an invaluable filter; she kept the mayflies off Timmons's neck. She was also fiercely loyal. The Lambda chief could remember senators and cabinet members backing off from that tiny bespectacled figure. He grinned at the thought, then brought himself back to the present with a snap of his head.

"What is it?"

"Street talk," Carol said. "Probably derivative of white chattel. It's another name for a Disconnect."

Timmons nodded, and tapped the desk top meditatively. That cleared up some things, but left others more muddied than before. Disconnects were not rare, but they weren't plentiful, either. And, as a class, they were placed somewhere below that of streetwalker. "White goods" could only be a term of deprecation, of contempt.

He said, "Get me something in depth on them, will you? And find out who's available to take on a Priority One assignment. Kendall Peterson has been murdered."

Carol's eyes rounded. "No wonder Bernard was upset!"

The Lambda chief looked at her grimly. "He wants *us* to handle the investigation. He's threatening to close down *Grüen Drei* if we don't."

"He can't do that! He'd sooner cut off his own arm!" Carol Massey's voice rang with emotion.

Timmons raised both hands in a what-can-you-do gesture, then cut the switch and stood up. His secretary was right, of course. Green Three was Peterson's life. Five years before, his theories had been ridiculed by all save the Lambda Bureau. And now, ironically, he was getting close scrutiny as a Nobel candidate. And, Timmons thought briefly, rightfully so. There was no denying it—Peterson was on the verge of pulling the world's chestnuts out of the fire. At least temporarily. There was enough hydrogen locked in the oceans to provide energy for centuries, but to date no method had proved economical in separating the combustible gas from its water compound. Bernard Peterson was a hair-breadth away from achieving that miracle.

In ten minutes Carol Massey was standing beside his desk with a green file folder and a list of five names. Timmons glanced over the list first and shook his head silently at each of them.

He said, "These are trainees or first-assignment men. Where's Polk, or Callahan?"

"Polk is in Afghanistan," Carol said. "And Callahan is involved in that microwave project on the west coast. He won't be available for at least a month."

The bureau chief put the list down. "I can't ask any of these new men to take on a Priority One job," he said with finality. "None of them is equipped to handle it."

Carol brushed back a vagrant lock of hair and pursed her lips. She said, "Well, hold off on the investigation until we get a field man back from one of the other projects. Certainly Peterson will grant that the police are capable of doing preliminary leg work."

Timmons squinted into the middle distance and shook his head. "Peterson isn't granting anything. He thinks the police are near-total incompetents." With a shrug he took the file folder from Carol's hand and opened it.

Most of the material was familiar to him. Disconnecting had come about with the invention of the Ziewalter Phase Effect, a black box that owed more to shock therapy techniques and EEG studies than it did to original research. The results were unique enough, however—even spectacular. In a few individuals, each borderline-retarded, there was a submersion of personality — subsequent with short duration overlay of a dominant partner's personality characteristics. Which was dense reading, Timmons decided, for a mind transferring itself, temporarily, to another body.

Disconnecting had received a great deal of attention immediately after its discovery. For a year and more it had caused a worldwide sensation. Timmons remembered reading accounts of early experiments in scholarly journals. Unfortunately for its future, it was not without risk. Several wealthy transferees, "trippers" in the jargon of the day, had simply vanished, their bodies left to collect dust in the back wards of mental hospitals. And almost all of those who went on trips reported nausea, headaches, and severe depression.

Still, for those who were jaded enough, disconnecting offered something exciting, something new. And, most of all, a piper who did not have to be paid in his own peculiar coin. Obsessive eaters stuffed their hosts, and never gained an ounce. Heavy drinkers left their disconnects to endure the inevitable hangover. And there were those, Timmons assured himself, who broke new ground in sexual excess. He grimaced and put the folder down. Now it looked as though there had been a final experiment. Someone had used a disconnect to murder!

He said wearily, "I promised Peterson I'd look into his son's death. I guess it's time I did. Get me a car, huh?"

Carol Massey stared. "You, chief?"

"Me."

"But . . ." a flicker of concern whitened the edges of the woman's mouth. She took a step toward her employer and then stopped, uncertain of what to do next.

Timmons reached out a hand and gently patted her arm. He gave her his little-boy grin.

"Nothing is going to happen to me, Massey. I'll wear my rubbers. I'll look both ways before crossing the street."

His secretary ignored the jibe. Instead, she picked up the list of agents and scanned it briefly. She pointed to a name.

"Take Doyle with you. He's very good. He came in first in his class at the Academy."

"You think I need a bird dog?"

"I think we need you alive," Carol retorted, unimpressed. "And besides, it will give him a chance to pick up some things. I'm sure he'll welcome the assignment."

Timmons did not pursue the argument further. He merely nodded and rose to put on his coat. Though his male pride suffered, he knew she was right. His scars told him that.

Brian Doyle was short and stocky, with massive arms and blunt efficient fingers. He had a round Irish face with a scattering of penny-colored freckles. Timmons liked him immediately.

Settling into his seat beside the other, Timmons said: "I'm an alganesthesiac. Do you know what that is?"

Doyle nodded. "Massey filled me in. Alganesthesia is the inability to feel pain in any part of the body. She said you could hurt yourself badly and never know it."

"That's right," Timmons said, and then added stiffly, "That doesn't mean I have to be treated like a baby. I'm still alive, and I'm a lot older than you are."

The other eased the car into the lanes of traffic, glanced once at his bureau chief, and shrugged. He said wryly: "It must be great in the dentist's chair."

Timmons felt a weight lift. He grinned as though the sun had broken through. "And voodoo dolls," he said after a moment's reflection. "I almost never feel the pins."

"You're representing the dead man's family?" Lieutenant Hardiman asked. He looked overworked, and the piles of papers on his desk lent mute testament to that fact. Physically, the police officer was as large as Doyle, who stood just behind Timmons's chair. But there all similarity ended. Where the Lambda man was muscle, Hardiman had long given up to fat.

"The dead man's father," Timmons said. "Bernard Peterson."

Hardiman lit a cigar that looked like black rope and blew smoke in a cloud toward the half-open window. He said, "I remember talking to him. He was mad as hell we didn't have the whole thing sewed up an hour after we found the body." The pliceman snorted and raised his eyes in mute appeal. "We get maybe three, four murders a night here, not to mention burglaries, rapes, and assaults. And in this particular case we got nothing to go on. Absolutely nothing!"

Timmons nodded commiseratingly. "I tried to tell him you were doing all you could. But you know how grieving fathers are." He paused and gazed around the room. "He did say something, though, about a Disconnect. "

Hardiman leaned forward on his elbows and trestled his fingers. "Goddam white goods," he said explosively. "You ask me, we should run them all out of town, break every damn transfer box we find—they're nothing but trouble! You wouldn't believe. !" He stopped himself and chewed savagely on his cigar, his temper on the edge of breaking through.

"Could you tell me about this one?" Timmons asked.

Hardiman nodded. "I've got her jacket here someplace. You can look at it if you want." He rummaged through the clutter on his desk, finally located

a folder. "She's a real case. We get her in here ten or twelve times a year on one thing or another." He handed the folder to Timmons and leaned back in his chair, causing it to creak in sudden protest.

The Lambda chief leafed through the arrest record, pausing to look at the girl's picture and personal data file. Danielle (Dani) Southland, he noted, was an alias. Last year she had called herself Lainie Barstow, and before that Caitlan Smith. The girl's real name—and parentage—were unknown. He studied the face, saw a frightened white oval framed by a cowl of black hair. The eyes were huge and brown and haunted-seeming, almost ugly in their fear. Timmons passed the folder over his shoulder to Doyle and directed his gaze once more to Hardiman.

"I'd like to know what happened in that hotel room," he said. "I have to tell the boy's father *some*thing."

Hardiman rocked in his chair and looked at Timmons through coils of acrid smoke.

He said, "There's not much to tell. They checked in about four o'clock and went right to their room. Twenty minutes later the manager hears screaming." The policeman paused to knock ash from his cigar. He shrugged. "Manager says that kind of thing goes on all the time—he paid no attention to it. Some people get their kicks that way. So he looks up a few minutes later and sees the white goods creeping down the stairs, blood all over her dress. He collared her and took her back upstairs. She'd bashed the nudge's head in with a cast-iron doorstop." He shrugged again. "Even though there was a gun in her purse."

Timmons sat a little straighter.

"No signs of struggle?"

"Sure there were. The girl's clothes were torn and she had bruise marks all over her arms. It looked like Peterson came very close to raping her."

The Lambda chief raised his eyebrows.

"But you're not calling it self-defense?"

Hardiman snorted. "Hardly. Somebody went to a lot of pains to use the Southland girl and stay unidentified. We interviewed her pimp, a nudge named Jacko Mann. The money part of it was arranged through a messenger, so neither Jacko or the girl ever saw who was calling the shots." Hardiman looked from one Lambda man to the other. "If you ask me, somebody used a lot of savvy in snuffing this guy. We wouldn't have *any*thing, if the killer had known more about system shock transfer."

Timmons's spine suddenly tingled. He suppressed an urge to bounce up and drag answers from the other. Instead, he said deliberately: "I don't know much about disconnecting. What is system shock transfer?"

The policeman ground out his cigar before answering. He debated lighting another and then decided against it. He teetered back on his chair again.

"Some disconnects have hair-trigger nervous systems," he said, looking at Timmons. "You dump their blood streams full of adrenalin and they'll override their clients." He suddenly grinned. "It's filled a lot of hospital beds."

"What happened here?"

Hardiman nodded. "The fight, the killing—it generated one hell of an overload. Tell you this," he said, leaning forward confidentially, "whoever killed this nudge has a headache right up there in the world leagues. You don't go through shock transfer for free."

There was a moment of silence, while Timmons digested the information he'd received.

He said finally: "Every track you've taken so far has led to dead ends?"

Hardiman shrugged. "It's only been four hours. But the girl can't give us anything, and the killer didn't leave any clues we know about. We're keeping it an open case, but I don't think we'll find much. I have a man doing background work to find out who might have motive. That's routine."

"You're turning the girl loose?"

"Can't think of any reason to keep her."

"Thank you, Lieutenant," Timmons said. He stood up and shook hands silently. "I'll tell old man Peterson you're doing all you can."

"Thanks." Hardiman shook hands with Doyle, briefly inspected his fingers as if to make sure they were all there, and watched the two Lambda men leave.

Outside in the corridor, Timmons said: "Hardiman hasn't made the connection yet—Kendall Peterson is just another homicide."

Doyle looked at him. "And when he finds out who he really is?"

"Things may tend to hot up a little," Timmons said, smiling. "The death of a Nobel candidate's son is going to rate some newspaper space. Hardiman may find his tail in a crack."

They waited in the car, and in less than an hour the girl they both knew as Dani Southland walked out of the door. The Lambda chief was suddenly alert, his eyes clear and filled with purpose.

"What time is it?"

The stocky Lambda field man looked at his watch, glanced at his superior.

"Nine fifteen."

Timmons nodded. "Good—there may yet be time." He got out of the car and waited, smiling, while the girl approached. She did not *seem* especially retarded, he decided, studying her carefully. Though that would be difficult to tell simply from outward appearances. She did show weariness, however; there were dark circles beneath her eyes and her steps lagged. Timmons was surprised to note the expensively cut dress she wore—and the professional application of mascara and rouge. A trifle overdone, perhaps, but then he had expected sequins and stiletto heels.

The sun had risen until it was above the city's concrete canyons. It turned a long string of cumulus clouds blindingly white, and a patch of sunlight washed across the sidewalk, making Timmons blink. He took a step forward.

"Dani Southland?"

She looked at him, startled, on the verge of flight. Her eyes were wide and frightened.

"Y-yes."

Timmons gave her his name. "Talk to you a few minutes?" he asked. He retained his smile, indicated the open car with one hand.

"Are you police?"

"No."

"Is this about what happened?"

Timmons saw the tension tightening the girl's mouth and suddenly felt sorry for her. Take the haunted look out of her eyes and she might even be pretty, he thought, studying her.

To the girl he said, "I'm afraid so. Will you answer some questions for us?"

"But I don't *know* anything!" It was almost a wail. The girl seemed to notice Doyle for the first time. She looked from him to Timmons and back again.

"You might, and not realize it," Timmons said. He gently took her arm and guided her toward the car. He said, "For instance—is that dress you're wearing part of your own wardrobe?"

Dani looked down at the dress as though seeing it for the first time.

"N-no."

"Then I'd be interested in where it was purchased. That alone may tell us something." He smiled again at the girl. "See—already you've helped us." The Lambda chief closed the car door and then leaned in to address Doyle.

"Take her to Doctors Hospital. Get these tests done." He wrote at length on a pad, thrust a scrawled list at the other. "And check in with Massey. Tell her from this moment on Dani Southland is on retainer as consultant." He glanced at the girl, who stared back bewilderedly, then looked again at Doyle. "And tell her to make up a list of Kendall Peterson's paramours."

"So where will *you* be?" the younger man asked. There was a grimness to the set of his jaw. "I'm supposed to stay with you no matter what."

"Uh uh." Timmons shook his head. "You take care of Dani. I'm going to look over that hotel room. And don't worry," he said, his voice rising, cutting across the other's protest, "I really *can* take care of myself."

Doyle's lips twisted. "I'll drop Dani off and meet you there."

"You'll obey a direct order," Timmons said peremptorially. He riveted Doyle with his gaze. "You stay with Dani until you hear from me!"

The Lambda field man did not like it, but he nodded his head and watched as Timmons strode off toward a taxi stand.

The manager of the Antler Hotel filled exactly Timmons's idea of what crawled from beneath rocks when sunlight was safely fled—right down to the death pallor, pupil-less black eyes, and pencil-line moustache. When the Lambda man mentioned the homicide, the other assumed he was part of Hardiman's investigative squad. Timmons did nothing to dissuade him from that belief.

"What's your name?" he asked.

"Tanner."

Timmons looked at the man. "Well, Mr. Tanner, what I'd like to do is walk through this morning's events. You can start where Miss Southland came down the stairs."

Tanner shrugged. He came around from behind his desk, passed close by Timmons and stopped just short of the spiraling staircase. Timmons caught the heavy scent of hair oil. It did nothing to shake the image he had already made of the man.

He had Tanner go over everything twice before visiting the room where the murder had taken place. It had a minimum of furniture, a single locked win-

dow, and a rug that bore stains and the chalked outline of a man's body.

"Kendall Peterson come here often?" he asked, turning to look at Tanner.

"No—not that I know of," the other responded. He took in the bare and nearly featureless room with half-lidded eyes. Timmons wondered briefly if the squalor registered in the man's brain.

He asked: "And the girl?"

There was a shrug. "Sure. Sometimes. She was white goods, though." The man sneered. "There's no way of telling who was really controlling her body." Tanner stopped abruptly and stared reflectively at the tops of his shoes. "Funny thing ." he murmured at last.

Timmons leaned forward and cocked his head. "What's a funny thing?"

Tanner interlaced his fingers and popped his knuckles. He frowned. "Just the way she looked at him," he said. "When Peterson signed in she was standing two or three feet in back, toward the door. I thought she was going to stare a hole right through him."

"She say anything?"

