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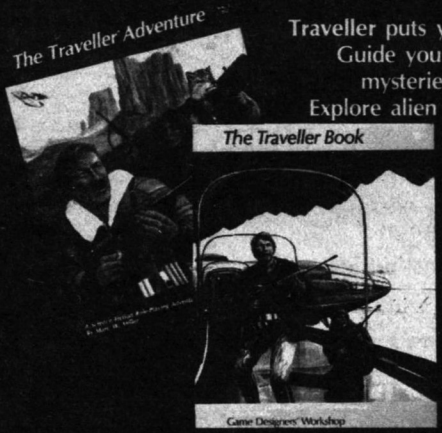


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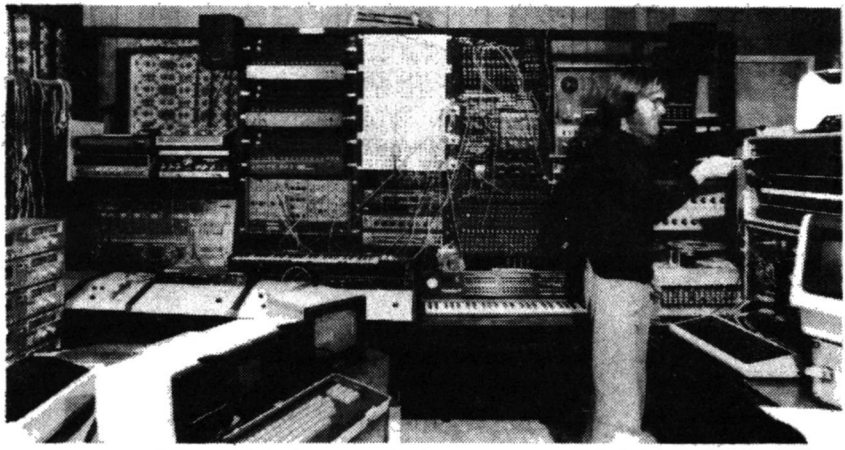

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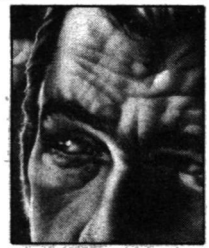

Vol. CIII, No. 10
Mid-September 1983

Next Issue On Sale
September 13, 1983

$19.50 per year in U.S.A.
$1.75 per copy

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Analog Science Fiction/Science Fact is published 13 times annually by Davis Publications, Inc. at $1.75 a copy. Annual subscription $19.50 in the U.S.A. and possessions, in all other countries $22.75, 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. Canadian 3rd class postage paid at Windsor, Ontario; 2nd class pending. 

POSTMASTER: SEND FORM 3579 to ANALOG SCIENCE FICTION/SCIENCE FACT, P.O. BOX 1936, MARION, OH 43306
IN CANADA RETURN TO 698 MONMOUTH ROAD, WINDSOR, ONTARIO N8Y 3L1
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 0161-9398

Cover by Val Lakey Lindahn/Artifact

# Editorial

# WHERE THE DEER & THE PREDATORS PLAY

## Stanley Schmidt

Thirty to forty miles north of New York City is a state park, little known elsewhere though larger than several major national parks, which has recently become the focus of a controversy which promises to recur every fall. The park's 80,000 or so acres of rugged forest support quite a large deer herd—larger, in fact, than it *can* support on a continuing basis, according to those responsible for protecting and managing them. So in the last couple of years the park administrators have tried to reduce the problem by allowing a brief deer-hunting season in a small part of the park.

And each year there has been strong resistance—at least once strong enough to stop the season before it had run its scheduled course—both from neighbors

of the park and from people living elsewhere with an abstract interest in "ecology."

Unfortunately, many of these people do not seem to understand the difference between ecology and unthinking sentimentality. If given their way, they may do the deer population as a whole far more harm than hunters ever could.

For the record, I am not personally a hunter—though I am willing to be, under some circumstances, and I do eat venison—and I am very interested in maintaining a viable ecosystem on any planet that I live on. But I understand that there is more than one way to make a viable system—and there are a lot of nonviable ways. The viable ones, with no exception that I know of, are more concerned with species than individuals, though an arrangement which benefits a species tends also to be better for more of its individuals than an arrangement which doesn't. And the viable systems always involve checks and balances. If one of those checks and balances is disrupted, something must be found to replace it, or the thing unchecked is likely to wreck the whole system —including itself.

Our local deer hunt is, in itself, not likely to profoundly interest people living elsewhere (or even local people who see no benefit in having a park maintain some semblance of a "natural" ecosystem). But the psychology of the controversy surrounding the hunt should be of much wider interest, because similar thinking is likely to be applied to other ecological problems which may vitally affect anyone anywhere.

I have heard two main types of objections to the deer hunt. Perhaps the more sensible is the fear of local residents for the safety of their children and property—though even that seems a bit exaggerated when the hunting lasts a short time and is confined to a clearly posted region well inside the boundaries of the park. Between the ages of five and ten I lived in a rural area where hunting was common much closer to homes, and it never seemed a major threat to my safety. I was taught quite early to avoid being shot at by hunters, which seems like a sensible thing for anyone to learn quite early. Having taken appropriate precautions, I went about my business with no particular worry. I won't pretend that hunting (or any other activity) is devoid of danger to participants or nonparticipants, but those dangers can be minimized, and a reasonable effort has been made to minimize them in this case.

The other type of objection, from people without a direct personal interest who think killing deer is Not Nice, is more interesting because it often betrays at least two levels of subtle but profound misunderstanding of ecology. One is an exaggerated concern for the plight of a single deer without due consideration for what's happening to all the others. The local papers always carry a prominent picture of one of the first successful hunters with his kill, soon followed by Letters to the Editor from people who are thoroughly revulsed by this "display of savage brutality." They don't notice the fine print which mentions that the largest deer being shot weigh about half what healthy ones should, and front pages rarely show

photographs of deer which have starved to death. What has happened here is that the predators which once kept the deer herd small enough to thrive on the available food have been exterminated, and the numbers of deer have increased to the point where they've exhausted the browse and *none* of them can get enough to eat. "Leave them alone," some of the anti-hunting letter writers tell us, "and Nature will solve the problem." It sure will—but I have a hunch these same people would not like Nature's methods if they saw them close up.

Which is better: a thousand deer suffering from malnutrition, or five hundred in good health? It's not a nice question, because it has no nice answers. The nice answer—a thousand in good health—is not one of the options with the available resources. And a harsh winter will leave fewer *live* deer from the big undernourished herd than from the smaller healthy one.

There used to be a cartoon on the biology department bulletin board at the college where I taught, showing two deer with a hunter in hot pursuit and one deer grumbling to the other, "Why don't they thin their *own* damn herd?" I sympathize and think the question merits serious consideration, but in the meantime the deer in Harriman Park have a real problem—and more predation seems the only ecologically sound solution it's likely to have. It is not, obviously, a good solution for those individual deer who are preyed upon, but all the others stand to benefit from more predation. If the only available predators are human hunters, then maybe the deer—as a group—need more, not less, hunting.

The other level of misunderstanding by people who reject hunting as cruel is a peculiar kind of hypocrisy. In fairness to them, it must be admitted that few of them have any idea that they are


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being hypocritical, because they are acting under the influence of a powerful cultural anesthetic. The man who piously argues against hunting while eating a steak he bought in a supermarket may really believe he is innocent of the hunter's "sins." This is nonsense, of course, if you think about it even a little. His ability to eat a beefsteak depends on someone's killing a cow as surely as venison depends on someone's killing a deer. It is not obvious to me that the killing is made more admirable either by the city dweller's using a hired killer (hired through an intermediary, yet!) instead of taking responsibility for the act himself, or by the rancher's raising the cow from before birth for the sole and express purpose of premeditated slaughter.

I'm not pushing vegetarianism—just honesty. I have no use for a hunter who kills solely for "sport" or trophies—but killing for food is an integral and indispensable part of the ecological web which includes us. Shooting a deer for the hunter or his friends to eat requires not a whit more apology than paying a butcher to pay a rancher to raise and kill a cow. It might be a good educational experience for *everybody* to *have* to hunt occasionally.

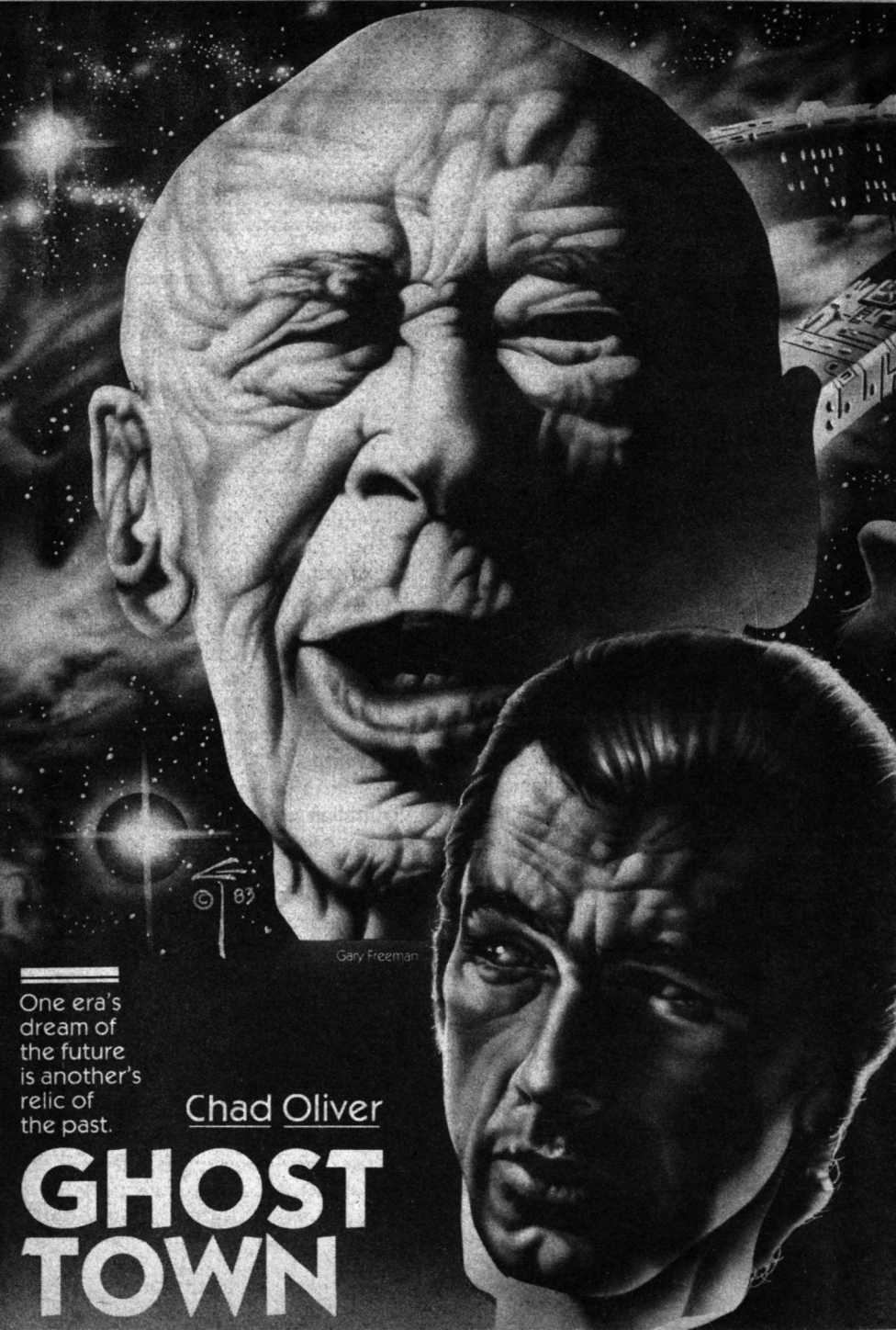
How about this? I don't much like the kind of measures that might be necessary to make participation in this truly universal, but otherwise I'd like to see us try something like the following. Let's expand the idea of "Earth Day" or "ecological awareness day" and designate a whole week to live by rules something like this:

1. Any nonendangered (nonhuman) species may be hunted by anyone licensed as a safe hunter, with no restrictions except Rule 3.
2. For nonhunters, edible domestic animals will be marketed, but only "on the hoof," with do-it-yourself slaughtering and butchering facilities located near the checkout.
3. Any animal killed *must* be used as human food, at least partly by the hunter or slaughterer himself.
4. No one except young children and the aged or infirm may eat the flesh of any animal which he or she did not personally kill.

These rules do *not* force anyone to kill anything—but they may make him *realize*, perhaps for the first time, that the only alternative to killing, personally or by proxy, is vegetarianism.

Meanwhile, I also have an alternate solution to offer for the problem of the overgrazing deer and their human neighbors who don't like hunters. Since most parks strive for something like a pre-civilization ecosystem, why not reintroduce some of the original predators? A pair of cougars introduced into the park, for example, would eventually solve the problem by restoring a more "natural" balance than the park has had in years. And the slim chance of seeing one would add a little spice to the experience of park visitors.

I think it's a good idea, but I'm afraid I won't see it happen soon. Those same people who are afraid to have hunters anywhere near would no doubt balk at cougars, too—despite the well-documented fact that cougars are far less likely to bother people than other people are. ■




One era's dream of the future is another's relic of the past.

Chad Oliver

# GHOST TOWN

Caroth knew that they were coming.

He felt an anticipation that went beyond hate or joy or hope. The years had been long. His people were growing old.

He clasped his gnarled hands together in the firelight, seeking warmth. The pain was in him again. It throbbed from his fused neck through his powerful shoulders. He was used to pain. That did not make the hurting easier.

Caroth did not think about the pain. He thought about the hunger. It surged in him.

He knew that he had little time left, but there would be an end to waiting. The waiting was almost over.

They were coming.

Caroth was ready for them.

Rick Malina would not have admitted it to just anyone, but he had a sneaking affection for the damned things.

The ship had it on close visual now: a doughnut-shaped O'Neill like a thousand others, still rotating at the standard speed of one revolution per minute, its shielding still bright if a trifle pockmarked, the spidery appendages still swinging in a frozen dance against the stars.

Junk, of course—but valuable junk.

Space garbage—but garbage worth collecting.

Something left behind.

Rick supposed that his own ancestors—biological and professional—had felt the same way about the abandoned cliff houses in the moonlight, the rings of tipi stones that weathered in the brown grass of summer, the bits of charcoal and flakes of flint that marked an ancient campsite. You had to be a bit

of a romantic to go into archeology in the first place. You concealed it later, masked it with the routine of job competence. It got covered up, just as the ruins themselves became buried in the earth.

But it was there.

And it was here. He could feel it, even on a conventional mission like this. It was a tiny stubborn flame that refused to go out.

"Hey, Doc." The commander's voice held nothing but boredom. She was not getting any younger and she was good enough for the starships. She hated shuttle flights and antediluvian spacecraft. "You going to suit up or go the Superman route?"

"Just checking," Rick said. He was not overly fond of the ship's commander, but she *was* stretching the Sacred Rules to allow him up here with the primary screen. He was basically cargo, after all. "Sometimes the optical configuration gives us a scan on the modular modification." It didn't mean a blessed thing, but it sounded impressive.

"Sure," she said with massive disinterest. "We'll be matched and ready for the dump within an hour. I assume you're still going?"

"I'm going," Rick Malina said. "Science never sleeps while the grants are awake."

He allowed himself one more look at that little artificial world floating in the cluttered space sea. He knew it up one ring of the torus and down the other. He knew it from the solar mirrors to the processing labs for nickel, iron, and titanium. He knew every dimension and atmospheric component.

He had done his homework.

This wasn't the first time his crew had worked an O'Neill.

Just the same, he enjoyed eyeballing it. It was a world. You didn't get to see them every day, even dead ones.

He executed a maneuver with the handholds that was fancier than it really had to be and drifted out of the control room.

"We'll be ready," he said.

It would be good to feel gravity again.

Caroth knew what he was. He had the kind of self-knowledge that came from endurance. Caroth was a survivor.

To survive was to continue.

He knew that his family name had once been Carothers. He knew that his people had used first names, long ago. That was before the population decline. That was when there had still been children.

Caroth was the only name he needed now. His people were few. Some of them had retained family names. Others just went by descriptive tags: One Eye, Smoke-Eater, Floater, Dreaming Woman.

Perhaps, if the ape-things that had stayed behind had been a little closer genetically—

But they weren't.

Caroth was facing more than death. He was looking at extinction.

He refused to accept it.

Among other things, Caroth was a very stubborn old man.

Every O'Neill had an airlock that could be activated from outside. That was the law, a routine safety precaution. The lock could be sealed from the inside

simply by dropping a metal bar into sockets, but that was an emergency procedure. An abandoned colony was never barred.

Getting inside was no problem. Transferring the supplies was no problem. Life-support tests were no problem.

It was after the shuttle had been released and the rendezvous time had been double-checked that the problems began.

"Did you see that?" asked Ann Vaughan.

"I saw it," Rick said.

Something had moved through the wild tangle of vegetation against the slight concavity of the O'Neill rim. The light was not ideal but it was sufficient. The moving form had two arms and two legs. It was about the size of a human being. It was dark and hairy.

It should not have been there.

"What the hell was that?" Pete Hurwitz stood as though he had taken root.

Rick took a deep breath. The air was not stale. Neither was it of the texture he had experienced before: heavy, full, redolent with the smells of untouched plants. This air tasted *used*. It had a greasy feel to it.

"It looked like a chimpanzee," he said carefully.

"Oh, sure," Ann said. She prided herself on her rationality. It took a lot to jolt her.

"You got a better idea?"

She hadn't.

Rick considered. Archeologists were not inclined to be fussy about such things, but he was nominally in charge. It was his job to maintain some perspective.

"It isn't the first time we've found some livestock left behind in one of these things," he said. "They can reproduce, you know. Keep going."

His explanation was on the feeble side and he knew it. Yes, they had encountered feral cattle twice before, and even those mutated chickens in the Kovar site. It made poor economic sense to remove all the animals when an O'Neill was emptied. It wasn't unprecedented for a few of them to survive.

But a chimpanzee?

Chimpanzees were valuable creatures: intelligent, trained, half-human, sometimes loved.

They were *never* left behind.

That chimp—if it had indeed been a chimp—raised some chilling possibilities.

Rick looked around in the uncertain light and tried to appear less concerned than he was. He saw nothing that he had not seen many times before. That was not surprising. He might not word it that way in his reports, but the plain fact was that one O'Neill was very much like another.

He was not reassured. He knew from experience that first impressions could not be counted upon. It took some time to ferret out the unusual or the unique. That was what salvage archeology was all about.

In the past, when archeologists had been sent into construction sites or areas destined to be flooded by building dams, it had been the same. You went in and worked your tail off, searching for new information that might otherwise vanish forever. There were times when you found nothing significant. There were times when you struck the mother lode

relatively quickly. There were times when you found nothing until the last day, the last hour, the last five minutes.

It was the same with a salvage operation in an O'Neill. There was more to it than just determining what was worth saving and what wasn't.

There was history in an O'Neill. The trick was to find it.

The O'Neills that were not primarily close-in generators of solar power had been abandoned in a hurry. Few people wanted to go on living in a fossil tube, particularly when the paycredits stopped coming. Population pressure was no longer a problem on Earth, and there were more attractive worlds available than artificial colonies.

There were similarities between the O'Neills and the high mining camps that had once flourished in the Rocky Mountains of North America. Rick had seen some of those camps, restored meticulously by the Preservationists more than a century after the silver crash of 1893. Sagging cabins with the thin cold wind keening through the empty window frames, deserted log hotels inviting the guests who never arrived, cheerless corrals for long-vanished mules, tons of dirt and rock that had been torn from the mountains with rust-ruined picks and shovels. Iron stoves and schoolbooks decaying on snow-stained tables, ancient newspapers stuffed into cracks between warped and water-spotted boards—

And the graves. So many graves.

The people had been tough in those years.

Just the same, when the people moved out fast they *went*.

Only ghost towns were left.

Nobody kept records, nobody took inventory, and nobody gave much of a damn.

The idea was to leave.

Ghost towns. Waiting, perhaps. Maybe just there, like the scarred rocks and the dark trees and the cold, cold air.

The empty O'Neills were less fortunate. They remained intact and habitable, since nothing was gained by shutting down their self-contained power sources. At one time, there was even the forlorn hope that people might return to them, somehow, sometime.

Technology ruled otherwise. With the development of the stardrive, the near-space colonies of Earth lost their function. There is only one kind of stardrive that is useful, and that is one that is nearly instantaneous. If it is, then you don't need way stations.

The O'Neills were a slight navigational hazard for the starships, but that was no big deal. The critical problem was that they could not compete economically—and they all contained silent history.

The solution was neat and simple: salvage what was worth the effort and destroy the rest.

It was deeply touching.

But just for the record—

Just in case something of interest turned up—

Maybe even to ease a little collective guilt—

Check them out.

Rick Malina already felt something less than wild enthusiasm for what he had to do. He was not a stupid man. They were a team of five, and they were unarmed. They were on their own until the shuttle returned.

He had no fear of a deserted colony. It might be a bit on the eerie side, but he was used to that. He even enjoyed it, finding pleasure in the familiar details of a situation he knew well. He could run an analysis on an empty O'Neill in his sleep. When you got right down to it, all you had to do was to identify the standard features and then concentrate on what was unusual.

A chimpanzee was unusual.

Oh, yes.

This was one O'Neill that wasn't deserted.

Chimpanzees by themselves could not be taken lightly. Pound for pound, they were twice as strong as a man. In a strange environment, they could be dangerous.

The real question, though, was disturbingly simple. *What the hell else was left alive in here?*

Rick managed a smile that would not have fooled a distracted child.

"Okay," he said. "Maybe we've got us a primate colony."

Nobody laughed.

The five of them moved in.

Caroth knew exactly where they were and exactly what they would do. He understood his world.

He knew himself well but that did not mean that he had his feelings entirely under control. Conflicting emotions stormed in his gut. Pain, hunger, regret, eagerness, fear—

It would not be easy to do what he had to do.

He was sure of his power, but he could not select from a wide field. He had to take what came.

*Come on, come on*, he thought. *Let's get it over with.*

When you are in an O'Neill, orientation can be confusing. Horizons tend to wobble. You can go "in" by moving in a great circle around the outer rim. The sensation of gravity remains a constant determined by centrifugal force. You can go "in" by working along the shafts or spokes toward the hub of the wheel. Then things get tricky and your stomach starts to float away from you.

Rick Malina was a cautious man. He seldom acted on impulse. He knew that he would have to examine the intermediate food-producing areas and the industrial complexes clustered near the center. He didn't have to do it *now*, however.

He had seen enough to rivet his attention on the rim. When he moved toward the hub, he wanted to be very sure about what was behind him.

He felt a sense of strangeness that was alien to him. It offended his picture of the way things should be. It wasn't the curvature of the surface; that was almost undetectable. It wasn't the slime-covered spherical dwellings that sprouted like bubbles; they were standard. It wasn't the twisted shrubs and crazy trees and grotesquely overgrown gardens.

He didn't mind the phony clouds or even the see-through horizons with their shifting colors. He could even take the pale rubbery mold that squished and compressed under his boots.

It was the air—the oily air that neither smelled nor tasted *right*.

It was the shadows—fugitive shadows where shadows should not be. Chimpanzees, maybe. Still

It was a power that was reaching out for him, seeking him. He could feel it in the marrow of his bones. The issue was not *if* he was going to find something outside the range of his experience. The problem was *when*.

He did not have long to wait.

He caught a whiff of it before he saw it. It took him a long minute to classify that dry pungent smell. It was one of the oldest smells of all, and should have been instantly familiar.

Familiar? Not here.

It was smoke. Plain old woodsmoke.

In an O'Neill?

He shot a look at Frances Bauerle. Fran had the best nose in the group; it was a standard joke between them. Fran smelled it too. She had come to a halt, sniffing the greasy air.

Rick's mind tensed and coiled, threatening to run away with him. The impurities could be taken out when the air was recycled, of course. If there were not too many fires. If they were located properly—

But who would build a fire? And why?

He had a wild moment when he thought of forgotten chimpanzees, chimpanzees subtly changed over the generations, chimpanzees building fires and beginning a weird new life in a world where they finally had a chance.

Impossible? Not in *this* O'Neill.

He put the brakes to his imagination. He had enough problems without conjuring up phantoms.

"I see it," said Sandy Bayer. His vision had always been sharp. Fran's nose, Sandy's eyes: they covered the waterfront. "It's a fire, Rick. There are —figures—around it. I think—"

It was too late to think. Rick felt a blurring in his brain. He sensed that there were forms behind his group, cutting them off. It was as practical to keep going in the same direction as to turn back.

Why not?

They moved toward the fire.

There was really nothing else to do.

Out of the wavering light there emerged a scene not quite as old as time, but old enough. It sent a haunting chill through Rick. It fingered chords of memory he hadn't known he possessed. It had a dreamlike quality, a dream that twisted back through ancient sleeps.

A crackling orange flame that hissed and danced. The sharp warm scent of blue woodsmoke. Another smell: sweet, dripping, blood-salty. Meat. Fresh wet meat sizzling in tongues of searing fire.

Yes, and figures. People? Half-naked, crouching around the licking flames. Eyes that gleamed. Sweat that glistened. Bodies that cast monstrous shadows.

Savages? (Good God, where had that word come from?)

Human?

Rick searched for the magic words and could not find them. Oh, more than a memory and more than a dream. Here they *were*. It was a situation that had not existed on Earth in his lifetime. Archeology come to life. Not stones and bones and sterile museum reconstructions. People. Or—

A man detached himself from the huddle around the fire and walked toward him. Rick had never seen such a man. He was dizzy with shock.

Human, yes. He could see that now.

But the man was more than old: he *looked* old. Rick had never known a person who actually showed the signs of age. And the man was sick. He was crippled. His body was hunched forward, his spine locked into a frozen arch. In the world Rick knew, there were only healthy, perfect people.

The man had lost his hair. The skin on his skull was white and taut and blotched. Rick could see the lumps and depressions in the bone. Rick had seen plenty of skulls in his time. This one was within the range of variation for *H. sapiens*. Just one of the gang. But aged, stressed, showing the telltale signs of a body chemistry too long ignored by medical attention.

There was still power in the man: a raw physical strength and an unyielding force that went down deep. The shoulders were uneven, but they were massive. The gnarled hands were like chunks of rock. The man's belly was creased and lined; it looked like an old leather apron. The legs were thin, all bone and gristle and sinew and knobby knees.

The man's swollen nose was too big for his face; the nostrils flared and the veins were distended. When he breathed, there was a slight bubbling noise that seemed to gurgle down and lose itself in the flaps of wrinkled skin on his chest.

His eyes were bloodshot and there was pain in them. There was more than pain. It was not hate. It was not anger. It was certainly not fear.

Resignation? Weariness? Something of that, perhaps.

But much more.

Call it pride. A hard, flinty, uncompromising pride.

Call it determination, a will that would not break.

Call it hope.

The man was now so close that he could have reached out and touched Rick Malina. Rick could smell his decaying breath.

The man stopped.

The bloodshot eyes stared at Rick.

"So," the old man said. His voice was flat. "You have come back."

In a strange kind of way, Caroth felt that it was over. He experienced a sense of letdown. All the waiting, all the planning, all the suffering—

And now this.

A child from Outside. So young, so perfect, so unmarked. There was intelligence there, of course. But the mind had never had to fight. It didn't know what endurance was. It was no match for Caroth.

He had him. It was too easy. It was like throwing a net over a young pig.

Caroth could get into Rick's head. He could twist him around and tie him in a knot. There were no barriers, no defenses. He could smother him, absorb him. He took a lot with very little effort: a name, a general life history, a swirling blur of impressions.

Caroth was not overly pleased. He had much to give. He wanted a *man* for his son, not a pliable lump of mud.

Caroth had to struggle with his disappointment. It would be easy to let go. He was hurting.

Quickly he rechecked the others. No, they were not an improvement. He had the right one. The leader.

Some leader. A child . .

There had been one stroke of luck.

Caroth took a certain satisfaction from that: he was entitled to one break. The colony had been founded by English speakers. He would not have to master a new language. The words had not changed much.

Caroth did what he had to do. He got his head jammed up against the startled face of the young man. He turned on the power, gulping at his mind.

"You are Rick," he said. "I am Caroth. I will now tell you what you are going to do."

Rick Malina felt as though he had been hit in the head with a hammer. His brain pulsed with flashes of light. The palms of his hands were dripping wet. His legs trembled.

His reaction was instinctive. He could not think.

He reached out with his two slippery hands and touched Caroth squarely on the chest. The old man's skin was rough and dry. It had iron under it.

Rick shoved Caroth back. It was not a monumental push, but it was hard enough to get the job done.

The bloodshot eyes were shocked and surprised. It had been a long, long time since any man had put a hand on Caroth.

Rick did not know what to do next. He shook his head, trying to clear it. The fuzziness would not let him go.

Still, he had a corner of his mind back. There was some grit in there, and some anger. Rick did not entirely recognize himself.

He fought without knowing what he was fighting, or why. There seemed to be three distinct personalities churning in his head. One belonged to an arrogant old man who had lived a life that was strange almost beyond belief. One still belonged to Rick Malina. *Rick Malina*. Who was he? What was he? Hang on: thirty-two years old, six feet tall, black hair, brown eyes, free from disease, archeologist, involved with several women, occasional drinker, fond of cats—

Nothing?

And a third personality. Detached, watching, taking it all in.

Laughing?

Here he *was*. He was in the big fat middle of an intact society of hunters and gatherers. It was the find of the century, the opportunity of a lifetime.

And what was he doing? He was in a pushing and shoving contest with a sick old man whose breath stank. He was struggling just to *think*.

His brain swirled. There were memories in there that did not belong to him. He remembered the ancestors of Caroth, people who had stayed behind when the exodus began. He saw a small population that had dwindled with the generations. He felt the changes. When industrial systems became pointless, the people farmed. When they were too few to maintain the crops, they hunted the feral pigs and cattle. When the bubble-houses failed, they built their own shelters. When they had nothing else, they found the security of ancient fires.

Oh, the fires were good. The fires threw the shadows back. The flames kept the chimps at a distance. The strong and patient and waiting chimps

He looked extinction in the eye. It was a cold and frozen and unblinking eye. There were no more children—

Rick shuddered. He wrenched his mind free, isolating it.

He had some measure of control now.

*Hang on, hang on.*

Rick spoke. His voice was almost steady.

He said: "Okay. You are Caroth, and I am Rick. That's a beginning between us. I think it's kind of early for either one of us to start giving orders. Let's slow down, shall we? How about it?"

Caroth was not displeased. He could have crushed the young Outsider with little effort, but that was not the point. Caroth wanted a son.

He had not become the leader of his people by brute force alone. He had mental powers that were beyond Rick's understanding. He also had some diplomatic skills.

He used them.

"Come now, Rick," he said. His tone was as warm as he could make it. "You are welcome here. We have been waiting for you. Your people will be the guests of my people. Together, we will decide what we should do. Is that satisfactory?"

Caroth had the advantage, and he knew it. He preferred a more direct approach, but he could play with words as well as the next man. The pain bothered him. He ignored it; he had lived with pain for most of his life. He had a wedge in Rick Malina's mind. He could manipulate him to some extent.

The old man caught an errant sense impression from one of the chimpanzees, standing flat-footed and knuckle-handed outside the range of the flickering firelight. Waiting, watching. Damn chimpanzees. He hated their guts. They kept on breeding, mocking the people. And they were so strong. They could tear a man apart. They had done so, more than once.

Caroth silently told the chimp exactly what he thought of him and his mother and his mother's mother. Then he turned his attention back to Rick Malina.

"Are you hungry?" he asked. He went back to the fire and retrieved a chunk of bloody, half-cooked meat. He held it out to Rick. "Is this not also a good way to begin?"

The life-scarred old man was not without a sense of humor. Rick's fight to conquer his revulsion tickled him.

Rick took the meat. He ate some of it and passed the rest to his companions. He did not vomit.

Caroth smiled and tried to look harmless. He studied Rick with something that was fairly close to respect.

They might get along.

That was just as well. Caroth had no intention of leaving his world with his people. He wasn't going anywhere.

And neither was Rick Malina.

Not yet.

For Rick Malina, time began to move along two separate tracks.

In one dimension, he did the best he could to cope with what he had found. He seemed to himself to be entirely rational. He made the moves he had to make and he got the expected results.

Sandy managed to get the communications equipment going again and they re-established contact with Earth. That was when the fur began to fly.

At a time when the starships came in almost daily with tales of wonder, it took one hell of a story to make a splash. This was that kind of story.

Rescue was the name of the game.

There had always been a kind of lingering guilt about the abandoned O'Neills. Here was a colony that dated from the early days of space exploration. It still had people in it. They were caught in a lifeway that was almost forgotten on Earth. They were sick and they had come to the end of the line, but they were *alive*.

They had survived.

They were instantly heroic.

Rescue, yes. But rescues can get complicated. The doctors had their certain-sure input. The media people were drooling with anticipation. The politicians smelled votes. And the scientists —well, this thing was too *big* to be left in the hands of a junior archeologist.

Rick did what had to be done. He had Ann and Pete measure everything from the oxygen content of the greasy air to the depth of the mold-growths that sheathed the processing machinery. Fran and Sandy took the photographs and did the interviewing.

*Get it all. Get it all now.*

It was a hectic time, a time without sleep.

In another dimension, Rick knew that he was reacting oddly. He was not sure what reality was—or where.

That damned old man was in his head.

Rick *absorbed* the stalking of a pig through a dripping jungle of slime-wrapped plants. He *felt* the pain that gnawed at his failing body. He *lived* with the patient chimpanzees, always gliding through the dark shadows. He *exulted* in the protection of the orange-yellow fires. He *loved* the shifting pale pastel colors of the closed-in sky.

And he remembered so much. A lifetime of memories: the Sorceress when she was young, the time when Stalker had tried to fly too far, the warm rain that had pelted down when there could be no rain—

Continuity. That was what it was all about. Rick had been on the fringes of it before, extracting an ancient artifact and holding it in his hand. He was not immune to wonder. He had his day dreams. But this was genuine. So had all the countless generations been, back on Earth, back through the immense spans of time that archeologists tagged so glibly as the Neolithic and the Paleolithic.

He knew that his work here would not end when the rescue ships came. His life was bound up with that of Caroth. The two of them were linked.

Caroth would stay in his world, of course.

Rick would stay with him. It was *their* world now.

Until—

Caroth had tears in his bloodshot eyes. He was ashamed of them.

The ships that came from Earth were impressive. These were no mundane shuttles on ho-hum runs. These were sleek metal fish that flashed through space with their figurative flags flying.

Caroth could not have cared less.

For a time, there were Important People in the O'Neill. There was enough hot air from speeches to raise the temperature of the galaxy a fraction of a degree.

Caroth did not listen to the fancy words.

The farewells were hard on him. He said little. He embraced some and sim-

ply touched others. One Eye, Lansing, Floater, Lundelius, Smoke-Eater, Last-born, Dreaming Woman

His people.

He would not see them again.

Maybe the doctors could help them. Maybe not. They could not help *him* in what was left for him to do.

He did not forget the Outsiders. He could not feel strongly about Fran and Pete and Ann and Sandy. Still, they had been understanding. One of them might have been chosen.

He knew what Rick was thinking. They were together.

When the airlock closed and the ships left, there was a terrible silence.

Two men cannot fill an O'Neill, and there were no words.

The Important People had not been happy with Rick Malina.

Rick was not overly concerned about their opinions. He had plenty of other things to worry about.

The law was quite specific. As long as an O'Neill was intact, no inhabitant could be forced to leave without a vote by the local citizens. An O'Neill was a world.

There were other laws. One of them stated that the senior archeologist on a salvage project made the final decisions about what was to be done. Not forever, no. But for a reasonable period of time—and it was up to the courts to figure out what "reasonable" meant.

They could not expel Caroth until they blew the place up.

Rick could go when he was good and ready.

Just the same, Rick had not endeared himself to his superiors. He had not behaved Professionally. He had allowed himself to become Emotionally Involved.

He had also become, as one stern gentleman had so elegantly put it, a pain in the butt. A glory hound.

Rick Malina didn't care.

That was all part of another world.

His world was here and now: the twisted oily-green vegetation that seemed to grow before his eyes, the stained bubble-houses, the spongy rot beneath his feet, the soft colors of a shifting sky.

And one irascible old man, trying to knot the final loop in his life.

Rick's mind was almost clear. He was not entirely himself—he knew that he never would be again—but he was not a puppet dancing on an invisible wire. He had the capacity of choice, and that was a kind of freedom.

He wanted to be where he was, and what he was.

He looked at Caroth. Physically the old man was the same: the locked and tortured spine, the bald and lumpy skull, the swollen nose, the massive and uneven shoulders, the curiously fragile legs. The eyes were still bloodshot, and pain lurked behind them.

The sight of him no longer affected Rick. It was hard for him to remember his first sense of shock.

Something had grown between them.

Call it trust.

Fear was gone from Rick Malina. In its place was expectation. More than that: exhilaration, eagerness, joy.

He had never really known his father.

He hadn't known one hell of a lot of joy either.

Rick was ready. He nodded at Caroth.

"Okay, Pops," he said. "It's your move now."

Caroth had waited for a very long time.

Now that the waiting was over, an alien emotion crept through the old man: doubt.

It was Caroth who felt fear.

What if it didn't work? What if it all fell flat? What if Rick Malina could not absorb it?

What if he laughed?

The two of them were alone. Caroth would not get another chance.

He spat, disgusted with himself. He had come this far. He would not show weakness now.

"Come," he said.

Ignoring his pain, he took Rick to see the world.

Rick suspended his will and followed Caroth. It was not easy. He lost count of how many times he slept. He ate when Caroth brought him food.

The old man seemed tireless. He did not try to save himself. He used it all.

Rick was intensely alive. He found a strength he had never known before. He felt as though his whole life was converging on this place, this time, this event.

He knew that Caroth was showing him more than a world. He was showing him a life.

Rick understood, and was grateful.

He opened himself and took it all in.

There was a dark sea without waves that curved like heavy oil toward the horizon. Nameless things swam and scuttled in its shallow basin. The sea had pinpoints of light that reflected on its glassy surface.

Starlight.

The other side of the rim was translucent across that section, of course.

You could actually see Outside.

That didn't matter.

What counted was Inside.

The sea that would have been a small lake on Earth was a beginning. Caroth had been born in a nest on its shores.

Rick saw it, felt it. The nest was snug and dry and lined with flowers. Then it was sticky with blood. Caroth was a healthy and unscarred baby, but his mother died within hours. Caroth was nursed by another woman whose child had been stillborn.

Caroth survived. There were few children then, and he was indulged.

Rick followed the years of childhood. It had been a happy time: gliding through the bright corridors that were the spokes leading to the hub of the O'Neill wheel, exploring the silent and mysterious processing labs, playing the hunting game of two-on-a-side.

Caroth had not been lonely. Smoke-Eater was almost his own age; his name had been Owens then. There had been others young enough to share his life—Mac who laughed so readily, Snare who had been quick but not quick enough, Blossom who had done just that. Blossom had changed from a girl into a woman very rapidly, and she discovered sex. That had been fun for them all.

Caroth's childhood ended with the storm.

He had been looking forward to the Acknowledgment. But the storm came first.

The storm was a freak and therefore awesome beyond belief. There was not even a memory of such a thing, and the O'Neill was full of memories. Rick could feel the horror. He relived it with Caroth.

Electrical charges built up in the atmosphere. The clouds turned dark and sullen. There was *wind* in the O'Neill: a river of wind that moaned through the rim of the colony. It was strong enough to snap trees.

The rain materialized. It did not fall —it came from all directions. Huge fat drops of warm water swirled and splattered. There had been controlled rains in the early years, but nothing like this. The O'Neill would never be wholly dry again. The wind-driven globules of water smashed the world.

Lightning exploded in searing discharges. The crash of thunder was continuous. The sound could not get out. The booming echoes were so loud that people screamed to relieve the pressure in their ears.

At the end of the storm—just before the silence began—Caroth was struck by lightning.

Rick felt the stunning shock that hurled him to the wet vegetation. He smelled the acrid burning of ozone. He fought the numbness

Caroth was marked. He did not know that the lightning had triggered his sickness, but he believed it. When his senses returned, it was pain that he felt. The pain chewed at him for the rest of his life. He lost his hair. His body became bent and twisted.

He worried about the Acknowledgment. What would his father think of him now?

There was a change in the way that people treated him. There was distance. Even Smoke-Eater withdrew a little, and Mac was careful with his jokes. Caroth knew their minds. He had the power. It was not uncommon among the people, a kind of compensation perhaps for shrinking numbers.

The people took it for granted that Caroth had been marked for a reason. Such things did not just happen. Caroth had been singled out.

And his father? Caroth could not read *his* mind.

They waited warily, father and son.

When the Acknowledgment came, it was strange.

The fire was like other ceremonial fires: four logs blazing on Spirit Hill. The feasting was good, but there was a sadness in the heavy air. The people were aware. Lastborn was already a child, and Dreaming Woman had seen her visions of hollow emptiness.

His father had always been a stern man and there was no softness in him now. He held the ancient knife with a steady hand.

His father slashed his own left arm first, wrist to elbow. Then he cut his son, deeply. He offered the knife to the flames. He grasped Caroth's arm and pressed it against his.

The red bloods mixed.

As the people chanted, his father said new words: "I will be your father, but you are not as other sons. I acknowledge you, and we are one. I charge you to continue. Remember me as I will remember you."

Caroth responded with the old formula: "I have heard your words." It was the best that he could manage.

Caroth's father seldom spoke to him again. He never explained the meaning of what he had said at the Acknowledgment. When his time came, Caroth's father climbed silently onto the traditional metal raft and poled himself out upon the waveless sea. He said no goodbyes.

Rick could identify with Caroth, and more. There had been no farewell from his own father. There had not even been an Acknowledgment.

It hurt.

Emotionally spent and exhausted, Rick followed the remainder of Caroth's life. It was a world and a life that Rick knew: he had come in at the end of it. Caroth, the leader. Caroth, the unbroken. Caroth, the schemer—

An old, old man fighting the decay of his world.

Waiting, dreaming . . .

And always the dripping rot of the jungle, the pain, the mold that oozed, the fires that warmed, the dark shadows of the watching chimpanzees—

And hope, the hope that would not die.

When the journey was over, Rick and Caroth stood not far from Spirit Hill. Both men were shaking with fatigue.

"Which way do we go?" asked Caroth. His voice was harsher than it had to be. He feared Rick's answer.

Rick still had the strength to smile. "Do we have time?"

"There is enough."

"The Hill first, of course. Then the other."

Rick Malina understood.

Caroth held himself together by the sheer power of his will. He shut every-

thing else out and concentrated on one urgent thought: *Do it right.*

It was now or never, and never was intolerable.

He took the time to kill a small pig. He gutted it with the ancient knife and got the meat ready. There had to be a feast. It was nothing without the feast.

They climbed Spirit Hill. The elevation was not great, but the ascent was a struggle. Caroth was very tired.

There was no need to gather the four logs. Caroth had put them in place long, long ago.

Rick started the fire in the old way. That gave Caroth immoderate pleasure. The boy was learning.

While the meat was sizzling in the flames, Caroth cleaned his knife.

The two men ate in silence. There were few words left. They should not be wasted.

When it was time, Caroth stood in the dancing shadows. He felt the ghost-people who once had gathered on Spirit Hill. He could hear the chanting. Ah, it was clear, so clear. . . .

Caroth gripped the ancient knife firmly. He ripped his left arm with great care, wrist to elbow. There was a lot of blood. The pain was nothing.

Rick extended his arm. Caroth slashed it. He locked their arms together with all the strength that remained to him.

The red bloods mixed.

Caroth said the words: "I will be your father, but you are not as other sons. I acknowledge you, and we are one. I charge you to continue. Remember me as I will remember you."

He offered the knife to the flames. His release was so boundless that he had almost forgotten part of the ritual. He

was soaring. It was like gliding through the bright corridors of yesterday—

Caroth hardly heard Rick's response: "I have heard your words." Caroth knew that Rick would not fail him.

He was not a bad son.

Caroth could feel himself staggering. He almost fell. His will was failing him. He was ashamed.

A strong bloody arm supported him. Rick.

There wasn't far to go.

Caroth was not used to accepting help from any man. He took it now.

He offered no thanks.

Damn son.

That was what he was *supposed* to do.

Rick Malina was so tired that he could not think. He just did what he had to do.

Caroth was too heavy to carry. He would not have permitted that in any case. The old man still had some pride.

He wanted to die with dignity.

Rick assisted him without being obtrusive about it. When Caroth stumbled, Rick caught him. When Caroth hesitated, Rick took the lead.

They made it, somehow.

The old metal raft was waiting on the shore of the waveless sea. Caroth collapsed on the raft and then struggled back to his feet. He picked up the pole.

Rick started to help him with the launch but thought better of it. He let Caroth do it for himself.

The raft drifted out and up across the surface of the dark and oily water. Caroth became small and indistinct. The last view of him that Rick had was starlight reflecting from his white bald head.

Then there was only starlight.

Nameless things swam and scuttled in the shallow basin of that sea. They were great for the ecology.

Rick staggered only a few steps before he found it. He knew that it would be there. A fresh nest, snug and dry and lined with flowers. The old devil had thought of everything.

Rick crawled into the nest. He closed his bloodshot eyes. He slept and slept and slept.

When he was conscious again, Rick felt the pain in his shoulders. He examined himself. He half expected to find the body of a twisted old man.

No. There was a raw slash-wound on his left arm. Otherwise, he was the same —on the outside. He experienced a guilty surge of relief. Rick was young enough for vanity.

He picked some red berries. He knew the right ones. He swallowed them by the fistful.

*Eating for two*, he thought wryly.

He had his mind back. He rather liked it. It was stronger now.

There was a lightness in him, a soaring.

Call it joy.

Grief? Not for Caroth. They were one. Caroth continued. He had no use for a maudlin son.

It was time for Rick to finish what he had started. There was more than one kind of salvage operation.

Rick returned to the communications equipment and sent his signal to Earth.

He built a small fire close to the airlock. He sat hunched in the shadows,

waiting. There was pain in his shoulders. His arm was beginning to scar.

They were coming.

He was ready.

He had an enormous advantage now. He could see into their minds. There was much that he could do.

He could stall the destruction of the O'Neill indefinitely.

He could work with the remnant of his people.

He could bring something back to Earth more precious than artifacts. He had lived the past, and he had professional training. He was a link with all the vanished generations. He *knew* them. Not just on the O'Neill. On Earth.

He would endure. He would continue.

When the unbarred airlock was opened from the Outside, Rick Malina crossed to the shuttle with a smile on his face.

One day, he might have children of his own. Caroth had a good chance of becoming a grandfather yet.

The old man would like that.

The O'Neill waited patiently as it had waited for so many years. It was waiting for decisions. Most of those decisions would be made far away.

The air inside was fresher now. There were no more fires.

A troop of chimpanzees knuckle-walked along the trail near the airlock. There were ten of them: big old males with their massive arms, smaller females, infants with their brown gamin eyes. They barked and hooted cheerfully.

They acted as though they owned the place. They did.

There were other chimp troops, but there was plenty of food. Sweet fruits grew in the tangled vegetation. There were lots of bugs in the spongy mold. Once in a while, the chimps could catch a young pig or a calf and feast. It kept things interesting. It was fun to live in a world without humans.

They were free, and they knew it.

A female detached herself from the group. She had a child that was still so young that it rode on her shoulders, hanging on for dear life. The mother moved purposefully, without wasted effort.

She went to the airlock and examined it with her dark intelligent eyes. She muttered to herself.

She balanced on her flexible feet and the roughened knuckles of one hand. She reached up with her other hand and grasped the metal sealing bar. She was very strong. She slipped the bar from its moorings and dropped it into the sockets. It was easy.

She knew what she was doing. The airlock would not open from the Outside.

She twisted her head around. Her child leaned forward and nuzzled her.

The mother gave a low bark of pleasure.

She turned and rejoined her troop. ■

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● It does not do to leave a dragon out of your calculations, if you live near him.

J.R.R. Tolkien

# Jay Kay Klein's biolog

Chad Oliver is a scientist, a departmental chairman in a large university. Not so unusual for an *Analog* author—except that the presence of *this* science as an accepted part of science fiction dates back to earlier days in this magazine, when the engineering-oriented editor realized that mechanical parts do not make a whole man. If anything, John Campbell proclaimed that the proper study of man was man. Accordingly, stories rooted in anthropology have appeared in these pages to show that man must come to terms with his own nature or improve on it in order to make his way in the physical universe.

Chad's initial impulse was to be a full-time writer. At age 13 he came down with a very serious case of rheumatic fever, and only his physician father and nurse mother pulled him through. Enforced inactivity led him to read large quantities of science fiction. When well enough, he bought a second-hand typewriter and wrote something every month for the next eight years before making a first sale to a science fiction magazine. Six months later another story appeared, in the December 1951 *Astounding*.

By that time, Chad had a B.A. in English from the University of Texas with a minor in Anthropology. Discovering that science was like coming home, he says, and he went on to secure a Ph.D. at UCLA. He has been on the faculty of the University of Texas since 1955.

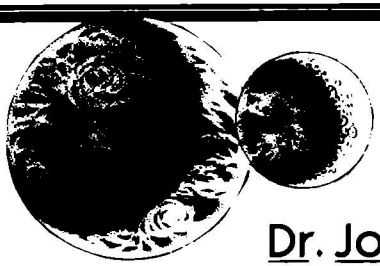
As readers of this magazine would expect from an *Analog* contributor, his lectures are far from the perfunctory affairs too often dumped on hapless students. In 1980 he was given the Harry Ransom Award for Teaching Excellence. A specialist in cultural ecology who has conducted research on the Plains Indians and the Kamba of East Africa, Chad sees science fiction from a particular viewpoint. Many writers are deep into the physical sciences and explore the surface changes that may result from the impact of new technology. Chad notes that a great deal of science fiction really involves the questions of cultural change and culture contact. To an anthropologist, the central cores of humanity are deeper and stronger than some externally applied technology. Indeed, outward forms of technical change may likely be a response to what comes from within.

When writing in the scientific field, Chad uses his full name: Symmes C. Oliver. His most recent nonfiction book, *The Discovery of Humanity*, appeared in 1981. He's published eight books of science fiction, and his output includes other types of writing, too, including stories for *The Saturday Evening Post* and *Argosy*. In 1967 he received the Western Writers of America's award for best historical novel, for *The Wolf Is My Brother*.

Chad notes: "I don't care for fictionalized essays and I don't care for stories that are absurd scientifically. I want people in my stories, and I want to care about what happens to them." As for the cultural value of science fiction, he says, "We *must* think about who we are and where we might be going. If we don't, we run the risk of going Nowhere—fast." ■

## Chad Oliver

Photo by Russell Lee



Dr. John Gribbin

# AN ASTRONOMICAL VIEW OF THE GREENHOUSE

**Our actions have to be influenced by our expectations of their future consequences. The trouble is those expectations are very sensitive to the assumptions on which they are based.**

The "greenhouse effect"—a detrimental global warming brought about by a buildup of carbon dioxide in the atmosphere of the Earth—has become a familiar doomsday scenario, with many climatologists warning us of the dire consequences of our increasing dependence on fossil fuels. The pictures painted range from a new dustbowl across the central and southern United States to coastal inundation as the icecaps melt and sea level rises. There is no doubt that carbon dioxide is building up in the atmosphere of our planet as fossil fuel, predominantly carbon, is burnt in ever-increasing quantities to provide the energy our industrial society needs. And the potential for carbon dioxide to do its work of warming the Earth is often highlighted by drawing attention to the inferno of Venus, where thanks to a thick carbon dioxide atmosphere the

surface temperature is a searing 500°C.

But how real is the threat of a greenhouse effect on Earth? After all, the atmospheres of the Earth and Venus are very different, and the presence today of about 340 parts per million of carbon dioxide in our atmosphere is not in the same league as the existence on Venus of an atmosphere which is more than 95% carbon dioxide and which reaches a pressure 90 times the pressure of the Earth's atmosphere at the surface of the planet.

Nobody seriously suggests that the greenhouse effect on Earth could carry us into such a runaway state as the heating on Venus. Our planet contains as much carbon dioxide as Venus, but on Earth the vast bulk is stored in the form of carbonates in rocks, laid down from carbon dioxide initially dissolved in the ample supplies of water which are a feature of the strikingly misnamed planet "Earth." Venus either lacked the water necessary to dissolve carbon dioxide or, thanks to its slightly closer orbit to the sun, was never cool enough for water to condense from vapour in the atmosphere of the young planet, long ago when the solar system was forming. Water vapour in the atmosphere would then have been split by the action of solar ultraviolet radiation into hydrogen—lost into space—and oxygen, which has gone to oxidise the rocks of the planet's surface. All that was left was a thick blanket of unreactive carbon dioxide, to keep the planet warm.

But where, between the pleasant conditions which we regard as normal on Earth today and the searing hell of Venus, does the limit on any potential terrestrial greenhouse effect lie? And how quickly could a buildup of carbon dioxide in the atmosphere warm the Earth? These are the questions around which climatological debate rages at present.

The widely publicised consensus among those climatologists who model the behaviour of the atmosphere using mathematical equations processed in high-speed electronic computers is that a doubling of the concentration of carbon dioxide in the atmosphere —something that could happen in fifty years or so, at the rate global demand for fossil fuel is increasing—would increase the average temperature of the globe by between two and three degrees centigrade. That doesn't sound so bad; but other climatic studies show that if that happens the Earth will not warm evenly, and in addition rainfall patterns will be distorted. High latitudes could warm by three or four times the average—up to 10°C—while the tropics remain almost unaffected. And recurring drought would strike regions such as the U.S. Midwest, which is at present so productive a supplier of grain that it has been dubbed "the breadbasket of the world."

Hardly surprisingly, this debate among the climatologists has become a hot political issue. Some forecasters paint a picture of North American grain shortages destroying the world's limited reserves of food and bringing widespread famine and political upheaval in the Third World, now dependent on American food aid. Others say that if such a threat is a real prospect if we continue to burn coal and oil profligately, then we must turn at once to a massive pro-

gram of nuclear power. And way out on a limb a few experts claim that there is a real possibility that even a modest rise in global temperatures could cause the floating ice sheets of West Antarctica to break up, allowing the glaciers behind them to slide into the sea and melt. This could raise sea levels by tens of metres, inundating coastal cities such as New York, Washington, and San Francisco, while practically wiping Florida from the map.

But in the face of a bandwagon rolling along with increasing momentum, a few people have been heard crying "halt." A tiny minority of climatologists who have investigated the greenhouse effect "problem" believe that all of the computer forecasters are making the same mistake. The basis for this belief is a straightforward astronomical interpretation of the way the greenhouse effect operates on a planet like the Earth with an atmosphere like our own. And it says that the potential for a carbon dioxide-induced warming is no more than one tenth of the effect "predicted" by the computers, with an absolute limit on *any* increase, no matter how much coal and oil we burn, of 4°C!

The astronomical view of the terrestrial greenhouse is, it turns out, rather more reassuring than the view of the climatologists. And since the whole greenhouse effect is, in a real sense, more an astronomical process than a climatic one, perhaps the astronomical voice should be heard a little more loudly than it has been in this continuing debate about our future weather.

There is nothing new about the greenhouse effect. Just as it has acted to keep Venus super-hot over the eons, so it has ensured equable conditions on Earth, with average temperatures close to 15°C, throughout most of our planet's 4½-billion-year history. The way an atmospheric greenhouse effect works is simple to understand. Unfortunately the glass of a real greenhouse keeps its interior hot in a rather different way, but we seem to be stuck with the same name to describe both kinds of warming. Earth is warm because it receives radiant heat from the sun. Only a little heat escapes from the molten interior of our planet, and this is insignificant compared with the energy of solar radiation. But to reach the surface of the Earth, the sun's radiant energy has to travel through the atmosphere.

When solar radiant energy arrives at the Earth's atmosphere, about 35 to 50% is reflected back into space. Another 10 to 20% is absorbed by the atmosphere, warming it slightly in the process; and the balance reaches the Earth's surface, where it warms the land, sea, or vegetation that it encounters. This pattern of energy distribution depends on the wavelengths of the incoming energy, which is mostly concentrated in the visible band of the electromagnetic spectrum. Of course, this is no coincidence —our eyes have evolved and adapted to make use of the available electromagnetic energy, which is sunlight. So it would be very surprising to find much of the sun's energy radiated at wavelengths where we cannot see it, that is, outside the visible band.

For present purposes, we can think of the sun's energy as spreading over

three regions of the electromagnetic spectrum. Visible sunlight has a wavelength from 0.4 to 0.7 microns (a micron is one thousandth of a metre). The shortest wavelength of visible light is violet in color; the longest is red. About 46% of the sun's radiant energy is visible light. Another 7% of solar radiation has wavelengths shorter than 0.4 microns, in the region of the spectrum called the ultraviolet; and the longest wavelength energy, above 0.7 microns, is called infrared. Infrared radiation is synonymous in everyday terms with heat; the warmth you feel from a radiator without touching it is infrared radiation.

Nearly all the incoming ultraviolet energy is absorbed in the atmosphere by molecules such as those of ozone, which dominate the chemistry of the stratosphere. Some of the incoming infrared radiation is also absorbed, by molecules such as carbon dioxide and water vapour. The rest of the incoming energy warms the surface of the planet, and the warm surface radiates energy back toward space in its turn. But there is a crucial difference.

The region of the electromagnetic spectrum in which a warm body radiates depends on its temperature. The sun, with a surface temperature around 6,000°C, radiates chiefly visible light. Planet Earth, with a temperature around 15°C, radiates chiefly infrared (heat) energy.

So the outgoing energy is chiefly in the infrared part of the spectrum, from about 4 to beyond 30 microns in wavelength. The energy around 8 to 12 microns does escape into space. But most of the rest is absorbed in the atmosphere, chiefly by carbon dioxide and water molecules, which are sensitively tuned to respond to energy in these wavebands. The result is that the atmosphere near the ground is kept warmer than it would otherwise be. The heat absorbed is re-radiated in its turn: some back down to keep the ground warm, some out, eventually, into space.

Overall, a perfect balance is maintained. The amount of heat the Earth receives from the sun in the course of a year or a decade is exactly the same as the amount radiated into space over the same timespan. If this were not so, our planet would warm up or cool down until a balance was struck. The "greenhouse effect" of the atmosphere is not to sequester energy indefinitely, but to raise the temperature of the planet to the point where the two sides of the equation do indeed balance. To the climatologists, the link between carbon dioxide and infrared radiation suggests that more carbon dioxide in the atmosphere must make the Earth warmer, by filling in part of the remaining open "window" in the atmospheric greenhouse. From an astronomical viewpoint, the balance tilts slightly in favour of a higher equilibrium temperature; and the question is how far, and how quickly, the balance may tilt.

It is very difficult to calculate the way in which all the pieces of the Earth's weather machine interact. The task the climate modellers have set themselves involves making estimates—based on observations of the real world—of the way in which oceans, ice cover, water

vapour, clouds, and other constituents of the air respond to the warming influence of the sun and move air in a complex circulation pattern to carry warmth from the tropics poleward, and cool air from the poles towards the equator, depositing rain or snow here and there along the way. It is, indeed, impossible to "model" the workings of the atmosphere mathematically with the precision we would like. But the modellers can calculate the run of average temperature over the whole globe, or one hemisphere, using as input the present-day pattern of land, sea, and ice, the amount of heat arriving from the sun, and the physical laws which describe evaporation and condensation of water and the convective circulation of a warmed gas. If the computer is set the task of modelling Northern Hemisphere temperatures, with the solar input appropriate for summer, then it comes up with figures close to the summer temperatures observed in the real world; if the solar input is changed to correspond to winter conditions, then sensible winter temperatures come out of the computer. This makes the modellers confident that their computer calculations are saying something meaningful about the climate of planet Earth. But it is another matter to calculate even the surface temperature—let alone changes in rainfall patterns—for a planet in a rather different stage.

Take one key example. We know the rate at which water evaporates from the oceans today, so that is one number that can be confidently set in the computer calculations. But what happens if the temperature rises? All of the widely publicised computer forecasts of the greenhouse effect *assume* that evaporation from the oceans increases as temperature rises, and that the extra burden of water vapour in the atmosphere causes temperatures to rise still more through its own contribution to the greenhouse effect: absorbing infrared radiation that would otherwise be lost to space. But this is only an assumption, a guess based on no direct measurements. Furthermore, some experts point out that even if more water vapour does get into the atmosphere, its main role might be to make more clouds—clouds which reflect away *incoming* solar heat and could thereby *cool* the Earth below!

These subtleties of the argument are all too seldom reported. The story that emerges for public consumption—and is already beginning to influence political debate—is that the computer models predict a rise in temperature of at least 2°C for a doubling of the concentration of atmospheric carbon dioxide, and that because the forecast comes out of a computer model it must be right. The truth is, any computer model is only as good as the assumptions fed into it, and all these models which seem to be in such fine agreement have been fed with the same assumptions. Robert Kandel, of the Pierre and Marie Curie University in Paris, has tried feeding the models with different assumptions about the way evaporation changes as temperature changes, and he finds that a range of entirely plausible estimates of the crucial humidity parameter can lead to forecast global warmings anywhere in the range from 0.5 to 10°C, all for a dou-

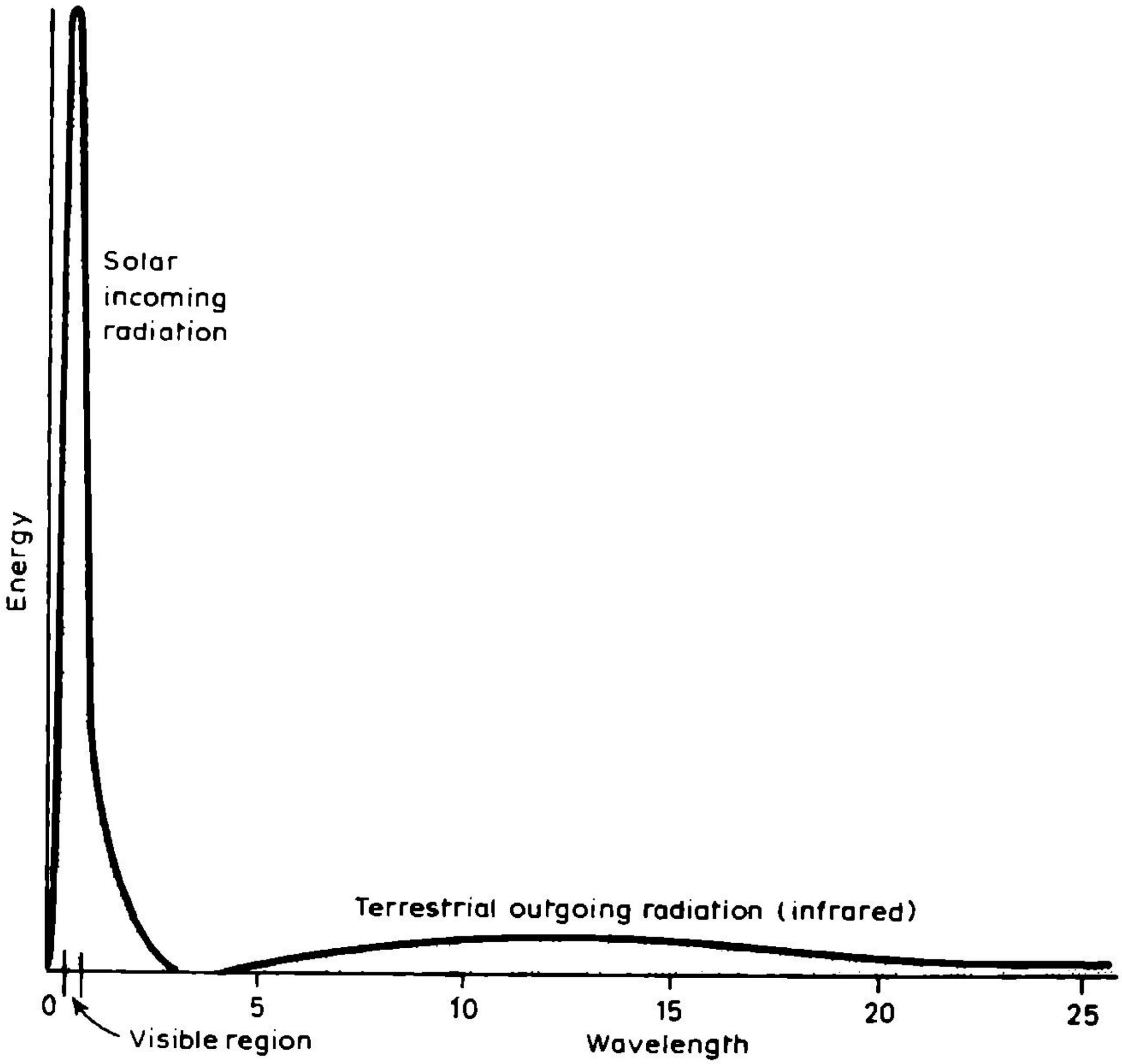



**Figure 1** *Incoming sunshine* (left) is converted to longer wavelength infrared (heat) before being re-radiated out to space. This long wavelength radiation can be absorbed by $CO_2$ molecules. Only a part of sunshine is visible: shorter wavelength radiation is ultraviolet (to the left of the peak) and longer wavelength radiation (to the right of the peak) is infrared (heat). (Wavelength shown in microns.)

bling of the carbon dioxide concentration.