Tanner shook his head. "Just looked—but it was one of those looks you know when you see it. If looks could kill, she wouldn't have had to use that door stop."

Timmons used a phone in the hotel lobby to call his office. He smiled when Carol Massey's familiar features appeared, but he sensed trouble.

He said, "Did Doyle call in?"

Carol nodded. "Half an hour ago from Doctors Hospital. Where are you? I can get another operative over there in no time at all."

Timmons shook his head. "Don't bother—I'm heading to the hospital now. Is there anything else I should know about?"

"They've had a barrage of calls over at Green Three," his secretary said shortly. "The newspapers have tumbled to the fact that the murder victim is Bernard Peterson's son."

"Bloody hell!" Timmons said. "That means the police are going to open up on this."

"They already have," Carol said with a touch of asperity. "I had a call from the Pentucket Police Department. They think you have the Southland girl and they want her back."

Timmons grinned wickedly. "They can try. But she's part of Lambda now. I put her on retainer."

Carol looked worried. And Timmons had long ago learned to respect her intuitions. If she said the sea was deep and full of sharks then it was so.

He sighed. "I'll be careful, Massey. But just to be on the safe side, start pushing through paper work to make me " he paused, " and Doyle —federal marshals."

"The Justice Department has to okay that," Carol told him. "And they'd like nothing better than to nail *your* scalp to *their* lodgepole." She gave him a small smile at the cliché and shrugged. "Oh—what the hell. I can try."

Timmons hung up. He was aware of the animosity rival agencies felt toward the Lambda Bureau, was aware also of the reputation he had gained as a ruthless Machiavelli who stopped at nothing to achieve his own ends. Timmons grimaced. The Lambda Bureau was responsible for nineteen projects that in one form or another supplied half the

energy requirements of a nation. Crash projects, some of them, brought to fruition over the protests of entrenched obstructionists. Carol Massey had sensed trouble, had radiated that alarm to him in invisible Morse. He could disregard it at his peril.

When Timmons arrived at the hospital he found Brian Doyle and Dani Southland sharing a pot of coffee in the snack bar. Dani, Timmons saw, was ill, white-faced, as though the testing she'd undergone had been a harrowing experience. Timmons knew for a *fact* that it had been. Having your stomach pumped is seldom conducive to feelings of well-being. He felt a twinge of remorse, and as quickly banished it.

He sat down and helped himself to the coffee. "Sorry," he said, looking at the girl. "But there was no time to be lost in getting those samples. Food passes through the body in about six hours. *You* may not know where you were before the murder, but your body does. If you had a meal I want to know what it was—it may be traceable." He took a sip of coffee and turned toward Doyle. "Did you get the pictures and make-up samples?"

The stocky field man nodded and laid Timmons's list on the table. "*And* we tested for everything. Blood, vaginal smears, shoe soles. " He looked up. "We even vacuumed her hair. And they're doing a gas chromatography work-up to determine the kind of perfume she had on." Doyle handed his superior a handful of high-resolution photographs. They were of Dani, all of them taken from different angles. Timmons examined them closely, then grunted his pleasure.

"These should do it. Any cosmetologist should be able to recognize his handiwork by these." He handed the photographs back. "That's going to be your job, Doyle. We need to know what salon worked on her, what store sold her these clothes." Timmons paused, added sugar to his coffee, stirred. "I'm betting the killer knew Kendall Peterson's tastes, the sort of thing that excited him." He looked from Dani to his field man. "I think Dani was bait, and Kendall went for it."

"That would point to one of his old girl friends," Doyle said. "But which one?" He put the photographs into a pocket of his tunic and looked at Timmons in sudden agonized realization. "If I start calling around to salons and clothing stores you'll be left alone again. Massey was very explicit about that—I was to stay with *you*."

Timmons shook his head. "It can't be helped. The police are after Dani. I'll take her to her apartment, let her get some clothes and personal items." He turned to the girl and smiled. "That okay with you? You don't really *want* to spend more time with Hardiman, do you?"

Dani had been steadfastly studying the formica top of the table. She glanced up momentarily, giving Timmons an anguished appeal from wide frightened eyes. She mumbled something he could not quite make out.

On impulse he took her hand in his and squeezed. It was ice-cold. He said: "I didn't hear you, Dani. What did you say?"

Her lips twisted. "My manager will

kill me," she said miserably, her voice low. "For causing all this trouble."

"Jacko is not going to kill anyone," the Lambda chief said firmly. He patted her hand. "Let me deal with Jacko."

"That's just what you *can't* do," Doyle put in, face tight. "You're not indestructible—and Dani tells me Jacko can get mean."

Timmons grimaced. "So can I," he said.

The taxi circled the ancient brownstone apartment twice before Timmons was satisfied the building was not being watched. He was furious with himself, and his face was a stormcloud as he signaled the driver to pull over and wait. Doyle and Massey were, of course, right. He was being stupid. Timmons had not been trained to deal with danger—not the physical kind. He bit his lip savagely. For some reason he had been unable to admit that in front of the girl.

He turned to look at her: frightened, almost visibly quaking in the afternoon's wash of light. Jacko must really have her on a string, Timmons thought angrily. Well, it was time to get her away from that environment.

There were no signs of obvious disturbances in the girl's small apartment. A Ziewalter Transfer Box was plugged into a wall socket, its green tell-tale blinking on and off. Timmons pulled the plug, then picked the device up and studied it.

Except for a pair of cables leading off to duplicate headbands, and the electric cord, Timmons thought the transfer mechanism resembled a rather cheap portable radio. There was a single timing switch located on its face, its increments measured in hours and portions of hours.

Timmons set the device down and watched Dani dig a small suitcase out of a closet.

He said, "Need help?"

The girl didn't turn around but Timmons saw her head move from side to side. She began going methodically through a bureau, taking this, throwing out that. She was hurrying, her fear an almost palpable presence in the room.

Timmons watched her for a few moments, searching inside himself for some analog of that fear. He did not find it. He gave an inward laugh, half in earnest. Perhaps they were right, he thought sardonically. Perhaps he was, in more ways than one, a man without feelings.

In that light he tried to analyze his feelings about Dani Southland. Hardiman had called her white goods, sneeringly; it was clear he thought her beneath human contempt. Timmons gave a mental shrug. Maybe it was her very vulnerability that appealed to him, he thought briefly. Or perhaps it was simply because they were both different.

He let it go and moved into the kitchenette. There was a window there that looked out onto the street below. Timmons raised the blind enough to peer out, saw nothing but the waiting taxi, and let it drop again.

"I'm ready," Dani said from the living room. She gave him a tentative smile. She had finished packing, and the suitcase lay overturned in the middle of the floor. She had, he noticed, packed the transfer box. Then oddly, almost unconsciously, the girl took a bottle

from her coat pocket, opened it, gulped two pills. She replaced the bottle before Timmons could see what it contained.

He started to say something, but there was a small scuffling noise by the door. Dani's head jerked around as though it were on strings. There was no mistaking the terrible fear that showed on her face.

"Hello, Dani. Going away?" The voice was deceptively soft.

"Jacko—" the girl breathed. She seemed frozen in place, like a small bird transfixed by a snake. Timmons took a half step forward, enough to bring the other man into view.

Jacko looked at him for a moment, startled, and then grinned broadly. He took two light steps forward, balancing on the balls of his feet. He was tallish, though not so tall as Timmons, and dark-haired. He might have been handsome, except for the knife scars that burdened the lower portion of his face.

He put one hand in the pocket of his leather jacket and measured Timmons carefully.

He said, "I handle all business with the white goods, mister. What're you interested in?"

"I'm interested in leaving," Timmons said evenly. "With the girl." Inwardly he was damning himself. He should have listened to Doyle and Massey—he was no match for the other! Doyle, though, could have handled Jacko with one hand tied behind his back.

Jacko smirked. He took his hand out of his pocket and Timmons caught the bright glimmer of a blade.

"No one is going anywhere with my property," he said, the smirk changing to a scowl. "Dani belongs to me."

Out of the corner of his eye Timmons saw the haft of a kitchen knife on the edge of the sink. He reached for it, his mind working furiously. Give Jacko a chance, he knew, and he might as well forget it. Jacko was a street fighter; he'd carve Timmons into pieces without giving him a second thought.

It came to him the moment his fingers touched the knife. Psychology is used in warfare, too, he thought grimly. And, if you can, you turn a liability into an asset. He grinned then, and let the grin widen until it threatened to engulf his face. He forced a giggle out from between his lips. Slowly, he brought the kitchen knife out in front of him, holding it sideways so that the light glanced off its length. He riveted his eyes on Jacko and began to chuckle, the sound wholly incongruous to the situation. Then he raised his left hand and moved it forward as if in slow motion, skewering it inch by inch on the knife blade. Blood dripped in thick red droplets on the floor. Timmons twisted the knife, chuckling, his mouth still bearing its hideous grin.

After a beat of seconds he drew his left hand away, flicked blood in the other's direction. He said: "Come on, Jacko—come on!" and laughed outright.

The other man had paled. He looked at Timmons as though he doubted his senses.

"Jesus!" he said once, softly.

The Lambda man took a step forward, the bloody knife held before him like a wand. Jacko eased slowly for the door, his own weapon forgotten in his hand.

Timmons moved quickly, rushing the other, and Jacko abruptly turned and

fled, his footsteps echoing in the corridor outside the apartment. Timmons leaned weakly against the doorjamb, still laughing. He dropped the knife, then wound his handkerchief around his bleeding hand. What, he couldn't help wondering, is Massey going to say?

In the taxi, Timmons gave the driver the address for the Lambda Bureau, then fell back thankfully against the cushioned seat. Dani had insisted that his wound be dressed properly, and, surprisingly, had done a creditable job of it. He looked at her now, happy to see more color in her face than usual. Well, she had seen her tormentor run. Maybe that was worth a hole in his hand. He smiled at the thought.

He remembered something then, something that had been nagging at him until it finally surfaced.

He said, "What pills were you taking, Dani, back there in your apartment?"

The girl flushed. "Aspirin. I—I get headaches sometimes."

Timmons didn't press it. He gazed out of the taxi window at the buildings, their glass and concrete fronts flashing by. He looked again at the girl.

"What is it like for you—when you disconnect?"

"Like going to sleep."

"That's it? You don't dream, you don't remember?"

She shook her head.

"And when you wake up?"

"It's bad, sometimes." Dani closed her eyes and relaxed against the seat. "The worst times are the drug things — you know, the lows. Then I want to die."

Timmons found himself studying her face. It was the first time he had seen it in repose.

"Well, you won't have to do it anymore," he said reassuringly.

It was more than a minute later that he realized she didn't answer because she was asleep. When he thought of it, that wasn't so odd. Her body had had no rest for the better part of twenty-four hours, on top of which she'd experienced the trauma of waking up in the middle of a murder. And all, he remembered, without a complaint.

Carol Massey said nothing when Timmons entered the office with Dani, but her gaze flicked over his bandaged hand in silent rebuke. Timmons acknowledged it with a shrug and a half-chagrined smile.

"Honorably received," he said, holding it up for inspection. Briefly, then, he made introductions. When he was through, he added: "Dani needs someplace to hole up for a while. And this is certainly as good a place as any." Unspoken was the confidence Timmons had in Carol Massey. He could not have asked for a better combination of nurse and watchdog. Dani was safe in her hands.

"The police called," Carol said, after showing Dani Timmons's big couch. She closed the connecting door. "They're escalating this right to the top. I think we're in trouble."

Timmons rubbed his forehead with the back of his wounded hand. He said, "The police department just isn't that quick off the chocks. And they have no *real* animosity toward us. I think we're

feeling pressure from someone in Government.''

''Who?'' Carol asked. She gave him a steely look.

The Lambda man shook his head and shrugged. ''It doesn't really matter. But it means we have to shorten our timetable.'' He was silent for a moment, before glancing her way. ''Anything else?''

Carol nodded and scanned her log. ''Bernard Peterson wants you at Green Three. Right away. He won't say about what, but I don't think it's his son's murder.''

''*More* trouble?''

Carol Massey nodded. ''By the look on his face. I've seen happier expressions on steers going to slaughter.''

Timmons had a sudden sensation of the world caving in around him. Deliberately he thrust the feeling away.

''I'm on my way,'' he said. He frowned then and switched subjects. ''Have you located all of Kendall's conquests?''

''I'm still working on it,'' Carol said. ''It appears he was pretty indiscriminate at times.'' Her voice held disgust and something else. Timmons decided she had a streak of puritanism in her somewhere. He grinned.

''Get everything you can,'' he said. ''Names, addresses, pictures ''

Carol Massey gave him a brief nod.

Timmons turned to go but stopped just short of the door. Reaching into his pocket, he took out a pill the size of a pencil eraser and put it on the desk in front of his secretary.

He said, ''I got this out of Dani's pocket while she was asleep. Get it analyzed, would you? One thing I know it's not, and that's aspirin.''

The glass columns that were the heart of *Grüen Drei* thrust up off the laboratory floor like silicon monoliths. The largest of them was thirty feet across, water-filled, the biomass within twisting in the convection currents like a million-tentacled sea monster.

Timmons stopped and surveyed the columns, awed by their immensity. The biomass, he knew, was mainly a variant of kale, genetically modified. Intermixing with the kale were tiny metallic shells, microscopic spheres of osmium and indium-tin. The process mimicked photosynthesis, then sidetracked much of the resultant energy into stripping loose hydrogen atoms from water molecules. The metallic spheres aided in the conversion and acted as collectors of oxygen, while the hydrogen rose through the mix to be collected at the top of the column.

The system worked well enough. Timmons was satisfied that, given time, Peterson would solve the final glitch, a thorny problem involving plant chemistry. The kale, Latin name *Brassica oleracea acephala*, insisted upon killing itself with its own by-product. Peterson and his team were experimenting with a bacterial stabilizer. Should they succeed, and the Lambda chief had no doubt they would, similar columns (called Peterson stacks) would soon be rising all across the country.

Timmons moved toward the office area. He had entered the laboratory through the rear entrance, thus avoiding the gaggle of reporters on the front steps. The security guard recognized

him easily enough and waved him through.

The hydroponics section made up a quarter of the laboratory. Timmons looked in, saw Tav Webling brooding over a seedling trough. Webling was a small, thin man, bitter as bad wine. He was, however, the best hydroponics technician in the business. Peterson, with Timmons's help, had succeeded in shanghaiing him away from M.I.T.

Webling looked up, saw him, nodded briefly, his mouth retaining its usual mournful lines.

Timmons did not stop. He waved a hand in greeting and hurried on, his attention on the little knot of people in front of Bernard Peterson's office.

"What's up?"

Four heads swiveled his way. The one on Timmons's left belonged to Mel Groome, Peterson's second-in-command. He was a short man with brown spaniel eyes.

The two in front were Manny Cruz and Ellie Shaw. Cruz, a physicist and metallurgist, was small and intense, his manner unconsciously arrogant; he always reminded Timmons of a matador about to enter a bullring. Ellie, on the other hand, acted as though life were a joke. Tall and striking, with a wealth of wheat-colored hair and blue, blue eyes, Ellie Shaw was pretty near the pre-eminent scientist in her field, that being the study of photosynthesis.

The three of them had been with Green Three since its inception, and Timmons himself had done background on them.

The fourth figure to look his way was that of Bernard Peterson himself, his face flushed and grim as death.

He stared at Timmons. "The eastern bloc is putting the finishing touches on their own biomass project," he said harshly. "And it just happens to be an exact duplicate of *ours!*" His head swiveled slightly. He looked from face to face with bitter eyes. "And there's only one way they could have gotten that information," he said at last. "Somebody here gave it to them!"

Timmons was unused to Peterson's taste for espresso. He sipped the rich, hot coffee uncertainly, his mind working over the events of the past few minutes. After a moment he put his cup down and stared at the backs of his hands, noting as he did that blood had seeped through the bandage on his left hand, turning it the color of rust.

He was alone with Peterson. He had wanted to hear the story from the beginning, without the distractions of personality.

He gave the other man a glance. "Where is this other Green Three?"

Peterson looked at him broodingly. "Chelyabinsk—in the central Urals."

"How did you happen to hear about it?"

Peterson snorted, then leaned forward so that his shoulders hunched beneath his jacket.

"They announced it, for Christ's sake! Making political hay, no doubt — the bastards!" He settled back in his chair and surveyed Timmons bleakly. "And all this on top of Kendall's death. It's too much "

He stopped, and the two men looked at each other.

"Well, there *is some*thing," Timmons said gently.

"What?"

"If the eastern bloc copied *Grüen Drei*, then they've copied the glitches as well. Have you solved the stabilizer problem yet?" There was irony in the look Timmons gave the other.

"Not yet." Peterson drew in a deep breath. He gave the Lambda man a weak smile. "You think they've announced too early?"

Timmons shrugged. "Stands to reason. The biomass doesn't begin to die until after it's been producing a while. I'd say that about this time tomorrow there are going to be some red faces in Chelyabinsk—and no pun intended."

Peterson steepled his fingers, looked off into space.

"Even if you're right, that still leaves the traitor."

"Yes," Timmons said. And it troubled him. He knew the entire team — hell!—they were friends, colleagues. He hated the thought that one of them could betray the years of effort—years of shared joy and pain. He shook his head disgustedly. Mel Groome was one of the bulwarks of the program. He routinely put in sixteen-hour days and seemed to thrive on adversity. And Manny, for all his prized *machismo*, was definitely a team player. He had worked closely with Peterson in developing the metallic shell concept. Ellie? Timmons couldn't believe it. She had been a pupil of Peterson when the latter taught at Cal Tech. Their relationship was more father-daughter than many merely biological kinships.

He reflected, said finally, "What about Tav Webling? Or the other technicians and security people?"

The older man spread his hands on the desk top and waggled his head in gloomy negation. "Tav and the others don't have access to the material. It's kept locked up when we're not using it."

There was a long silence. Finally Timmons said quietly, "I think the Bureau will have to do some digging. I'll pull in some field operatives—it's certain we've got to stop the leak. How close *are* you to solving the plant chemistry problem?"

"I have some ideas that look promising," the researcher said after a short pause. He gave Timmons a glance and shrugged. "It's really just a trial and error program with a finite number of choices. There are only a limited number of bacteria that meet our specific needs."

"So as soon as the eastern bloc realizes what is happening, they'll be hot on your heels," the Lambda man said. He stood up without waiting for a reply and began to pace. "Can you do a trial and error search and keep the findings to yourself?"

"No—they'd know," Peterson said, nodding toward the door. "They are all very bright people. You should know that—you screened them." There was a faintly sardonic tone to his voice.

"So I did," Timmons said musingly. He seated himself again and refilled his coffee cup.

"What have you found out about Kendall's murder?" Peterson asked abruptly, switching subjects. His eyes were full of pain, but he maintained a rigid composure.

The stoic Teuton, Timmons thought. Briefly he recounted the events of the past few hours. When he was through,

the older man settled back wearily into his chair, deep ridges in his cheeks revealing his strain.

When Timmons emerged from Peterson's office he found Brian Doyle waiting for him. The stocky Irishman had a puzzled, hurt, angry look about him. He stared pointedly at the bandage on Timmons's hand.

"Massey told me," he said. "She said to pay no attention to what you might say from now on—I was to stay with you."

"She's right," the Lambda chief admitted sourly. He clapped his field man on the back. "I'm glad you're here. Did you find out where Dani's make-up job was done?"

The other gave a nod.

"And the clothes?"

"Not yet. They're off a rack. They could have been purchased anywhere in the city." He paused. "I did get the lab reports, though." He took several folded sheets from his coat pocket.

Timmons scanned them hurriedly. The blood analysis showed slight traces of amphetamines. Not a surprising finding in itself. The perfume had been broken down into esters and acids, with a rendering to one side that indicated a musk origin. The stomach contents were likewise treated. And likewise flagged. Beside a long list of complex proteins a marginal note had been circled and underlined: *H. pomatia*.

"What is this?" Timmons asked, gesturing.

Doyle suppressed a smile. "Snail. Or, to be more precise—escargot."

The bureau chief felt a rising tide of excitement. How many restaurants could there be serving that particular delicacy? With luck they could forge another link in the chain Timmons was building.

He said, "Look and then stopped, aware that someone—Ellie Shaw—was semaphoring at him from down the corridor.

"Carol Massey's on the hot line," the botanist said, drawing nearer. A tiny line of worry marred her otherwise perfect features. Timmons wondered idly if Kendall had ever tried to add Ellie to his list. It seemed a natural. He made a mental note to check it out.

Timmons took the call in Peterson's office, first closing the door and checking that the scramblers were working.

"What's up, Massey?"

"Trouble! The police have a warrant for Dani Southland's arrest. They're going to try to pin Kendall's murder on her." His secretary's face was a somber testimony of frustration. She paused, then hurried on before Timmons could interrupt. "I also found out where all the pressure is coming from. Justice and Interior have formed a coalition. They're going to try to nail you on this thing, Chief. They think you're vulnerable."

"They're probably right," Timmons said grimly. "But if I solve the murder, it will pull the foundations right out from under them."

Carol Massey looked worried. "Can you?"

"Hell if I know. You have that list of women Kendall was involved with?"

Carol glanced down at a file on her desk. "I've located sixteen so far. That takes it back about two years."

"He was sure quite a fella," Timmons said in disgust. He hung up the

phone and simply stood for a moment, staring at the empty screen.

The Barclay was located in a high-rise, its glassed dining area looking out over half the city. Just after six o'clock in the afternoon Ralph Timmons and Brian Doyle rode up in an elevator and entered the hammered bronze doors. The waiter whom they'd arranged to meet, a dark man named Rassaf, greeted them with a handshake and an almost invisible click of his heels.

"Thanks for seeing us," Timmons said. He held up a picture of Dani Southland. "On the telephone you said you recognized this girl."

The man studied the photograph carefully. He nodded, brushing one side of his moustache with a manicured fingertip. When he spoke, his words were lightly accented.

"I remember her. *And* the man with her." Rassaf's voice was filled with contempt and disdain.

Timmons's eyebrows rose. "Did he make trouble?"

"No—he was a boor." Rassaf's tone indicated that that was a much more serious fault. He gave both Lambda men a solemn stare. "He was drunk, but not enough to excuse his behavior toward the lady."

"Abusive?"

"Oh, yes. He was taunting her. Laughing at her."

"And how did she respond?" Timmons felt intensity begin to build inside him. He desperately needed to know the personality borne in Dani's body—a personality that remained tantalizingly out of his reach.

The other shook his head and shrugged. "Her face grew white, her lips bloodless. She said little. But she stared—oh, how she stared!" He paused a moment before continuing. "I have seen mongooses in my native country when they chance upon a cobra. That stare was very similar—a mongoose stare."

That was what the manager of the hotel had reported. Timmons felt frustration churning at his gut. It was like trying to lasso a wraith. And time was becoming increasingly a-factor.

"Have you heard of hypnotic patterning?" he asked from desperation.

Rassaf looked startled. "No."

"It's a forensic trick," the Lambda chief said matter-of-factly. "Witnesses under hypnosis are made to relive an event minute by minute. Then the material is computer-scanned for similarities. A lot of useful information can be generated that way."

"But I remember last night very well," Rassaf insisted stiffly. He drew himself up to full height. "Ask me what you want to know."

Timmons shrugged. "Did the woman smoke?"

"No."

"Did she lean in toward her companion when he talked, or away from him?"

Rassaf looked uncertain. "She did neither, I think. She sat upright, very tense."

"You *think*," Timmons pointed out grimly, his hands gesturing. "Using hypnotic patterning we would be sure."

"It is that important, these small things?"

"Possibly. The man, Kendall Peterson, was murdered shortly after he left

here. The police are saying Dani did it."

"You do not think she is guilty, this Dani?"

Timmons shook his head. "No."

"She looked capable of it last night, I must tell you."

Timmons gave a lopsided smile and said nothing. He waited.

"Very well," Rassaf said at last, nodding. "If you think it will make any difference, I will consent to relive that period of time."

"Excellent!" Timmons turned to Doyle. "I want you to get the manager of the hotel, name's Tanner, and the cosmetologist who worked on Dani. Run them both through patterning. Maybe the computer can come up with some identifiable traits."

The stocky Irishman lowered his head. "That would mean leaving *you*, sir." His mouth was suddenly a firm hard line.

Impatience showed on Timmons's face momentarily, then vanished. He said, "I'm going back to the office—then straight home. No side trips. That's a promise."

Doyle looked less than pleased, but after a moment conceded the point and gave a grudging nod. He said only: "What if Tanner refuses to submit to patterning?"

"I'll leave it up to you to persuade him," Timmons said, a glint coming into his eyes.

Approaching his office, Timmons paused to scan the street. He detected at least one stake-out car, its occupants dull shadows behind deeply tinctured glass. There was no way of knowing if they were federal or local. Nor, Timmons decided bleakly, did it matter very much. Time was on their side. If he could not prove, conclusively, that Dani was innocent, then his own time was running out as well. If the Lambda Bureau existed afterward, it would be as a pale, emasculated thing, a tiger without teeth. Timmons felt a sudden helpless anger at the faceless men who wanted to bring him down—even if it meant paralyzing a nation.

Carol Massey glanced up when Timmons strode into the office, saw the anger that darkened his face.

She said, "They're federal—the stakeout team. And they've got men in the back, as well."

"They know for sure Dani's here?"

Carol shrugged. "If they did, they'd be up here with a warrant. As it is, they're content to sit tight and wait."

"For a while," Timmons amended in a tight voice, "until they check all the angles. Then they'll be up here—I know them too well." He paused and stared sightlessly at the far wall, his mind checking off possibilities.

Finally he said quietly, "Chances are they don't know about the linking tunnel below the computer room—it's not on any blueprints. I'll take Dani out that way."

"Where will you go?" His secretary's eyebrows drew together and she gave him a quizzical look. Timmons noted the urgency of her manner and almost smiled. He pitied any federal man who crossed her path when she was in one of her moods.

"We'll go to the lodge," he said after a moment's silence. "It's secure."

The lodge, about fifty miles north of

the city, was used as a Lambda training post. As far as either of them knew, it had never been breached by rival agencies.

Carol Massey gave a brief acknowledging nod. Then she adjusted her spectacles, sighed deeply, and glanced down at a computer printout on the desk in front of her. Her mouth grew taut.

She said, "I have one more item on Kendall Peterson's love life. Two years ago he was living with a girl named Jennifer Stovall. She committed suicide by jumping out of a tenth-floor window."

Timmons looked at her. "And ?"

"And " his secretary echoed for emphasis, "she was Ellie Shaw's half-sister."

"Oh, my God!" Timmons snatched the printout off the desk and examined it, his scowl deepening, a sinking feeling growing in his stomach. Ellie Shaw? He tried to imagine the tall scientist as a killer and could not. Still, what did he *really* know of what went on behind those cornflower-blue eyes? He couldn't think of a more practical camouflage.

He put the printout down, smote one hand with another. He needed time—time to think it all through. And time was what he did not have.

"Oh, hello."

Timmons turned around. Dani Southland was standing in the doorway to his office. Her eyes were puffy from sleep, her hair a tousled mess across her shoulders. But she seemed alive, genuinely alive, for the first time since the Lambda chief had seen her. The fear was missing, sloughed off like an invisible extra skin. She gave him a smile.

A long moment later, he said, "Hello, Dani."

The lodge stood on a finger of land jutting into a shallow inland lake. There was a hidden tracer-work of alarms and tell-tales that wound around it like the twinings of a spider web. In front was a beach of dark pebbles, and behind a promontory covered with a thick growth of scrub pine. It had cost the tax-paying public two hundred thousand dollars to make the place secure, and Timmons considered every last dollar of it well spent.

He stood quietly, gazing out at the moonlight glancing off the water's slight chop, listening to the wind in the trees. Heaven, the Lambda man decided, would be to have a whole week here with nothing to do but maybe fish. He grimaced, then looked down at Dani, sitting cross-legged in front of the window. She had been quiet on the trip up, too quiet for Timmons, who normally enjoyed a little chatter. A few times he had caught her looking at him, something like awe in her eyes. He wondered what Massey had told her.

"Sleep seems to have perked you up," he murmured lightly, studying the back of her head. *Damn!* How did you talk to someone retarded and not sound patronizing?

She turned enough to give him a glance, then resumed her rapture with the water. Without turning around again, she remarked uncertainly: "You can't feel pain. Carol said you never have."

"She's right," Timmons said. "I never have."

Dani turned around full and looked

at him. "You put that knife through your hand—and never felt it?"

"Yes."

"Why?"

"To keep Jacko Mann from carving on me on *us*," Timmons said with an attempt at a smile.

"No I mean, he wouldn't have." The girl put her hand across her mouth as though she were in pain. She said in a low voice, "He wouldn't have for white goods."

"That the way you think of yourself?" Timmons asked harshly, his lips twisting. He half turned away, then turned back. "You cook?"

"Oh, yes!" The answer was quick, pathetic in its need to please.

"Well, the kitchen's over there," the Lambda man said, pointing. "We always keep it fully stocked. Call if you need help." Deliberately he turned to the attache case he'd placed on the table. He looked up just as the girl was vanishing through the doorway, saw her surreptitiously mouth two more tablets. What in hell were they, Timmons wondered angrily. Then he dismissed it from his mind. He opened the case and spread out a stack of folders, each one of them representing a member of Kendall Peterson's private seraglio.

He removed the pictures from the folders, fanned them rapidly across the table's top. He looked for similarities but didn't find them. *Goddam it to hell!* What key was he missing?

Oedipus?

Timmons mused for a moment on the possibility. If Kendall had nursed a love-hate obsession about his mother, that would explain quite a few things. But it would take some proving. On impulse the Lambda man moved to a small console and laboriously punched in a series of numbers. The screen lighted, showing an entry code that would give him access to the Lambda computer.

QUERY FILE ON DR. BERNARD PETERSON, he typed with one finger.

When the file came on he punched code specific for Mrs. Judith Peterson, saw her picture fill the screen. Below it, in a running commentary, was the information: Divorced. Living Seattle Pinehurst Sanitarium. Diagnosis autochthonous delusion. Physician Dr. Theodore Brinnel.