In truth, the computer forecasts are much less reliable than the apparent consensus would seem to imply. In such a confused situation, and with such an important subject that literally affects every one of us, the pressing need is for a completely different way to tackle the problem, an alternative approach which might independently indicate which end of this range of computer forecasts—from 0.5 to 10°C—is the better guide to the temperature increase we might expect within our own lifetime. Just such an alternative view of the greenhouse effect

comes from Sherwood Idso, of the U.S. Water Conservation Laboratory in Phoenix, Arizona.

Instead of trying to calculate mathematically all the interactions of the weather machine which affect the temperature of the globe and then add in the effects of a carbon dioxide buildup, Idso has studied changes in the surface temperature of the real world when the composition of the atmosphere changes. During his studies of the changing balance between incoming solar energy and outgoing infrared (heat) radiation from the ground, Idso has monitored changes produced by dust storms over the Arizona desert, changes related to cloud cover variations, and changes linked with changes in the moisture content of the desert air. In every case he measures the same response to changes in the radiation balance, a response which implies that an increase in the concentration of carbon dioxide in the air from 300 parts per million to 600 parts per million would cause an increase in global mean temperatures of only about 0.33° Centigrade, even allowing for the feedback effects of infrared radiation absorbed by water vapour. The computer modellers argue that Idso and the handful of climatologists who support his view are underestimating the influence of water vapour; Idso and his colleagues argue that the computer models overestimate the influence of water vapour. And when we get away from the complexities of these subtle arguments and look at the real world with an astronomer's eye, we find persuasive evidence that Idso may be right.

If the Earth could somehow be stripped of its atmosphere, but otherwise left the same, then very simple calculations of the balance between incoming solar radiation and outgoing infrared radiation show that it would settle down with an average surface temperature of −19°C. This is not the same as the temperature of the original, airless Earth long ago when the solar system was formed, but the temperature an airless, but otherwise magically unaltered, Earth would have *today* if, equally magically, its atmosphere were removed. But we know that the average temperature of the world with its atmosphere is 15°C. So the total greenhouse effect of all the atmosphere at the present time is to increase the temperature of the globe by 34°C above what it would otherwise be. This is an unambiguous number which depends on no assumptions about the subtleties of the feedback processes involving water vapour, carbon dioxide, clouds, and everything else that goes to make up the weather machine. We do not need to understand those feedback processes at all to know that their combined influence is to warm the world by 34°C. From this secure base, Idso has estimated how much extra effect a little more carbon dioxide in the atmosphere might have.

The next step is to look at a property of the atmosphere called its emissivity. The emissivity of a body is a measure of how closely it approximates, in terms of its absorption and emission of radiation, the behaviour of the most efficient radiator possible, which physicists dub a blackbody. A blackbody is, in this sense, an abstraction, a physicist's

idealised view of reality. But many astronomical objects behave like blackbodies in many ways.

The sun, for example, emits radiation very much in the same way that a blackbody at a temperature of 6,000°C would emit radiation. And the famous cosmic background radiation, thought to be an echo of the Big Bang in which the Universe formed, is very much like the electromagnetic radiation that would be radiated by a blackbody at a temperature of only 2.7 K, that is −270°C. A perfect blackbody would absorb all the energy falling on it; hence the name. In the real world—or the real Universe—few absorbers are as indiscriminate as this, but many objects absorb radiation very efficiently at certain wavelengths.

The atmosphere, as we have seen, is transparent to a great deal of the incoming solar radiation, so in that sense it is far from being a blackbody. But at the infrared wavelengths of the outgoing radiation from the Earth's surface, it is a much more efficient absorber. Indeed, for this all-important outgoing radiation the Earth's atmosphere is already 90% as efficient as a blackbody. *Whatever* happened to the composition of the atmosphere, it never could be a more efficient absorber, in any wavelength band, than a blackbody. And acting now as a 90% blackbody in the infrared, it has produced an overall greenhouse effect of less than 40°C, warming the Earth, in effect, from −19°C to 15°C. This is exactly in line with Idso's calculations of the effect of each watt of energy falling on each square meter of the Earth's surface today, and suggests not only that the conclusions based on his observations apply to the world as a whole, but that the same relationship applies over the whole of the range of the present greenhouse effect.

Going from zero greenhouse to 90% efficiency, the "response function" of the Earth averages out at its current value. Although any extrapolation must be treated with caution, this consistency of behaviour over such a range of conditions suggests that the best estimate of how temperature will increase as the last 10% of the greenhouse is filled in is to assume that the same response function will continue to apply. On that basis, says Idso, the extra 10% efficiency could not possibly do more than add another 10% to the global greenhouse effect, raising surface temperatures by no more than another 4°C.

This somewhat startling conclusion —to anyone familiar with the computer forecasts of climatic doom —can also be explained by the greenhouse analogy. What the emissivity measurements tell us is that there is only a very small open window in the greenhouse, and that 90% of it is already doing its job. Closing that remaining window can only bring about a modest further increase in temperature. And how much of that window could carbon dioxide close up?

Geological evidence shows us that for at least millions of years, and almost certainly for much longer, the Earth has never been more than a couple of degrees warmer than it is today. It has often been colder, during Ice Ages, but it does seem that present-day temperatures are only a little less than the highest ones experienced in the recent

geological past. Yet the amount of carbon dioxide has certainly varied considerably, as the analysis of air bubbles trapped in the ice of polar caps reveals.

All this is powerful circumstantial evidence in support of Idso's argument. At the Carbon Dioxide and Climate

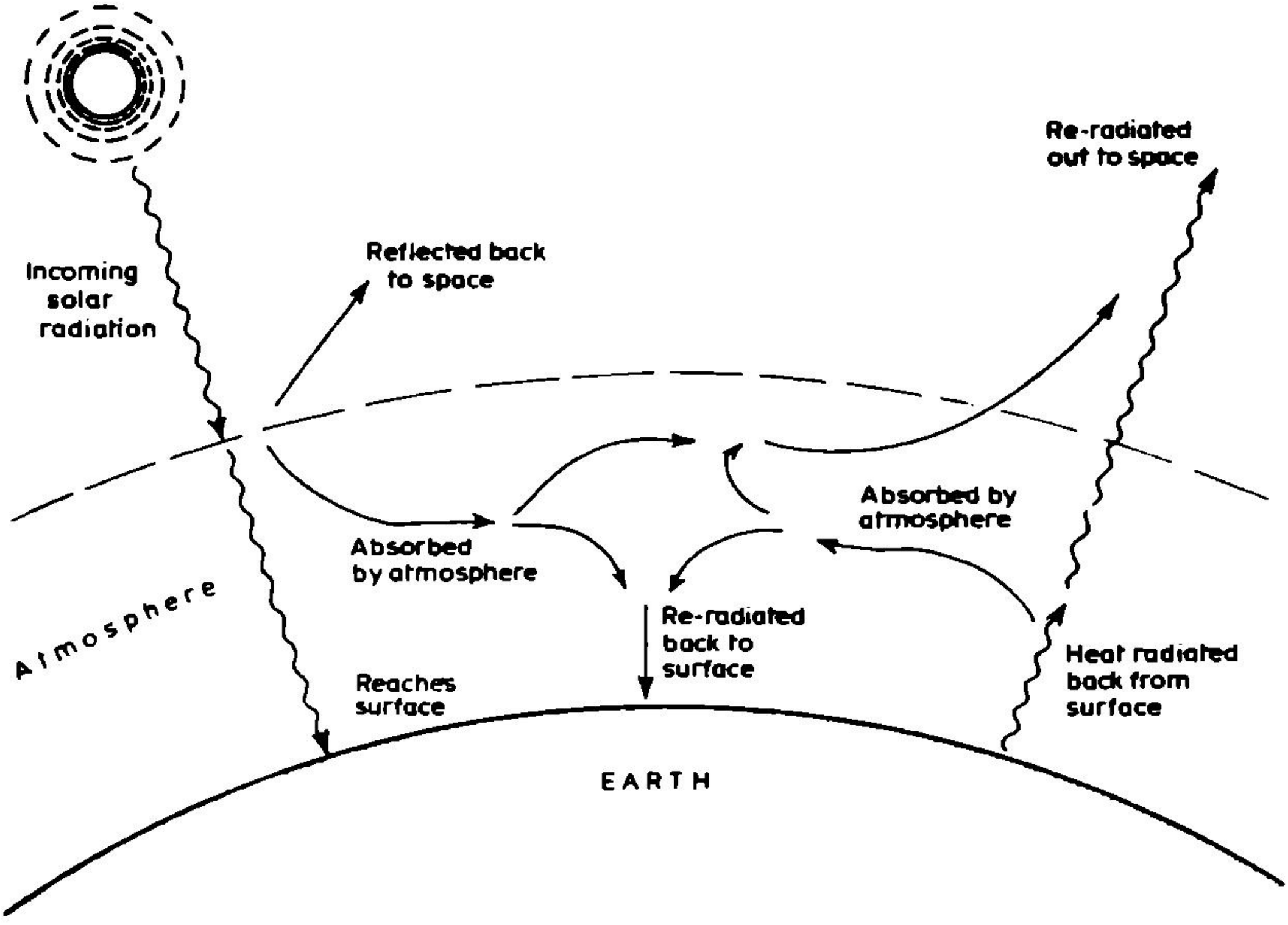



**Figure 2** *The greenhouse effect.* Of the incoming solar radiation (top left) about 40% is reflected back to space, 15% is absorbed by the atmosphere, and around 45% reaches the Earth's surface. This is eventually re-radiated as heat (bottom right). Most of this heat is absorbed by the atmosphere, and some is re-radiated out to space. Of the incoming and outgoing energy absorbed in the atmosphere, some is eventually re-radiated out to space, and some re-radiated down to Earth. The process whereby outgoing heat is absorbed by carbon dioxide and other molecules in the Earth's atmosphere is called the "greenhouse effect."

Research Program Conference held in Washington, D.C., in April 1980 Wallace Broecker, of the Lamont-Doherty Geological Observatory of Columbia University, was asked if it might be possible to find out what a warmer world would be like by reconstructing, from geological evidence, the climate patterns of an epoch when the world was 2½°C warmer than it is today. He replied "there may never have been a time that warm, at least in the last few million years." Could there be a time that warm, then, in the next few decades?

The astronomical viewpoint must be that such a greenhouse effect warming is impossible, as long as carbon dioxide remains just a trace gas in the Earth's atmosphere. Even doubling the carbon

dioxide concentration would leave it at only some 600 parts per million, a mere 0.06% of the volume of the atmosphere. Carbon dioxide is not the only contributor to the present-day greenhouse effect, which owes as much—or more—to the presence of gases such as water vapour in the atmosphere. Yet in order to match up the astronomers' view of the terrestrial greenhouse with the widely publicised computer models, and to ensure that doubling the carbon dioxide concentration really does produce a global temperature increase of 2°C or more, that additional carbon dioxide would have to fill in more than half of the remaining gap in the global greenhouse.

This is not possible, because part of the remaining gap is at frequencies which are not absorbed by carbon dioxide at all and, of course, much of the radiation in the bands where carbon dioxide does absorb is already being absorbed by the existing carbon dioxide. If anything, the response of the Earth to the greenhouse effect should *decrease* as the last panes of the carbon dioxide greenhouses are filled in, and it is very difficult to see, on this evidence, how those doomsday forecasts of a 2 or 3°C rise in global mean temperatures in our lifetimes can possibly be accurate. It looks as if the lower end of the range of estimates reported by Kandel is the more reliable guide, and that the carbon dioxide buildup from mankind's consumption of fossil fuels will contribute no more than a fraction of a degree warming to the greenhouse effect in the immediate future.

It might be different if we found some way to break down the carbonates laid down in rocks over the eons, and if we then busily released all that carbon dioxide to the air, building up a super-thick, carbon dioxide atmosphere like that around Venus. Merely putting back into circulation some carbon dioxide that was sequestered by growing trees and laid down as fossil fuel for a time is a much more modest proposition, with much more modest repercussions. The astronomical view of the terrestrial greenhouse is that it is doing its job nicely, thank you, and without it we wouldn't be here. Filling in a gap or two—closing one of the few open windows in the greenhouse—might increase the temperature marginally, but no more. And since plants need carbon dioxide to grow, and one of the most pressing problems facing mankind in the late 20th century is the need to feed an ever-growing population, a buildup of carbon dioxide in the atmosphere may well be a very good thing, provided the climatic balance is maintained. But that, as they say, is another story. ■

## KEY REFERENCES

Publishing scientific papers on the carbon dioxide greenhouse effect has become a major growth industry in scientific research. The following selection provides no more than an entry into the resulting maze.

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R.E. Newell and T.G. Dopplick, "Questions Concerning the Possible Influence of Anthropogenic $CO_2$ on Atmospheric Temperature," *Journal of Applied Meteorology*, Vol. 18, p. 822 (1979).

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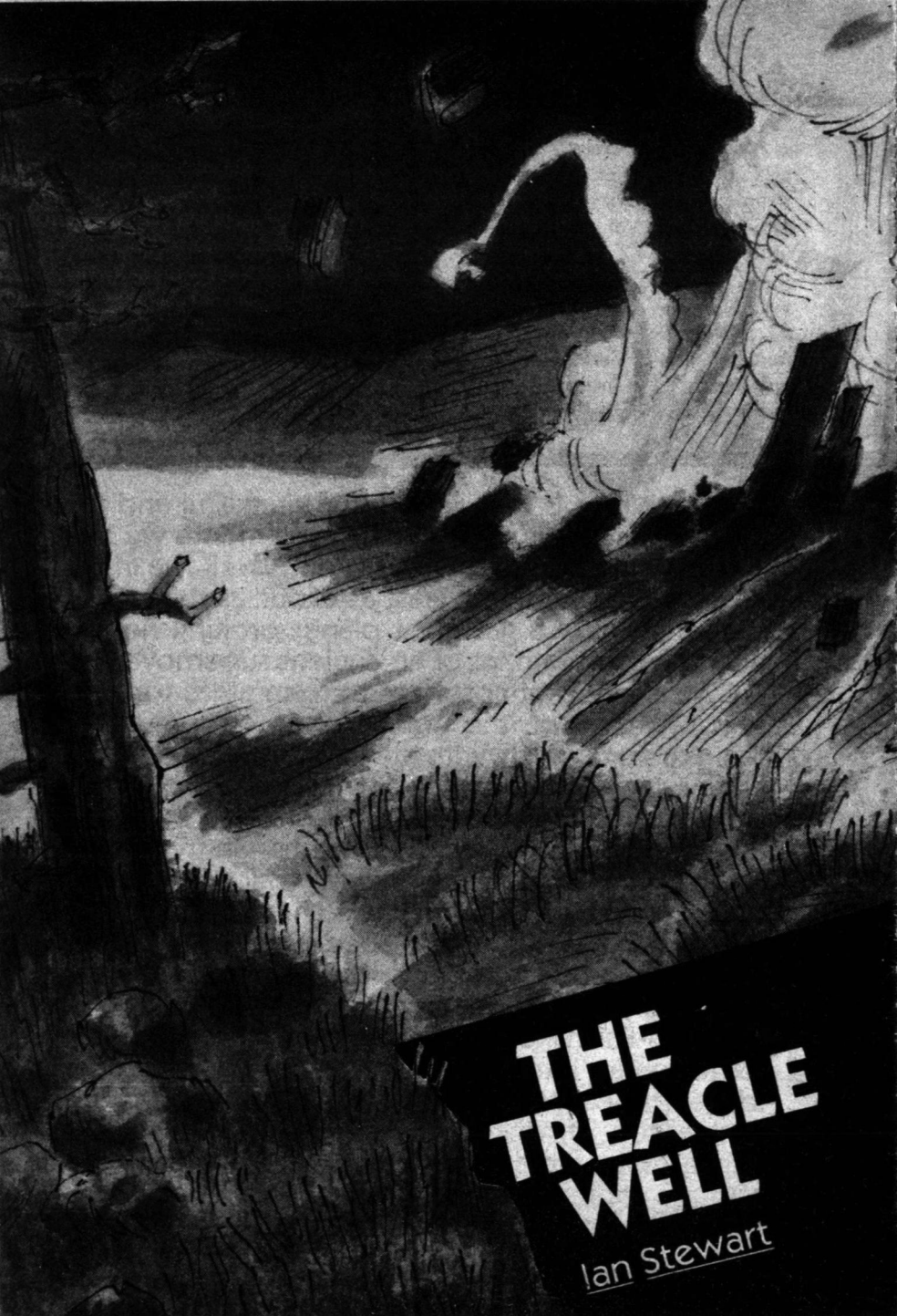
## IN TIMES TO COME

● Larry Niven is well known for his skillful and lively creation of truly exotic locales. Next month we begin a complete serialization of his new novel, *The Integral Trees*, with a setting at least as exotic as that of *Ringworld*. Imagine a gas giant planet orbiting near the neutron star remnant of an ancient supernova, gradually leaking its atmosphere to form a gas torus. The densest part of the torus forms an organic-rich "smoke ring" which, with the help of illumination from a surviving G-type companion star in a more distant orbit around the neutron star, has all the ingredients it needs to evolve its own lifeforms—in free fall, but subject to tidal forces and winds which give the "integral trees" of the title their characteristic shape. Add an exploring human "seeder" ship, its crew divided and dispersed by mutiny, give them five hundred years to adapt in a variety of ways to this most un-Earthlike environment, and you've set the stage for an intriguing tale rich in both action and ideas. The cover and other illustrations are, as befits such a story, by Vincent Di Fate.

The fact article, by Walter B. Hendrickson, Jr., is about a topic familiar to Analog readers—industry in space—but with a significant new twist.


THE
TREACLE
WELL
Ian Stewart


An occupational hazard
of research is that it
leads to unexpected problems.
But those can lead,
in turn, to most
unexpected solutions!
Leo Summers

*"But they were in the well," Alice said to the Dormouse.*
*"Of course they were," said the Dormouse. "Well in."*

I was unwrapping my sandwiches when the phone rang. Before it got a chance to ring twice, I grabbed it—don't dare risk losing an order. "Revitalizing Industry," the Government calls it. *I* call it "Scaring The Pants Off The Workers." But enough of that. I recognized the voice at once—I suppose you could call it "reverberant"; it certainly had a great deal to reverberate *in*. My old sidekick, Oliver Gurney. I enquired to what I owed the honour.

"Business, Johnny. *Urgent* business. I'm placing a trade order for Decal Labs. You do *have* a couple of Säfkow Genetic Sequencers in stock?"

*My God,* I thought. *Those cost forty thousand apiece.*

"We need them pretty desperately," said Olly. I hauled over an order form to note the details and called up delivery schedules on the office micro. You'll have gathered I'm a salesman. I work for a Coventry firm that deals in medical equipment. Nowadays that includes molecular biology; and we're the sole UK agents for Säfkow Biotechnik.

"We could probably manage a week Thursday " I began tentatively.

"That's no good! We want them *now!*"

*"What?"*

"I told you, it's *urgent!* Leave no stone unturned! Top priority!"

"It'll cost you eighty thou, Olly. At least."

"Peanuts!"

I can't say I agreed, but Decal did have some kind of arrangement with Britoil, so maybe they felt differently. CovMed could make good use of every peanut it could lay its grubby little paws on. "I'll do my best, Olly. Where do you want them? Bristol?" That's Oliver's home town. Decal Labs is an "innovative hi-technology" outfit with some pretty weird ideas. Olly is a kind of engineer-*cum*-executive: a rotund and jovial lunatic with a touch of genius in his pudgy fingertips, *when* his inventions actually work. He also has a consuming passion (and I choose the adjective advisedly) for beer. Not any old beer: just the traditional British ales now making a dramatic comeback through the exertions of CAMRA —Campaign for Real Ale. Olly was a founding member.

"No," said Oliver. "Preston." That's on the Lancashire coast, where the Ribble flows into the Irish Sea. I tapped more keys.

"The earliest I can manage is midday tomorrow," I told him. "But it will mean extra delivery charges."

"No sweat. I'll confirm by telex, of course. But just get them here *fast!*"

"What's all this about, Olly?" When Oliver Gurney gets into a panic, I get nervous. Not so long back, he nearly unleashed a metal-eating plague of mechanical viruses on the world; soon after, he accidentally released an electronic analogue of Adolf Hitler into the computer networks. You see *why* I get nervous.

"Sorry, can't say over the phone. 'Bye!" He rang off. My heart sank. It was then that I decided to make the delivery in person. But first I had to make a few calls. The first, to Säfkow's ware-

house in Rotterdam, confirmed that they had a couple of spare geneseeks crated up and ready for dispatch: one was last year's model, a K88; the other an up-to-date K88C. The second was to Croydon Helicargo to arrange urgent delivery to Manchester airport. Geneseeks are far too expensive for us to carry a regular stock; but I'd never let a customer realise that. Then I called up Ted Patchkiss, in charge of UK sales, to clear up the paperwork. He couldn't believe it, even with the telex in his hand: we usually take *months* to sell that sort of equipment, having to arrange demonstrations, haggle over prices, you know. But he didn't let his disbelief prevent him authorizing the use of a helicopter and a company van. Profits are profits. He authorized a rail ticket for me, too. Second class. Profits must *remain* profits.

I picked up the van and a driver at Manchester airport just after five o'clock the next morning, after an uncomfortable inter-city ride from Coventry. Croydon Helicargo landed soon after, and by the time I'd got customs clearance and we were on the road it was ten o'clock. Maybe Decal would give me a bonus for early delivery.

I'd been to Preston once, for a Medical Research Council conference. (Selling, not participating.) It's a big, brash Lancastrian town, absolutely reeking of "where-there's-muck-there's-brass." And by the degree of reek, it must have an awful lot of brass. The Council Hall is a vast Victorian construction with white marble walls and beautiful green-veined marble pillars, and rows of stern bewhiskered City Fathers gaze severely from gilt frames on the walls. Kind of friendly, though: I could imagine Olly fitting in like a True Northerner—even though he *was* born in Potter's Bar.

But my destination wasn't the city itself: it was Garstang, ten miles north on the A6, set in pleasant rolling countryside on the edge of the Forest of Bowland. At 10:51 precisely we pulled into the gateway, stopping under a sign that read:

BRITOIL/DECAL LABORATORIES UK
GENETIC ENGINEERING
FIELD LABORATORIES
GARSTANG
NO UNAUTHORIZED ADMITTANCE

My visions of Oliver Gurney amok amid the DNA were spine-chilling. And Britoil? That was what the British National Oil Corporation had become when the Tories flogged it off cheap to their rich friends. What on earth did Britoil want with genetic engineering? And as for *Field Laboratories*

The guard checked my credentials and let us pass. Twenty yards inside the van had to pass through a trough of evil-smelling liquid. They made the driver and me get out and wade through the stuff. Disinfectant.

I asked why. They said there had been an outbreak of foot-and-mouth disease in the area. I hadn't realised they used cows in genetic engineering. Or oil production. And there'd been nothing in the papers about any outbreak.

Oliver seemed surprised to see me, although he knows that I'm as curious as a treeful of cats. After shepherding the precious geneseeks off somewhere or other, he hauled me off to his office.

"What's all this twaddle about foot-

and-mouth?" I said. "Oliver Gurney: *what have you done this time?*"

"Me? What makes you think *I'm* responsible?"

"You always are. And you've confirmed my worst fears. Responsible for what?"

"Well . . unh .

"At a guess, you've vented another plague upon long-suffering humanity. *Have you?* Another virus, perhaps?"

"Good God no," he said heatedly. I breathed a sigh of relief. "Bacteria," he added.

"Bacteria?" *Bacteria?*" Hysteria was a better word, but I wasn't listening to myself that critically. "*What do they do?*"

He groaned like a beached whale. "I think I've destroyed the world's oil," he said.

"Oh my God."

"Not *yet*," he said hurriedly. "Only one teensy little bitty oilfield so far. But I'm afraid it may spread if we don't get the stuff under control."

And then he tried to explain.

The trouble with oil is not so much that there isn't enough of it: just that most of it is in the wrong place. The potential value of oil-bearing shale, for instance, has been known since the 1920s—but so has the problem of waste-disposal. If you dig up shale, and heat it to get the oil out, it expands; so you can't stuff it all back down the hole again. You *can* heat it underground, but that's too expensive.

So the oil companies are trying other methods, notably biotechnology. Tailored bacteria that live on oil and produce . something useful. Oliver Gurney, never slow off the mark in a new field, had got Decal Labs involved in a project to build bacteria capable of converting the heavy, tarry oils into more volatile ones, possibly even natural gas. These would seep into cavities bored in the shale, to be extracted by steam pumping or natural pressure. During the last year they'd managed to produce a bacterium that gave good results in lab tests, and Britoil had given the go-ahead for a small-scale field test, seven thousand feet down in the Lancastrian shales.

"We made some bores," said Oliver, "fed the bacteria down the tubes, and sat back to await results.

"The first result wasn't quite what we expected: the bacteria decided to *spread*. They showed up in the Morecambe Bay Gasfield. God knows what they think they're *doing* there, but it put them into the domestic gas supply and they could be *anywhere* by now.

"Apart from that, they didn't seem to be doing anything much else at all. We certainly weren't getting any volatile oils or gas worth speaking of.

"Last month we decided to take some new cores for analysis. Last week we got down as far as the shale strata. Yesterday we got the results. That's when I telephoned you, because we need to mount a crash programme to find out what went wrong with the bacteria's genes. Maybe then we can cure the trouble."

"What trouble, Olly?"

"Um. Well, it turned out that those bacteria *were* doing things after all; changing the jolly old oil like billyo. But *not*, I fear, into lighter oils."

"What *exactly*, Oliver?"

He stared blankly, like a candidate for the Electric Chair. He said:

"Treacle."

As the van took me back toward Manchester I brooded on the prospect of the world's oil turning into treacle. Damn it, I don't even *like* treacle. Olly might at least have turned it into after-eight mints.

It wasn't really treacle, of course. But the tailored bacteria did produce a mixture of sugars in a semi-solid, rather sticky form. Treacle—especially Oliver's version—doesn't pump too easily; and you'd be hard put to run a car on it. The energy's there, I guess: sugar *burns* efficiently. For a moment I had a vision of myself pulling into a filling station. The sign didn't read "Amoco," "Mobil," or "Shell," though: it said BRITISH SUGAR CORPORATION. Just down the road was another one saying TATE & LYLE. The pump-attendant was carrying an enormous pair of sugar-tongs, and the pump was actually a large bowl. I was saying "Five lumps please, and can you check the tyres?" I suppose it wouldn't be like that exactly, but it was an unconvincing scenario all the same.

Two days dragged past. On Saturday, Olly phoned me at my home number.

"Johnny?" Thank God he didn't call me "Jonathan"—he only does that when he's trying to pull a fast one.

"The very same. And how is the Kandy King this fine afternoon?"

A cavernous groan. "Up to his neck, old son. It's no laughing matter! I need to come up with at least half an answer fast. I need someone to talk to that I can trust—someone not too closely involved. You."

"But I know absolutely nothing about bacteri—"

"All the better. A responsive wall, ideas off which to bounce, is what I need. Can you get over here right away?"

I supposed I could, provided he explained where he was. He said, "Fine. Do you know Piddingford?"

"No."

"Small textile town just east of Manchester off the B 6107. There's a marvellous pub I've just discovered in the main street, name of the *Potted Dormouse*. I'll meet you there at opening-time. See you." He hung up.

Trust Olly. The world's main industrial feedstock and energy source was turning to treacle all around him, and he'd found a new pub. He dotes on beer like a mother moose on her moslings. About the only thing he doesn't do is make it himself which gave me an idea. It might help cheer him up to do just that. So I nipped into the big Boots in Coventry precinct and bought him a beer-making kit: dried hops in a poly bag, a can of malt, yeast, gelatine finings—the lot. "Moreby's Traditional Old English Ale," the label said. It *looked* the sort of thing that might appeal to him; and if I'd got rubbish by mistake, he could release some tension by telling me so in his usual inventive fashion.

I headed northeast on the M6 for Spaghetti Junction and Lancashire.

From the outside the *Potted Dormouse* was, to say the least, unprepossessing. A dull grey stone box, with a tatty sign more closely resembling a pig

in a fur coat; and paint peeling from its window-frames in repulsive shreds.

From inside it was a bit better. Bare wooden floor, the same stone walls. A large and empty grate. Old bobbins and shuttles decorated the walls, mostly woodwormy and chipped. A few venerable Lancastrians eyed me stonily across their beer-mugs. It was dark and cold. I spotted Olly, hunched in a corner with his overcoat on.

"I thought this was supposed to be a marvellous pub, Olly? It looks like Death before anyone even *tried* to warm it up!"

He shoved a pint into my hand. "Try that."

I sipped gingerly, in case there was a dead cat floating in it. Actually, it wasn't bad. Come to that, it was pretty good. In fact—

"Fosdick's," said Olly reverently. "Do you realise, Johnny, that there are only two pubs in England that sell draught Fosdick's? It's a miracle there are any at all, yet it's a beautiful brew. Small brewery, couldn't compete, going downhill fast: rescued in the nick of time by CAMRA."

I sipped again. "I agree the *beer* is good, but—"

"Beer good: pub good," said Olly. His life's philosophy. "Anyway, once Elsie's lit the fire, it'll be quite cosy. You'll be surprised." A large, pleasant-faced woman was laying newspaper in the fireplace: I hadn't noticed her come into the room.

Olly sank his pint; ordered two more, one for me. Then he leaned forward and began to talk in a low, urgent voice.

"We've found out what went wrong. One batch of bacteria got two sequences of codons transposed. Then Murphy's Law got in on the act: that particular batch could survive much better in an oily environment under pressure, and it started to displace the others. And it was producing sugars, not light oils.

"The question is, what do we do about it? I've got one group looking for an effective antibiotic, but so far the little beggars have proved resistant to everything from penicillin to prontabulyn. We're trying every antibiotic that the pharmaceutical companies have invented: oil wells don't care much about side-effects." He looked ready to cry into his beer—but of course he'd never *do* that, it would ruin the taste. "I'm stuck, Johnny."