Timmons regarded the bland, almost sexless features of the woman. The hair was nearly white, the cheeks puffy. This was what she had become, not what she once was. He punched more numbers and a series of pictures ghosted across the screen. He watched Judith Peterson grow younger.

Suddenly he grunted deep in his throat, slapped savagely at the hold button. *More like it!* The young woman looking back at him could be no more than twenty. And though her hair was pulled back in a twist and her eyes were in shadow, Timmons felt a thrill of recognition.

It was there, by God! Subtle, easily overlooked, but there, all the same. He snorted gleefully, then picked up the stack of pictures from the table and scanned them one by one. His eyes were drawn to the cheek bones, to the delicate tracery of the upper lip. Further on he saw eyes that bore that same peculiar intensity.

Timmons grinned like a wolf. Once you knew what to look for, the pattern was apparent. Kendall Peterson had

found his mother—or some aspect of her—in each of these women. A set of eyes, the shape of a skull, a sensuous upper lip whatever, it was enough to start him on the scent. Timmons gathered the pictures together like a deck of cards and riffled the edges. He had no doubt now that with a pair of scissors and some glue he could make a composite of Judith Peterson's face. Which, he noted to himself, explained some other things.

Ellie Shaw had been safe after all, because she no more resembled Kendall's obsession than did Jeanne d'Arc. Her half-sister, on the other hand, had had the misfortune to be born with Judith Peterson's eyes.

Timmons tapped his fingers idly on the tabletop, then swore softly. It meant the killer knew all this too, of course. Else why do that makeup job on Dani, accenting her eyes and high cheek bones.

The console abruptly chirped, indicating an incoming call. Timmons put the pictures down, activated the scramblers, and slumped into a chair. He punched the receive button.

It was Carol Massey, looking tired and brittle.

"Well, you were right," she said, nodding at him. "They got their warrant and came up. They were very upset at not finding you here."

"I bet." Timmons grinned in spite of himself. "Oh well. Sometimes the hound, sometimes the hare."

Carol Massey raised an eyebrow. "Well, the hounds haven't given up. They dusted the place and found some of Dani's fingerprints. They convinced a judge that constituted conspiracy. *You're* named on the new warrant, chief."

Timmons swore. It was becoming a bloody quagmire. Each step you took sucked you that much farther in, until finally you were too far in to reach *terra firma*. And time continued to work against him.

"Where's Doyle?"

"On his way up there," Carol said. "He's going slow and round-about, so he can lose the cars that are following him."

"He get the patterning data?"

His secretary nodded briefly, then scanned the room to either side of Timmons.

"Dani around?"

"She's making dinner—I hope," the Lambda man responded.

"Good." Carol gave him an enigmatic look. "I know what is in those pills she's taking."

"What?"

"Ribonucleic acid and magnesium pemoline."

Timmons stared. "RNA magnesium pem why?"

"It's easy enough to figure out," Carol told him. "RNA is supposed to carry genetic information. Magnesium pemoline is a memory booster. Dani is trying to fit into this world the only way she knows how—by bootstrapping herself smarter."

"But—*hell!*—it doesn't work that way." Timmons felt a wave of something sweep over him. He exchanged glances with his secretary.

"Don't tell me," Carol said finally, flatly, her eyes troubled. "Tell her—*if* you've got the heart."

* * *

Dinner was pork chops and rice pilaf. They ate it on the patio, because Dani wanted to feel the breeze off the lake.

Timmons pushed a square of meat around his plate before eating it. "I need to know something," he said, looking straight at the girl.

"What?"

The Lambda man paused. "I've been trying to put myself in the shoes of Kendall's killer. To do that, I have to know what it's like to disconnect."

"Of course." Her answer was devastating in its simplicity.

Timmons wondered why he felt suddenly frightened.

"Here, put this over your head," Dani said. She handed him one of the transfer box's headbands, donned one herself. She gave him a smile, slow, tentative, that said more than words. *I trust you*, Timmons read. *And damn you if I'm wrong*.

"All right." The Lambda man put the headband on, then tightened the strap and leaned back in his chair. He was beset by a sudden feeling of tension and strove to ignore it. Hell—people did this all the time—and he was getting to do it for free.

"Are you ready?" Dani's hand was on the phase switch.

Timmons steeled himself. "Ready."

He heard a suppressed giggle. "This is your first time. I bet you're not."

An infinite second later he felt a shock, like somebody lightly sandbagging his temples. He started to shrug, then stopped. He raised his head and looked around.

His first sensation was simply one of changed perspective. Timmons had been sitting facing the fireplace, his eyes on a level with the mantel's base. Now he was suddenly three feet to the right and several inches lower. And the room's colors seemed brighter, more vital.

To his left was a somnolent mass Timmons recognized belatedly as himself. He rose, awkwardly, and pushed the slack jaw closed. Christ! Was he to be embarrassed because his abandoned body drooled? He grinned at the thought and stood erect. Then he did what he supposed was an initial and almost universal reaction of a man disconnecting into a woman's body. He put his hands on his breasts, cupping them, feeling his own strangeness through the layers of cloth.

He noted the time. It had taken him just over ten minutes to become acclimated to Dani's body, secure enough in his own motor responses to move around with some ease. At the same time, he knew it was something he would *never* get used to. The change was too radical. Too seductively alien.

But it was when he picked up a hot poker that his world shattered. Shock waves ran through him, jerking from him an involuntary scream. Pain? He had no gauge, only the throbbing that made his hand the center of agonized distress.

After the throbbing had eased, he rubbed an arm experimentally—and too hard—against the coarse brick facing of the fireplace. Slow waves of pain exploded up his arm, causing him to weep, then cradle the injured limb tightly against his chest. Pain, he thought savagely—it was like a veneer that fitted

over the body, a tactile coat. And it hid beneath the flesh like a trip wire.

Timmons ran cold water over the lacerations, then sat down in a chair facing the window. He found himself appalled—shaken—by the terrible barrier of pain. How did people function, he wondered. The *least* of humans faced life beneath a knife edge of paralyzing trauma. And he had sampled but the mildest form of what could become a consuming torment. *You're a freak,* he thought, not for the first time, shaking his head. *And your freakishness is an armor, a blanket of invulnerability.* He looked down at Dani's hands with new eyes. God! No *wonder* Jacko had run.

Timmons stirred, checked the transfer box, saw it had another fifteen minutes to run. As he was turning away he was struck by a sudden thought. Why in hell was he thinking so clearly? Or was he? Maybe it was only his imagination. He stopped to consider, then grinned and shrugged. Well—hell, he had a premise, and with it a method of proving that premise. He thought it through, nodded to himself, and moved to the table. He took a stylus and a blank sheet of paper from the attache case and deliberately began to write.

"Ever hear of a man named Johann Dase?" Timmons asked. He leaned a shoulder against the rough-paneled wall and looked down at Dani, awake now and seated before him in one of the big overstuffed chairs.

The girl shook her head.

"He was an *idiot savant,*" the Lambda man said. "He could multiply hundred-digit numbers in his head."

When the girl looked wordlessly at him, Timmons continued. "*Idiot savants* are people who do tricks like that. Some of them can, for instance, calculate on what day your birthday will fall a hundred years from now. Nobody knows exactly how they do it."

Dani's gaze grew puzzled. "I've never heard of them."

"They have a lot in common with disconnects," Timmons told her, staring down at the floor, hands close by his sides. "They're rare, and the 'idiot' part means pretty much what it says. Their IQ is about thirty points below average." He glanced up, caught the sudden betrayed look that flitted across her face. He winced as though he'd slapped her.

"But then there was Dase," he said, leaning forward and taking her hand. "He had the *savant* ability, but he was no idiot. He was, in fact, an engineer, and a good one."

Dully: "What does that have to do with me?"

"Everything!" Timmons breathed sharply. "Intelligence is something that's hard to pin a definition to, but we're pretty sure now it's linked to the speed of synapsal firings—how quickly the brain cell receives and processes information." He paused. "While I was disconnected I worked out the relationship between relativistic mass and velocity. I couldn't have done that if you were retarded." Jubilant, grinning, he strode to the table and held up a sheaf of papers. "You can only compute mentally what your brain is capable of." He waved the papers. "And your brain computed this. Pretty good!"

Dani merely looked at him, refusing

to believe. "You mean you never worked out that relationship before?"

"Of course I have, but that's irrelevant." Timmons stopped. He studied the girl carefully, then frowned very slightly, concern enveloping his features. He said, "You've been told for so long that you *are* retarded that you won't believe anything else. It's common enough. You're a victim of labelling."

"I'm white goods," Dani said, face pinched, hands trembling.

The Lambda chief shook his head. "No you're not. You're Johann Dase — you don't fit the pattern." He went to her, took both her hands in his, and stopped their trembling. "Have you ever had any testing done?"

"Jacko brought some papers home that asked questions. I filled them out. He said that proved what he'd thought all along." The girl paused miserably, teeth pressuring her lower lip.

Timmons made a disgusted sound and shook his head. "That bastard! He knew! I'll bet he never showed you the results."

"N-no."

The Lambda man leaned down and kissed Dani gently on the top of the head. He said, "I think it's time you took those tests over again."

Brian Doyle arrived an hour later nursing skinned knuckles, his usually open face suffused with anger.

"They must have figured I was on to them," the stocky field man said. "They ran me off the road, tried to take me prisoner."

"Their first mistake," Timmons said, suppressing a smile. Then, as the seriousness of the act drove home, he found himself frowning. The bureau was being hounded, and with the time pressure it was becoming increasingly difficult to operate with any degree of normalcy. Timmons clenched his fists. It all hinged on Dani—find out who *really* killed Kendall Peterson and the coalition would backpedal so fast they'd think they were on jets.

The bureau chief swore, looked at his subordinate. "Let's take a look at that patterning data," he said. He hoped the words didn't sound as desperate as they felt.

The other only nodded. He produced a satchel and sat it on the table.

The recording computer had broken the patterning data into overlapping lines on strips of paper, with the resultant peaks and valleys correlated to the hypnotic inductees. Timmons laid them on the table's surface and looked at them, intent, his jaw assuming an unconscious rigidity. What were they telling him, he demanded of himself —assuming they were telling him *anything*. Was this spike the killer's? Was this one? He felt frustration gnawing at the knot in his stomach.

Dani had taken the time to fix Doyle a sandwich, and the field man sat eating it, his gaze fixed on his superior. Timmons turned toward him.

"Get Massey on the line. Maybe the big computer can make sense out of this."

"Righto."

Carol Massey came on. Timmons caught a glimpse of her face in that first unprotected moment and stiffened. He felt chagrin, and a sudden terrible anger. The lines of strain overshadowing her

features were there because she was taking heat reserved for him. Goddam! *And she was a stationary target, after all; she couldn't get out of the line of fire.* And, he realized, she'd spent the better part of twenty-four hours in the Lambda office, protecting *his* tail. The Lambda chief drew in his breath with a sharp hiss, then carefully blanked his face. The best thing he could do for his secretary was simply to tie this thing up—*if he could*.

"Massey, I need a main computer link-up," he said, his voice flatly neutral.

"Yes, sir."

"And dredge up one of those human-analogs. I want to program it with this patterning data."

Carol Massey's head bobbed acknowledgement. Her fingers flew over the console in front of her. And her image shrank suddenly in size, occupying finally only the upper left quadrant of the screen. At the same time an artist's mannequin, androgynous and faceless, strolled out and stood arms akimbo, its slightly bulbous head thrown back, as though staring out at the Lambda chief.

"Okay," Timmons grunted. He keyed his own console for transmittal and fed in the paper strips, listening to the almost animate *chirring* of the console's electronic viscera.

"Whose pattern do you want to start with?" Carol asked.

"Tanner's," Timmons said. He sank into a chair and studied the mannequin. For a moment it didn't move, and then abruptly it did. It executed a series of gentle jerks and rotated its head. Then it began walking down an invisible stair, its body hunched in against itself. Timmons realized he was watching Dani descend the spiral staircase at the Antler Hotel. His jaw tightened. By this time Kendall Peterson was already a corpse.

"Go to Rassaf," the Lambda chief said, looking up at Carol.

The mannequin blurred, was abruptly seated, as if in a restaurant. Its movements thereafter seemed restricted, held in check with a tense but nerveless restraint. Some moments later the tiny ersatz figure leaned backward and raised its chin, as though acknowledging a rebuff. Timmons felt a welling tide of despair. *Some*thing should be coming through, some quirk of the killer's idiosyncratic manner. That much would be like fingerprints and retinal patterns—no two would be alike. Timmons ran his fingers through his hair and frowned. Possible, of course—even likely—that the killer was suppressing identifying mannerisms. A chameleon in chameleonland.

He swiveled his head, looked at Doyle. "Who's on the third tape?"

"A cosmetologist name of Maxwell," the other said around a last bite of sandwich. "He said Dani just walked in off the street, paid him double rates to take her immediately."

"He notice anything odd about her?"

"Nope." Doyle glanced at his chief. "Just that she seemed tense."

Timmons nodded despondently, then raised his hand and stopped the display. "Run Maxwell's tape," he said, squinting at the screen.

The cosmetologist's pattern provided no new information. Timmons let it run all the way through before glancing up at his secretary.

"No common patterns?"

Carol shrugged and shook her head. "There aren't any high correlations, but there is differentiation. That last bit of Rassaf's was definitely unique to the persona."

"Okay," Timmons said. "Let's see it again."

The mannequin, seated, suddenly leaned backward, its face lifting as it confronted an invisible tormentor. Something niggled in the back of Timmons's mind, but then was gone so swiftly he was unsure even of its existance. *Who are you?* he agonized to himself, his gaze focused on the analog, his grip tight on the chair arms. *Who are you?*

It was late, but Timmons could not sleep. He paced back and forth the length of the living room, lost in thought, his stride that of a caged animal. There had been something . . something. He shook his head in bafflement, then stopped, staring out the window at the lake.

Maybe, he thought, he was approaching this thing from the wrong direction. Perhaps the question he should be asking was not *who* killed Kendall Peterson, but why he was killed. He pondered that for long moments, his hands clasped behind his back, his lips drawn into an unconscious snarl. *Grüen Drei*—it all seemed to come back to *Grüen Drei*. Something there ?

God, yes!

He wheeled abruptly and made for Dani's bedroom, his mind on fire.

Dani opened her eyes at his touch, then sat up.

"What's wrong?"

"Plenty," the Lambda man said with urgency. "I need you for a few moments. How about getting dressed."

Presently the girl slipped into an overstuffed chair in front of the fire Timmons was stirring back to life. Her eyes were huge in the semi-darkness, and quizzical.

"You saw that artist's analog," Timmons said, turning toward her. "I want you to take its place, do what it did at the end of Rassaf's tape."

The girl looked doubtful. "I don't remember all of it."

"No problem. I'll coach you—and we can always go back to the tape." The bureau chief smiled briefly and put away the poker, unconsciously flexing his hand as he did so.

He took Dani through the sequence of events twice before he was satisified.

"You've got it down pretty well," he said finally. "Now I want you to pretend you're mad at me. Angry as hell. Show it in your eyes. Stare at me. Stare *through* me."