"Too true."

He flinched visibly. "It may seem funny to you, but I can assure you it soon won't." He knocked back the last of his pint, and Elsie brought two more. Mine were lining up on the table: I'd been so intent on Olly's tale that I'd neglected my drinks. I took hasty steps to rectify the error.

By nine the fire was crackling amiably, the bar was crowded, and the *Potted Dormouse* was starting to live up to the first half of its name. In particular Olly and I were well tanked, and life seemed temporarily more rosy.

During a lull in the conversation, I remembered Olly's present, the beer-making kit. It was in a bag, and I'd put it on a shelf over Olly's head until the moment was ripe. And promptly forgotten about it. I said, "Hang on, Olly: this will cheer you up," and got shakily to my feet. As I reached for the bag, Elsie brushed past and jogged my elbow. The bag tipped forward.

I suppose the lid of the malt tin was loose. At any rate, there was a funny strangled "gloop" sound, and the tin upended itself, to land on Olly's head. Sticky malt trickled slowly down his face and arms, and even—o horror!—into his beer.

He reached up angrily and pulled the tin off his head. This was a mistake, as it was still upside down, and it merely added to the mess.

I knew he was going to kill me.

He turned the tin in his hands, leaving sticky spiderwebs behind him as it moved. He looked blankly at the label: *Moreby's Traditional Old English Ale*. Something was adhering to his left ear: he removed it and stared blankly at that, too. It was the packet of yeast.

His face changed. It was most peculiar. I couldn't recognise the expression at all, but an explosion was surely imminent. I wanted to run away, but I couldn't move a muscle.

The vision rose slowly to its feet, and spoke. "My God, Johnny," it said through a fringe of syrup. My heart shrank to the size of a pea and stopped beating. Time hung suspended, the bar was silent. "You're you're a ." I waited for the worst: Olly has a colourful line in invective. "Jonathan Forth, you are an absolute . *GENIUS!*" A rotund, syrupy mass—Winnie-the-Pooh meets Tony-the-Tiger—hurled itself across the table, scattering glasses of beer in all directions, and embraced me in a bear-hug.

I fainted.

The next thing I clearly remember was Elsie leaning over me, mopping at my sticky shirt with a damp cloth. Oliver had gone. Even though I paid for the damage, it was made clear that as far as Oliver Gurney and I were concerned, there was now only *one* pub that stocked draught Fosdick's.

The other one.

I tried for more than a month to find out where Oliver had disappeared to, but without success. It was all very frustrating. North Sea oil was turning to treacle, and I was a genius because I'd tipped a can of malt over Oliver Gurney's fat head.

Then, when I'd abandoned all hope, he called. Wanted me over at Garstang—which for weeks had denied all knowledge of him. Wanted to show me how my idea was working out.

*My* idea?

I went. But I was wondering whether a one-way ticket to Paraguay might not be a better plan.

He was pleased to see me, but he seemed a bit apprehensive. I tried to apologise about the malt, but he wouldn't hear of it. "Nonsense, Johnny, nonsense. A *brilliant* stroke!" He refused to explain further, but dragged me into a Land-Rover, and we set off across the fields. There was a cluster of derricks about eight fields away, and when we got near them, Olly stopped and began off-loading pieces of equipment from the tailboard. Occasionally looking at his watch, he fitted the pieces together, plugging the lot into an electrical outlet on the side of the Land-Rover. Then he started the motor—I suppose to power a generator.

"Ten minutes to go, Johnny," he shouted over the roar of the engine. "Cross your fingers."

I crossed everything I could think of

and wished I was a centipede. The minutes passed.

"Olly, what—"

"Shhhh! Can't you *feel* anything?"

"Only my stomach churning, Olly. I wish I—" Then I *did* feel something: it had been masked by the vibrations of the Land-Rover. The ground was shaking. With a sound like seventy-six million trombones, a white torrent sprouted from the ground ahead of us and shot skywards, to break at its apex into a mass of foam.

"Thaaar she bloooows!" screamed Oliver. Before I could suggest that that wasn't quite the right phrase, we were both enveloped in bubbling froth. Oliver scooped some into a funnel and rammed it into a spout on top of his pile of instruments, studying the dials intently. Whatever he saw must have pleased him, because he started jumping around like a garden gnome that's just had a win on the pools. He scooped up some more foam, and crammed it into his mouth.

"Yugh! But by God it's powerful stuff! Try some!" I did, hesitantly; I had nothing to lose anyway. The taste was appalling, like moonshine brewed from British Rail mashed potatoes. But the warm glow in the gut was unmistakable. We danced in the alcoholic rain along with the drilling-crew, and were soon all emulating the proverbial drunkenness of the newt.

So now you know the true story of Britoil's remarkable new shale-oil-alcohol fermentation process, currently earning Britain billions of pounds in foreign licences. It's based on the well-known fact that yeast ferments sugar into alcohol. Alcohol is an excellent fuel: for years the Americans have mixed it with gasoline to make "gasohol." We British will shortly be marketing "petrohol": which we haven't been able to produce before, lacking spare agricultural land on which to grow sugar-producing plants.

My clumsiness with the beer-kit had given Olly the idea of developing a tailored *yeast* that would work seven thousand feet underground, with "treacle" as its feedstock. The really neat part was that fermentation produces carbon dioxide, and the pressure from that helps pump the alcohol up to the surface.

It's not *that* straightforward, of course: there are plenty of technical snags. But they're all routine. It was "my" idea that cracked the problem.

So I'm a rich man now?

Sadly, no.

"My" idea was really Olly's. *His* ideas are really Decal's. And Decal had leased patent rights to Britoil during the horsetrading that got them the go-ahead for the project.

Decal has now developed an antibiotic for the treaclifying bacterium, so the world's oil fields can be debugged at will, making the process practical. Unless a resistant strain but away with pessimism.

What actually gave Olly the greatest satisfaction, though, wasn't our audacious solution to the energy crisis at all.

It was an entry in this year's *Real Ale Guidebook*, written by Dick Boxtop himself. Oliver Boswell Gurney has gone down in the annals of recorded history as the first man ever to have drilled a well

and struck beer. ■

# On Gaming

## Dana Lombardy

Many of you have personal computers. Many more of you may be considering buying one for your home.

In addition to the word processing, filing, finance, and other practical-application productivity programs available for personal computers, a huge variety of game software exists, for use with nearly every model of computer. Games may not be the main reason for buying a computer, but they can be intellectually challenging and offer entertaining diversion.

In 1982 over 400 different game programs were released by 81 software companies. This year about the same number of new games will be introduced. With such a welter of product to choose from, how do you find the games that are "best"—that is, offer best graphics, best playing, and best value for the money?

To help you, at the end of this article is a list of computer games compiled in late spring from wholesaler "hot seller" reports. Each of these titles has appeared continuously on such lists for at least six months.

Wholesaler lists are probably the best way to judge how games are selling nationally, which is why the stores you are likely to buy from use them to guide their own selections. Wholesalers buy and sell programs in vast quantities from many publishers. Since they collectively deal with thousands of stores and departments nationwide, wholesalers have a detailed day-to-day knowledge of the products they sell and of who buys what.

The majority of new computer games come and go quickly. Word-of-mouth and published reviews have helped the following 27 games to become "classics," if such a term can be used in so new a field as personal computers.

Some of the programs are arcade-style action games, such as *Frogger* and *Pac Man*. Others are adventure games, such as *Wizardry* and *Starcross*. Some include features of both action and adventure designs, such as *Aztec* and *Mask of the Sun*.

Rather than rank games by dollar volume or number of units sold, the list gives them alphabetically. It's more important to recognize that a game has remained among the top 50 in a fast turnover market for so long—not which one is currently "Number One." Information includes game title, publisher, and compatible personal computer in parentheses.

*Ali Baba & the Forty Thieves*, Quality (Apple, Atari)

*Apple Panic*, Broderbund (Apple, Atari, IBM)

*The Arcade Machine*, Broderbund (Apple)

*Aztec*, Datamost (Apple)

*Canyon Climber*, Datasoft (Apple, Atari)

*Centipede*, Atari (Atari)

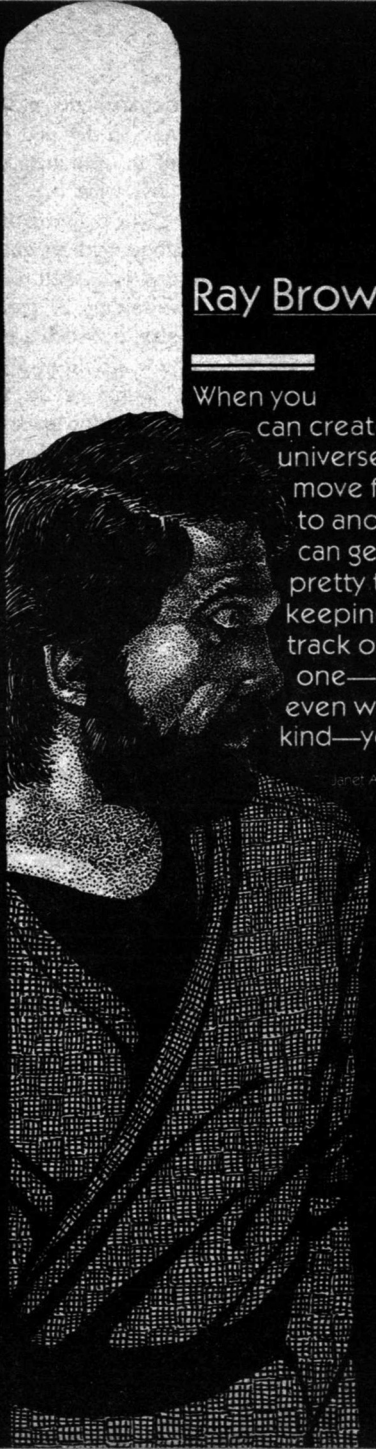
*Choplifter*, Broderbund (Apple, Atari)

*Crossfire*, Sierra On-Line (Apple, Atari, IBM, VIC)

*Deadline*, Infocom (Apple, TRS, Atari, CP/M, IBM)

*Frogger*, Sierra On-Line (Apple, Atari)

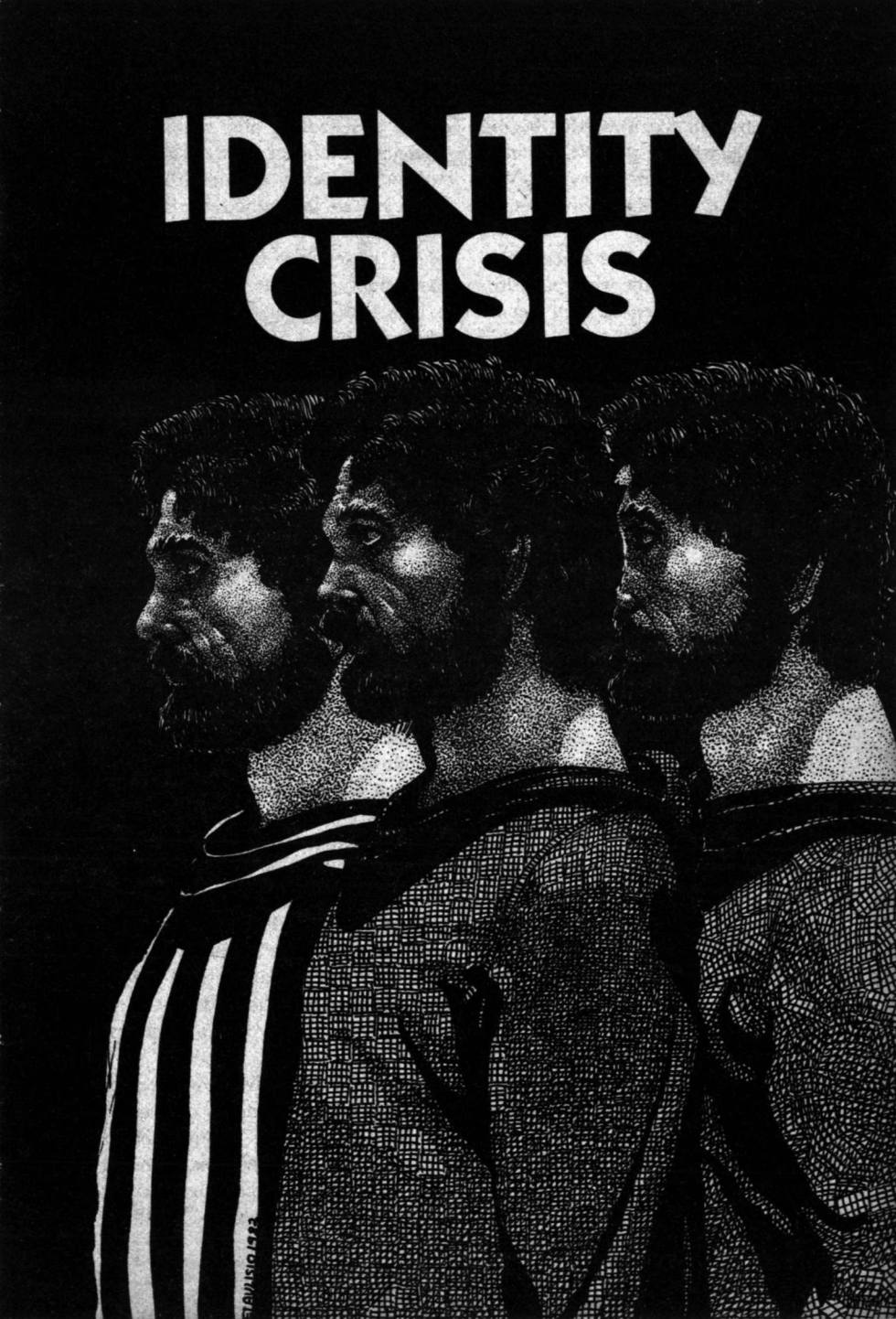
*(continued on page 95)*



# Ray Brown

When you
can create
universes, and
move from one
to another, it
can get
pretty tricky
keeping
track of which
one—or
even which
kind—you're in!

Janet Aulisio


IDENTITY
CRISIS

On the third night after Regulus had vanished from the sky a cheerful, buxom little redhead whose clothes were painted on stopped Jacob Huntziger on DeWitt Street to ask if he'd like to have a really good time.

Jacob was unsure. Her voice was a pipe pitched almost the way some drill sergeants pitch theirs, so they can be heard by the men in the rear without straining their lungs. On the other hand, she had to do something to be heard through the noise.

Finally he decided against it and, in answer, pointed to the shiny gold crescent on his collar.

"What's that supposed to mean?" she squeaked. "Are they castrating officers now?"

"We're supposed to be above all this," he yelled.

"Then what are you doing down here in the first place?"

She had a point. Jacob gave in and asked, "Your place?"

She nodded, took him by the hand, and led him down the street.

Octopus Bay, he noticed for about the thousandth time, was no longer a quiet city of outwardly devout Reformed Sufi overachievers. It had almost completed its metamorphosis into an army town; and since Jacob had been born and raised in Octopus Bay, he wasn't very happy about it. Most of the buildings in this end were saloons and crude copies of the expensive bordellos and mood shops of Earth a century or more ago. There were mechanical barkers at every door and the din was stupefying.

They turned the corner at Erdman Avenue and after a few steps the woman led him through the doorway of a glittering whipped-cream front that produced a seductive alto speaking at deafening volume of the most beautiful women not merely of Alpha Centauri Four, but all the settled worlds. She slammed the door behind them and activated the seal, and the noise level fell considerably.

They both stepped forward and were reborn in a hall of holostages displaying the most beautiful women of all the settled worlds performing their specialties. By that time Jacob had decided he loved the little redhead and he looked for her among them, but couldn't find her. He didn't have much time to look, though, because she pulled him with her under another ceiling transmat unit, and they were reborn in a room so thick with hangings the walls were invisible.

Jacob was offended.

This was, after all, the same transmat which made instantaneous travel between the settled planets possible—the machine which vaporised the body at the transmitting end in the process of scanning and recording its most probable subatomic state, and thus made true Rebirth possible at the receiving end. There was a time when they had tested men with the transmat to see if they were infidels—infidels claiming, illogically, that when you're destroyed in the transmitter you're dead for good and the fact that a duplicate is made in the receiver doesn't make you a whit less dead.

Good Reformed Sufis know that man, body and soul, is ultimately only information, and welcome the transmat as a test of faith, but the ostentation of using one to travel from room to room bothered Jacob. It was crude—something

only the new rich did. It cheapened Rebirth somehow.

Also, he suspected, it kept the customers from seeing anything except what the management wanted them to see.

The redhead gestured for him to follow her behind an abstract tapestry for yet another rebirth. He sighed, followed, and was nearly blinded by a bright light that suddenly flashed in his face.

Then he realized there was another reason for the transmat set-up: to confuse the Church Police. He was about to get rolled.

Through the light he could dimly make out the form of a man advancing, blackjack raised high—too fast to get his pistol loose.

For no discernible reason the man stopped short. Jacob fumbled with his holster.

A surprised voice said, "Jake! What the hell are you doing here?"

The light dimmed. Jacob blinked and brought the figure of the man with the cosh into focus: loose blue robes with the blue badge of the Manifestationists over the left breast, and atop that a fat, clean-shaven, schmoo-ish face.

"Eads!" he cried. "Earl Eads!" He lifted his hand from his still-holstered gun and offered it to the man, who shook it.

"Looks like you bagged the wrong badger, honey," Earl said to the redhead, who had reappeared from behind a curtain. "I don't want to bruise a home boy."

He threw the blackjack on a pile of cushions, and his whole demeanor magically changed. His shoulders slumped to a comfortable position. He no longer strutted. His cheeks seemed to grow fatter and the speech coming out of them more refined.

"I think we've garnished enough anyway, Viola," he said. "I feel like drinking, and there's a good bar downstairs. Do you want to come, Jacob?"

"Sure," Jacob said. "I could use a drink, after the scare you gave me."

Earl pulled a curtain back, revealing a dial. He reset it, and they all marched under the ceiling machinery.

They were reborn in a roomy, well-lighted beer hall. The bar was lined with long-faced men staring at a holostage suspended where, in other places, a mirror or a picture of a naked lady would be. Scattered among the men were a few of the most beautiful women of all the settled worlds.

"Hey," Jacob said. "I've been in this place before. This is a Manifestationist hangout, isn't it?"

"That's right," Earl said. He guided them to what Jacob remembered was Earl's favorite table in any establishment—the one smack in the center of the room. They sat and punched out their orders.

"So," Jacob said, "what were *you* doing up there?"

Earl grinned and pointed at his blue badge. "Taking up a collection," he said.

Jacob shook his head. "That crazy sect of yours is going to get you jailed someday, Earl."

"Nothing crazy about it. A lot of our old buddies are Manifestationists now."

"I know," Jacob said, sadly.

Conversation lulled for a while, and

Jacob watched the bar's holostage. He was too far away to hear the announcer clearly, but he didn't have to—the newscasts had been full of the Regulus story for the past three days and they were getting repetitive. He'd already heard everything the authorities had to say on the subject, and what it boiled down to was that the three-star system had simply disappeared that night. No nova, no previous sign of anything funny going on. One second it was there, and the next it wasn't.

The holostage showed a bright point of light (just one) being enveloped by a black cloud suggestive of a claw. Then a quivering question mark. Jacob knew they were rehashing the dust cloud theory, which had been accepted for about the first twenty-four hours, until the experts started to recover from their astonishment and asked: "Where did this dust cloud come from? They're not produced out of thin space." The bullshit had come thick and heavy ever since.

The redhead spoke at last. He was pleased to find that her voice was actually a mellow soprano.

"I've been watching the news a lot lately," she said, "and I haven't once heard the real reason for Regulus' vanishing."

Jacob made a face and Earl said, "Notice, Viola, that my friend Jake doesn't believe things have real reasons."

"OK," Jake said. "I'll bite. What's the Manifestationist theory?"

"It's a warning to us," Earl said. "A warning to refrain from the blasphemy of this Paracelsus mission. Look at the timing. How far away from Paracelsus are we now?"

"We'll be there the day after tomorrow," Jacob said.

"You see?"

"But .."

They were interrupted by a waiter bringing their drinks. The waiter also wore the blue badge, and Earl tipped him heavily.

"It's silly, in a way," Earl said when the waiter had gone. "All this fuss over something that was never really there in the first place."

"Well," said Jacob, trying to sound sarcastic, "since nothing is really here in the first place, and since it's human nature to fuss over something, it follows we have to fuss over noth—"

Another interruption: a lanky fellow with a knotted forelock entering by the front door, yelling "EARL!" and waving. Earl brought him to the table and introduced him.

"My good friend Al Tidrow," he said. "A reformed Sufi Adept, obviously, and, though not a Manifestationist, a member of the Alliance of Concerned Churchmen, at least."

Tidrow scowled at Jacob. "Damn," he said. "A real, live colonel."

"Lieutenant colonel," Jacob corrected automatically.

"Are you on the Paracelsus Mission, warmonger?"

Jacob found himself getting pissed off at Tidrow's attitude. He stood up and yelled defiantly, "Not only that, but I'm on Isaac Bentz's personal staff—the Celestial Master to whom *you* of all people should have pledged your allegiance!"

"Calm yourself please, both of you," Earl said soothingly. "We are discussing Paracelsus. Please, sit."

They sat.

"And how is the Celestial Master?" Al asked.

"He's in good shape, physically," Jacob said.

"Let's be grateful for that," Earl said piously.

Tidrow looked annoyed, but let it pass and asked Jacob, "How does a man like you come to be in this place?"

Earl answered for him. "Jake and I have known each other from childhood," he said. "Unlike most of the uniforms you see around here, he's a native. And he's not quite the warmonger you think he is. Actually, he has certain reservations about this so-called jihad."

Tidrow relaxed a bit and punched an order. "That so?"

"Smart career men have always been opposed to getting into wars they can't win," Jacob said.

Tidrow looked shocked. "You don't really think Paracelsus can prevail against the spiritual force of the Celestial Master himself, do you?"

"Wait a minute," Jacob said. "I thought you were *against* the war."

"I am. Just because the CM is a powerful spiritual force doesn't mean he's a good one. Explain yourself, please."

Jacob clutched his head and rocked dramatically. "There are too many factions around here," he said. "I can argue with a Manifestationist—but to argue simultaneously with a Manifestationist *and* a real person "

"Very witty," Earl said, scowling.

"I'm serious about wanting an explanation," Tidrow said. "I've never heard the jihad attacked by an officer before."

"OK. But before I do that, why don't you tell me what you think of Paracelsus."

Tidrow shrugged. "It's the inevitable next step in our religious and racial evolution. Given that we are all information—and that idea's the very basis of Reformed Sufism—then it seems only proper that we try to live in the state that's closest to being pure information."

"I don't see how that follows," Jacob said, "but that's not what I meant, anyway. I'm talking about Paracelsus' military capabilities."

"Whatever those capabilities are, they can't stand against the power of the CM," Tidrow said sadly.

"That's the kind of answer I've come to expect. The whole issue is pumped so full of religious feeling, nobody can look at it straight."

"I'm sure you'll set me straight, Colonel."

"That's right. To start—the only two people to return from Paracelsus since the trouble started are the CM and Adept Bulgakov. The pictures they paint of the place are very different, but if you take out the editorials, you'll find the facts usually match.

"In the first place, the Paracelsian universe didn't come into being as the result of any great religious plan. The planet was a base for medical researchers. They discovered a way to record the information coming from a transmat and store it in a computer, as a self-programming program, where they'd operate on a person by editing the information. In effect, a person lived in that machine with a body that was a stream of electrons and only the illusion,

if he chose it, of a physical body and a physical world. But the Paracelsians found certain things about living in this way so advantageous they rejected the bodies God gave them and they all moved in . . ."

"Now *you're* pumping it full of religious bias," Tidrow said. "And I must answer that that makes the Paracelsians *better* Reformed Sufis than us."

"The CM and I happen to think the idea's kind of creepy."

"Please," Tidrow said coldly, "go on with your tale."

"OK. Isaac Bentz got sick and went there. When he found out he was actually a program, he decided he didn't like it and wanted to leave. The Paracelsians wouldn't let him. Bulgakov said that was because they'd discovered a mental condition they wanted to treat first. The CM says living in such a place leads to spiritual degeneration and they did it out of pure cussedness. But whatever you believe, the fact is that they *did* hold him against his will. So they certainly can't be very scared of us.

"And they have good reason not to be. Electrons move so much faster than nerve impulses that they can live a thousand times faster than we can. Bulgakov and Bentz both made that point. When they shut off the transmat to their planet, they knew the nearest inhabited world was three years away by our fastest ships. They knew they were giving themselves what amounts to three thousand years to prepare for us. We can't even imagine how far they've advanced in three thousand years! Why, three thousand of *our* years ago, the Greeks were still taking Zeus seriously . . ."

Tidrow interrupted in a voice hoarse with emotion.

"So you don't believe Paracelsus should be an example for all RS. You don't even care that if the Paracelsus Mission is successful, millions of innocents will be killed. Your opposition to the war is based solely on fear."

"Call it fear if you like," Jacob said. "I call it a realistic professional assessment."

Tidrow turned red. He looked as if he were about to choke to death.

Earl clapped him on the back. "Calm down, Al," he said. "We're all good Reformed Sufis here, whatever differences we might have. There's no reason why we can't discuss those differences without hard feelings."

"That sounds strange," Tidrow gasped, "coming from a sect that bangs people on their heads and rifles their wallets to support itself."

"But there's no malice in it," Viola objected.

"And you're getting yourself upset over nothing," Earl added.

"That's right," Tidrow said bitterly. "The death of millions is nothing to a Manifestationist."

"You must remember," Earl said pedantically, "that there's really no question of killing them. We are dealing here solely with a phenomenal bombing of a phenomenal Paracelsus, to be opposed on the grounds that it is a sacrilege. There can be no question of harming the noumenal Paracelsus—it's impossible."

Jacob suppressed a smile. He liked Earl, but in his opinion the Manifestationists were the most wigged-out of all the parties in the antiwar Alliance of

Concerned Churchmen. They didn't believe in the reality of the war. In a sense, they didn't even believe in their own reality. The CM and Bulgakov had both reported that the Paracelsians could create independent electronic entities—new people—and set them playing in a "world" that could be isolated from the rest of their computer-universe. The Manifestationists believed that the inhabitants of the settled worlds were really in such a "world" in Paracelsus and that they were such creatures. So for them, everything was turned inside-out. The noumenon was a computer, and "matter" was created by the interaction of its programs.

Though Jacob thought they were nuts, he also thought they were harmless, outside their tendency to violence. Tidrow took them more seriously. He immediately began lecturing Earl on the danger his assumptions put "the movement" in, and they wandered into a complicated theological argument that gave Jacob twenty minutes to contemplate the foolishness of religious factionalism.

After twenty minutes of it the bartender decided to turn off the holostage and turn on the music. "When You Wish upon a Star"—a big hit for the past three days—blared out at full volume; Jacob could barely hear Al and Earl and so lost even that mild amusement.

"Excuse me," he said in his command voice. "I'd like to stay, but "

Al's and Earl's heads were shoved together—almost touching. He leaned forward, and could barely hear Earl saying, "How can you still doubt after they turned off Regulus?"

They'd forgotten anyone else was at the table.

So he said goodbye to Viola and left.

It was even louder outside, of course, and to make things worse he saw his boss, Brigadier General Yuan, not four meters away, walking straight towards him.

"JAKE!" he boomed.

Yuan grabbed his arm with a pudgy hand and pulled him down Erdman Avenue in the direction of the Reformed Sufi Meditation Center. The noise level dropped a few decibels when you went that way, so Jacob figured Yuan intended to talk with him.

He studied Yuan as they walked, wondering what was going on. The general was an amiable man who had absolute faith in the ability of the Octopus Bay army to destroy whatever the universe could throw at it, so his usual expression was one of amused self-assurance. It seemed no different now. But something odd was going on. Yuan was married—*really* married, and rarely seen in these parts.

When they were far enough down Erdman that they could hear each other, Yuan released his grip on Jacob, slowed his pace, and said, grinning, "You must not have known you were under surveillance."

*Oh, shit!*

"No, I didn't," he said aloud. "What for?"

Yuan shrugged. "Just one of our random security checks. Just happened to be your night. Quite an eyeful, that redhead. You must introduce me sometime. What's her name?"

Jacob had the feeling that he'd be

getting people into trouble if he answered. "Gee," he said. "I didn't even ask. It was one of those spur-of-the-moment things. You know."

"Hmm. Really not very discreet of you to be seen going in with her in uniform. You should plan these trips. What are you staring at, Huntziger?"

Jacob felt his face grow hot. He jerked his eyes away from Yuan's forehead. The general was also an Adept, and like all Adepts wore the knotted forelock. But since he was totally bald he bought his forelock—a strawberry blond one—at the church store, and always pasted it on carelessly, so that it flopped in and out of his eyes with each step. It was hard to avoid staring rudely.

"Sorry," he said. "Are you taking me to the Meditation Center?"

"Yes. The CM wants to see us."

"What's going on?"

"He's having a little get-together," Yuan said. "A sort of goodbye party to Aycee Four. For a few of his favorite people from his personal staff."

"I'm not uh, we've only met a few times. I'm only nominally on his personal staff, because I'm assigned to the bridge with him on the command ship for the Paracelsus Mission. He barely knows me."

Yuan shrugged again. "You were invited."

They walked along in silence for a while, giving Jacob time to work himself into a little religious paranoia. He'd been raised to believe the CM was to be venerated. The CM was over 170 years old, thanks to a clone-and-memory-transfer operation, and likely to live at least fifty more, thanks to Paracelsus. He was wise. He was the founder of the religion Jacob followed. He was holy. And Jacob had the audacity to criticize his mission! Jacob was damning himself.

He decided to distract himself with conversation. "Just think," he said idiotically. "Only the day after tomorrow we leave."

Yuan grunted, squinting past the bright city lights skyward in the direction of the star Paracelsus orbited. Jacob looked there too, but nothing dimmer than second-magnitude was visible.

"Three years," the general finally said. "Three years of trying to keep the men in order in the middle of this pleasure garden. I tell you, Huntziger, the damned transmat is the greatest threat to military discipline since they invented politicians."

Jacob opened his mouth to speak, and the general waved it shut. The Meditation Center loomed in view and they started up the walk to the back door.

"Oh, I know," Yuan said. "The transmat is the Test of Faith—but you will permit me this little heresy, eh?" He winked. "Here we sit on Aycee Four while our ships plod along at less than lightspeed, waiting for them to get close enough to Paracelsus. Because we can get reborn there instantaneously, General Percy decides everybody should stay here until it's time to go into action. Good for morale, he says. Well, I say it's *terrible* for morale. How can the troops have a sense of mission when they train for six hours a day, like it was a regular job, and then come out each night to this?"

They reached the back door. Yuan plunged in his code key.

"It's a good thing the officer corps

is immune to that sort of thing, eh?" Yuan added hastily.

It was a very quiet, decorous party. Bentz's top-storey apartment was jammed with antiques, and everyone moved carefully.

Jacob looked in vain for someone of lower rank. There was one other light colonel; all other collars shone silver, including Bentz's. The CM was also a general and, though he didn't make strictly military decisions, he *was* the boss, so it took finer reasoning than Jacob was capable of to decide whether or not the rank was honorary.

Bentz looked more like a military man than Jacob did. His thick body filled out the uniform. His blocky face carried an expression of command practiced for over a century.

He was standing before a small oak secretary bearing an antique manual typewriter. He was surrounded by generals. He was indulging in a rhetorical argument. Jacob had heard rumors of this habit—since no one dared to contradict him, he pretended someone had and argued anyway.

"Of course," he was saying, "it seems obvious to you that the virtual immortality Paracelsus offers is a wonderful thing. But if you think about it you'll see that this kind of immortality is a wonder only in the way Hell is a wonder. You live in a man-made universe, walled off from God's, so you're limited to experiencing only those things a man can think of. Since you're there forever you're doomed to repeat yourself endlessly, eventually becoming confirmed in your evil and incapable of recognizing the fact . . ."

Bentz spotted them and waved, yelling, "Yuan! You and the colonel must join us."

They walked over. Bentz grabbed a stack of paper from the secretary and waved it about.

"I've about finished the *Pinocchio* paper, Yuan," he said.

"Excellent, Isaac," Yuan said, gulping and nodding.

Bentz whirled around to face Huntziger, smiling kindly.

"You look confused, Colonel," he said. "How much religious training have you had?"

"A little," Jacob stammered. "I made Zealator in my study group."

"Then you studied Christianity in comparative religion?"

"They spent more time on that than any other, since you were raised in that religion on Earth."

"And you've seen Walt Disney's *Pinocchio*?"

"Sure," Jacob said, wondering what the hell the CM was getting at. "It's famous. Amazing what they were able to do with such a limited technology."

"I saw it again two days ago," Bentz said, nodding eagerly. "When they started playing that song again, after Regulus vanished. And I noticed something—I was a fool not to have noticed it before—did you know that Jiminy Cricket is Jesus Christ?"

"Huh?"

Bentz grinned at Jacob's confusion. "It's true," he said. "Or at least, he's a sort of combination of Jesus and the Holy Ghost. Remember your Christianity now—and then remember that Pinocchio is a *puppet* trying to become a *real boy!*"

"Yes?" Jacob said, weakly.

"Another piece of evidence is historical—maybe something only I remember. My grandfather was raised in a part of the U.S. that was still very strict religiously, and he never lost the habits of that place. It was a rule that you couldn't call on the name of Jesus Christ unless you really meant it. That is, if you found yourself calling on him in anger, or just frivolously, you forced yourself to say something else instead. What my grandpa would holler in those moments was 'Jiminy Cricket!' Apparently it was quite common at one time. So Jiminy Cricket is a substitute for Jesus Christ. Clever, huh?"

Jacob was dismayed. Christ was recognized by the RS as an important teacher, but was in no sense worshipped. Another rumor Jacob had heard was that the first cause of Bentz's jihad was that he'd lost his ability to change with the times and was reverting to the religious habits of his childhood. This farfetched theory of Bentz's proved his fascination with the topic. It could very well mean that those who said he was in his second childhood were right. He tried to cover his fear with a smile and a nod.

"Of course," Bentz said, "there's a lot more of that kind of stuff in the movie. A lot of it, like the conscience business, is too obvious to go into. I'm writing a paper that lays it all out, though. You think I'm nuts, don't you?"

Jacob reddened. "Not really, sir," he said. "It's just that religion isn't really my specialty."

"Nonsense. Religion's something everybody's an expert on. You mean to tell me the Manifestationists don't have a slant on that sort of thing?"

"Pardon, sir?"

Bentz took Jacob by the arm, shooed two people off a spindly, delicate-looking loveseat, and sat him there. He perched on the arm. Jacob was beginning to feel like a chesspiece.

"I didn't realize until recently that I had a Manifestationist on my staff," Bentz explained.

"If you're talking about me, sir, then somebody's made a mistake."

Bentz smiled knowingly. "Earl Eads," he said.

"Uh yes, I know him. An old buddy of mine. But I must say my connections with the ACC . ."

"The ACC!" Bentz snorted. "A bunch of RS do-gooders so wrapped up in doctrine they've forgotten the most elementary rules." He leaned sharply forward, almost off the arm of the loveseat, and watched Jacob intently enough to give him the delusion that he was being x-rayed.

"That's why it's such a relief for me to be working with the military," Bentz went on in a cheerful tone. "They respect the idea of the hierarchy. So they understand that in the Reformed Sufi Church, the principal rule is allegiance to the Celestial Master and adherence to his word. Right?"

"That's right, sir," Jacob said, forcefully.

Bentz relaxed and leaned back, smirking. "No," he said, "I'm not interested in any of the groups in the ACC except the Manifestationists. And I don't have that much opportunity to get out among the people. I've never met one except for you—uh, I mean I've

never met one. My command and I are kind of isolated ''

Jacob nodded understanding. Among the ''people'' the war against Paracelsus was not popular. People raised in the simple religious dictum that man was information had trouble seeing what was wrong with Paracelsus' application of it. Going out among the ''people'' wasn't as safe as it used to be.

''So,'' Bentz said, ''what do you think of, uh, Eads and his beliefs.'' He winked.

Jacob concealed his annoyance. He decided to try to convince Bentz that he really wasn't a Manifestationist by playing it straight. ''Eads is a nice guy,'' he said. ''His beliefs strike me as laughable.''

Bentz wiggled his eyebrows. ''Really. You've been seen with him and his friends so often I'd hoped you were inclined at least to respect his ideas.''

''Indeed?''

''I'd like to talk with someone who's into it. I believe the Manifestationists might be partly right. Look—you've studied Paracelsus. Do you know what an access code is?''

''Something to do with the way the Paracelsians can communicate with each other in their machine. Right?''

''That's right,'' said Bentz, ''but there's a lot more to it. Each access code is a world in itself. Not only is it a method of connecting these computer programs that think they're people, but it's also a way of keeping them discrete. Each code has enough storage and processing capacity to allow a talented man to build a whole world with its own rules. I was in a code once, for instance, where you stayed on the floor because that was one of the rules, but there was no rule about gravity. You weighed nothing. Follow me?''

''Yes.''

''Another thing I saw them do in these codes was create people. Very convincing ones. I knew they were created only because some of them were historical figures, long dead. They can carry on a conversation. If you insult them they get angry .''

''OK,'' said Jacob, ''I'll grant you that their thesis is possible. But not probable. I don't believe Paracelsus is so good that it could create a world which could completely fool us, which would have the consistency of the natural world, for one thing . .''

''What about Regulus?'' Bentz asked.

''Who knows?'' Jacob answered. ''There have always been natural phenomena nobody could explain. Every time we see something we can't account for, that's no reason to believe we're actually living in Paracelsus. Anyway, the dust cloud might still be the explanation. Scientists have detected dust there.''

''A few scientists claim they have,'' Bentz corrected. ''And a lot more wonder what the hell they're talking about.''

''They see what they want to see.''

Bentz grinned maliciously. His eyes twinkled. ''Maybe they only see what Paracelsus wants them to see.''

''That may be, sir. But let me ask you this: Why would Paracelsus do such a thing?''

''They all think they're good Reformed Sufis, you know. They couldn't stand the fact that I didn't think so, so they concluded I was crazy. Allowing me, in this restricted access code, to

bomb what you guys call the 'phenomenal' Paracelsus may be their way of allowing me to work off my aggressions. That would fit in with their shrinks' warped view of things—they'd tell themselves this Aycee Four was just as good as the real one, and a lot safer for them."

"How can you go on, then, planning for a war against them? I mean—if that's true, what we're doing is meaningless."

"It's a possibility, not a certainty. Paracelsus is Hell—I mean that literally. As long as there's a chance of wiping that Hell out of existence, I'm going ahead full steam."

Jacob was shocked again. Reformed Sufism didn't recognize Heaven or Hell—at least, it hadn't when he was younger.

"Why don't you relax, son," Bentz said. "The strain of your deception is beginning to show."

"Huh?"

"It must be a great strain to keep up this pretense—to have to argue against what you really believe."

"Sir, I am *not* a Mani—"

"I've been told," Bentz interrupted, "that the Manifestationists get funds by robbing people."

"That's true."

"I've also been told that they think the Paracelsians are so proud of them, as creations, that they take them out of this restricted access code when they die and make them full-fledged members of their society. So they don't have to worry about what they do in this world. They needn't work at perfecting the soul. Nothing they do here counts. Any lie will be forgiven. Any betrayal will be forgiven."

*So that's what's bothering him*, Jacob thought. And that meant there was no way he could convince Bentz that his intelligence was faulty.

"It's too bad the Manifestationists think this war's a sin," Bentz mused, almost to himself. "With their attitude, they'd make great soldiers."

Jacob pricked up his ears at that. He saw in Bentz's musings the hint of a possible way out. He developed it quickly in his mind and decided he had nothing to lose by trying it out.

"OK, CM," he said. "I admit it. I'm a Manifestationist."

"Well!" Bentz exclaimed. "About time!"

"But at the same time, I'm not a typical Manifestationist."

"Oh?"

"No sir. I think the majority of Manifestationists are wrong about the phenomenal Paracelsus. It seems to me the Paracelsians gave us this world to do whatever we wanted with it. Bombing the phenomenal Paracelsus is no more sacrilegious than busting a heckler in the mouth. In fact," he added, gaining confidence, "it's crazy to attribute holiness to *any* phenomenon. Only the noumenon is holy."

Bentz was looking at him wide-eyed. "I almost think you're telling the truth," he said. "It would be a load off my mind if I could be sure."

"As far as that goes, sir, you can't really be sure of anyone, can you?"

Bentz cheered at that. "That's true," he said. "Let's put this suspiciousness behind us for the time being. As long as you're admitting what you are now,

I wanted to ask you about these manifestations.''

''Uh I've never seen one myself, sir. But Earl has. He's told me about it at least a hundred times. He saw an Adept who claimed to be from Paracelsus, spoke briefly, and disappeared. Earl says he and a couple other suspicious types checked the room out afterwards and there was no transmat machinery hidden in the ceiling, or any mirrors, or anything like that.''

''I was more interested in what he looked like,'' Bentz said. ''I've heard stories . .''

Jacob held up his hand. ''I know what they are, sir, and Earl bore them out. He says the Adept looked like you.''

Bentz looked sick.

Jacob slept poorly that night, haunted by visions of a Bentz-god who judged him and sent his soul plummeting to Paracelsus.

He got out of bed grouchy, long after he'd been buzzed. A meeting was scheduled: Bentz and all officers of field and general grade, for a final briefing at the Meditation Center's auditorium. It was the sort of meeting that threatened to last all day and into the night. He never did get that last night on the town he'd wanted, and now it looked as though he never would.

He walked to the meeting, grumping about that and about the fact that Bentz now considered him his private Performing Manifestationist. (''We need to be amused, Fool. Philosophize for us!'') By the time he'd arrived at the Meditation Center's great bronze doors he was cursing out loud, his thoughts running in circles. He started doing breathing exercises to calm himself.

By the time he reached the auditorium he was only mildly insane, but still so wrapped up in himself that he had taken a seat and stared at the stage for several minutes before he noticed that Bentz, seated alone by the lectern, was wearing white Adept's robes instead of his general's uniform, and his forelock was knotted.

*What kind of damned theatrics is the CM planning now*? Jacob wondered.

He looked around at his fellow officers. They all seemed puzzled, but calm. None of them seemed to know the significance of what was on stage. Could Bentz be planning something just for him? Not likely.

No, there was Bentz now, in uniform, walking out from behind the curtain, placing his notes on the lectern, staring at the Adept in obvious shock.

''What the hell are *you* doing here!'' Bentz said.

The Adept looked up. ''I don't believe we know each other,'' he said. ''I'm Rafe Coleman, of Paracelsus —Adept of the Reformed Sufi Church. And of course I recognize the Celestial Master. Our observatory satellites noticed your warships coming near. Naturally, we want to discuss the matter with you before we take any drastic action.''

Bentz fainted. He was immediately surrounded by a gaggle of officers itching to practice CPR; fortunately, he came to in less than a minute. Jacob heard Bentz's voice from behind the wall of stiff backs, booming ''Gimme some air, for Christ's sake!''

The soldiers backed off. Bentz sprang

to his feet and began jerking his finger at various men, calling their names, telling them to join him on stage. General Yuan was among them, but he seemed to be picking mostly burly ones.

"The rest of you," Bentz added, "get out of here. We'll resume the meeting in a couple of hours."

"I really think," Adept Coleman said, "that it would be better if everyone heard what I have to say."

Bentz, frowning in thought, ignored him. After a few seconds his wrinkles faded and he said, "Wait. Colonel Huntziger—I want you to stay, too."

Jacob plopped into an aisle seat, waiting for the rest of the officers to push past, then joined the others onstage. When the auditorium was cleared of everyone except those he had named, Bentz sent a general to lock all the doors.

"What do you think, Huntziger?" Bentz asked. "This one look like what Earl Eads described to you?"

Jacob nodded yes.

Bentz turned on Coleman. "You've been going around spreading sedition, stirring up the Manifestationists—right?"

"He's talking to you, geek," one of the goons rumbled.

"This is the first time I've been off Paracelsus," Coleman said at last.

"Lord," said Bentz. "How many look-alikes do I have?"

"Actually there are quite a few," Coleman said. "Standards of beauty are largely a matter of fashion, and this look happens to be what you might call business dress on Paracelsus." (Was there a veiled insult in there somewhere? Jacob wondered. No, couldn't be.) "And, as I'm sure you all know, we can pick our own physical appearance in our universe."

Yuan was shaking his head at Bentz. "This guy doesn't come from Paracelsus," he said. "We've got every transmat on this planet that has enough power for a space transmission covered. If anyone tried to come in from there, alarms would be ringing in half the offices in this building."

"Adept Coleman," Bentz said, "is there any way you can demonstrate to us that you are who you say you are?"

"I think so," Coleman said, fumbling around in the big pocket at the front of his robe.

After feeling around for a while, he pulled out a tiny box lined with pushbuttons. "About two thousand years ago," he said, "we stumbled on a bunch of new ways to use the PK link "

He punched out a quick series on the box and disappeared. About five seconds later he reappeared, standing at the other end of the stage. "We no longer need machinery at each end to make the transmat work," he continued. "The whole system is operated by machinery at one central point—on Paracelsus. Until now, it's only been used to bring things to us at least, that's what I understood. Of course, if you're telling the truth about this other visitor ."

All the brass was staring in horror at Coleman. Bentz directed a beefy major with murder in his eyes to unholster his pistol and burn holes in the ceiling above the spots where Coleman had been and was now. There was nothing up there.

"Shit," said Bentz. "The Manifestationists are right."

"Pardon?" said Coleman.

"This is Paracelsus. I'm in a restricted access code. I never got out."

"No," said Coleman, "you misunderstand me. I transmatted to Paracelsus and back. You see, we no longer need to have machinery at both .."

"I heard you the first time," Bentz snapped. "But what I've seen is accounted for equally well by just assuming that your damn psychiatric staff has set this up to allow me to 'work off my aggressions.' In fact, it's a better explanation. Why should you risk having me return to Aycee Four and war against you?"

"You're the Celestial Master!" Coleman protested. "And we're good Reformed Sufis!"

"Then how do you explain Regulus?"

"Pardon?"

"You know," Bentz said, speaking carefully, as if to a moron, "the star. About three and a half days ago—that would be ten years ago, your time—it went poof! All gone. No more Regulus."

A look of absolute horror spread over Coleman's face.

"Are you sure?" he said.

"Why would I make up something like that?"

"My superiors have to find out about this," Coleman muttered. "Such a thing shouldn't be ."

"What's the matter," Jacob asked. "Don't you have astronomers?"

Coleman nodded. "Yes, we do, and I think that's the answer. It's the damned astronomers. They're all Universalists anyway."

"You're babbling, Coleman," Bentz said. "Are you still trying to claim, somehow, that we're separate from Paracelsus?"

Coleman calmed down. He nodded thoughtfully. "I see," he said. "I don't quite see about Regulus, but I can see why you wouldn't think the physical evidence favors one theory over another. But maybe you should consider some non-physical stuff. When you were on Paracelsus, we could have altered the content of your mind in such a way that you'd have come out loving us if we'd wanted to. Did we do it?"

"Obviously not, but ."

"So if we were going to take the safe course, that would have been the safest of all. But it was unethical, and we refrained. So why should you doubt what I say now?"

Bentz was silent and thoughtful.

"I don't have time to go on with this argument," Coleman said. "You can't believe how much time I'm losing. I came to tell you of Paracelsus' intentions. Do you want to listen?"

"Spit it out," said Bentz.

Coleman looked around the stage at the assembled officers and said, "I hope some of you spread the word around. It's important that everyone know of this. When we designed the Paracelsus transmat I described, two millennia ago, we made it quite powerful. We were inspired to do this, as a matter of fact, by an argument of the Celestial Master's; so you see, even when He opposes you, he gives to you."

"What argument was that?" Bentz asked, choking.

"Well," Coleman said, "not all of your arguments impressed us, but many of us did come to feel, after a few

hundred years, that there was a lot of truth in your criticism that we could never experience anything truly new because we were cut off from God's universe and could think only human thoughts, invent human things. So when the possibility of building this new kind of transmat came along, we built it really *big*. It has the potential of reaching clear across the galaxy. And we've got quite a range of focus, too. We've recorded the information from tiny botanical samples and whole herds of enormous beasts. In fact, theoretically, we have the capability of recording entire solar systems—though that, until recently, has been strictly prohibited."

"What do you mean, 'until recently'?" Yuan asked suspiciously.

Coleman shrugged. "We feel that your continuing hostility toward us cannot be tolerated. We want to live in a safe, sane galaxy. So if you persist in this war, we'll *have* to make you a part of Paracelsus, whether you want to be or not. Of course, I think that would be a wonderful thing, but I understand not everyone here feels that way. And it would be impossible to do it selectively in the time we have. The Alpha Centauri system would be reborn in Paracelsus and nothing would be left here but microdust."

"Why are you telling us all this?" Bentz demanded. "If you could really do what you say, you'd *do* it, and we'd never know the difference."

Coleman looked surprised. "It's an ethical matter," he said. "Bad enough that you force us into a position where we have to bring some of you in unwilling. To allow the situation to come about without even giving you warning would be intolerable."

The Adept got his box out of his kangaroo pocket again, punched numbers hurriedly. "Now I must go. I've said what I came to say and wasted five days getting around to it."

"Wait!" Bentz said. "We need to know

Adept Coleman was gone.

Jacob found himself laughing uncontrollably. He tried hard to keep a straight face, but it was no use. Bentz glared at him.

"I'm sorry, CM," he gasped, "but I can't help it. It *is* funny. He was as surprised at what happened to Regulus as we were!"

"What's funny about that?" Bentz asked.

"It's a big, funny universe. Nobody ever considered the possibility of there being another force besides Paracelsus at work."

Bentz frowned. "I don't even want to think about that," he said. "Things are complicated enough."

"*That's* what makes it funny!"

Bentz shook his head. "No," he said. "The way I see it, there are only two possibilities that deserve serious consideration. The Manifestationists may be right. If they are, this incident is probably another of Paracelsus' weird ideas of psychological treatment. Or else there's an ACC agent at one of our booths—not an improbable assumption—and he let this guy slip through. And Paracelsus has invented an impossible transmat that threatens me with what they think I fear most."

"Three thousand years," Yuan said solemnly. He looked to Jacob as if his

unshakable confidence had finally been shaken.

"Maybe," said Bentz. "But while we have the smallest chance, we fight." He shrugged, looked at Jacob. "You know," he added, "my intention was to capture that adept and order you to shoot him."

Jacob was shocked. "Why, sir?"

"To see what would happen to him. And to see if you would do it. Ah well, I suppose it wouldn't really have proved anything."

The next day Jacob herded one of eighteen long lines of troops into one of a row of eighteen transmat booths on the outskirts of Octopus Bay. The men were sullen. Soldiers always grumble, but it seemed to Jacob that today their nastiness had strong overtones of the kind of righteous indignation men indulge in when they're afraid. The jihad was never more immoral than it was that day. He guessed the news of what had happened yesterday had leaked out.

He was the last to be reborn on the *Dr. Dee*'s bridge.

He'd been on the ship once before, a year earlier, as part of a five-man team doing a midflight equipment check, and things weren't as he remembered them at all. Before, the ship had been an enormous, hollow thing, so empty it seemed haunted. Now it was so cramped it was already starting to stink. The spin that was their excuse for gravity was so mild that the only way to stay on the floor was to stand in one spot, and nobody was standing in one spot. There was pushing and bumping and cursing from every direction.

His job was to run continual spot checks on the command computer. That is, the computer worked so much faster than he that if he checked it continually he would still, necessarily, be doing spot checks. It was a thankless and probably futile task, but since it was only *probably* futile there he was, shoving flailing bodies aside and squeezing into a seat wedged between two other flunkies at the big console under the two big screens.

Bentz and Yuan were there, staring at the screens, and since there was no point in starting until everyone got settled down, he joined them.

The screen that showed a dimmed version of the view outside was filled with Paracelsus' K1 sun, for the *Dr. Dee*, being the command ship, got to play it safe. For the past few hundred million miles the ship had made its approach on the side of the sun opposite the planet, and it would stay about thirty million miles behind it, in reserve. In case Paracelsus figured out a way to stop the other two ships, the *Dr. Dee* would analyze their records, figure out how to counter Paracelsus, and move in. At least, Jacob thought ruefully, that was the theory.

The view on the second screen was transmitted from the lead ship's telescope—a view of Paracelsus. It was something.

It wasn't the Paracelsus Jacob remembered seeing in his atlas. The major continents now were filled with enormous cracks. Huge, violent storms blew everywhere. And at the top of the planet, from about the 70th degree up, was the cause of it all—a strip of machinery 200 miles wide and 300 long, topped by huge radiators glowing red.

The Paracelsian machines had done an unbelievable amount of construction work on their universe in the past three years. The planet really did look like hell.

"Why do they need so much room?" Yuan breathed.

Nobody answered. The scope's magnification increased. The picture lost resolution, but they could still see the fuzzy shapes of the millepedal construction robots, building furiously.

"I wonder what it is they're trying to get built so fast," Jacob said.

Bentz turned his head, noticing him for the first time, then looked back at the screen. "This is nothing special," he said. "When I was here three years ago this place took up only about twenty square miles. So what we're seeing is just SOP. They'd have to have been working this fast all along to build it up to that size."

Bentz exercised his divine right to change the subject without warning. He whirled around to face Jacob and said, "I really ought to apologize to you for my suspicions. I know I've been picking on you. But—you're a Manifestationist and your thesis is driving me crazy. Do you understand?"

Jacob was astonished to see tears in Bentz's eyes, one of which was working at developing a tic. Maybe Bentz was being driven crazier than he knew.

"I understand, sir," he said.

"Good. I hope you'll accept my apology, in the interest of harmony aboard, if for no other reason."

"Certainly, sir."

"Good. Then get the hell to work."

Jacob bent over the console. He wished heartily he'd never met Bentz. This up-down relationship was driving *him* crazy.

It was hard for him to keep his mind on his job. For one thing, the command computer was running so smoothly it was almost unbelievable. For another, he kept remembering the folk wisdom about how, when the gods decide to get somebody, they drive him mad first. It made him very uncomfortable.

After an hour or so, he was pulled out of his funk by the sound of an argument raging above him.

Almost directly above him, in fact. His neck cracked as he looked up at the top of Bentz's and Yuan's heads. They were standing between the airlock and a bank of instruments. Yuan was screaming at a technician Jacob couldn't recognize—or at least, not from his hairdo.

"Are you trying to tell me," Yuan was saying, "that the surface temperature of a K1 star is 73 degrees Fahrenheit?"

There was a sigh from the technician. "All I'm telling you," he said, "is what the machine told me. The conclusion is that something's wrong with the machine, of course."

"But you checked it out," Bentz said. "You couldn't find anything wrong with the equipment."

"There *isn't* anything wrong with the equipment!" the technician yelled defiantly.

"You've just contradicted yourself!" Yuan yelled back.

"Uh . that's right."

"How did you check the equipment, son?" Bentz asked in a gentle voice.

"I went through the circuitry in this thing," the technician said, patting the

console. "Everything's hooked up the way it's supposed to be and each board, taken individually, performs its function. And I also checked it by using it to measure the temperature of something I already know for sure how hot it is. Right inside this bridge. And it gave me the right answer, 73 degrees."

"Well," Yuan said, "there's your problem, dummy. You're somehow measuring the temperature right inside this room when you think you're taking a reading on Paracelsus' sun."

"No, I'm not . ."

"Wait a minute!" Bentz said excitedly. "That's their second mistake! They've given themselves away for sure this time—they're not perfect, you know."

"What are you talking about, sir?" Yuan asked.

"I know what's going on. Regulus was their first mistake, and now this is their second. Huntziger knows what I'm talking about."

Bentz looked up—or down, Jacob wasn't sure. At any rate, he looked at him and crooked his finger. Jacob rose from his seat, twisted his head around to make sure it wasn't stuck, and walked carefully around the room until he was looking at them eye to eye.

"You do know what I'm talking about, don't you, Colonel?" Bentz said. "The Manifestationist Thesis?"

"Yes, sir—but a broken thermometer is hardly ."

"Nonsense. This machine was carefully designed to measure temperatures over millions of miles. It's more than just a thermometer. And you heard what this young man said. The most likely explanation isn't that it's broken, but that it doesn't really exist at all. This is a faulty bit of programming on Paracelsus' part."

"What if it isn't?"

"OK," Bentz said, shrugging, "maybe not. But I think we have an excellent chance here of clearing up the question once and for all. What if one of us were to walk out there without a suit?" He pointed at the airlock.

"Then that person would die a very ugly death," Yuan said.

Bentz ignored him. "I need a volunteer," he yelled. "Someone to go out the airlock suitless!"

Most of the men on the bridge became particularly busy at that moment. A few laughed nervously.

Bentz snorted with disgust. "How about you, Huntziger?" he asked. "You're a Manifestationist. It shouldn't make any difference to you."

"I'd really rather not go out there," Jacob said.

"Come, now," Bentz said, slapping him on the back, "I bet there isn't even a 'there' out there. It's probably solid as brick when you open the hatch. After all, they don't need to create a whole universe just to fool us into thinking we've bombed them. Just pictures."

"Then why not just send somebody with a spacesuit?" Yuan asked, wide-eyed.

"Because," Bentz explained patiently, "that would fit into the rules of this particular access code. You can live in space with a spacesuit. That illusion is probably available."

"You can't just send somebody out there to fry for no reason."

"I've got a reason," Bentz said,

"and Huntziger understands better than anyone else what it is."

He turned to Jacob and added, "That's why I've got to order you to go out there. It would be unfair to order someone without your particular beliefs."

Jacob closed his eyes, grimacing, and thought. If he refused, they might just shove him out. Probably would. And even if they didn't, there would go eighteen years of military service up in smoke. And it was possible that the Manifestationists were right. Or—even more likely—that Paracelsus had carried out yesterday's threat.

Anyway, he remembered, soldiers were supposed to risk death when ordered to. That was the whole idea of soldiering.

He opened his eyes, nodded, and without speaking opened the inner airlock door and shut it behind him. He heard the sound of air being pumped out. He gulped and waited for his ears to start hurting. Nothing.

He decided to open the outer hatch without waiting any longer, wondering whether he'd be blown through.

He wasn't.

He grasped the outside of the hatchway. The metal felt cold, but not especially so, and wet. He pulled himself through the hatchway and out a manhole on DeWitt Street, Octopus Bay, Aycee Four. A Bentz look-alike in Adept's gear squatted nearby, looking very sad and apologetic.

"Coleman?" Jacob asked.

The adept nodded.

"The CM isn't going to like this one bit," Jacob muttered.

When he went back to the *Dr. Dee* and explained things to them they demanded a demonstration. As if standing in an open airlock weren't proof enough, they crowded around Jacob, watching his head vanish as he stuck it through the hatch. When the show was over, some of the harder heads—Yuan's among them—began dismantling the airlock, looking for hidden transmat equipment.

Jacob ignored this foolishness. He returned to his chair at the console, turned it inward, and sat, holding his pocket notebook against his knee and scribbling like mad. Certain questions had been driving him crazy since he'd first looked out of the hatch—the same kinds of questions, he guessed, that were driving the CM crazy. He wasn't sure who or what he was any more. He'd pretended to be a Manifestationist, and now it turned out that either they were right all along, or events had made them right. And each of those possibilities suggested further possibilities. He might have been a creature of Paracelsus all along. He might be a copy of a real (real?) person still living on a real (real?) Aycee Four. He might have been transmatted.

He whipped a line down the center of a page, began making a chart, stopped to organize his thoughts, looked up and noticed Bentz nearby with a notebook in his hand, too. Their eyes met.

"We're doing the same thing, aren't we?" Bentz asked.

"I think so," Jacob said. He was struck by the fact that Bentz seemed a lot calmer—as if he were relieved to finally have the question of his flesh, at least, settled.

"Any conclusions?" Bentz asked.

"I don't know," Jacob said. "A lot

depends on whether we've been here all along, or Coleman's story about the new transmat was true. I think I'd almost prefer that the first possibility was true."

Bentz looked interested. "Why?" he asked.

Jacob shrugged uncomfortably. "At least then I'd know what I was," he said. "I might be the creation of a Paracelsian, but at least I'd be where I belonged. If the transmat story is true I might be transmatted or invented and given the memory of earlier times or who knows?"

"You're getting paranoid," Bentz said.

Jacob thought that sounded rather odd, coming from Bentz. "How do you know for sure that *you're* not a Paracelsian invention, CM?"

Bentz smiled a strained smile. "Leave it to a Manifestationist to think of that," he said. "That would make your philosophy a lot more of one piece, wouldn't it? The CM wouldn't have to be a special case any more."

"That's not what I

"Hell, I don't know. Maybe it's possible. All I know is I've got to find out."

Jacob agreed with that, heartily.

They made a strange parade, Jacob thought: the entire Paracelsus expedition, led by Jacob and two Bentzes, climbing out the manhole and heading through the red-light district to the Meditation Center, like rabbits from the hat of some compulsive magician. Coleman, screaming himself red-faced, had insisted they go someplace where all could hear what he had to say. (Even though it was only six in the evening, business had already picked up so much it was almost as loud as it had been last time Jacob was there. There were more than enough soldiers left behind in "support" to keep things booming.)

As the line of soldiers lengthened, the sight became strange enough to make a stir even on DeWitt Street. Some proprietors turned their barkers off. People stood on the sidewalks silent, wondering. The noise level fell ten decibels, easy.

At the corner of DeWitt and Erdman Earl Eads joined them. He ran, tucking his blackjack into his belt, from the whipped-cream front to the middle of the street where he stood and waited for them, staring at the two Bentzes. He walked along with them, first giving Coleman a once-over, then joining Jacob.

"That's a new one," Earl said.

"Huh?"

"A new manifestation." He smirked. "That, it seems, would make all you people Manifestationists."

"What do you mean by saying he's new?" Jacob asked.

"I've never seen this one before. I've seen several different Paracelsians manifesting themselves as Bentz, but not this one."

"How can you tell the difference?"

"You get so you can tell after a while. The way they move. The way they talk. Would you mind telling me what's going on?"

Jacob told him, starting with Coleman's appearance at the MC the day before and working up to the return to Aycee Four.

Earl looked at him askance when the story was done. "That can't be the way

it really happened," he said. "A Paracelsian would never pop into this world and spin out a lie like that one about the new transmat."

"Oh—I forgot," Jacob said. "We've always been a part of Paracelsus."

"Right. So what's the real story?"

"I just told you."

"It's OK," Earl said huffily, "if you don't want to tell me."

"Aw, hell, Earl!" Jacob grumbled. "I wish I could talk to somebody who could be really open-minded about this. Say—would you believe a Paracelsian could say this stuff if you heard one say it?"

"Sure," Earl said.

"Well, this Paracelsian sounds like he wants to speechify. Why don't I ask the CM if you can come along and listen?"

"I was going to ask you that, anyway."

When they ran to Bentz and asked, he jerked his thumb toward Coleman and said, "Ask him. He seems to be running things."

Coleman's answer was that he didn't care. "But he doesn't have to come with us to hear me," he added. "I'm going to be giving the same talk all over this access code pretty soon—or, at least, copies of me are."

Coleman turned around and waved his arms for everyone to stop. That took a while to accomplish—the line was pretty long, and there was a lot of jostling. When the men within sight were still, he yelled, "Is everybody out of the manhole yet?"

The question was passed back along the line. The answer rippled back: yes.