"Like this?" Dani narrowed her eyes into slits and squinted. She giggled.

"No. Not like that." Timmons glanced at her, did not succumb to her mood. He said instead, tensely: "Let's do it again. But this time make believe I'm Jacko."

Dani gave a short nod, the giggle evaporating. She began the sequence of movements anew, sitting up straighter in her chair, raising her chin, arching her back. Her eyes smote Timmons with a sudden ice-cold fury.

There was something there he recognized. Timmons's hands clenched, then loosened. *Oh, oh—hell!* It was nuance, really, a combination of movement and carriage. A gestalt. Timmons

blew out his breath, gave an unconscious groan. He knew now, he realized, who had spent that evening in Dani Southland's body, who had first enticed, then murdered Kendall Peterson.

He shook his head dully. It would be, he knew too, something else to prove it.

"Massey!"

"Yes, sir?" Carol Massey looked up from her console, gave her employer a faint smile. It was eight o'clock in the morning. Six hours of sleep had brought color back to her cheeks.

"Any sign of our friends?"

Carol made a rude gesture with one hand. "There are half a dozen federal marshals on the doorstep. And the news services are having a field day." She grimaced. "Face it, chief. You're an item."

"Yeah." Timmons rubbed his chin dubiously. He said, "Listen, I have to get into Green Three without being noticed. You have any suggestions?"

Carol Massey mulled it over for fifteen seconds. "We might do it with some kind of diversion," she said finally. "Hire an actor who looks like you—that sort of thing."

"I like the way you think," Timmons said, smiling. He paused for a moment, reflecting. "But you'll have to hire more than one. And I'll need all the stock footage of *Grüen Drei* you can locate. Of the personnel." He glanced up. "Now here's what we'll do " He leaned forward confidentially, his long frame tense with excitement, his voice soft but incisive.

Twenty-four hours later a car pulled up to the entrance of the *Grüen Drei* complex and a man and a woman got out. They started for the entrance, then stopped abruptly as half a dozen news reporters and federal agents spotted them.

"That's the girl!"

"Timmons—halt!"

The two ignored the commands to stop. They beat a hasty retreat, scrambling into the car just ahead of their pursuers. With a lurch the car sped off, followed by a swarm of both government and private vehicles.

At precisely the same instant, a contingent of eight uniformed security men were unloading themselves from a truck at the rear of the building. They marched smartly up to the entrance, their captain saluting the squad of federal officers posted there.

"We're supposed to report to Peterson."

"Right through there," one of the federal men said. "His office is all the way to the front. He's expecting you."

"Okay—thanks." The captain saluted again, and his troop swung through the doorway into the huge bay that made up two thirds of *Grüen Drei*.

"Boy—talk about easy!" exclaimed Brian Doyle softly, removing his uniform cap, then scaling it at a wall peg. He grinned hugely. "I'll bet we could carry away the whole building if we asked nice."

"One place they wouldn't think of looking for us," Timmons mused, sharing the other's humor, "is in a security detail. But it's just as well that Peterson himself asked for it." He peeled off a thick moustache of russet hue and dropped it to the floor.

Just ahead of them one of the guards took off his cap, exposing a wealth of raven-colored hair.

"Dani!"

The girl turned toward the Lambda chief, eyebrows shooting up.

"I want you to stay out of sight for a while. Hide behind one of the stacks until I give the word."

"All right." The girl moved in between two of the huge Peterson stacks, becoming effectively invisible.

Bernard Peterson was just coming out of his office when Timmons and the rest of the troop approached. The researcher eyed them inquiringly. "There weren't any difficulties, I hope."

"None," the Lambda chief said, shaking his head. "Where's the rest of the team?"

"Around." The chemist gestured vaguely. "Want me to call them?"

Timmons gave the older man a glance. "Yeah, I do. But give me ten minutes first, to get set up."

Peterson's expression suddenly shifted, hardened. He gripped the other's arm. "Did you find out who murdered Kendall?"

The Lambda chief nodded, gently extricated himself. "I know who it is. But you're going to have to trust me on this let me do it my way."

Peterson's face clouded. "Who?"

Timmons said nothing for a moment, then shook his head. He said, "Wait for the show, Bernie. That will answer your questions better than I can."

Timmons looked from Peterson to the others seated around the room. The office was big (it doubled as a conference room) but seven people crowded it. Ellie Shaw and Tav Webling were seated in chairs against one wall, Tav wearing his usual sour expression. Manny Cruz, Mel Groome, and Bernard Peterson were sharing the desk. Their faces reflected a guarded anticipation.

The Lambda chief stood up, leaving Brian Doyle seated on the far side of the office. He walked to the front of the room and stopped just short of the entrance. A cloth screen had been set up to cover the open doorway. Behind the screen was a strong light source that turned the cloth a glowing white. Timmons placed his hand on top of the screen and gave the research team a grin.

He said, "In case you're wondering, what this is is kind of an experiment. Bear with it—and see if you can guess who these people are." He smiled widely, quoted: " 'Oh to see yourselves as others see you ' "

Almost immediately a silhouette darkened the screen, the profile of a large man, shaggy-haired, nearly shambling. The figure awkwardly drew a handkerchief from its hip pocket, sneezed into it, then replaced the handkerchief and brushed back a lock of hair with a sudden movement of one hand.

"Why, that's Bernie!" Ellie Shaw called from her seat.

"A dead-ringer, anyway," Mel Groome said, grinning. He looked to his left, where Bernard Peterson sat, his jaw clamped grimly shut.

After some moments the silhouette of the research director strode away. The one that replaced it was smaller, almost stick-like, with an overhanging brow and belligerent jaw. The movements it made were short and jerky, as

though a hidden puppeteer was pulling its strings.

"Tav!" Manny Cruz burst out. There was a chorus of agreement by all save Tav Webling himself, who merely sneered at the profile on the screen.

It was shadow-play, caricature, an exercise in exaggeration. But Timmons, watching each new silhouette perform its antics, thought it was effective enough. Trust Massey to hire good actors. Ellie's shadow-persona had been unconsciously sexy, fluffing its hair and flaunting its breasts. It produced howls, as had a near-perfect rendering of Timmons himself.

The present shadow-double had a full head of bushy hair, a long straight jaw, and a studied arrogance. It was eating, and disdain seemed to drip from every silhouetted line. Timmons watched as the figure stopped, then rocked back and forth on its heels with its nose in the air, as if sniffing some monstrously foul odor.

"That's Manny Cruz, right enough," Mel Groome said, laughing. Around him were nods, and even Tav Webling unbent enough to grin a little.

The silhouette continued its antics for a moment, then stopped and wheeled toward the front. With one smooth movement of his hand Timmons pushed the screen aside. Dani Southland, wiping makeup putty from her face, looked straight out into the group. Her eyes fixed on a single face. Almost whispering, she said: "What's the matter, Manny? Don't you recognize me—don't you recognize *yourself?*"

Manny Cruz's lean face went ashen. He flicked a glance toward Peterson, then at Timmons. Finally, he looked again at the girl.

Timmons said, "You made all those movements at the Barclay, Manny, while you ate dinner with Kendall Peterson. We have it all on computer tape."

There was a moment of silence, and then almost dreamily, Dani was saying: "All the time you were eating those damn snails, swilling that expensive wine, you were thinking of killing him — how much he deserved it. Remember, Manny?"

Timmons moved slightly forward, never taking his eyes off the small physicist. On the other end of the desk Bernard Peterson was rigid, his body held in a dreadful tension. The Lambda chief hoped he would wait—at least a little longer.

He had counted on surprise, on his knowledge of the man. And he had been right so far—there was no denial from Manny, only a stricken look, the barest echo of the haughty stare Timmons had seen so often—the last time in Dani Southland's eyes.

Manny's teeth clamped, his lips twisted. Abruptly he made a sick sound, a grunt that was thrust up from his diaphragm. He had to force the words from his throat.

"You can prove nothing!"

"No," Timmons said, agreeing. "But then this will stay in the family, won't it—here in *Grüen Drei*?"

"What do you mean?"

The Lambda chief shrugged, made a brief gesture with one hand. "I think you planned to murder him, but never carried it out. I think his actual death *was* an accident—or more nearly, jus-

tifiable homicide." Timmons paused and leaned against the wall. "Tell us why you wanted him dead, Manny."

The other stared wordlessly. He shook his head.

"*Why?*" The word was an eruption from Bernard Peterson. The older man's face was pain-wracked, his lips pulled back hard against his teeth. His grip on his chair left his hands white-knuckled.

"Tell him, Manny," Timmons said. "You tell him—or I will."

Cruz's eyes flicked toward Timmons and then across the desk at Peterson. "Kendall was selling you out," he said harshly, biting off the words. "He was giving the plans for Green Three to the eastern bloc. For money."

"That's a lie!"

The little physicist shook his head. "No. It isn't. I caught him in your office taking pictures. The safe was open. He was going through the files." Cruz paused, looking miserable. "He said he'd been doing it for months."

There was a tension-filled silence, broken finally by Ellie Shaw. "But why kill him—why not just turn him in?"

When Manny did not immediately respond, Timmons said shortly: "He did it for Bernie, of course. Better Kendall be dead than a traitor to everything his father stood for."

Mel Groome swore under his breath. "He would have destroyed Green Three. Hell—he almost did! I'm sorry, Bernie. I agree with Manny. He had to be stopped." He looked at his superior with sorrowful eyes.

The head of *Grüen Drei* appeared not to hear. He thrust himself out of his chair and stepped around Groome. His eyes were fixed on the small figure of Manny Cruz. His face was mottled with rage.

Seeing disaster looming, Timmons nodded almost imperceptibly at Brian Doyle. The stocky field man intercepted the research chief before he had completed his second step, then guided him forcibly back to his seat.

Timmons's gaze left Peterson and fastened on Cruz. He tried unsuccessfully to read the expression that veiled the man's features. He said carefully, "I'm guessing now, Manny. You planned the murder—Kendall's execution. And it should have been perfect, it really should. You hired a disconnect and made her over to look like Judith Peterson. Then you lured your victim to that hotel room in Pentucket. Everything went exactly the way you planned it. *Except you couldn't go through with it!*"

Manny Cruz's head snapped up. He made an inarticulate sound and his eyes were suddenly those of a trapped animal.

"Damn you! That's enough!"

"Not quite enough," Timmons returned softly. "More guessing. You tried to convince Kendall to turn himself in, or leave the country, or any of a dozen other alternatives. And he guessed who you were. " Timmons left the sentence hanging and stepped away from the wall. "What really happened in that hotel room, Manny? The manager heard you screaming. Attempted rape must have been the least of it."

Manny Cruz flushed scarlet. He stood up and took a faltering half-step away from the desk. In a very quiet voice, a voice full of strain, he asked, "What

do you *know?*'' There was a glint of something shiny in his right hand.

''Only that you were probably justified in doing what you did,'' Timmons said. ''Kendall liked to destroy lives — especially those who reminded him of his mother.'' The thing in the other's hand bothered him. He looked at Doyle and then flicked his glance back to Cruz. The Lambda field man nodded his understanding, half turned toward the little physicist.

''Goddam it, Manny,'' Ellie Shaw said from across the room, her face white. ''If that's true, no jury is going to convict you. Not given Kendall's track record, not given the lives he's ruined.''

Bernard Peterson said something then, something angry, but Timmons could not make it out. He took a step forward just as Cruz raised his hand. A small hypodermic caught the room's light, its barrel full of colorless fluid.

Mel Groome raised a hand, dropped it. He said earnestly, ''Ellie's right, you know. When you tell the authorities what went on in that room they'll probably give you a medal.''

It was the wrong thing to say. Timmons knew it instinctively, the moment the other man spoke. He flung himself across the room, one hand vainly reaching for the hypodermic, the other for the physicist's wrist. Given his Latin *machismo*, Manny Cruz would rather have his fingernails pulled out than rest his defense on personal shame. And the hypodermic was proof he'd been considering at least one other option.

Manny twisted away from him, blocking his advance with a hip. Then with a single sure movement, he plunged the hypodermic into his arm just below the elbow. Timmons cursed, then stopped his efforts to forestall the suicide and simply held the other man in his arms. He felt cold.

''What was in it, Manny?''

Manny gave him a half grin. ''Nothing you're familiar with. But it's sure — and quick.''

Hopelessly: ''You didn't have to do this, you know. The Lambda Bureau would have stood behind you.''

''Better this way '' Manny said. He leaned against Timmons. His knees started to buckle, his eyes began to glaze. ''You got it right though, fella — damn smart — knew I was in trouble moment you got into it.'' He peered around uncertainly. ''Sorry, Bernie. Your son was no damn good not your fault.'' He sagged further against Timmons, head lolling awkwardly as first unconsciousness and then death overtook him.

It was raining, but Timmons was unaware of it. Beethoven, Sonata in C, Opus 53, spun from a recorder. Timmons was oblivious. He sat numbly, his frame of mind matching the gloom of gathering shadows. Firelight made his face a mask.

''Coffee?'' Dani Southland.

''Thanks.'' Timmons took a sip, put down the cup and saucer.

The girl looked at him over the rim of her own cup. ''Carol Massey called again. There's trouble in Peru. And she says not to forget the Senate hearings coming up.''

Timmons nodded absently, his mind elsewhere. He watched a pine knot explode in the lodge's big fireplace. A

shower of bright sparks shot across the hearth.

"She said something else, too," Dani said. She sat down cross-legged beside Timmons's chair, looked up at him brightly. Tests had shown her IQ to be within one or two points of normal, a finding Timmons had considered a given ever since her performance at Green Three.

He gave her a glance. "What else did she say?"

"That you blame yourself for Manny Cruz's suicide."

The Lambda man shrugged, said sourly: "I should have considered the possibility, at least. Manny had a lot of pride—too much, maybe—and Kendall walked all over it with hob-nailed boots."

Dani ducked her head. "But you said it could stay in *Grüen Drei*. That nobody from outside would ever have to know."

Timmons grunted, then shook his head. "Those in *Grüen Drei* would know. And Manny would know they knew. From that aspect of it, it would have been better if I *had* believed he'd killed Kendall in cold blood. He could have lived with that." Timmons chuckled lugubriously at the double meaning of his words.

Everything else had turned out so well, he thought bitterly; why did Manny Cruz have to go one up on him? Only a couple of hours after the incident Justice and Interior had backed off whip and spur. The following day Bernie Peterson said he had a lead on a bacterium—a clever little brute with a name Timmons found too long to pronounce.

He was aware suddenly that the girl was speaking.

"What?"

"It wasn't too long ago," Dani said, looking at him, "that I thought you couldn't *make* a mistake, that you weren't human. It's good to know, is all. You're capable of failure, too." She took another sip of coffee and smiled up at him almost shyly.

Timmons glanced from the girl to the hands lying in his lap. He flexed them unconsciously, feeling again the hot poker, the terrible pain—it burst within him like a sadness—the vulnerability.

Human?

Maybe that wasn't so bad, he thought then. ■

brass tacks

Dear Stanley Schmidt and Company:

As far as *Analog* is concerned, 1981 was a fine year. I think the July issue was the one most jam-packed with memorable goodies, but I haven't been disappointed with any of them.

One complaint I do have, however, is the unfairness of lumping all the novellas and novelettes into one category and then being ornery enough to publish more than three (a *lot* more than three!) really excellent ones. I've been reading, re-reading, and analyzing for the better part of a month, off and on, before answering this AnLab (it's an excellent way for me to re-assess my own tastes and perceptions in the field), and in my notes to myself I've listed nine in this category that I feel are of special merit in one way or another. Next time. ?

Enough preliminaries:

Best Serial: Shuttle Down by Lee Correy. For some reason the serials this year strike me as the weakest of your categories; I actively disliked some parts of *Dawn* and most of *Dragonstar*, so my choice here was not difficult. For some reason the characters in the serials this year have struggled very much to be realistic and haven't quite made it. Certainly they cannot compare with the depth of the characterizations in, for instance, Zahn's "The Giftie Gie Us," or Tannehill's "Last Words." I enjoyed much of *Shuttle Down*, especially the technical and intercultural aspects, which I thought were well handled. The interpersonal relationships? Stiff; artificial.

Best Novella/Novelette: Oy, where do I start? You say I *have* to stop at three? Well, okay

"The Giftie Gie Us" by Timothy Zahn (surprised at that one, aren't you?)

"Taboo" by Phillis Eisenstein

"Guardians" by George R. R. Martin

It really hurts not to be able to men-

tion "Emergence" by David R. Palmer and also the two Ian Stewart pieces, which while not heavy are excellent fun. I've begun to approach anything with Ian Stewart's name on it the way I approach a Callahan's Bar story—as a sure bet for a good read. Of course there's also but no! You said three, and I count six already!

Best Short Story: I don't have quite the problem in this category that I did in the last, but in listing only three I feel I'm leaving out some very good pieces.

"Collector's Item" by Barry B. Longyear (for reasons I can't quite pinpoint, I came out of this story with a feeling of excitement like I haven't had since reading Martin's "Nightflyers" in the April 1980 issue. It's like finding unexpected treasure).

"The Iceworm Special" by Joe Martino (this is a nice, tight story—no strain in any way. The lifestyle is well assimilated and feels natural, and the story is fun. It sticks in the mind).

"Incredibility Gap" by Ian Stewart (this is an excellent glimpse of the creative process in action—and anyway, Stewart is his own recommendation).

Best Science Fact Article:

"Base Eight Arithmetic, Meteors and Man" by John Gribbin

"Extraterrestrial Zoology" by Dr. Robert A. Freitas, Jr.

"Xenobiology" by Dr. Robert A. Freitas, Jr.

Does it seem to you that I have a rather narrow range of interests? Well, um, actually, you see, in addition to the fact that biology (especially zoology and paleontology) was the branch of science that attracted me first, there is also the painful fact that according to Robert Heinlein I am one of the many mathematical illiterates wandering the country and getting in the way. Science fact articles that assume the reader has at least a high school chemistry, physics, and higher math background assume a bit too much for me (I had to make a choice between geometry and French as a sophomore, and though I've never regretted my background in French, I have frequently regretted the lopsidedness of the education I received while operating on such a philosophy). The choices above are made for what I term readability. You may draw whatever conclusions you wish.

Best Cover:

February, by Vincent DiFate
October, by Robert Crawford
June, by David Hardy

In that order. As an artist, I'm pretty opinionated about the artwork in any publication I have in the house, and the above were judged on criteria of technical excellence, composition, and whether or not I'd blush to have my friends see it on my coffee table (December, by the way, never made it to the coffee table. Really!). I also want to say that of the five issues I narrowed it down to before final choices, Wayne Barlowe's work comprised two (August and July, in that order). He is much better in color than in black-and-white, as is/are Val Lakey/Artifact Studio. My favorite of your staff artists didn't do a cover, so I'll just create a category: Janet Aulisio, you frequently delight me!

I also want to note my great regret at Spider Robinson's retirement from book reviewing, but I'm hoping this will mean more stories in the future. I think that Tom Easton does an excellent job with the review column, too (when I pay attention to a review it's usually either his or one of Charles N. Brown's), so I'm not complaining about a void being left—just complaining about the lack of Spider.

Thanks, folks, for the nice things you sent my way in 1981.

JAN S. GEPHARDT
Shawnee Mission, KS

Dear Brass Tackers:

I don't intend to speak for Lee Correy or the *Dragonstar* team either, but I think that Mr. McClure (Brass Tacks, December 7, 1981) should be made aware of a few things. First, in America, for quite some time the state of marriage has undergone a change—for good or worse I don't know whether anyone can tell at this time but I think that it is well within the realm of SFers to think about interpersonal relationships as well as whatever SF themes they may write about. *Shuttle Down* was/is about the near future and about the contact between alien cultures right in our back yard, so to speak. I also think Mr. McClure missed the calibre of Our Lady of the State Department altogether—since she has grown up in a culture markedly different from that of the *Atlantis*'s crew, and she knows how that culture works, etc., why should she operate like a quote/unquote "God-fearing American"?

THORNTON GREY KIMES
Box 1017, 30 South 9th St.
Minneapolis, MN 55402

Dear Stan:

"Children, it can be reasonably argued, are an exception" to your proposed January rule (Editorial: "The 'Moral' 'Majority.' ") No, it cannot either be reasonably argued, at least from my point of view. Admittedly I am biased, being part of that group (although I think most people would think it quite reasonable for a black to give a lecture on black prejudice, or a Jew one on anti-Semitism, or such), but if I weren't biased I wouldn't be writing this. A bias is an opinion.

You seem to have two major objections. First, "If they are allowed to do everything they want to, too few may survive to adulthood." I think more would survive than you think (despite TV shows, books, etc., to the contrary, many runaways, some below even ten, do manage to make quite a respectable life for themselves. It may be less comfortable, but that's their choice.) Once they figured out that nobody was going to stop them and they were fending for themselves, they'd probably become reasonably careful. And within, by evolutionary times, a very short period, I strongly suspect that children would become more precocious and self-dependent then ever before.

Objection two. "Or if they do, they may be insufferable. " The answer to this one is: by the time they reach adulthood, probably before, they'd have learned that they *must* respect other people's rights. "Insufferable," according to my *Webster's Collegiate*, means "incapable of being endured." Someone who knows he *must* respect other people's rights probably *will* by adulthood. If "respecting other people's rights" means the right of not being hurt, then this person will do so. This does not fit the definition of insufferable.

Lastly, if this principle, which I think I have cast a good bit of doubt on, is adopted anyway, why should it not be based on *social* and *intellectual* maturity, instead of *chronological* maturity? Chronological maturity is, in many (I hesitate to say "most") of the opportunities in our society, but it is still used. A fifteen-year-old genius cannot vote; but anyone, even a moron, over eighteen can. Any society intelligent enough to see the sense of your rule should also

see this. (For that matter, I think it should also see my principle before, but this is a prejudice everyone over about twenty-two has, but almost nobody knows he has.)

Otherwise, it was a superb editorial, in a superb issue, particularly the novelettes from White and Zahn.

Lastly, I would like to see the proof Dian Hardison says she has (preferably in a story). If the whales and the dolphins are this intelligent, why aren't they *doing* something?

BOB CARRICO

Mayfield, KY

P.S. Just got your February issue. It was almost as good as the January, particularly Anvil's story. By the way, I think Rinehart was referring to "Litterbug" by Tony Morphett.

I agree that many children could manage on their own much earlier than they're allowed to, and many of them would ultimately be better for it. I also know (working just a few blocks from Times Square) that some who try do not do very well, and it's not clear that enough *would make it on their own to sustain a viable society.*

The theory that "someone who knows he must *respect other people's rights probably* will *by adulthood" is a lovely one—but unfortunately, in practice, that's not always what street life teaches. Again I refer you to Times Square.*

I suspect you'll agree that not many two-*year-olds are ready to be self-sufficient, and that some direction is needed to get people past the normal egocentricity of infancy and aimed toward considering other people's rights. The problem is, when and how should the guidance be removed?*

Chronological age as a method of determining qualifications has always bothered me, too. I'd much rather see intellectual and social maturity used as criteria. But who measures those things —and how?

The floor is open for suggestions.

Dear Stan,

Analog is looking better, especially since what I instantly perceived as the "flying cigarette butt" cover; I could never afterwards think of it as anything else. I *especially* like Val Lakey's illustrations; she is terrific! Literary content, as ever, is delightful. By the way, unlike many of your readers (from their letters), I have no objections to the classifieds. In fact, they have produced on occasion wild shrieks of laughter which no doubt alarmed the neighbors (ah, that Jones kid has finally gone round the bend); just how *gullible* do the advertisers think *Analog* readers are? Having just read a breakdown of your readership, it is possible to feel some pity for the poor advertisers, miserably withdrawing their non-revenue-producing ads some issues hence. In the meantime, they are there for all to enjoy.

JUDY JONES

Chesterland, OH

Dear Stan,

Let me thank John Gribbin for the kind reference in his "Base Eight Arithmetic, Meteors & Man" (December 7, 1981). I am downright eager to accept the Alvarez Disposal Chute for Dinosaurs. Yet I feel misgivings, which can no doubt be dispelled. Of course, some dinosaurs weighed in below his 50 kg. limit. Rejection of the thesis that dinosaurs were warm-blooded may deal with this. But the Iridium evidence depends on mere tonnes of the element scattered across the Earth. Local traces are so low as to be inflated sky-high by an analyst's platinum ring. Mere contact with this transferred Iridium from ring to samples, multiplying their estimated

content of the metal thirty-fold. One would like to have more substantial supplementary indicators. Maybe characteristic micro-spherules from the asteroid and target area. These will have been distributed by the billion tonnes.

A further point. Asteroidal impacts are NOT vanishingly rare. The heyday of the dinosaurs might have seen others. We can't extinguish them more than once! To clinch the Alvarez thesis, Iridium pollution and other evidence for big impacts should be ruled out in earlier Cretaceous and Jurassic strata.

Let me trail my coat again. Since you published my second article ("Mercury's Missing Divot," Jan. 5, 1981) a year ago, I have awaited annihilation from day to day. My assertion was that impacts on the Basin scale fuse planetary crusts at depth. I expected to be torn to shreds if this were physically impossible. Informed critics in this column would swing butcher's cleavers.

Reaction elsewhere would be impersonal. Few academics are as generous and courteous as Dr. Gribbin. They might name me for my errors, but do not credit me for original ideas. Since they have not spoken either way, I breathe on with growing assurance. Certainly my assertion was not negligible.

JOE ENEVER

Dear Stan:

In light of John Gribbin's excellent article, "Base Eight Arithmetic, Meteors and Man" (December 1981), recent speculations by Dale Russell, curator of fossil vertebrates at the National Museums of Canada in Ottawa, deserve special notice. Extending the same reasoning Gribbin followed, Russell has constructed a "dinosauroid" model of what an intelligent dinosaur might have looked like, had it evolved.

I would suggest that this model by Russell may be more than something that only *might have been*. If dinosaurs can evolve into sapience, and if reptile-like creatures normally evolve before mammal-like creatures, then should we not expect that intelligent dinosauroids should be far more common throughout the universe than intelligent mammals like us? On Earth it was apparently only the chance intervention of a catastrophic meteor strike that wiped out all the dinosaurs and gave mammals the opportunity to evolve into sapience. Russell's model may represent reality on most other inhabited worlds.

Furthermore, if there is an interstellar civilization, it would most likely be composed of dinosauroids. Maybe now the reason becomes apparent why it is that intelligent, star-traveling aliens have not contacted us. They probably have never before come across intelligent mammals, and want to study this interesting and perhaps unique phenomenon while being careful to minimize the effect of the observer.

RONALD R. LAMBERT

Troy, MI

On the other hand, there may well be enough variety in the circumstances under which life evolves that many planets have neither *mammaloids nor reptiloids, but only things we would* both *find pretty exotic.*

Dear Mr. Schmidt,

As a regular reader of *Analog*, which I find most of the time quite exciting (this is particularly the case with the October 12 issue), I believe it rather natural to send you this letter.

I am currently looking for advice (technical, conceptual, etc.) in order to devise and implement a project which can be summed up as follows: I would like to stay in space for a duration of one to two hours. This means, ob-

viously, reaching a low orbital trajectory and coming down again before completing this orbital revolution. I am to "travel" alone, starting possibly from a high-altitude airplane.

I consider this project (which should cost no more than $15,000-$20,000) to be a sport/physical/technological/ intellectual challenge. An equivalent could have been, in the early 1900s, the building (and driving) of a car able to reach China, or the designing and experimenting of an aircraft. It could have been, in the 1920s-1930s, the experimenting of deep diving equipment. Space could be today the new frontier, both for the industry (from the point of view of society) and for the "free" individual (in the realm of adventure and sportsmanship).

I do want to emphasize two points which might render this project feasible: the *relatively low weight/volume involved* (a human body + enough equipment to stay one hour in space), and *the short duration of the trip* (two hours, at most—but 15 minutes would suffice.)

I personally consider *Analog*, as far as readership is concerned, the magazine best suited to help me with practical, no-nonsense, yet imaginative/ creative advices/suggestions/data. After all, this involves risking my life! ! ! Let me add, to define my personal constraints, that I am a physicist, familiar with computers by training; my favorite sports being diving, skiing and motorcycle riding.

L. D. HANEUSE
3, Rue des Blancs Manteaux
Paris, France ■

CLASSIFIED MARKET PLACE

ANALOG — published monthly. CLASSIFIED AD rate is $1.10 per word — payable in advance — (20 word minimum). Capitalized words 40¢ per word additional. To be included in the next issue please send order and remittance to R. S. Wayner, Classified Ad Director, DAVIS PUBLICATIONS, INC., 380 Lexington Ave., New York, N.Y. 10017.

ADDITIONAL INCOME

MECHANICALLY INCLINED INDIVIDUALS Assemble electronic devices in your home. Knowledge or experience not necessary. Get started in spare time. Turn your spare or full time into cash. No investment—Write for free details. ELECTRONIC DEVELOPMENT LAB, Box 1560AN, Pinellas Park, FL 33565.

"EARN $1,000'S" Selling "How-To" books, manuals, directories, Illustrated Catalog $1.00 (refundable). Grahamco, DPBX 99371, Tacoma, WA 98499-0371.

AUTOMOBILES & MIDGET CARS

IS 200 MPG Possible? DID someone achieve it? Write! MPG-DP782, Box 2133, Sandusky, OH 44870.

CONVERT, CUSTOMIZE ELECTRIC CARS! Engineered. Moneymakers! Business Plan, $1.00 (refundable). 3E, Box 19409FN, San Diego, CA 92119.

200 MPG Carburetor Fact/Fiction? Did Someone Achieve It? Write! HMP-DP782, Box 143, Bellevue, OH 44811.

AVIATION

ANTIGRAVITY PROPULSION DEVICE! Free Brochure. RDA 873, Concord, NC 28025.

BOOKS & PERIODICALS

THE LAST PLACE ON EARTH - Book Locator Service - If we don't have it? 1-702-456-5575.

ANALOG, Asimov, Astounding, Galaxy, Weird Tales, etc. Back Issues at Reasonable Prices. Free Catalog. Collections also purchased. Ray Bowman, Box 5845A, Toledo, Ohio 43613.