"Good," Coleman said, and suddenly they were all seated in the MC auditorium again, almost the same as yesterday. There were a few important differences. The lower ranks were there too, this time. Coleman was behind the lectern instead of Bentz. Jacob got a front-row seat, between Earl and the CM.

The front row was a bad place for hearing, but Coleman spoke in a voice that somehow carried perfectly in the hall's quirky acoustics. "I hope that wasn't too much of a shock for anybody," he said. "We're going to try to break you into this new universe gently—we want to avoid things like that whenever possible, at first. But some of you needed a little more proof of where you were and, besides, I was tired of farting around.

"If there are any of you who still don't understand what's happened: You've been taken involuntarily into Paracelsus. We warned your leaders that this would be the consequence if they didn't call off the attack. They didn't listen. Now, I don't really like to say 'I told you so,' but if I hear any resentment at this—especially from infidels—I'm going to have to say it because there's really no other answer.

"Really, though, I don't see why there should be any resentment. This is a wonderful opportunity for you people. A much longer life—maybe even an eternal one. The opportunity literally to create whatever you dream of and desire, after a few years' training. Truthfully, I think you're going to like it here."

Coleman beamed joyfully at the congregation for a few beats, then said, "Getting to practical matters for a mo-

ment, this world is in what we call a restricted access code. That means the rest of Paracelsus can get in—with authorization—but you can't get out. This is for your own protection. Like I said, we want to break you in gently, and besides, processing you does take a little time.

"In fact, it takes three hours. However, since we're all running on fast time now, that'll seem like 125 days to us. And since, for you, the rules of this access code are the same as they were for your material bodies on Aycee Four, you'll be denied the advantages of the Paracelsian way of life for about four months. Then each of you will get your own, private access code, and can join us. The CM, who's been here before, already has his own code and since he *is* the CM he can, of course, come and go starting right now."

"Thanks a lot," Bentz muttered.

"Now, I wouldn't be being completely honest with you," Coleman went on, "if I tried to pretend that everything is perfect out there. When you get out you'll find a lot of dissension, and much of it will concern you. Until now there has always been a strict injunction, for ethical reasons, against taking in anything involuntarily that might, even by the remotest chance, be intelligent. Even when we started taking plants and animals there was a faction that was against it. And we've never taken any stars or planets. Now you've forced us to do all three of those things at once, so you can imagine the stir you've made.

"Any questions?"

Bentz was on his feet at once. "Yes," he said. "I want to talk to Strampanis."

"Who?"

"Dr. Robert Strampanis, senior man on the medical staff in this joke of a hospital."

"Oh!" Coleman said, the puzzlement clearing from his face. "You mean one of the original settlers. You must have met him when you were here before. Frankly, I don't know how to get hold of him, sir."

"How can that be? He's the ranking  ."

"Please, sir. It's been three thousand years here, remember? It's turned out that usually a little after your first thousand years here, and invariably by your second thousandth year, you get interested in what they call 'Circuitry,' and don't ask me what that is, because it's beyond me. All I can tell you is that it doesn't seem to mean what it sounds like. When it happens, you disappear for long periods of time and nobody can contact you. I asked one of the oldsters once where they went and he tried to explain it to me, but I'm barely a thousand years old. It was just out of my reach."

"Wait a minute," Bentz said. "If you're only a year old, then where did you come from?"

"I was created," Coleman said proudly, "by a creation of a man named Larry Coleman, one of the most talented and prolific of the original settlers. As is customary, the last name was handed down. We're all like that. Once you get out of this access code it'll be years —maybe centuries—before you meet an original settler. They're all doing whatever it is they do. Ordinary folks are all Paracelsus-born."

"I'll tell you what *I* think," the CM

said angrily. "I think that everybody in this auditorium is Paracelsus-born except me. I think you created this whole farce for my benefit, because you didn't want me to get back to Aycee Four and get together a real army."

Coleman sighed. "Why would we do it this way?" he asked. "Why would we go to all this trouble?"

"To get me resigned to never leaving Paracelsus, of course. To convince me that Aycee Four is destroyed. To ."

Earl Eads shot out of his seat on the other side of Jacob, yelling, "You're right, sir! And this man is an imposter!"

Bentz turned to face Earl. "Explain yourself, son," he said.

"I've been a Manifestationist since the beginning, two years ago. I've seen lots of manifestations, and this guy has never been one of them. Every one we've seen has assured us, all along, that we've always been part of Paracelsus."

Coleman looked very annoyed and disappeared.

Jacob heard later that some people in the auditorium waited as long as three hours for Coleman to come back before they gave up. He and Earl and the CM didn't even wait five minutes.

Bentz said to Earl, "Used to be I didn't believe in your manifestations. But Coleman just made me believe in them. You sure put him in a rush to get back."

"Glad you're coming to see the light, sir," Earl said.

"Hold on there," Jacob said. "That doesn't mean the Manifestationists are right, Earl. What if Coleman was pissed off because Paracelsians were slipping out to Aycee Four over their transmat and lying to us?"

"Now why," Earl asked tartly, "would they do that?"

"Beats me," said Jacob, "but I know people can accumulate a lot of motives we wouldn't even be able to guess in three thousand years. Wouldn't you like to find out for sure?"

Earl took a deep breath, then nodded energetically. "I would, at that," he said. "There are questions that are driving me batty."

"Us, too."

"But I don't see anything we can do about finding out."

"I'd like to talk to a manifestation," Bentz said. "Is there any chance of that? Do they maybe come on some kind of schedule?"

"Not really," said Earl. "Well—they did at our meeting place on Erdman Avenue, now that I think of it. Every two months, give or take a day. But if what Coleman says is true about our being sped up a thousand times, I don't suppose the old schedule would apply." He frowned and scratched his head. "I just don't know. I mean, they've been waiting two thousand months between visits and now they only have to wait three until we join them. Maybe they won't show up at all. On the other hand, maybe they're so excited at this new development that there's one there now."

"If that's even possible," Bentz said, "I want to get over there before he goes and hear his side of things."

Earl swept his arm towards the aisle leading out. "You'd be welcome, sir," he said, and added, "You want to come, too, Jake?"

Jacob didn't bother answering a question that silly. He just followed them up the aisle and out the door into the street.

Apparently, he observed, the district hadn't yet recovered from its shock. It was still very quiet for that end of town.

"I hope we don't get into too many arguments once we're there," Bentz said. "Or on the way there, either. You two have got to remember that I'm not a Manifestationist. I still hope I can get back to Aycee Four."

Earl looked puzzled. "It sounds like you think Jake's a Manifestationist, sir."

"He is. He told me so himself."

"Jake—what's going on?"

Red-faced, Jacob explained.

Bentz was even more embarrassed. "I guess I asked for it," he said. "I was so sure my Internal Security boys were right. Some heads are going to roll in that department well I don't suppose it matters, now."

"Do you really think there's any hope of getting back, sir?" Jacob asked.

"Sure. A small hope, but a hope. I have to act on it while it exists. The way I see it, either I've been here all along, in which case Aycee Four is still in business and I've got to try to persuade them to send me back—or Paracelsus really did what it claims and I've got to try to persuade them to put it back the way it was."

"How are they going to do that?"

"You're forgetting," Bentz said, "that they have the complete recording on file. We're part of that recording."

"I was thinking more of the practical side," Jacob said. "It seems to me it would take a lot more energy to reconstruct a material world than to tear one apart and make a record. When Coleman was talking, he never mentioned their even considering something like inventing a world and putting it in space. Besides, even the most advanced Transmat needs material to make stuff out of. There'd still be a cloud of subatomic particles where the solar system used to be—but how fast is it dispersing?"

"I don't know," Bentz said. "Like I said, it's only a hope. What do you think of all this, Mr. Eads?"

"I don't know, either," Earl said. "As Celestial Master, you're a special case. Maybe for you there *is* an Aycee Four. The rest of us are Paracelsian, though. And frankly, I think it'll be a sad day for us all if you leave us."

"Maybe you could come with me," Bentz said. "I think anybody in this place, including the artificially created people, can be saved if they just get out and into God's universe."

"This is God's universe," Earl said. "And it's *your* universe. If it weren't for your dictum that man is information, this place would never exist."

"Christ!" Bentz groaned. "I must have been told that a thousand times since this business started, and always I have the same reaction. When I first started the Reformed Sufis I was warned that starting a religion was an affront to God, and I keep thinking this must be his idea of poetic justice. To say nothing of the eternal damnation angle." He shook his head sadly.

"You call *this* eternal damnation!" Earl exclaimed.

"You already know my objections to this place," Bentz said. "Why go through them again? But I could

add—maybe an eternity of *anything* is damnation."

Earl's eyes were starting to bug. The CM's ideas were obviously disturbing him deeply, and Jacob decided to head off the scene that was coming.

"I've been thinking," he said, "that with all the changes Paracelsus claims to have gone through, they must be three thousand years older. And if that's the case, that would prove we were out of Paracelsus until recently and their claim of having invented that new transmat is true. Coleman said you were allowed in and out of here. Why don't you go check it out—see if all the original settlers are missing, for instance?"

"I like this place better than the rest of Paracelsus," Bentz said. "At least it works on the same rules as God's world, more or less. Anyway, I don't have to check it out, because if Coleman hadn't been telling the truth I wouldn't be allowed to leave."

"So!" Jacob said. "That proves .

"It proves nothing," Bentz interrupted. "For one thing, you can run any access code at any speed you want. Paracelsians tend to stay at maximum speed, so they can keep up with everyone else going at maximum speed, but they could easily have kept us going a thousand times slower. Or more, if they'd wanted to."

At that point they were across the street from the whipped-cream front, and Earl started toward it.

"Hey," Jacob yelled. "I thought we wanted to get to that meeting place as soon as possible." He and Bentz started across the street after him.

Earl stopped at the door of the bar he took Jacob to after he almost knocked him out. He opened it and motioned them through. "This is it," he said.

Jacob was surprised to see that the back wall had disappeared, revealing another room with a row of wooden pews, almost like an old terran church.

There were other surprises. There was a party going on. Jacob recognized several of his old Manifestationist buddies. There were also a number of fantastically ugly fellows, unclothed, with pumpkin heads, splayed-out noses, and mouths so wide it seemed possible they might literally be able to grin from ear to ear.

One proved it, scuttling from the bar to a spot a few inches in front of Bentz and grinning.

"The Celestial Master Himself!" he exclaimed. "It's an honor."

Bentz jumped backwards a couple feet. "What are you?" he asked.

"Excuse me, sir," the goblin said. "I didn't mean to startle you. This is party dress. If you'd like me in business attire . ."

Bentz shook his head violently. "No! I'd like to have just one of me around. Far less confusing."

Earl's red-headed partner, Viola, spotted them from a back table and ran over. "Hi folks!" she said, chuckling happily and giving Earl a squeeze. "We're having a celebration. We're all going to be made full-fledged members of Paracelsian society, just as he promised." She pointed at the goblin.

"Then you're one of those who've been making appearances here for the past couple years," Bentz said.

"Correct," the goblin said. "Allow me to introduce myself. I'm Lee Schurtz,

astronomer. I'd like to congratulate you on your coming freedom."

Bentz smiled a pained smile and shook Schurtz's hand. "You wouldn't happen to be one of the original settlers, would you?" he asked.

"Pardon?"

"Are you one of the people who were originally here as hospital personnel?"

"Oh! You mean the so-called founders. No. In fact, I'm only three hundred years old. Why do you ask?"

"It was just a thought. Forget it."

"Ah . won't you please sit down? I'm going to. I'm not used to the gravity rule and this body isn't really designed for it." Schurtz raised a spindly leg and waved a great, floppy, flat foot, then grabbed a chair at the table nearest them, by the door.

Before he could sit, Earl took his arm and started herding all of them toward a table in the middle of the room. Jacob was in the rear, behind Viola, and he found the sight of her sinuous walk was making him horny. He felt relieved that the rules of this access code matched the rules of Aycee Four so completely, then realized that meant he was starting to accept Coleman's version of reality. The horniness disappeared. They sat.

"So," Jacob said thoughtfully, "you're an astronomer. Adept Coleman seemed to think you were responsible for the disappearance of Regulus."

"Adept Coleman!" The goblin assigned Adept Coleman the status of nonentity with a wave of his hand. "A fool—he and his kind. Their days are numbered."

"But about the matter of responsibility ?"

"Uh, yes. He did happen to be right about Regulus. We wanted to study how the internal structure of those three stars was programmed, and that silly prohibition against practical astronomy had gone on long enough. We took matters into our own hands."

"By 'we' you mean astronomers?" Bentz asked.

"Coleman probably called us 'Universalists,' " Schurtz replied. "That's the name his kind applies to anyone who isn't trapped in their old-fashioned, mystical worldview. Ah—but you've been kept isolated from fast-time affairs, so you wouldn't know. There's a primitive superstition which, thank God, is at last dying out, that any information stored in the slow-time access codes may be observed, but is otherwise to be left alone. Exceptions have been made, over the millennia, but Reason has had a hard struggle."

"I'm sorry," Jacob said, "but you've completely confused me. What's a slow-time access code?"

"Why, we brought you out of one. We brought Regulus out of another. Surely Coleman explained to you that we've just recently taken you out of a slow-time access code and given you a code where you run a thousand times faster—up to normal Paracelsus speed!"

"Not exactly in those words," Jacob said.

"Hmph. I should have guessed. Well, it looks like I'm going to have to do a lot of explaining. I don't know where to begin, though."

"Perhaps," Bentz said, "you could give us some idea of what your own view of things is."

"Yes," Schurtz said, musing. "Hm. To put it simply, we of the scientific

community do not believe that anything in the slow-time access codes—or any code, for that matter—has any special, holy status. You see, the old guard has many superstitions connected with slow-time access codes. They call most of them 'transmat settings'—they have a lot of labels like that, most of them equally meaningless. For instance, slow-time stuff is said to have the quality of 'materiality,' though what makes it more 'material' than the rest of Paracelsus is beyond me. And some of Coleman's crowd claim that slow-time stuff isn't even *of* Paracelsus. Anyway, we reject all that.''

Jacob was beginning to see the light. He looked at Earl and Bentz and concluded that they were, too. Each looked horrified, each for a different reason.

Earl obviously felt betrayed. ''When your people came to speak to us,'' he cried, ''you assured us that we were in Paracelsus!''

''Well, you were.''

''You make it sound like we weren't. You make it sound like we were just transmatted here.''

''You see,'' Schurtz said, nodding as if he had won a point, ''that's the kind of thinking we were trying to combat. That's *why* we came regularly to assure you that you were in Paracelsus. The verb 'to transmat,' if it means anything at all, simply means getting from one code to another, or from one part of a code to another. But you've all been infected with the superstition that there's more to it.''

''I see,'' Earl said. He looked as though he were getting a headache. ''But when you said we were part of Paracelsus, you didn't just mean Aycee Four. You meant the whole universe.''

Schurtz shook his head angrily. ''That's just more of the same kind of nonsense that makes Coleman call us 'Universalists.' This distinction between the 'universe' and Paracelsus is superstition which can not be substantiated scientifically.''

''All your scientists are of this opinion?'' Bentz asked.

''The vast majority are,'' Schurtz said. His bony chest puffed up with pride as he added, ''and all the astronomers are. Astronomy led the way in this revolution of thought—which was only natural, since what is astronomy, after all, but the exploration of the programs in the slow-time access codes?''

''That makes perfect sense,'' Bentz moaned.

''Sure,'' said Schurtz. ''And not only is this a revolution in thought, but in morality. It's a disgrace—whole human worlds not only utterly isolated from the general Paracelsian community, not only running a thousand times slower, but trapped in a system where human programs are terminated without the consent of the human—utterly erased!''

''You're talking about death?'' Earl asked.

''Yes, that's the word. Nothing wrong with it, of course, if it's your own choice—but in slow-time it very rarely is. Of course, I don't need to tell *you* that. Anyway, you can image how shocked astronomers were when they discovered this state of affairs. That was really what made us decide that all the material in slow-time should be brought up to speed.''

"*All* of it?" Bentz asked, his voice cracking.

"Well—we haven't quite cracked the problem of getting all of it in. But we can certainly dispose of this galaxy in a relatively short time—we proved that with Regulus."

"The whole damned Milky Way!" Bentz breathed.

Jacob was as shocked as the CM —maybe more so. He tried to speak, but couldn't. Only the Manifestationists seemed to be adjusting.

"I don't get it," Viola said. "Who's in control here? You guys or Coleman's bunch?"

Schurtz grinned.

"Nominally—Coleman's bunch," he said. "But we outwitted them. We used their own superstition against them. When you sent those ships to us we waited until the last possible minute before reporting it, and panicked them into bringing Aycee Four up to fast time. It was really easy. The more extreme they were—the more they believed slow time was outside of Paracelsus—the easier they were to soare."

Bentz's brow wrinkled. "But," he said, "with the power they had, I mean, *I* underestimated their power, for God's sake. With the power they knew they had, how could they think we were a threat?"

Schurtz cleared his throat and said, "Uh—we sort of let them believe that Regulus was your responsibility. We kept its new access code secret, and let them conclude that you'd tested some kind of weapon on it. Coleman caught on, there at the end, but by that time events were moving too fast for him."

Bentz nodded dumbly.

"And now that they've sped you up," Schurtz went on, "they're worrying about the other planets. Ecesis is scheduled for tomorrow, and Procyon Five for the day after. Momentum's on our side."

"Well, that's a relief," Bentz said, only half sarcastically. "You can't bring in whole galaxies at once. You have to work on them one solar system at a time."

It was Schurtz's turn to be shocked.

"It sounds as if you don't approve, CM," he said.

"That's right," Bentz said. "I tried to destroy Paracelsus. Haven't you heard?"

"Oh, we didn't take that seriously. How can you destroy the whole universe?"

"I really did try," Bentz assured him.

"That's very strange," said Schurtz, "considering the status you traditionally have. There are even some who say Paracelsus was your creation."

"That's true only in a sense," Bentz said.

Schurtz shrugged. "Frankly," he said, "I don't see how that can be true in any sense. How can you say truly that a part of the work created the work?"

"I'd love to be relieved of the responsibility," Bentz said. "Believe me."

For a while there was only embarrassed silence, then Bentz said, "Listen, Schurtz, I want you to lay aside this philosophical stuff for a while. Can you answer me something just as a scientist?"

"I'm not sure you can separate philosophy and science so easily. I'll give you the best answer I can, though."

"OK. There are people, believe it or

not, who don't want to join Para— uh, who liked things the way they were. Does your transmat—I mean—is it possible for you to put things back exactly the way they were?"

"You really want that?" Schurtz said, eyes bugging.

"Yes."

"Well, it's no problem, if that's what you really want. We'll just put you back on slow time. This access code is still operating with the old rules, so if we do it in 125 days we needn't even worry about rule changes. And, of course, we'll isolate you again, but that's easily done."

Bentz shook his head and, waving his hands towards the ceiling said, "No, I don't mean that. I mean I want you to put us back out there, in the galaxy."

"I don't understand," Schurtz said. "What's the difference? I mean, I thought that's what I just said I'd do."

Bentz's brow doubled its wrinkles. He hunched over the table, deep in thought. Then he looked back up.

His jaw dropped.

"Jesus!" he said. "There's an answer to that, I'm sure there is. But I'll have to think about it for a while. OK?"

"Sure," Schurtz said confidently. "There's no hurry. You've got all the time in the world." ■

# Probability Zero (Or Is It?)

# INFORMATION IMPLOSION

## Arlan Keith Andrews Sr.

George Vernor smiled and waited for the world to explode. "And some explosion it'll be, too," he said aloud, reaching up to pat the 8 × 12-foot translucent screen of the wall-sized TV.

"What do you mean, George?" asked his wife, Doris, who was settling down for an evening of game shows and sitcoms on their new entertainment center.

"It's the INFORMATION EXPLOSION, Doris," he said, waving his arms proudly at the expansive screen. "I mean, in a few minutes, this wall will be finally connected," he pointed at rows of connectors near the floor, "and we will be fiber-opticked, satellite-dished, and microprocessored into every electronic service known on Earth." Doris was not impressed. *Expansive and expensive*, she thought.

"Ever since they killed the PBS network, there's been nothing on for an intelligent person to watch," George continued. "But now, with 1,500 U.S. channels and the other 8,000 channels around the whole Earth, I'll have thousands of programs to choose from!" He lay back in his easy chair and smiled.

"And I won't ever again have to watch dumb game shows" (Doris winced) "silly soap operas" (she frowned) "or damned TV sports!" (she

shook her head; *too bad we have only one TV wall.*).

"All of that's changed, now," he said in a contemplative voice. "With the information millennium at hand, with all the world to see, there will be specialty channels for every conceivable interest—chess games, operas, education; why, once Dr. J. R. Pierce of Bell Labs said that there would even be entire TV stations devoted just to amateur science fiction productions. Great, just great." Doris wasn't listening.

In a moment the TV screen came to life with a technician's visage. "It's all set, Mr. Vernor. Don't forget—this is a totally voice-responsive system. Just speak up and the whole world is yours for the watching." He smiled and added the famous line, "We now turn control of your set over to you." His image was replaced by a videotex display of detailed operation instructions.

George closed his eyes in ecstasy. *Thank God, here at last. No more sitcoms, no more powdered, pouting, pompadoured preachers, no more reruns of "Lucy" and "Gilligan." Just the cream*, he thought, *the cream of human creativity.*

"TV!" he shouted.

"Yes, sir?"

"Skip all the crap on the American TV channels; they probably only have three different ball games, anyhow. Right now, show me the best that England has to offer."

The TV quickly scanned its memory of George's preprogrammed interests and responded. A scene of a panel discussion appeared, greater than life-size. "Sir, this is the leading talk show in the English Kingdom. But "

"Well, just turn up the sound, TV," George sputtered, "I can't wait to hear it."

With a seeming reluctance, the sound increased to audible level.

". . . and this week's top pop/rot/rock is by Larry and the Organleggers with their smasho, 'Dust Enema' . "

"Stop! TV, what is this crap?"

"Sir, I merely compared what you "

"Look, TV," George said after a minute's meditation to reduce his stress level, "I KNOW that American TV is bad, but I thought the English might be better."

After a moment's perusal of the videotex channel selector, he spoke again.

"TV, just skip the American and English channels. Show me the rest of the world's TV. Step through all of them, just a few seconds' worth at a time, and let me select what I like." In this way, he knew, he could find the very best in the world, and file those channel numbers for future viewing.

"Yes, sir," the TV replied, "I will display two seconds from each of the 8,318 other TV channels on Earth and Columbia Station. Just speak when you see a program of interest."

And so George grunted assent while the TV began a kaleidoscopic random walk through the boulevards of the wired world, the pathways of the global village

*Lucy Ricardo yelled at Ricky in hys-*

*terical French and in German Hoss Cartwright fired shots at sahib Gilligan and Monkees belted in Cuban-Angolan Swahili and Boering Lesothans kicked the soccer ball, Lucille, in Hausa, shouting at Fred as Rome in the Happy Days with Fonzie memories of all in the family, laughtracking as Gomer piles it on Indians of Calcutta dancing to pop/rot/rock tractoring old Sovietfunny-films heroes peoples of China naming that tune as Sun Yung Moon guitars hee hawingly while preachers pound profoundly, the Six Million Dollar Mandarin thais a knot in the bad guys, movin' up by diff'rent strokes as little Andy tags along in Tagalog and Barney milling around sprechen Deutsch and the Novosibirsk Komets kick the ball, lucille and ricky ay-ay-ays as gilligan heere's ol' '60s johnnie beaver cleaving to the bunker populace while a duke hazards a worn-out space ship around a red ball, lucille*

George ran screaming at the TV wall, pounding on the screen until he collapsed onto the floor, whimpering.

Doris calmly pressed the "Ambulauto Call" button on her commset and waited. George continued muttering very low.

"In answer to your inquiries, sir," the TV answered, "there are few operas, no chess programs, and certainly no science fiction fanzines being transmitted. A TV station must have tens of millions of viewers, to be economically viable. Therefore, there is a large amount of overlapping programming to support a global audience. The specialty groups you mention could barely support one thirty-minute program, not to mention entire channels."

George whimpered one last, subvocal request as the parameds slipped him onto inflatoracks and out the door. Only the TV heard him. And answered.

"Why certainly, sir. At this moment, of the 9,278 channels operating worldwide, there are 913 football games, 829 basketball games, 1,207 hockey contests, 445 tennis matches, 1,102 reruns of 'I Love Lucy,' 675 'Gilligan's Islands' "

George shuddered once and was still. The TV continued.

and 992 soap operas, half in English and half available in translation."

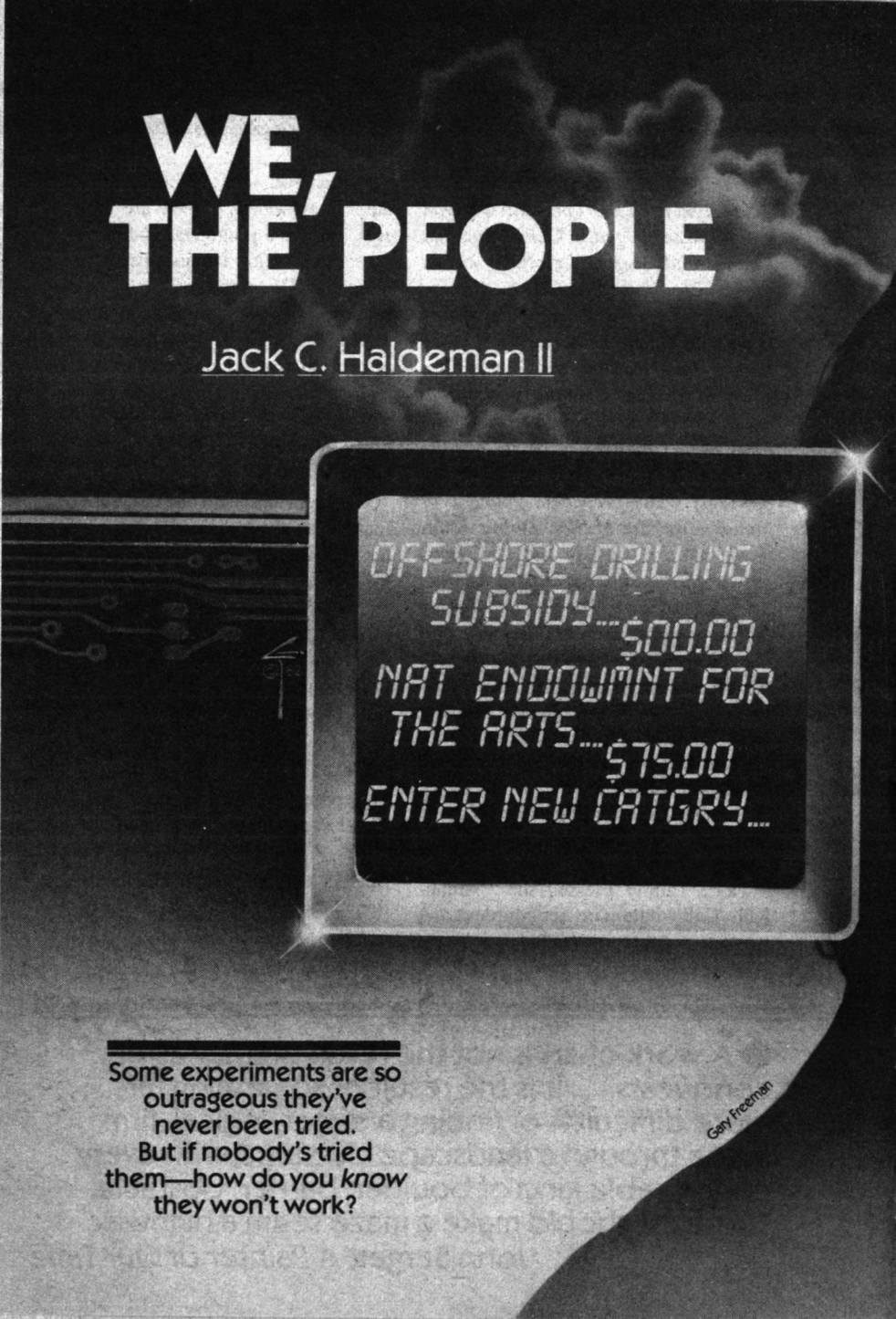
"Yes, ma'am? Any one of the 992? Certainly, ma'am." ■

● A work of art is not the result of a series of conquests . . . It is the result of something far more difficult—of finding a direct, logical, firm route through a landscape cluttered with every conceivable kind of boulder, barrier, obstacle. The artist should make a maze seem a highway.

John Berger, *A Painter of Our Time*

# WE, THE PEOPLE

Jack C. Haldeman II




Some experiments are so outrageous they've never been tried. But if nobody's tried them—how do you *know* they won't work?

The eggs were just the way he liked them. Mark ate slowly, enjoying the luxury of a leisurely breakfast. Outside his window the city was beginning to stir. Rain had been programmed for last night and the streets were still damp. Across the room his cat was curled up in a patch of sunlight on the sofa, tail swishing back and forth. The apartment was quiet and he dragged breakfast out as long as he could. Finally he got up, set his plate on the floor for the cat to lick, and walked across the room to his desk.

"Good morning," he said automatically.

GOOD MORNING, MARK. DID YOU SLEEP WELL?

Mark looked at the words as they danced across the screen. "Kind of a bad night," he said. "My arthritis is acting up again."

THAT'S TOO BAD, MARK. WAS IT YOUR KNEES?

"No, just my hands this time." He looked at his swollen knuckles and ran them through his thinning gray hair. There were worse things.

THAT'S THE THIRD TIME THIS MONTH. DO YOU WANT ME TO FLASH DR. CROMWELL?

"No, that's okay. I'll be seeing him next week."

DO YOU KNOW WHAT TODAY IS, MARK?

"Saturday." It couldn't be his birthday. He'd told the desk to stop reminding him of those several years ago.

TODAY IS APRIL 15TH.

"So what?"

THIS IS TAX DAY. WE HAVE TO FILE BY MIDNIGHT.

"I forgot," he said.

YOU HAVE BEEN PUTTING THIS OFF FOR MONTHS. SHALL WE START?

Mark looked around the room. The cat was busily licking the plate. He felt old. You could block out birthdays, but not the IRS. "I guess we might as well get it over with," he said.

THIS IS A PATRIOTIC OBLIGATION, MARK. YOU SHOULD FEEL PRIVILEGED TO DO YOUR PART.

"Can the pep talk. Let's go."

DO YOU WANT THE SHORT FORM OR THE LONG FORM?

"Don't be stupid."

I AM REQUIRED BY LAW TO ASK YOU THAT.

"Does anybody use the short form?"

CERTAIN CONVICTED FELONS MUST USE THE SHORT FORM, HAVING SACRIFICED FREEDOM OF CHOICE.

"I'm not a convicted felon and I'm not an idiot. Let's have the long form."

VERY WELL, MARK. BASED ON LAST YEAR'S INCOME OF $52,753.68, YOU HAVE AN ADJUSTED TAX OF $4,963.47. WOULD YOU LIKE TO SEE THE CALCULATIONS?

"Yes."

Mark scanned the figures as they rolled by. His income was higher than he'd thought, but not much more than comfortable, what with prices these days. Semi-retired, he did occasional projects for a variety of ecological organizations. He worked at home. He didn't get out much anymore.

"They look okay," he said.

DO YOU WISH TO ITEMIZE THE ALLOCATION OF YOUR TAX MONEY?

"Now you're being stupid again. Why else would I use the long form? Doesn't everybody?"

PLEASE DON'T BE HARD ON ME, MARK, I'M ONLY DOING MY JOB. I HAVE TO ASK

YOU THAT. IN RESPONSE TO YOUR QUESTION, ROUGHLY 99.987% OF THE ELIGIBLE TAXPAYERS USE THE LONG, ITEMIZED PORM.

Mark nodded. A person would have to be crazy to pass up the chance to say how his money would be spent.

AID TO DEPENDENT CHILDREN.