WORLDWIDE MAIL ORDER. Our quarterly catalogues update our virtually complete stock of SF and Fantasy hardcovers and paperbacks. Catalogue listing free US/Canada: $1.00 all other. THE SCIENCE FICTION SHOP, 56 EIGHTH AVENUE, NEW YORK, NY 10014.

BRITISH and American Mystery Paperbacks, Hardcovers, Magazines. Free Catalog: Grant Thiessen, Box Z-66A, Neche, ND 58265-0133.

BOOKS & PERIODICALS—Cont'd

BECOME part of the commercial exploration of space! Read and contribute to the Space Journal, the First Newspaper of Space, 350 Cabrini Blvd., N.Y., N.Y. 10040. Sample Issue: $2.

COLLECTING? Research? Send wants. Catalogs issued. Old Book Store, 210 E. Cuyahoga Falls Ave., Akron, Ohio 44310.

HOW to Publish your own Book successfully. Write to: Southern Marketing, 323 Franklin Bldg., Suite 804, Chicago, IL 60606.

START Making Money in stock through a self-teaching introductory guide to the Stock Market. Investment: $4.95. Iguy Enterprises, P.O. Box 129, South Lancaster, MA 01561.

A LAYMAN'S GUIDE TO HUMAN PERSONALITY. A FACTUAL, documented review of how your emotions, thoughts and behaviors develop. Easy-to-read. Very enlightening. Just $3.95 to: Personality, Box 480-B, Merrick, N.Y. 11566.

BOOK Store Used. All you need to know. My complete guide on trading and buying. Fifteen years of success. Twenty dollars cash or money order: S. Winer, 8058 N. 32nd Drive, Phoenix, Arizona 85021.

JESUS FICTIONAL! Positive proof Flavius Josephus created Jesus, authored Gospels. Learn leadership's secret! Booklet: $3.00 — Vecter, Box 6215, Bellevue, WA 98007.

NEW UFO INFORMATION DIRECTORY. 1982 annotated directory of organizations and publications. Only $2.95 postpaid from Rnine Press, POB 67, Triadelphia, WV 26059.

'82 SF AT '69 PRICES! Only by mail. Send $5 for order number, mailing entry, big savings to Buckskin Publications, Box 4, Sunset Route, Bonita, AZ 85643. You can save $5 in 1982 or money back.

BUSINESS OPPORTUNITIES

STAY HOME! EARN BIG MONEY addressing envelopes. Genuine offer 10¢. Lindco, 3636-DA, Peterson, Chicago 60659.

Classified Continued

BUSINESS OPPORTUNITIES—Cont'd

FREE BOOK "2042" Unique Proven Enterprises." Fabulous "unknowns," second inflation income. Haylings-E12 Carlsbad, CA 92008.

1000% Profit Bronzing or Chinakoting Baby Shoes. Free Exciting Details: NBSDG, 398 Sebring Airport, Sebring, FL 33870.

BECOME an ordained minister. Start a nonprofit organization. Many benefits! Credentials and information $10.00. Universal Life Church, 1335 Seabright Av (8M), Santa Cruz, CA 95062.

$450-$875 Weekly. Double after 90 days. Satisfaction guaranteed. Free details—SASE, ABD Services, Box 8097-IO, Silver Spring, MD 20907.

GOOD INCOME WEEKLY! Processing Mail! Free Supplies! Postage! Information? Rush stamped envelope! Foodmaster-DC3, Burnt Hills, NY 12027.

HOW WOULD YOU LIKE TO RECEIVE 100 LETTERS A DAY EACH CONTAINING $1.00? COMPLETE PLAN PLUS SIX FORMULAS FOR $1.00. RUSH DOLLAR TO: AMERICAN, 5307 NW 18TH COURT, LAUDERHILL, FLORIDA 33313.

SPARE TIME DISTRIBUTORS NEEDED! Unlimited Profits! Proven Automotive Product. Free Details! MOTALOY, Box 4457 D8, CA 90241.

BUY IT WHOLESALE

400,000 BARGAINS Below Wholesale! Many Free! Liquidations . . . Closeouts . . . Job Lots . . . Single Samples. Free Details. Worldwide Bargainhunters, Box 730-IO, Holland, MI 49423.

FIREWORKS—Just send $1.00 for catalog to: Kellner Fireworks Co., Box 67, Oil City, PA 16301.

DO IT YOURSELF

BUYER BEWARE – Consumer guide to SATELLITE TELEVISION – $3. Ghostfighters, Route 2 Box 136B, Stevensville, Montana 59870.

DREAMS. Make them dynamic. How? Send $1.00: Dreaming-A-N, 508 Delaware Avenue, Virginia Beach, VA 23451.

EDUCATION & INSTRUCTION

UNIVERSITY DEGREES BY MAIL! Bachelors, Masters, Ph.D.s . . . Free revealing details. Counseling, Box 389-AN-8, Tustin, CA 92680.

EDUCATION & INSTRUCTION — Cont'd

UNIVERSITY Degrees By Mail. EDUCATION, 256 South Robertson, Dept. 25, Beverly Hills, CA 90211. (213) 652-6452.

DESTINATION A.D. 2000—Is today's science fiction tomorrow's reality? Mensa Annual Colloquium, October 29-31, Boston, explores the future in four areas: Education; Government; Society; and Interpersonal Communication. Info: MAC/ANL, Box 326, Newtonville, MA 02160.

PARAPSYCHOLOGY Master of Science and B.A. degrees. Fully accredited. Parapsychology Program, John F. Kennedy University, 12 Altarinda, Orinda, CA 94563. (415) 254-0200 x 76.

UNIVERSITY Degrees By Mail. Accredited, Educational Counselors. Shinehouse Ltd., 15015 Ventura Boulevard, Sherman Oaks, California 91403.

FILM & TV SCRIPTS

WRITERS AND COLLECTORS. Over 700 movie and television shooting scripts! Hitchcock to Spielberg. Send $1.00 for Catalog. Scriptfinders, 1626 N. Wilcox, Hollywood, CA 90028. Suite #348.

FORMULAS & TRADE SECRETS

WOODBURNING Car? No Joke! Convert any gasoline engine (Piston or Rotary). Complete instructions, schematic drawings $5.00. Box 3, Fresno, CA 93707.

GOVERNMENT SURPLUS

"GOVERNMENT SURPLUS" JEEPS, CARS $30.00! 800,000 Items! Complete Information Your Area. Largest OFFICIAL Directory. $30.00 (Guaranteed). SURPLUS, Department A124, 4620 Wisconsin Northwest, WASHINGTON, DC 20016.

HOBBIES & COLLECTIONS

GREAT RADIO PROGRAMS—mystery, adventure, science-fiction. Free list cassettes. Rare Radio, Box 117, Sunland, CA 91040.

HYPNOTISM

FREE catalog. Hypnotism, self hypnosis, sleep learning, hypnotic tape cassettes. DLMH, Box 487, Anaheim, CA 92805.

IMPORT-EXPORT

IMPORT Anything at Fraction Wholesale. Monumental Retail/Mailorder Profits. Samples, Small Orders Filled. Comprehensively Annotated Seventy-five Hong Kong Exporters, Fifty Taiwan/India, $7.50 each. Videofoto, Box 601341, Miami, FL 33160.

Classified Continued

IMPORT-EXPORT—Cont'd

MARKET 2500 Amazing New "Fast-Sellers" Without Risk. Free Brochures! Ballrightco, Box 91309-N7, Cleveland, Ohio 44101.

JEWELRY

CLOSEOUT JEWELRY. 55¢ Dozen. 25¢ gets catalog. ROUSSELS, 107-310 Dow, Arlington, MA 02174.

LOANS BY MAIL

GET cash grants—from Government. (Never repay.) Also, cash loans available. All ages eligible. Complete information, $2 (refundable). Surplus Funds-DG, 1629 K St., Washington, DC 20006.

QUICK MAILOANS! FREE APPLICATION FORM AND COMPLETE DETAILS RUSHED IMMEDIATELY!: Lenco, Box 724-W19, McMinnville, Oregon 97128.

BORROW $1,000-$50,000 secretly — "overnight." Anyone! Credit unimportant. Repay anytime. Incredibly low interest. No interviews, collateral, cosigners. Unique "Financier's Plan." Full information, $2 (refundable). Spectrum, 12 Wall St.-16, NY 10005.

BORROW By Mail! Signature Loans, No Collateral! Free Details! Write! MBG-DPC782, Box 2298, Sandusky, OH 44870.

MONEY PROBLEMS? Write us. Immediate Loans and Outright Grants to individuals refused elsewhere. 98% eligible! Associates, Box 98-D2, Brooklyn, NY 11235.

THE ARABS HAVE MILLIONS to loan! $25,000—$10,000,000 Possible! FREE DETAILS! Arab-DC, 935 Main, Vidor, TX 77662.

OBTAIN A Mastercard/Visa Entirely By Mail! Free Details! Write: Credit-DPC782, Box 2298, Sandusky, OH 44870.

BORROW $25,000 "OVERNIGHT." Any purpose. Keep indefinitely! Free Report reveals little-known sources/techniques! Success Research, Box 29070-SV Indianapolis, IN 46229.

MEMORY IMPROVEMENT

INSTANT MEMORY . . . NEW WAY TO REMEMBER. No memorization. Release your PHOTOGRAPHIC memory. Stop forgetting! FREE information. Institute of Advanced Thinking, 845DP ViaLapaz, Pacific Palisades, CA 90272.

MISCELLANEOUS

SAVE! Fabulous Gems For Jewelry, Collecting! Gemcutter to You! Details Free. Taylor's, 113-A Martin, Indian Harbor Beach, FL 32937.

MISCELLANEOUS—Cont'd

TECHNICAL SECRETS—Electronic Surveillance, Lock-Picking, etc. Free brochures: Mentor-DP, 135-53 No. Blvd., Flushing, NY 11354.

ESP TEST. Write our ESP test. Your answers will be analysed by computer. Send $5.00 to: Data Profiles, Box 204, Stn. T, Toronto, Canada M6B 4A2.

SAVE Your Money—Booklet reveals classified advertising persuasion secrets. See through their pitch. Know what you're ordering. $5.00. Ads, Box 9085, Chesapeake, VA 23321.

MONEYMAKING OPPORTUNITIES

$300 WEEKLY SPARE TIME — MAILING Salesletters. Details: Delta: Dept.-D, Box 2902-CRS, Rock Hill, SC 29730.

CLOSEOUT JEWELY. 55¢ dozen. (Catalog 25¢). ROUSSELS, 107-911 Dow, Arlington, MA 02174.

MAKE YOUR CLASSIFIED AD PAY. Get "How to Write A Classified Ad That Pulls." Includes certificate worth $2.00 towards a classified ad in this publication. Send $1.75 (includes postage) to R.S. Wayner, Davis Publications, Inc., Dept. CL, 380 Lexington Ave., New York, NY 10017.

DISTRIBUTORS Urgently Needed! Become our Distributor and earn Big Profits! DIST-DPC 782, Box 2133, Sandusky, OH 48870.

$1000 WEEKLY POSSIBLE Mailing Envelopes! Easy Guaranteed Program! Free Details: Majestic, Box 415-DL, Lewiston, NY 14092.

$60.00 per Hundred securiting-stuffing envelopes from home. Offer-details: Rush stamped self-addressed envelope. Imperial, P-460, X17410, Fort Lauderdale, FL 33318.

$500+ WEEKLY in spare time; easy, guaranteed. Start immediately! Free details. Box 6946-D, Chicago, IL 60680-6946.

2000% Profit selling information by mail. Free details. Send stamped addressed envelope to: Walker Enterprises, P.O. Box 19149, Detroit, MI 48219.

PERSONAL

SINGLE? Meet that special person—anywhere! DATELINE, 316 Fifth Ave., New York 10001, (212) 889-3230, (213) 854-0640.

UNIVERSITY DEGREES BY MAIL! Bachelors, Masters, Ph.D.s . . . Free revealing details. Counseling, Box 389-DP8, Tustin, CA 92680.

Classified Continued

PERSONAL—Cont'd

BECOME A Legally Ordained Minister. Free Details. ULC-DPC782, Box 2133, Sandusky, Ohio 44870.

BEAUTIES worldwide want to hear from you! All ages! Inter-Pacific, Box 304-DT, Birmingham, Michigan 48012.

PRETTY PHOTOS. Correspondence, romance, marriage. Asia, Latin America. Golden Heart, Box 2423-DA, Yakima, WA 98907.

SPACE GODDESS POSTERS. Two unbelievable SF conversation "piece" prints now only $3.00. Raindrop Studio, P.O. Box 20193, Portland, OR 97220.

HAVE CONFIDENTIAL CHICAGO MAILING ADDRESS or branch office. Business, Personal: Since 1944! Mail Center, 323(g) Franklin, Chicago 60606.

BIORHYTHMS – 12 months for $7.50 – Send name and birthdate to Cache Data Systems, 19112 Carp Circle, Huntington Beach, Calif. 92646.

LET'S Go to Mars! Want to Help? New Group forming. For details, send $2.00 to "Outward, Ho!," c/o Lawson, 225 South Anaheim Boulevard, Anaheim, CA 92805.

ASIAN girls want penpals. Information-send 40¢ stamp. Yumifriends, P.O. Box 5657, Berkeley, CA 94705.

ISAAC ASIMOV's SCIENCE FICTION MAGAZINE, published monthly. Send $19.50 for 13 issues (includes shipping & postage) to Isaac Asimov's Science Fiction Magazine, P.O. Box 1855 G.P.O., New York, NY 10001.

PENPALS, from around the world. Send $4.00 for list or $1.00 to be listed. Money back if not delighted. Chris Sprouse—4519 Withers Dr.—Chas. Hgts. SC 29405.

SCANDINAVIAN Ladies, 18-68, sincere, seek correspondence, friendship, marriage. Details: Scannaclub, Dept. CO3, POB 4, Pittsford, NY 14534. (Please enclose stamp).

"CONQUER HARMFUL ANGER 100 WAYS". Find Love, Health, Security, Energy. Vernon Howard's Powerful $2 booklet. NEW-LIFE, Box 275-JC, Boulder City, Nevada 89005.

SINGLE? Widowed? Divorced? Nationwide introductions! Hundreds of sincere members! All Ages! Free information! Write: Identity, Box 315-DT, Royal Oak, Michigan 48068.

PERSONAL—Cont'd

BIORHYTHMS by COMPUTER—only $6.00 for twelve full months—Send name, full birthdate, and address to: A.B.R.S., Inc., P.O. Box 434, Smyrna, GA 30081.

RADIO & TELEVISION

CABLE TV DESCRAMBLERS and CONVERTERS. PLANS and PARTS. Build or Buy. For information send $2.00. C&D Electronics, P.O. Box 21, Jenison, MI 49428.

RECORD & SOUND EQUIPMENT

FREE Promotional albums, concert tickets, stereos, etc. Information: Barry Publications, 477 82nd Street, Brooklyn, NY 11209.

SELF-HYPNOSIS

FREE FASCINATING Illustrated Self-Hypnosis Tape Catalog! Eliminate weight, stress—Gain health, happiness. Over 50 titles. Research-DV3, 13906 Ventura, Sherman Oaks, CA 91423.

SONGWRITERS

POEMS WANTED. Songs recorded and published. Radio-TV promotions. Broadway Music Productions, Box 7438-DA, Sarasota, FL 33578.

SONGWRITERS: Exciting offer! Poems, songs needed. Free evaluation. Creative Music Productions, Box 1943-A5, Houston, TX 77001.

SONGWRITERS. The Guild was organized 28 years ago to help writers produce good songs and sell them. National Songwriters Guild, 2421 Walnut Rd., Pontiac, MI 48057.

SPECIAL SERVICES

ASTROLOGICAL CHART. Planet positions at Birth. Personality traits. Basic chart plus preview any week $14.00. Any month $20.00. Send date, time and place of birth to T. McCarthy, Ast., Box 212, Winthrop Harbor, Illinois 60096.

SUPPORT YOUR LOCAL BOOKSTORE

MOONSTONE BOOKCELLARS, INC., 2145 Penn. Ave., NW, Washington, DC 20037. WASHINGTON'S only science and mystery specialty bookshop. 202-659-2600.

TOYS, GAMES & ENTERTAINMENT

WIN AND SCORE BIG AT YOUR FAVORITE VIDEO GAMES, Send $3. J/K Associates, P.O. Box 892, Sharon, PA 16146.

WATCHES, WATCHMAKING & REPAIRING

WATCH and clock repairing books, tools, materials. Free Catalog. North America, Box 79, 1092, Fox River Grove, IL 60021.

analog
SCIENCE FICTION SCIENCE FACT

CLASSIFIED ADVERTISING ORDER FORM

Send to **ANALOG**
Classified Advertising Department/Suite 1401
380 Lexington Avenue, New York, N.Y. 10017

20 WORD MINIMUM
Only $22.00 for 20 Words or Less
$1.10 each additional word
Capitalized words add—40¢ per word
SAVE 15% WITH 3 CONSECUTIVE MONTHS SAME COPY ORDER

DEADLINE: Copy and payment must be in by the 5th day of the third preceding month for issue in which ad is to appear.

(PLEASE PRINT OR TYPE)

YOUR NAME _____

FIRM (NAME IN AD) _____

ADDRESS _____

CITY _____ **STATE** _____ **ZIP** _____

PHONE: _____ **DATE:** _____

YOUR SIGNATURE _____

_____ Words at $1.10 each $.

_____ Capitalized word at .40¢ each _____
Total amount for 1 ad $

15% Savings with 3 Consecutive Months Discount

(a) Multiply one ad total $_____ x 3 = $. . . .
(b) Multiply total amount on above line by x .85

(c) Total amount for 3 ads $

(Example: One 20 word ad $22.00 x 3 months = $66.00 x .85 = $56.10)

$ _____ is enclosed for _____ insertion(s) in the _____ issue(s) _____ Heading

(FOR ADDITIONAL WORDS ATTACH SEPARATE SHEET)

(1) **$22.00**	(2) **$22.00**	(3) **$22.00**	(4) **$22.00**	(5) **$22.00**
(6) **$22.00**	(7) **$22.00**	(8) **$22.00**	(9) **$22.00**	(10) **$22.00**
(11) **$22.00**	(12) **$22.00**	(13) **$22.00**	(14) **$22.00**	(15) **$22.00**
(16) **$22.00**	(17) **$22.00**	(18) **$22.00**	(19) **$22.00**	(20) **$22.00**
(21) **$23.10**	(22) **$24.20**	(23) **$25.30**	(24) **$26.40**	(25) **$27.50**
(26) **$28.60**	(27) **$29.70**	(28) **$30.80**	(29) **$31.90**	(30) **$33.00**

HOW TO COUNT WORDS: Name and address must be included in counting the number of Words in your ad. Each initial or number counts as 1 word: Mark Holly, 380 Lexington Avenue, New York, New York 10017: 7 WORDS. Zip codes are not counted. Phone #: 2 Words. Symbols used as keys are charged for. City or State count as 1 word each: Garden City, New York: 2 words. Abbreviations such as C.O.D., F.O.B., P.O., U.S.A., 7x10, 35mm count as 1 word. (P.O. Box 145 count as 3 words) Webster's International Unabridged Dictionary will be used as our authority for spelling, compound words, hyphens, abbreviations, etc. **Please make checks payable to ANALOG MAGAZINE.**

a calendar of analog upcoming events

27 June—2 July
JERUCON (First International Integrative Congress on Science Fiction, Fantasy, and Speculative Science). Many world-famous SF authors will be in attendance. Info: Organizing Secretariat, Jerucon 82, P.O. Box 394, Tel Aviv 61003, Israel. (Use airmail.)

2-4 July
SHADOWCON VI ("Dark Shadows" mythos conference) at Hyatt Hotel (airport), Los Angeles, Calif. Guests of Honor—Robert Bloch, Roger Dickens. Registration—$20 and two S.A.S.E.s (to Barbara Fister-Liltz), $25 at door. Info: Shadow Con, 8601 West Cermak Road, North Riverside IL 60546.

2-4 July
INCONJUNCTION 2 (Indiana regional SF conference) at the Airport Hilton Inn, Indianapolis, Ind. SF Guest of Honor—Frank Kelly Freas; Fantasy Guests of Honor—Wendy and Richard Pini; Fan Guest of Honor—Roger Reynolds; MC—Arlan Keith Andrews. Art show, hucksters, masquerade, etc. Registration—$12. (No checks on non-Indiana banks accepted after 31 May for registration.) Info: InConJunction 2, P.O. Box 24403, Indianapolis IN 46224.

2-5 July
WESTERCON 35 (West coast regional SF conference) at the Adams Hotel, Phoenix, Ariz. Guest of Honor—Gordon R. Dickson; Fan Guest of Honor—Fran Skene; Toastmaster—David Gerrold. Info: Westercon 35, Box 11644, Phoenix AZ 85064. 602-249-2616 or 602-841-1137.

16-18 July
CON*STELLATION I (Northern Alabama SF conference) at the Sheraton, Huntsville, Ala. Guest of Honor—Phyllis Eisenstein; MC—Andrew J. Offutt; Fan Guests of Honor—Ken and Lou Moore. Info: Constellation I, 7909 Charlotte Drive, Huntsville AL 35802. Note: This is NOT the 1983 worldcon.

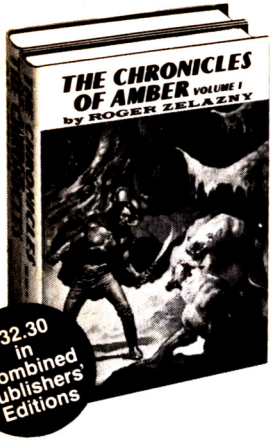
16-18 July
OKON 4 (Oklahoma regional SF conference) at Camelot Inn, Tulsa, Okla. Guests of Honor—Frank Kelly Freas, Polly Freas, Bob Tucker, Lee Killough. Registration—$15 at the door. Info: OKON 4, P.O. Box 4229, Tulsa OK 74104.

23-25 July
ARCHON 6 (St. Louis-area SF conference) at Chase Park Plaza, St. Luois, Mo. Guest of Honor—Stephen King; TM—Robert Bloch; Fan Guest of Honor—Walt Liebscher. Registration—$16. Info: Archon 6, P.O. Box 15852, Overland MO 63114.

13-15 Aug
OSFCI-CON (Oregon regional SF conference) at Greenwood Inn, Beaverton, Ore. Guest of Honor—Marta Randall. Registration—$7 in advance, $9 at the door. Info: OSFCI-CON, P.O. Box 12728, Portland OR 97212. 503-236-1366.

2-6 September
CHICON IV (40th World Science Fiction Convention) at Hyatt Regency Chicago Hotel, Chicago, Ill. Guest of Honor—A. Bertram Chandler; Artist Guest of Honor—Frank Kelly Freas; Fan Guest of Honor—Lee Hoffman. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate and vote for the Hugo Awards and the John W. Campbell Award for Best New Writer. Info: Chicon IV, Box A3120, Chicago IL 60690.

—ANTHONY LEWIS

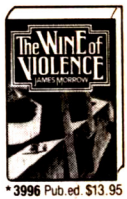


$32.30 in Combined Publishers' Editions

YOURS FREE WITH MEMBERSHIP

THE CHRONICLES OF AMBER A two-volume set including: ***Nine Princes in Amber, The Guns of Avalon, Sign of the Unicorn, The Hand of Oberon,*** and ***The Courts of Chaos***

1990 Spec. ed.



***3996** Pub.ed. $13.95

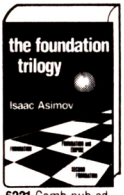
****8920** Spec. ed.

1677 Spec. ed.

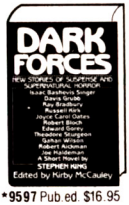
8979 Spec. ed.

9001 Pub.ed. $17.95

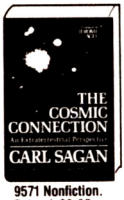
6890 Spec. ed.



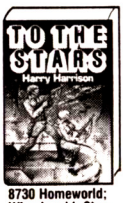
6221 Comb.pub.ed. $23.85



***9597** Pub.ed. $16.95



9571 Nonfiction. Pub.ed. $8.95



8730 Homeworld; Wheelworld; Starworld. Spec. ed.

8011 Pub.ed. $12.95

And take any 4 for $1 WITH MEMBERSHIP

SEE OTHER SIDE FOR ADDITIONAL SELECTIONS.

Note: Prices shown are publishers' edition prices.
***Explicit scenes and language may be offensive to some.**

How the Club works:

When your application for membership is accepted, you'll receive your 4 books for only $1 (plus shipping and handling) and a free copy of *The Chronicles of Amber.* You may examine the 4 books in your home and, if not completely satisfied, return them within 10 days—membership will be cancelled and you'll owe nothing. The free book is yours to keep in any case.

About every 4 weeks (14 times a year), we'll send you the Club's bulletin, *Things to Come*, describing the 2 coming Selections and a variety of Alternate choices. In addition, up to 4 times a year you may receive offers of special Selections, always at low Club prices. If you want the 2 Selections, you need do nothing; they'll be shipped automatically.

If you don't want a Selection, prefer an Alternate, or no book at all, just fill out the convenient form always provided and return it to us by the date specified.

We allow you at least 10 days for making your decision. If you do not receive the form in time to respond within 10 days and receive an unwanted Selection, you may return it at our expense.

As a member you need take only 4 Selections or Alternates during the coming year. You may resign any time thereafter or continue to enjoy Club benefits for as long as you wish. One of the 2 Selections each month is only $3.98. Other Selections are higher, but always much less than hardcover publishers' editions—up to 65% off! A shipping and handling charge is added to all shipments. Send no money now, but do mail the coupon today!

SCIENCE FICTION BOOK CLUB

Dept. FR-028, Garden City, N.Y. 11530

Please accept me as a member. Send me the 4 books whose numbers I have indicated below plus my FREE book and bill me just $1 (plus shipping and handling). I agree to the Club Plan as described in this ad, will take 4 more books at regular low Club prices during the coming year, and may resign any time thereafter. The FREE book will be mine to keep whether or not I remain a member. SFBC offers serious works for mature readers.

FREE BOOK	1.	2.	3.	4.

Note: If you select *The World of Tiers*, write the number 7195 in 2 boxes, then choose 2 more Selections.

Mr.
Ms. _____
(Please print)

Address _____ Apt. # _____

City _____

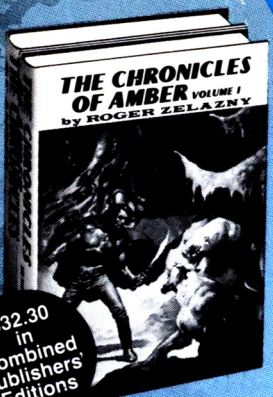
State _____ Zip _____

If under 18, parent must sign. _____

The Science Fiction Book Club offers complete hardbound editions sometimes altered in size to fit special presses and save you even more. Members accepted in U.S.A. and Canada only. Canadian members will be serviced from Canada. Offer slightly different in Canada.

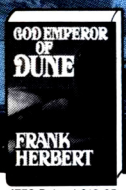
28-S240 A

YOURS FREE WITH MEMBERSHIP THE CHRONICLES OF AMBER

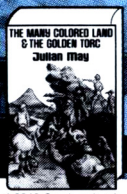


$32.30 in Combined Publishers' Editions

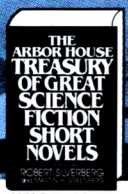
A two-volume set including: *Nine Princes in Amber, The Guns of Avalon, Sign of the Unicorn, The Hand of Oberon,* and *The Courts of Chaos*



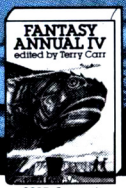
1750 Pub.ed.$12.95



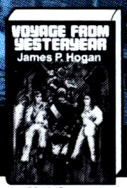
***2840** Comb.pub.ed. $26.90



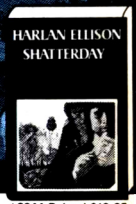
9076 Pub.ed.$19.95



8995 Spec.ed.

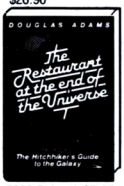


6049 Spec.ed.

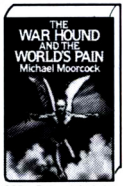


***0844** Pub.ed.$12.95

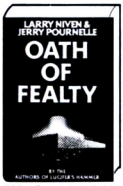
2683 Spec. ed.



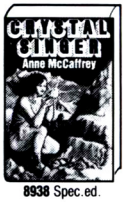
5686 Pub. ed. $7.95



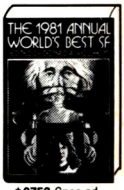
8854 Pub.ed.$12.95



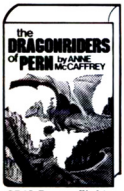
7021 Pub.ed.$13.95



8938 Spec.ed.



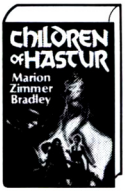
***9753** Spec.ed.



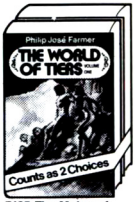
2543 Dragonflight; Dragonquest; The White Dragon. Comb.pub.ed. $26.85

4465 Rocannon's World; Planet of Exile; City of Illusions. Comb. pub.ed.$25.85

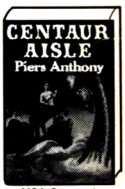
9837 The Man in the Maze; Nightwings; Downward to the Earth. Pub.ed.$14.95



6833 The Heritage of Hastur; Sharra's Exile. Spec. ed.



7195 The Maker of Universes; The Gates of Creation; A Private Cosmos; Behind the Walls of Terra; The Lavalite World. 2 vols. Spec.ed.



4184 Spec. ed.

AND TAKE ANY 4 FOR $1
WITH MEMBERSHIP

See other side for coupon and additional Selections.

THE SCIENCE FICTION BOOK CLUB

Note: Prices shown are publishers' edition prices.

***Explicit scenes and language may be offensive to some.**

28-S240 A