Mark was old enough to remember the hungry times, the children who had grown up without hope. "One hundred dollars," he said.

OFF-SHORE DRILLING SUBSIDY.

"Zero." They were almost all gone now, much to Mark's relief.

RE-EMPLOYMENT TRAINING PROGRAM.

"Fifty."

NATIONAL ENDOWMENT FOR THE ARTS.

"Fifty." He tried to imagine a life without music, without the sculptures and paintings all over town. He remembered how much Mary had liked the weekly concerts by the river and he recalled that day in the park with the kids and the dancers. "Make that seventy-five," he said.

NEUTRON BOMB RESEARCH AND DEVELOPMENT.

Mark laughed. They tried to slip that old chestnut by every year. "Zero," he said. A bomb that killed people and left buildings intact was crazy, pure and simple. If they could refine it so it killed only generals, he might be interested.

Mark relaxed and let the categories roll by. He always put his taxes off until the last minute. A lot of people did.

Alice Thompson was an actress. At 43, she felt her career was just peaking. She had worked her way up through the ranks from community theater to stage productions to Hollywood, from ingènue roles to character parts. She had a comfortable income, good investment advice, a secure career. She portioned out her calculated tax with good humor: the Actors' Old Folks Home, a theater scholarship at her Alma Mater, the Playwrights' Association, two summer camps specializing in drama, the National Repertory Theatre. She had little interest in the mundane affairs of state and saw no reason to spend any money on them. She had a little left over.

Erik Hesse was a janitor. He was sixty-three and had been a janitor for over forty years, from the day he got married. It hadn't been a bad life, especially after the union came in. These days it was hard to get someone to do nontechnical work, so he made a pretty decent wage. When the time came, Erik went to a tax preparer to find out how much money he had to allocate. He put it in off-track betting, weather control (he hated shoveling snow off the sidewalk), the sports cable network, two research projects that concerned beer, and woman's gymnastics. Erik had a granddaughter who was into somersaults. Even so, he had a little left over when he finished and no place to put it.

Raymond Montonero was a Supreme Court Justice. There was less and less for him to do, however. People were working their problems out together in an aura of optimism that astounded him. It seemed that the more control people had over the government, the more control they used in their daily lives. He carefully allocated his tax bite to the Congressional Library, scientific research, and social programs. He worried over the remaining balance for a long time.

Tom Hanna was a red dirt farmer in the Oklahoma panhandle. His family had worked the same land for five generations, and even though it wasn't a large spread, it was theirs. He was a proud man, and when he came in from the fields that Saturday he took his taxes seriously. He allocated the bulk of it to the Farm Bureau and the County Agriculture Commission. The rest he parceled out to the two state universities for operating expenses. He had a boy down at OU playing football and studying to be a veterinarian. Still, he had a little left over.

And so it went that day, all over the country. People put money into the programs that touched their lives and ignored the rest. They turned out to be excellent judges of the things they needed. The quality of life in the country had improved tremendously since the introduction of the Uniform Tax Act.

It had all started with a box on the tax form to support presidential campaigns. The next box to come along allocated money for the space program. Within two years the Mars project was completely funded. That unexpected success had lobbyists descending on Washington like a plague. Everyone wanted a special box on the tax form. Eventually they all got it.

Economists predicted chaos, but what they got was cooperation. People knew what they wanted, and for the first time in history they were able to get it. Unpopular projects came to a grinding halt as money for them was withheld. Politicians were forced to be more in tune with the desires of the public. Control of the purse-strings turned out to be the ultimate democratic tool, even more effective than the ballot.

Times changed. They changed for the better.

Mark's cat had climbed onto his lap and fallen asleep. He relaxed in front of the desk, stroking the cat and responding to the programs almost automatically as they rolled across the screen in the quiet room. They were presented to him randomly. Each taxpayer got them in a different order, so that position on the list didn't favor any one program over another.

Mark had been doing tax forms for years, so it didn't take much thought. He remembered his mother's last years and increased his amount for Aid to the Elderly. He allocated money for the school lunch program and aid for the handicapped. He supported environmental programs and medical research. Although solar energy was the norm now, he put a few dollars into geothermal studies. He refused to put any money into bailing out two major oil companies. If they couldn't change with the times, that was their problem.

He studied last year's military expenditures carefully. What was the sense in having enough weapons to kill everyone on the face of the Earth six times over? He cut back even farther than he had last year. He made up the difference in veterans' benefits. Being one himself, he had a vested interest.

Vietnam had cut a bloody swath through his family before he was born, but he hadn't managed to escape the oil wars and that fiasco in South America. The jungle had cost him two brothers, a hip and a knee. No amount of aid

could bring back his brothers or his friends. It had been such a useless loss.

The words on the screen were blurry, and when he blinked his eyes he realized he'd been crying. He softly cursed. He slipped one hand out from beneath the cat and wiped his eyes. The words became clear once more.

THAT'S THE END OF THE LISTING, MARK. YOU STILL HAVE A BALANCE OF $795.32. WOULD YOU LIKE ME TO RUN THE SCREEN AGAIN?

"No." The tears were coming again, damn it. He blinked his eyes.

YOU MUST ALLOCATE ALL YOUR TAX MONEY.

He thought of his brothers, and the times they'd had growing up. The days seemed bathed in the warm glow of summer sunshine. They were precious days, gone forever. He knew that every person who had died in any war on any side for any cause had been grieved for, just as he was grieving now. It tore at his heart. All that pain, all that suffering.

WOULD YOU LIKE ME TO RUN THE SCREEN AGAIN?

"No," he said softly.

WOULD YOU LIKE TO ADD AN ADDITIONAL CATEGORY?

"Yes." It was barely a whisper.

READY. ENTER NEW CATEGORY.

"Peace," he said, and his single word floated in the quiet apartment.

COULD YOU PLEASE BE MORE SPECIFIC, MARK?

"I said *peace*, damn it," he shouted. "*Everlasting, forever peace!*"

The cat jumped from his lap at the outburst, and Mark pushed his chair back, leaving the desk. His eyes were still full of tears, and he felt like a fool.

If he was a fool, though, he wasn't alone. On that particular April 15 over two hundred million taxpayers added their voices to his.

By Christmas it was an accomplished fact. ■

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● Education requires diligence, hard work, and humane sensibility. Attempts to design programs that will meet the needs of all schools in all places are destined to achieve, at the very best, only modest success. Good education is not created by government bureaucracies any more than great art is created by committee. Government can pay for education, government can give it structure and overarching purpose, but if education is subjected to the tender mercies of bureaucracies, it will wither and die.

Denis P. Doyle and Terry W. Hartle, *Journal of Contemporary Studies*

# The Alternate View

# THE TECHNOLOGICAL PROBLEM GAME

## G. Harry Stine

Recently, Herman Kahn of the Hudson Institute asked me to speak on the subject of the technological future as part of one of his seminars. It was a fascinating day. From an intellectual standpoint, it was also extremely intense. If any of you have ever heard Herman Kahn lecture, you know he thinks very fast and tries to speak as rapidly as he thinks. Herman claims this is to keep him from going to sleep at the lectern; I think he may also speak rapidly to keep his audience alert because if you miss a word or a point Herman is making, you're thereafter lost. In addition, getting a word in edgewise with Herman is a great challenge. Getting out a meaningful comment is even more difficult because Herman knows a lot about a great many subjects and is very quick to counter with a constructive criticism or with a mass of contravening data. Fortunately, having engaged in luncheon debates with the likes of the late John W. Campbell has helped me greatly in knowing how to deal with other fast-thinking people like Herman Kahn. It's a very good thing that he's one of the leading positive futurists who's putting forth the beginning postulates of abundancy economics, because he is a super-knowledgeable debater. I'm glad we're on the same side!

Herman's books—*The Next 200 Years*, and his new one, *The Coming Boom*—are complimentary to my own *The Hopeful Future* and supportive of my books on space industrialization. (It was no accident that Herman wrote the introduction to my book on space warfare, *Confrontation in Space*.) We're both pushing *solutions* rather than wallowing in problems. We're both saying that the basic assumptions of a world of limits are balderdash that cannot be supported by facts. We're both saying that the human race can *continue* to build a better tomorrow if it uses brainpower and technology, and if it doesn't screw up too many things with bad management.

The seminar was exciting because Herman had cast it with care. In addition to having as speakers such technological positivists as myself, Carl Hodges of the University of Arizona's Environmental Research Laboratory, and Bill Brown of the Hudson Institute, he also invited Hunter and Amory Lovins as The Loyal Opposition.

At the end of a long, intense, intellectual day, we sat together on a wrap-up discussion panel. The primary question was posed by a listener from the audience who asked the following highly loaded question:

"What's the most important technological problem of the next twenty years?"

When the first respondent on the panel said, "Water," and went on about it, I merely recalled "The Next Short-

age," which appeared as "The Alternate View" in the October 1982 issue. Water is vitally important in the American Southwest, but not in New England where you can sink a pipe fifty feet and get water almost anywhere.

The next speaker said, "Energy," but there was also ample data for rebuttal of that one. The late lamented "energy shortage" did indeed turn out to be an OPEC-created Attila game, and the rest of us did indeed learn how to handle an international resources cartel in the past decade.

"Food," came the claim, and I again felt justified about what I wrote in "The Next Shortage," because Carl Hodges independently supported it.

When it came my turn, I pointed out that only the use of technology creates problems for human beings, whereas a technical problem is merely vexing to the few individuals who are trying to solve it. It was my feeling, based on the five minutes of advance warning we had to prepare our answers, that the proper use of communications technology to solve the other problems created by technology was the biggest problem. In particular, we had to learn how to best use communications technology for education in view of the statement Herbert George Wells made in his 1920 opus, *The Outline of History*:

"History is a race between education and catastrophe."

If we did this properly, I argued, we'd be able to solve *any* problem in a logical, rational way based on a careful evaluation of the data rather than by hunch, emotion, gut feeling, etc. in a "muddle through" manner which—in view of the potential hazards of technology—could lead to disasters of a magnitude greater than the localized problems of Love Canal, for example.

Herman disagreed. That was okay with me, because it would be a dull world if we all agreed. As Dr. Theodore von Karman once observed, how can we make progress without controversy? Herman felt that the greatest technological challenge was the control of nuclear weapons. I objected on the ground that it wasn't a technical problem, but a social, political, and diplomatic one, and that education was part of the solution to that one, too.

In the end we all agreed to disagree, but also agreed in general that Stine's General Future Forecast was valid: "We can do anything we want to do, but we must be willing to pay for it and live with all the consequences."

Now that you've heard some of the answers to "The Technological Problem Game" that came from a Herman Kahn seminar, *What's your answer?*

We had a lot of fun with the "Six Books Game" a year or so back, and I was appalled at that time by both the shallowness and the lack of thoughtfulness apparent in most of the responses and delighted by the insight exhibited by one or two. I was disgusted by the readers who didn't want to play the game according to the rules, wanted the rules changed, or wanted to play according to their rules. But "Six Books" (which was originated by Robert Heinlein and which I unashamedly admit I stole) is such an exciting game that SF fans went on to schedule a session at the 1982 Chicago Worldcon.

Since the Kahn seminar question was rather vague and could be interpreted

in a number of ways, I'm going to revise the question slightly for our game:

What, in your opinion, is the most important problem that technologists should tackle in the next twenty years, and why do you believe this?

Answer in 500 words or less, which is about two double-spaced typewritten pages. No more than two pages. If you really know what you're talking about and have thought it through with care, you can succinctly summarize the important elements of your thinking in such a brief statement. If you can't type, write legibly. Responses written in crayon on wrapping paper will be used for land fill. Ye Kindly Editor and I both live by our eyes, and both of us stoutly refuse to read anything typed in red on yellow paper. Or written with a felt-tipped pen on toilet tissue.

Don't expect an answer. I'll pick the five most interesting ones (if we get five) and summarize them in a future "Alternate View" column. Ye Kindly Editor will review what I think the best ones are and get his licks in as he sees fit. I hope we get five good ones.

Naturally, each answer will be biased, distorted, or emotionally and semantically charged based upon the respondent's own prejudices, background, experience, education, ideology, personal philosophy, vocational or avocational hobbies, and world view. As a result, the answers will be highly revealing.

They will also be important and necessary feedback of a different sort than this department usually receives from readers. For those of you who understand electronics, system analysis, and information theory, you'll recognize at

once the importance of feedback in any system, particularly in large systems with long time delays (like the United States government or the Universe itself). One of the beauties of the Constitution of the United States of America is the clever way that controlling feedback loops were inserted into the system in a totally empirical manner, the Constitution having been written long before feedback theory was rigorized. While this department is designed to elicit controversy and comment by virtue of the fact that I'm supposed to take an alternate view to that commonly held or regularly touted by most other people, a great percentage of the letter responses to various columns have amounted to enraged, emotional frothing at the intellectual mouth because I *dared* to question or *dared* to look at a subject from a different and less comfortable point of view. If you happen to remember what occurred when we played "Six Books," most respondents didn't want to play at all; they wanted to chew on my anatomy because I neglected to place on my list *their* holy book, whether it was religious or politically ideological. Nearly all the responses failed to specify those books that should be substituted.

Here's another chance, another fascinating intellectual game to play. But, like the Six Books game, it has teeth in it that may bite you if you play it in a sloppy manner. There's no deadline, so don't feel compelled to dash off your 500-word answer tonight; think about it for a few days and consider all the consequences of your proposed solution. On the other hand, the total absence of a deadline automatically eliminates those intellectually undisciplined procrastinators who will eventually forget it because although it was emotionally enraging at the time, it didn't turn out to be comfortable to think about.

You've already heard my answer to the question, and I'm implementing my proposed solution herein by using this communications medium to encourage you to think, to learn, to study, and to consider the alternate view of all subjects. ■

*Please note: Replies should be sent to G. Harry Stine, % Analog, 380 Lexington Ave., New York, NY 10017.*

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## ON GAMING

*(continued from page 49)*

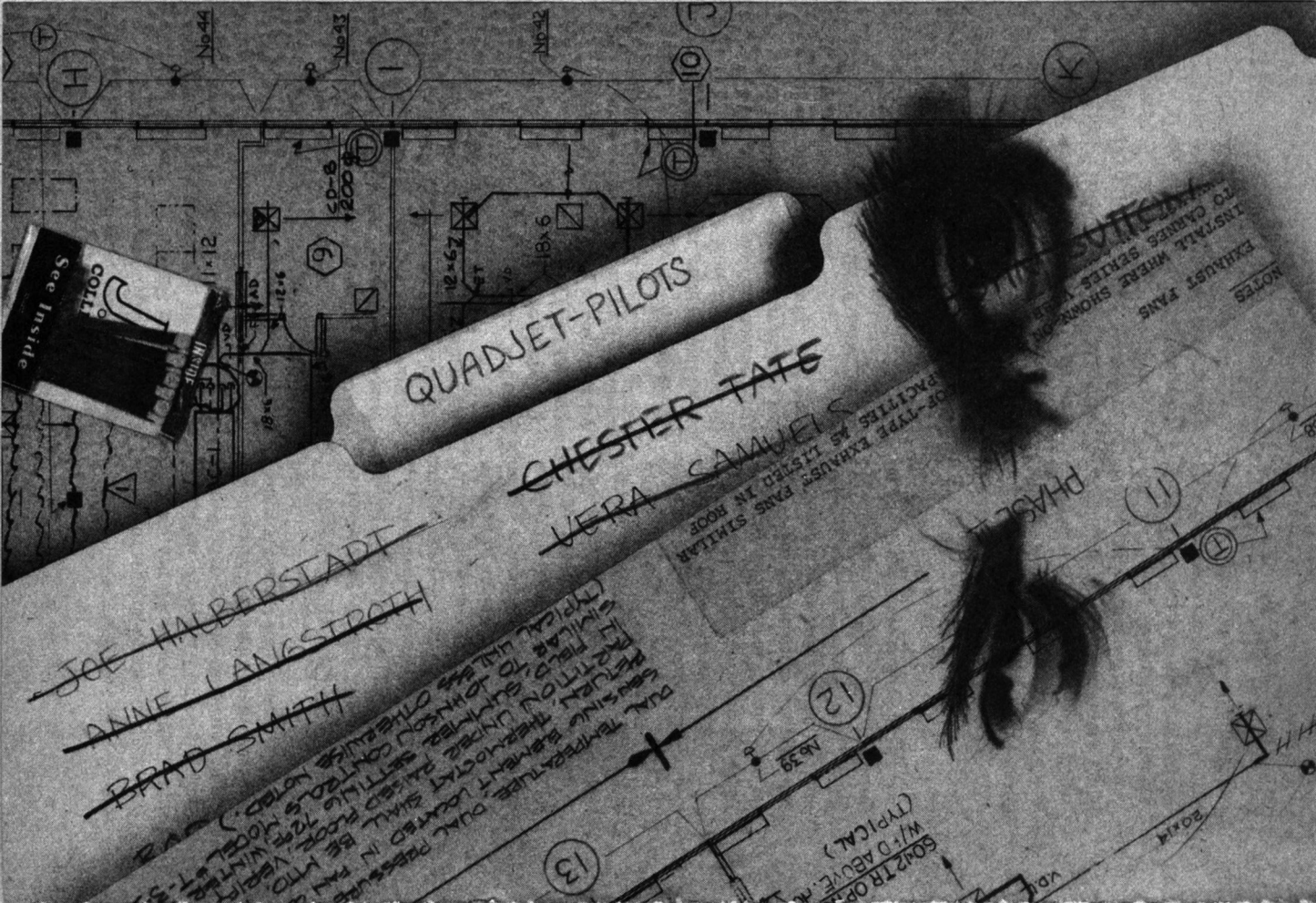
*Knight of Diamonds*, Sir-tech (Apple)
*Mask of the Sun*, Ultrasoft (Apple)
*Pac Man*, Atari (Atari)
*Pinball*, Sublogic (Apple, Atari)
*Preppie*, Adventure International (Atari)
*Sargon II*, Hayden (Apple, TRS)
*Serpentine*, Broderbund (Apple, Atari)
*Shamus*, Synapse (Apple, Atari)
*Snack Attack*, Datamost (Apple)
*Snooper Troops #1*, Spinnaker (Apple, Atari, IBM)
*Snooper Troops #2*, Spinnaker (Apple, Atari, IBM)
*Starcross*, Infocom (Apple, TRS, Atari, CP/M, IBM)
*Submarine Commander*, Thorn EMI (Atari)
*Temple of Apshai*, Epyx-Automated Simulations (Apple, TRS, Atari, IBM)
*Wizardry*, Sir-tech (Apple)
*Zork I*, Infocom (Apple, Atari, CP/M, IBM)
*Zork II*, Infocom (Apple, Atari, CP/M, IBM) ■

# SOLVING PROBLEMS

W. R. Thompson

Even a lousy tool can be useful. The trick is to find the right application for it!

Broeck Steadman


See Inside
QUADJET-PILOTS
~~CHESTER TATE~~
~~VERA SAMUELS~~
~~JOE HALBERSTADT~~
~~ANNE LANGSTRATH~~
~~BRAD SMITH~~

"But I don't know anything about spacecraft design," Robert Dubois complained. "I've got a degree in astronautical engineering, but my expe-rience—"

"—is all in planetary colonization work," Howard Cremer finished for him. He toyed with the polished lunar stone that he used for a paperweight. "And you've been working on the colony project for the past four years. That's where your heart is. I know."

"It'll take me months just to get into the swing of things at Grumman," he protested.

"I don't think so." The Astronaut Office Director put the weight back on his cluttered desktop. "Give me some credit, Bob. I always try to make the best decision—and I decided on you for this job.

"You might try to feel flattered. We've spent, what, eight billions on the QuadJet design? More importantly, all of our plans for the next decade hinge on having the QuadJet available. Exploration, asteroid mining, the Mars outpost, *everything*."

He gestured at the QuadJet model resting on one of his office's shelves. "It's a beautiful design, isn't it? We've had decades of experience in building spacecraft, and it all went into that." He looked pained. "The trouble is that the QuadJet seems to be too complicated for human use. Grumman has done a lot of work with the QuadJet simulator, and so far nobody has managed to make a simulated flight lasting more than two hours."

"Two hours?" Bob felt puzzled. "That's hard to believe. Does anyone have an idea about the problem—"

"Pilot error," Cremer said crisply. "The pilot starts making mistakes, sooner or later, and the ship's systems can't correct all of them. Out of the past thirty-nine runs in the simulator, thirty-seven flights have ended up as simulated hydrogen bombs. Small ones, granted, but—"

"Hoo boy." The QuadJet used four fusion-pulse engines. Laser beams zapped pellets of deuterium-tritium-lithium, hundreds of times per second, creating a steady stream of fusing plasma. At full thrust a QuadJet could reach Mars orbit in less than two days, or nudge a hundred-meter asteroid into Earth orbit. With that sort of energy, an engine failure could be catastrophic. "So what do I do, boss? Other than become hypothetical disaster number forty?"

"Don't do that." Cremer said grimly. "Bob, the problem is definitely pilot error. Find some way to correct it—fast! I've got confidence in you and your record." He reached into his desk and produced a thick tech manual: the provisional and much-revised operating book for the QuadJet. "I'm depending on you to get out to Grumman and save the day."

Bob thought that it looked like any simulator. There was the blocky shape of the pilot cabin, festooned with cables, conduits and hydraulic lifters. It was surrounded by various electronic units, technicians, and assorted heavy hardware. Everything was housed in a hangar-like building which Bob understood had once been an assembly area for lunar modules. The bright ceiling lights and

the echoing acoustics made him think of a movie sound stage.

A loud whistle caught his attention. "Hey, Bob! Over here!"

He grinned and went to the man standing by the simulator cabin. "I thought they put you out to pasture, Doc."

The older man grinned back. "I got tired of the university bit. I don't know what was worse—lecturing to lads like you, or listening to English profs tell me what a waste space is." Art Kirkpatrick's grin faded. "They tell me that you're NASA's latest sacrifice to the sun god."

"Yeah, you could put it that way. Say, what's wrong? Any ideas?"

Art shook his head. "I'm ready to blame it on gremlins and call in an exorcist. We've had a lot of good pilots in here, the best; and this beast has trounced them. They say—" He caught himself. "Well, I shouldn't prejudice you. You can see for yourself."

"Sure thing." Bob grasped the cabin hatch's handle, twisted it and pulled. It swung open, revealing a small, two-seat cabin filled with an impressive array of instrument panels.

"Before you ask," Art said, "it doesn't need two pilots for a short mission, anything under eight hours or so. The pilot positions are redundant. The truth is—" He grimaced. "We've found out that two pilots screw up faster than one. You ask me, that's clear proof that God never meant for committees to fly."

Bob laughed. "How soon can you warm it up for a run?"

"Tomorrow morning." Art gestured at the technicians. "We're running some debug programs this afternoon. We keep hoping to find that the problems are all in the simulator, but so far that hasn't been the case."

"In other words, you definitely don't blame the machine."

Art tried not to sound offended. "The QuadJet is pure state of the art, lad. It almost flies itself."

"Except that it's prone to self-detonation."

"You mean that the pilots are prone to ruin the ship." He pointed to multiple rows of symbols painted above the hatch, somebody's macabre jest: ranks of stylized mushroom clouds, broken up by a couple of death's-heads.

"What are they for?" Bob asked. "The skulls, I mean."

"Well, the first one, that's where Joe Halberstadt managed to explosively decompress himself. The other one, Anne Langstroth simulated a collision with the moon at a hundred and forty klicks per second. She threatened to kill the first guy that made a joke about women drivers, too. I think she meant it."

Bob contemplated the symbols. Both Halberstadt and Langstroth were highly experienced pilots, and Langstroth had a reputation of utter unflappability. Yet this machine had defeated them both.

Bob felt a twinge in his stomach, and he wondered if it was an incipient ulcer. Cremer had given him an unfair burden, he thought.

"You said that they're doing the debugging work this afternoon," he said to Art Kirkpatrick. "Will they be done this evening?"

"Probably by four o'clock," he said, looking at his watch.

"Good. I want to make my first trial then."

Art shrugged. "It's your funeral, so to speak."

It looks like the real thing, Bob told himself. The simulator's tiny windows gave a perfect view of space, including the Earth's curving horizon. The only thing to spoil the illusion was the gravity, which pressed him into the acceleration couch at a precise one G. He realized that lying on his back that way would get uncomfortable fast, although the seat was contoured for maximum support.

While the simulator staff readied their machine, Bob studied the panels. At first glance they seemed horribly crowded, much more so than the instrument boards in a shuttle or lunar tug. Much of the crowding was due to the liberal use of idiot lights. Critical gauges were accompanied by pairs of lights, one red and one green.

At first he had thought that the lights might be a contributing factor to the troubles. They presented the pilot with a lot of extra information but the QuadJet manual identified them as time-saving devices. So long as the green lights burned, the pilot could ignore the gauges. When a red light flashed on, it would catch his eye at once. He could devote a little more time and attention to the task of riding herd on four fusion jets.

"Flight, Houston. Ignition in fifteen seconds." It might all have been a simulation, but the control-room talker didn't let on as he ticked off the seconds.

The count reached zero, and the simulator played through its special effects. The cabin vibrated, and a low throb quickly rose to a powerful hum as the engines reached their nominal firing rate.

Various gauges moved to reflect the ship's behavior as it accelerated toward a paper moon. Accelerate for two hours at one gee, Bob thought, then flip over and brake for two hours; shut down the engines precisely upon hitting the keyhole into lunar orbit. Art Kirkpatrick had called it the easiest simulation; it had been more complex mission profiles which had sent Halberstadt and Langstroth to their hypothetical eternal rewards.

Fifteen minutes into the mission he noticed that he was blinking hard and often. His eyes felt odd, gritty, as if he had gone far too long without sleep. He realized then that several vents were blowing cool, dehumidified air into his face. Bob recalled that the operating book had mentioned that—an effort to reassure the pilot that the air systems were indeed functioning properly. Damned tinkering, he thought. It might be a psychologically sound idea, but his eyelids were beginning to feel like sandpaper.

Worse yet, his arms were getting tired. The instruments were above him, as they would be in any spacecraft under acceleration. The trouble was, he reflected, no spaceship ever moved under power for more than ten minutes, and certainly none of them needed as much supervision as the QuadJet. Like the crowded panels and the gusting vents, it was another grating nuisance.

A red light winked on, catching his eye. The electromagnets which kept the plasma in the number three jet from

touching the engine bell were weakening, losing their superconductivity. He corrected the problem seconds before the computer would have terminated the simulation—

No, he corrected himself, I caught it before the engine would have blown up. That could be part of the problem, thinking of this as a simulation instead of the real thing—

—the panel computer flashed an overload alarm, and while he corrected it another idiot light demanded his attention. He reached for an overhead switch, missed it, mashed his finger into the panel, tried again and got it—

"Mission terminated at plus three seven minutes," the talker informed him.

"Congratulations, Bob," Art said drily, breaking into the circuit. "You always did want to go out in a blaze of glory."

Bob glared at the instruments. The liquid helium pump to the number three engine had failed, they informed him, setting off an interlocking chain of failures which ended with the plasma in the engines breaking containment. The QuadJet had vanished in the equivalent of a two-kiloton atomic detonation; a fast way to die, with ground zero just behind his back.

Bob closed his eyes and felt the tightness in his belly. This was like being back in college, just before walking into a class to take a final exam. He had never gone in for a test with any sense of confidence: just the ever-present fear of flunking out, and the fatalistic belief that the instructor would spring at least one trick question. Art Kirkpatrick, he recalled, had done that to his students several times.

The hatch opened, and a pair of technicians helped him out. Bob was surprised to discover how badly knotted up his shoulders had become. He stretched his arms, working out the tension, and then rubbed his bleary eyes.

Art appeared. "Are you ready for the post-mortem?"

"Have some respect for the newly dead, will you? Cripes!" He tried to rub a crick out of his neck. "I'd like to catch the bastards who designed that thing."

"You're talking to one." Art's voice was flat. "We did the best possible job, lad. We did everything and anything we could to turn out a number-one flying machine. Physical factor, psychological factors, physiological—you name it, we took it into account. Now if you've got any complaints, other than an inability to use a machine that's about as complicated as a stone axe, you just file yourself a report and we'll look into it."

"When?"

"As fast as we can, damnit! This—" He waved an arm at the hangar around them— "is industry, not Tom Swift's wonder lab. There are ways of doing things in the real world, and coming on like a cowboy isn't one of them."

"Hoo boy." He looked at the cabin and saw a technician leaning over the hatch, painting another mushroom. "You people are really proud of that little killer, aren't you?"

"Only when it eats snotty rover-boys who'd sooner blame the equipment than themselves."

Hell of a world, Bob thought. I've got a professional engineer telling me that there's nothing wrong with a bla-

tantly awful machine, and that he won't check into it until I do the paperwork. The House unEngineering Activities Committee ought to investigate this!

He went to the technician and took his paint and artist's brush. "Get some people and equipment in here to move this cabin," he told Art. "I want it tilted over, ninety degrees, so I can sit upright instead of lie on my back like a drunk turtle."

"I don't have the authority—"

"I do. Call Howie Cremer if you want." Holding paint and brush in one hand, he started to climb back into the cabin. "Cremer said this was important and I'm taking him at his word. Art, while you're ordering the crane, or whatever you want to use, have somebody get me some tape and cardboard, so I can take care of those lousy vents."

"It's going to take a couple of hours," Art said. "We'll have to untangle a lot of wires and hydraulic lines."

"I've got plenty of time." Bob slid into the couch and began daubing black paint over the glowing idiot lights.

"Three successful simulations in three tries," Cremer beamed. "Well done. Tell me about it."

"It was pretty obvious stuff." Bob shrugged. "Having them tilt the cabin, so I could sit up, and putting cardboard baffles over those vents, to save my eyes."

"And the lights?" He tapped his paperweight on his office desk in impatience.

"Those idiot lights were more hindrance than help. You see a green light, so you automatically assume that the gauge readings are fine. You don't check them, and even if you remind yourself to check them, eventually it slips your mind. Then the red light comes on, and all at once you're in trouble. There was no problem after I painted them over. I suppose I missed other things that were wrong, but it worked, which is what matters."

Cremer nodded. "Anything else?"

"Yeah. Why were you testing me?"

His eyebrows arched up. "When did you figure that out?"

"While I was making the baffles. Everything just fell into place. There was Art Kirkpatrick, acting like a junior clerk instead of an engineer. Those moronic design blunders—any designer could have and should have caught them before they even got *on* the drawing board. Then there was you, you old fraud, sending me out to tilt with Grumman's windmills. I still can't figure out what you were up to."

"You can't?" Cremer got up and started pacing his office. "Good. I hate the sort of know-it-all who can figure out everything at one glance.

"First off, those blunders weren't blunders. I ordered Grumman to make a QuadJet simulator that was designed to fail. It turned out to be quite a trick, too, because I wanted it to have flaws that were serious enough to cause a disaster, but were easy enough to spot and correct. The same thing applies to that charade of Kirkpatrick's, of course.

"The real QuadJet design is perfect, of course. There's no problem with pilot fatigue, and it's impossible to make the engines explode. This was a test for you people on the lunar colony project."

"I think I see," Bob nodded. "You wanted to throw us a curve ball—set us

down in unfamiliar surroundings, give us a problem and see how long it would take to find the answer." He shook his head. "No, I *don't* see it. You already know that everyone associated with the project can handle something like that."

"You were right the first time, in a way." He went to one of his office's bookshelves and looked at the collection of books, manuals, and reports. "Look at this, Bob: over a hundred thousand pages on the project. We've tried to imagine every possible contingency and find an answer to it, and every day we think up more problems that the colony might face—probably will face, sooner or later. And God knows that possibilities we've missed!

"I don't have to tell *you* how important the project is. It's another link in humanity's future." He took down one of the volumes and began to leaf through it. "So what do we do if there's a disaster and the colony fails?"

"I've been working on the assumption that we can prevent a failure," Bob said. "Everyone has."

"And for good reason," Cremer agreed. "Listen to this." He began reading. " 'In the event of catastrophe, a minimum of three days will be required to begin an evacuation. At peak efficiency, one hundred personnel can be evacuated per week.' " He closed the book and put it back in place. "You can see that an evacuation of just the initial staff could take a month. That's impractical."

"You could get pretty dead in a month," Bob agreed.

"You could indeed. A total failure of the colony could set back the colonization effort by at least a decade—and with the shape the world's in, we may not have that decade. We—humanity as well as NASA—can't afford to fail."

Cremer went to his desk and picked up a manila folder. "I've given my little test to other people on the colony project. Eventually they all figured out that it was a test, of course. Usually they discovered that while they were writing up their reports." He handed the folder to Bob, who started leafing through it. He recognized the names of the report-writers; they were all involved with the colony project, and they were all scheduled, as he was, to make the trip to the moon. "They suggested changing the things you caught, as well as a few other things you missed. The thing is, you passed the test and they didn't."

Bob looked up from the folder. "I suppose you mean that the modifications I made were the critical part of the test?"

"Yes indeed. Consider. I placed you in a familiar situation, and I told you that an immediate solution was critical. Now, there was an obvious, correct, traditional way to approach the problem: study it, write up a report, and let somebody else take it from there. You, however, didn't waste time with s.o.p. You jury-rigged an answer right away, as soon as you knew what had to be done."

"You were testing for *that?*" Bob looked annoyed. "Boss, Grumman isn't the moon. Up there, everyone is going to know better than to muck around with a hierarchical, bureaucratic, everything-in-dodectuplicate approach—"

Cremer smiled thinly. "I know. You're all too bright to fall into that paper trap. Maybe you'll even find a way to improve on bureaucratic rig-

marole but you won't get rid of it, because *any* orderly, planned society has to have some form of bureaucratic structure. You'll have to develop an organization with its own techniques, methods, and customs. Sooner or later —probably sooner—it'll begin to ossify. Don't count on it taking decades, or even years.

"Eventually, some day or some year, the colony will come up against a problem that's totally outside its experience and problem-solving procedures. Don't ask me what—an electronics-eating fungus, a massive budget cutback, World War Three, a Klingon space-raid, *anything*. It's a big universe out there," he added. "and I want the colony to have every possible edge."

Bob frowned in puzzlement. "Does this mean that you want me to be some sort of troubleshooter? An institutionalized gadfly?"

"Not exactly. Look, I already know from your record that you can work within a bureaucratic framework. This test tells me that you can also work outside of it, when you have to. That's what I've been looking for—somebody who is more concerned with getting a job done than with staying inside established guidelines, whatever form they take. All you need is a little authority—a lot, actually—"

Realization dawned on Bob's face. He felt himself turn pale. "You mean —you want *me* to be the colony director? But—but—I don't have any experience—"

Cremer shrugged. "If you can name anyone who has any experience at running self-contained colonies on another planet, I'll hire him. Until then, you're the best solution I can find to that problem. You don't think I've gone through this charade out of boredom, do you?

"The colony is going to face all sorts of problems. Vacuum. Radiation. It takes two years to design and manufacture any special equipment you'll need. Even when the colony begins to show a profit, senators and activists are going to kick you in the budget. Your own people will be on your back all the time, and it'll be like that until you retire, thirty or forty years from now.

"I know you aren't eager to give up field-work for a desk job, even a desk on the moon, and you're not brimming with self-confidence. That doesn't matter. You're the man for this job. I'm depending on you to go to the moon and save the day, as often as required."

Bob still felt unsteady inside but he realized that he had come this far in his life, become an astronaut, despite his lack of self-confidence—and Cremer, the one man who was in a position to know such things, felt he could handle the task. That was enough for him to know, Bob decided. "I'll do it," he said, and smiled faintly. "At least the moon can't be as contrary as an Earthside bureaucracy."

Cremer nodded. "Most of what the Moon can throw at you will be the result of purely natural forces—which can never be as perverse as the ones we humans create!" ■

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● I'm a self-made man, but I think if I had to do it over again, I'd call in someone else.

Roland Young

# the reference library

## By Tom Easton

**The Windhover Tapes: Fire of the Gabriel Ratchets**, W. Norwood, Bantam, $2.95, 240 pp.
**Sector General**, J. White, Ballantine/Del Rey, $2.75, 196 pp.
**For Love of Mother-Not**, A. D. Foster, Ballantine/Del Rey, $2.95, 247 pp.
**The Unforsaken Hiero**, S. Lanier, Ballantine/Del Rey, $11.95, 224 pp.
**The Alien Upstairs**, P. Sargent, Doubleday, $11.95, 181 pp.
**Lyonesse**, J. Vance, Berkley, $6.95, 448 pp.
**J. R. R. Tolkien: A Critical Biography**, Ivor and Deborah Rogers, Hippocrene, $6.95, 165 pp.
**The Mechanical God: Machines in Science Fiction**, T. P. Dunn and R. D. Erlich, eds., Greenwood, $29.95, xiv + 284 pp.
**Formula Fiction? An Anatomy of American Science Fiction, 1930–1940**, F. Cioffi, Greenwood, $25.00, xi + 181 pp.

Once in a great while a book reviewer or critic develops such a following that he (or she) can make or break books. Many *other* book reviewers delight in the thought that they too must have such power. They chortle to themselves among the shadows of the literary alleys, rubbing their hands together gleefully, plotting their next hits.

Let's be honest. For most of us, the power trip is pure fantasy. It just ain't so. Too few people read our reviews! And besides, we're just as human as stumbling authors and greedy publishers—we don't really deserve the power. Ultimately only the readers, the market, can or should judge a book's worth.

Publishers know this. But they also know how reviewers dream. And there's one publisher out there with the slyest of PR departments. It sends me letters saying that the editors had noted my remark that while Warren Norwood's approach worked in the first *Windhover Tapes* book, it failed in the second, and I would not read or report on the third unless it looked a lot better. The latest

letter then says **The Windhover Tapes: Fize of the Gabriel Ratchets** "*is* quite different. Warren takes his writing career quite seriously and is always seeking to improve upon his work. Partially in response to comments such as yours, and partially through his own personal evolution as a writer, Warren has chosen to write this third book in the third person, feeling that as such (sic) he can bring the reader more deeply into the action of the book and also develop the personalities of the supporting characters more. . he will continue using this voice for the final book in the *Windhover* saga, *The Planet of Flowers*, which we will publish in early '84."

For a reviewer with dreams of power, this would be a very gratifying stroke. But I don't believe I have that power,* and I'm not at all sure I'd want it, except for what it might do to my reviewing income. I'm suspicious. There's too much horse manure in the world, and this smells like more of it. It's rubbish, folks. Isn't it? Mere flattery. Even sycophancy.

What about the book? Is it any good? Is it any better? Yes, it is. The third-person voice broadens our view just enough to let us grasp Norwood's universe, feel the action, and meet the characters. We are no longer at two removes from the story, but only one, and that is a distance we leap easily. We enter the story more easily, and not only because we are more used to this authorial voice. After all, we've seen plenty of yarns in the form of diaries (and tapes), or as told to a narrator. They never have worked well, for they lacked the immediacy that Norwood now gives us.

The *Fize* story gives us the missing background of Norwood's hero, Gerard Manley. Envoy to the Ribble Galaxy, his task is to spend a decade bringing about a rapprochement with his own Federation. The job grows complicated when he and the Ribble ruler, Princess Peg, fall in love. Becoming Peg's consort, he must also train and qualify as head (Fize) of the throne's special troops, the Gabriel Ratchets—and then he must play two roles, as Federation envoy and as Ribble leader, in the face of conflicting orders and deadly plots and counterplots. He is an innocent caught in a web of intrigue. He is a bottle bearing a tender missive and bobbing in a chop of conflicting currents.

The missive is love: for Peg and their child, for his Ratchets, for people. It is thus a crime that in the end, despite his services to two systems, despite his vectorial resolution of the two plots that each seek to use him fatally, he is mindwiped. Yet he has certain mental powers—he is at times prescient; he has a well into which he can dive to escape stress—and he seems finally able to protect his missive by burying it deep within his head, by driving in the bottle's stopper almost too deeply to remove again. And here, of course, we have a strong theme of *Tapes* 1 and 2, the continuing efforts of Manley's subconscious to pry the stopper loose, to

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**Or do I have it after all? On the very day when I am typing this column up, the mail brings notes from two readers, Jim Williamson and Jack Stocker, with the letters they received from ARCO when they asked for a copy of* The Tricentennial Report, *which I reviewed back in the March issue. ARCO apologizes for being plumb out of the Report and notes that "We were very surprised when we started receiving so many requests for this dated publication." Quite a few of you apparently wanted copies. If my comments on commercial books have a similar effect, then maybe Bantam is right to stroke me. Nevertheless, I won't believe I have any power until someone shows me a sales curve with an inflection point right after* Analog's *publication date!*

return to his consciousness the contents of volume 3.

What will volume 4 be like? I suspect it will leap ahead in time to show us a Manley with full memory. Perhaps it will reconcile him with Peg and restore his first child. Yet we know he has a wife now, ShRil, and another child. Perhaps he will find a way to have both women, both kids, both families, at once. Certainly, *Planet of Flowers*, as a title, suggests such a happy resolution, consonant with the missive in Manley's bottle.

James White brings us four new tales of his multi-species, multi-environment space hospital, **Sector General**. In "Accident," we see the stimulus for Sector General's development, a space-port accident where emergency medical care is hampered by war-fearing, hands-off-aliens attitudes. "Survivor," "Investigation," and "Combined Operation" then display hospital crises such as we have seen before. The difference is that here the focus is on a newly inaugurated space ambulance service which rushes to wrecks in space. Not too surprisingly, it is responsible for an inordinate number of first contacts.

I like the Sector General stories. They escape the clichés of war and quest, and they represent a future that might actually be, if and if and if. They show the highest of civilized impulses, not the lowest, in action, and they give hope.

The main trouble with them is that they sound too much like TV medical shows—perhaps "Trapper John, M.D.," or . . you name it.

Is that bad? Maybe not. We moan about the miserably low level of TV and film SF. What would we say if the Sector General stories made it to the screen? There are enough of them for a season or two. They demand plenty of special effects—Ah! The busted spiral starship of "Combined Operation" and its occupant! They might be just what both we and TV have lacked for years.

Is anybody listening? How about the "M*A*S*H" producers? They must need *something* to do now.

Alan Dean Foster brings us a third tale of beginnings in **For Love of Mother-Not**, which tells us not of a lost memory and not of an institution's roots, but of one Flinx and of how he got his minidragon, Pip. Flinx is the hero of four previous novels, notably *The Tar-Aiym Krang* and *Bloodhype*. All along, he has enjoyed the company and assistance of Pip, a hot-blooded reptile with gaily colored wings and an astonishingly toxic and corrosive venom. Pip is also a catalyst for psi powers such as Flinx's emotional telepathy.

Here, then, is material for a long run of stories. Yet Foster has never discussed the duo's early days, until now. As an orphan, Flinx was auctioned as a sort of slave. Mother Mastiff, aged curio dealer in the low-life district of Drallar, main city of the planet Moth, bought him for unclear reasons. Love grew between them, and Flinx grew boldly streetwise. Flinx's Talent appeared, and one night a sense of lonely hunger drew him from his bed to an alley garbage heap. There was Pip, who immediately adopted the boy.

How did Pip reach the alley? Foster does not say here (though I seem to recall that he does elsewhere). How did Flinx reach his auction block? Here lies the driving force of *Love*'s plot. Years earlier, a group of mad scientists, the Meliorare Society, strove to use genetic engineering to improve the human species. They committed atrocities, were discovered, banned, and hunted. A few remain in hiding, seeking the best of

their lost experiments. Flinx, it emerges, is subject number twelve, and they have found him. To control and guide his maturation, to create the success they believe will justify their project and free them from persecution, the mad scientists kidnap Mother Mastiff. Into her brain they will plant devices through which they will be able to reach Flinx.

Flinx and Pip pursue. They receive aid from a young woman who may be more than she seems (the Meliorares once lost a female subject, young and immature, with vast powers). They destroy the Meliorares, rescue Mother-Not, and confront government agents who would surgically make Flinx "normal." They escape all harm, and in the end Flinx shows signs of even greater power. For his destiny, see the earlier books.

The story moves. It satisfies. It entertains. Does it do more? Not really, though it is set in the same humanx context Foster uses for more serious work. Should it do more? Not by any rule I know. Sometimes all we want is fun, and it is nice to know it's available. Enjoy.

Ten years ago, Sterling Lanier published *Hiero's Journey*, set 5000 years after the holocaust in a world of mutants in which ecologically sane humans and their allies confront the exploitative, evil Unclean. The book was well received, and I have heard wishes for a sequel.

The sequel is now here—**The Unforsaken Hiero**—and it looks like there could be another. Hiero, warrior-priest from the Metz Abbeys of Kanda, and his princess bride Luchare have reached her kingdom of Dalwah. Hiero is now a prince. The Unclean still dread him, and they conspire to kidnap him, dose him with a drug that kills his mental powers, and spirit him off to a distant execution. He escapes, heads for home, and finds himself drawn off the track by an unnoticeable pull. The puller turns out to be a giant snail who manages to restore most of Hiero's powers.

Once more on his way North to his Metz home, Hiero acquires allies, joins a battle in the developing war between the Unclean and the Northerners, and then joins the war itself. He leads an army to victory, but then he learns that Dalwah has fallen to the Unclean and Luchare has disappeared. The next volume *must* cover his search for her and his vanquishing of the Unclean core in the south.

The plot is familiar, even too familiar. It is the quest adventure of both SF and fantasy, owing much to Tolkien (as does the whole idea of trilogies). If the book is better than many others of the type, it is because of the detailing of Lanier's imagination—less rich than, say, Gene Wolfe's, but still quite rich enough to let us accept Lanier's world as real.

*Is* the book better? Marginally. Lanier's rich imagination is at times crude; he sometimes neglects to give his monsters genuine niches in his world's ecology. Without such niches, they could not exist. Too, he seems to view atomic radiation and mutation magically, as something that can create great changes overnight. It can't; at most, it can create a long series of small changes that, over many generations of step-by-step natural selection, add up to major changes. This is why, to many biologists, many mutant yarns appeal as fantasy rather than SF, when they appeal at all.

I also bridle at a hint of debate—though the hint is false. In *Journey*, Lanier established the Unclean as those who want to restore pre-holocaust technology, even unto atomic power. The Abbeys

stood for a "small is beautiful" technology that does not harm the environment. Yet Hiero's initial quest was for a computer that would help the Abbeys collate the information in their files and let them extract the bits they needed to fight the Unclean successfully. Some critics seem to have missed this willingness of the Abbeys to embrace their own brand of pre-holocaust technology, taking Lanier to task for a simple-minded rejection of true civilization.

There *is* some simple-mindedness here, for Lanier does seem to forget that we don't need the atom to rape the world. But he clearly does not reject all technology. In *Unforsaken*, the Abbeys have successfully built a computer, and it does indeed help them defeat the Unclean in the North. High technology will surely play a growing part in their version of the good life. Lanier's point —hardly novel—now seems to be that it is possible to build a technical civilization that preserves the world. He still needs to say how that civilization's need for various resources can be met without rape.

If he is really answering—debating—his critics in his novels, he will try to satisfy me in volume three (which I hope is not another ten years away). If he is not, then that yarn, like this one, will still offer entertainment and satisfaction in ample measure.

Pamela Sargent's **The Alien Upstairs** is interesting, though less ambitious than some of her previous work. In a world of too many people and too few jobs, a world of scarcity, she shows us a small apartment house. A strange man, Rafe, who suffers no shortages and claims out loud to be an observing alien, moves in upstairs. A downstairs couple, Sarah and Gerry, grow curious and probe for truth.

The first portion of the book, which develops the mystery, is excellent. I found the characters sympathetic and rounded. However, once Sarah and Gerry follow Rafe to his base orbiting Mars, this breaks down. Sargent seems at her best with Earthly matters. Her descriptions of Rafe as a kidnapped Cro-Magnon, of his millennia-long watch over the planet and search for companionship, of his dilemma as his companions invariably leave to seek Rafe's kidnappers, and of his final resolution and replacement, seem hasty and incomplete. They do not convince. The book might have benefited by another fifty pages.

**Lyonesse** is being touted as Jack Vance's *magnum opus*, a "big fantasy novel which aims for the huge popular audience reserved for such classics as T. H. White's *The Once and Future King*." At well over 400 pages, including a map, a genealogy, and a "Preliminary," it's big, all right. It gives us intrigue among the elves, Celts, Goths, and ur-Vikings of the Elder Isles. Princess Suldrun is born to the king and queen of Lyonesse, grows up estranged, and is banished to an abandoned garden near the palace. A minor prince of another isle, Aillas, journeys with his cousin Trewan to learn the arts of diplomacy. Word comes to Trewan of a death that makes Aillas a rival for kingship. Trewan throws Aillas overboard, to wash up on Suldrun's shore. The two love and are caught. Aillas is jailed. Suldrun bears his child, ships the babe off to a caretaker from whom the elves steal him, and hangs herself. Aillas escapes. His son matures and leaves the elves. The two seek and find each other. Aillas reaches home in time to forestall his cousin's crowning. There is war, and truce, and the promise of a sequel.

And all bears the Vance stamp. Names ring strangely and evocatively. Scenery crawls upon the page. Motives are complex and subtle. Events concatenate. If you love Vance, you'll love *Lyonesse*. If you don't, you'll hate it. If you care more for his SF than for his fantasy, you may prefer to give this a miss. Me? I'd rather read something else.

Ivor and Deborah Rogers' **J. R. R. Tolkien: A Critical Biography** first appeared from Twayne in 1980. I didn't see it then, and I suspect you didn't either. So—here it is in paperback, not too long, and a pleasure to read. The authors like jokes and sprinkle them through the pages, as when they say, "Tolkien . . . saw with distress the fragility of ecosystems and the propensity of human beings to commit countrycide," on p. 105.

The book links Tolkien's corpus to its predecessors in myth and legend, as I'm sure other books have done as well. More interesting to my mind, it relates his works to each other in an illuminating way. For instance, in "Leaf by Niggle" an artist sets out to paint a leaf, which becomes a tree, which becomes a landscape. Later he journeys and finds a land containing his landscape, his tree, and presumably even his leaf. This story reflected Tolkien's own state of mind at the time—it began as a dream—as his famous trilogy grew of its own will beyond the bounds he set for it, and it demonstrates how an author's works affect each other. So too does it show how life and work, vocation and avocation, upbringing and belief and learning, all interact.

There are few surprises here. The book's value may be that it states these things in relation to a writer and a set of stories we all are fond of. Perhaps thus it brings them home more easily.

Thomas Dunn and Richard Erlich are the editors of **The Mechanical God: Machines in Science Fiction**. They report that when they trumpeted their call for papers through the groves of academe, they received an astonishing number of "fine essays." The nineteen on robots and intelligent computers went into this book. The rest, on "computer tyrannies, 'hive' worlds, mechanized societies, and like-SF works . . . in which literal or metaphorical machines threaten (or promise) to engulf humankind rather than replace us" will appear in *Clockwork Worlds: Mechanized Environments in SF*.

Dunn's and Erlich's basic idea was fine. Machines are prominent among the furniture, themes, and metaphors of SF, and they deserve discussion. However, the editors and too many of their contributors seem to share the common antimachine bias of the humanist. They see the machine—especially the intelligent machine—as encroaching on human mind, soul, will, and freedom. They slight the shining optimism of much SF, preferring to see only the pessimism—and even when they do discuss an optimistic story, they interpret it darkly.

I cavil. There is plenty of pessimism about robots and the like in SF, but there is also—and more pervasively—that optimism. Much SF seeks the form of a necessary future man-machine *modus vivendi*. Recently, a number of stories have made explicit the notion that men and intelligent machines can be each other's bootstraps into the universe.

But how about nonintelligent machines? SF contains plenty of those as well, and it occurs to me that a great deal of SF displays an attitude of acceptance that itself could form the germ of a critical study. Perhaps we need a book called *The Mechanical Compan-*

*ion* to develop this thought in nineteen more fine essays, to discuss SF's view of how people can take complex machinery for granted, of how they can use it without being diminished by it, even of how they can be enhanced by it.

Humanists often seem to believe that nothing less alive than a landscape or a rose garden can possibly be life-enhancing. They need to broaden their vision, for already many people live surrounded, penetrated, stimulated, enabled—in short, enhanced—by landscapes and gardens of machines, most of which are in no way intelligent. They are tools that diminish human dignity and worth no more than do shovels and fishing rods. And here is a thought that, given greater currency, might actually ease the general public's fear of being replaced or engulfed by machines. Should the humanists publicize it? Perhaps, if they could themselves be convinced. If they would, they would probably be believed more widely than the technophiles who now push the idea.

Frank Cioffi's **Formula Fiction? An Anatomy of American Science Fiction, 1930–1940** leans heavily on and gives much credit to the old *Astounding*. There it was, both before and after Campbell's advent, that the best of the 1930s' SF appeared, much of it still in print. There it was that SF freed itself of the prior genres it aped initially, and there it was that it developed three basic formulas of its own that still live today.

The first of the three formulas is the "status quo" story. It "moves in a straight-forward way: conventional reality is disrupted by change or anomaly of some kind, but by the story's end the conventional order has reasserted itself." This is the "humans lick the alien invasion" story, well suited to the needs of depression-era readers. In the "transplanted" status quo story, conventional reality is conventional only in some imagined future or world. In the "inverted" version, the rejected anomaly is positive, but still disruptive.

The second formula is the "subversive" story, in which the anomaly wins. Society adapts or crumbles in response, as in many after-the-holocaust yarns. Subversive stories come in "destructive" and "incorporative" varieties.

The third formula is the "other world" story, "the most mature of SF formulas" which "appears with regularity only toward the end of the 1930s." Here, the story "establishes a fictive universe that works on principles entirely different from those of any naturalistic world." It may posit a matriarchal society, a race of hermaphrodites, or the replacement of people by machines. It may set the reader into a world populated only by aliens. It works by contrast, by allegory, by simile and metaphor. In the "flawed" version, the other world meets and falls before some representation of contemporary or human values. In the "ascendent" version, the other world wins.

Does anything sound familiar? It should. Cioffi has given us a taxonomy of SF, based on the genre's founding years but quite applicable today. I'm not sure that any new formulas at all, in his sense of the term, have arisen since the 1930s. In fact, I'll warrant that every story in this issue of *Analog* fits one of Cioffi's formulas.

If you don't agree, write to Cioffi. He's at Eastern New Mexico University, and he does hedge that his "critical terminology . is preliminary rather than final." In addition, in his "Conclusion" he says a few things that suggest he is considering extending his analysis toward the present. ■

SYNOPSIS

**Justin Sudano**, *a young electronics company employee with big plans to gain fame, fakes a job order at the White House and enters the attic, ostensibly to repair an antenna.*

*Once inside, he removes a pane of glass, assembles a powerful crossbow from plastic parts he brought with him, and waits. When the president appears on the lawn below for a diplomatic reception, Sudano puts a quarrel in his back.*

*Sudano could probably have escaped; he is not suspected. But he approaches the T.V. people on the scene, confesses to the crime on camera, and is immediately arrested.*

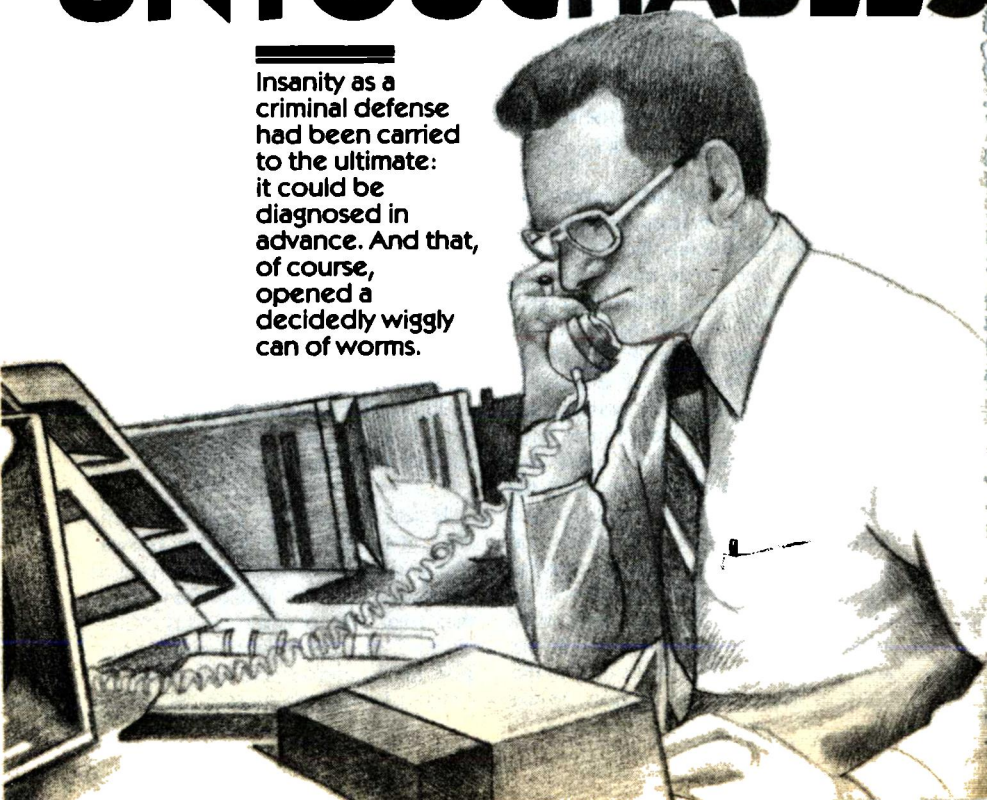
*Later,* **Clifton Chadwick**, *one of Sudano's defense counsel, travels to Scith-*

Conclusion

Joseph H. Delaney

# THE NEW UNTOUCHABLES

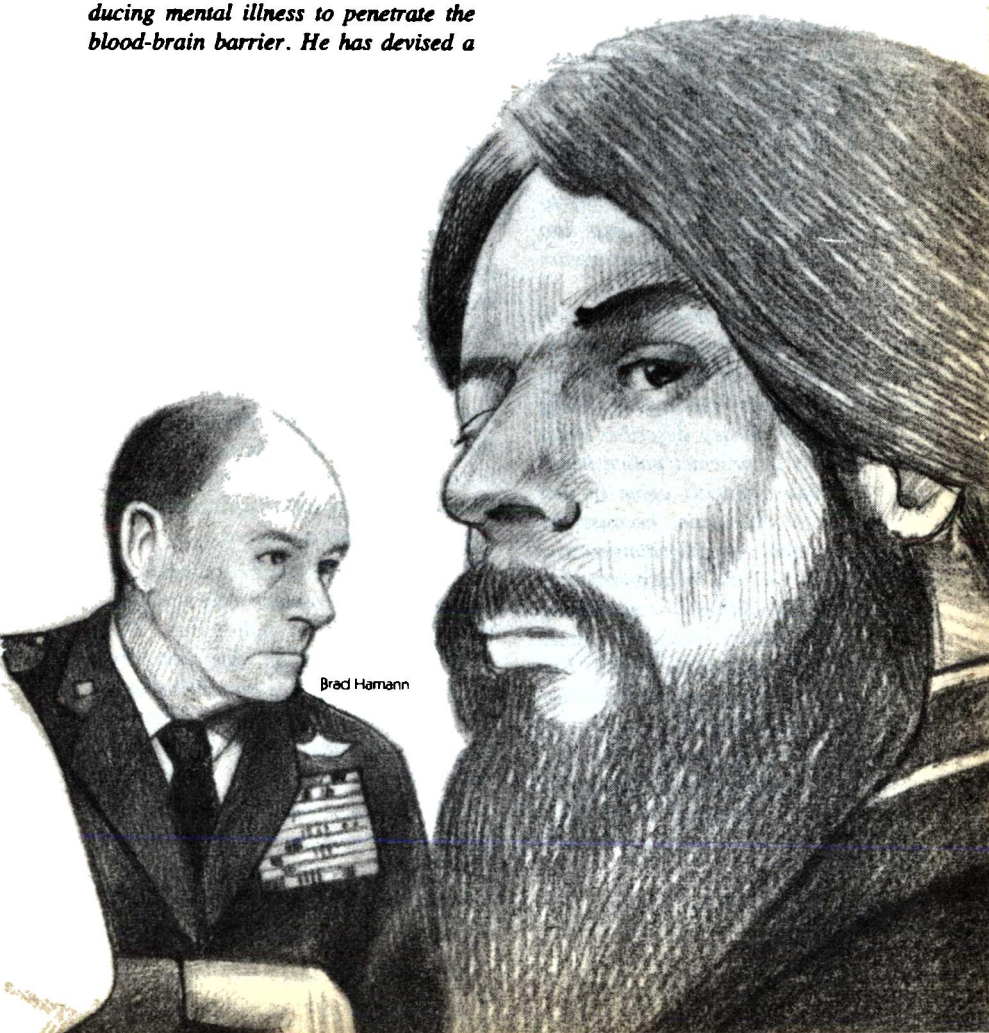
Insanity as a criminal defense had been carried to the ultimate: it could be diagnosed in advance. And that, of course, opened a decidedly wiggly can of worms.



*ersville, Illinois, to see psychiatrist* **Dr. Nelson Alban**, *whom the defense plans to use as an expert witness in the forthcoming trial. The defense will be insanity.*

*Alban recently had written a book about his work, which has to do with a certain enzyme of previously unknown function produced by some people's bodies. Alban claims this enzyme enables foreign substances capable of producing mental illness to penetrate the blood-brain barrier. He has devised a test for the enzyme and has a great mass of statistical data which indicates the enzyme is present in the bodies of an overwhelming proportion of the country's prison inmates. The only people who seem sometimes to defy the statistics are those over fifty.*

*Chadwick's plan is that Alban will examine Sudano, and that if he is determined to be a positive, testify that he*



*is within the definition of an insane person under the Federal Rules: incapable of determining whether his conduct is wrong or of conforming his conduct to the requirements of law.*

*Alban agrees, determines Sudano is a positive, and testifies at the trial. Sudano is found not guilty by reason of insanity.*

*The decision has far-reaching effects. Clifton Chadwick comes home unexpectedly early one day and finds* **Abbie**, *his roomie, packing to leave and furious with him. She had been employed by the National Security Agency until noon that day. But NSA gives its employees the Alban Test. Abbie flunked and is therefore a security risk. Attempting to calm her down, Chadwick gets too close. Abbie sticks her sewing shears through his back.*

*Later: Out on the street in the South Bronx, World Broadcasting System reporter* **Tyree Hosey** *and his cameraman,* **Abdul Hibib Watkins**, *are doing a commentary. Hosey describes what now happens at precinct police headquarters. The criminals come in and "zeme" right out again, because the police can handle only the dangerously violent. The rest have what amounts to immunity. Such things are happening all over the country and many places throughout the rest of the world. Unemployment among positives is rife, because employers and their customers no longer feel secure around positives. Positives licensed in the professions lose their licenses. The result: many positives find crime their only hope of survival.*

*Alban, too, is alarmed by the developments. He goes to see* **President Kinney**, *now recovered from his wounds. He knows the president is a positive—as is Alban himself. Alban urges the president to go public. Kinney is afraid, and at first resists. But to get rid of Alban he promises to think about it. As soon as Alban leaves, Kinney calls someone to "take care of the problem."*

*Alban is approached at the airport by a man with a gift: a travel clock from the president. He puts this under his seat. Later, high over southern Indiana, the plane disintegrates, killing all aboard.*

*When this happens, Kinney is informed by phone. He tells the caller to retest and rehire all the fired positives. He is not going to let "them" take away his spot in history.*

*Later: Once again, on orders of WBC President* **Nate Roth**, *reporter Tyree Hosey is on assignment. Accompanied by* **Dave Herrick**, *another reporter, he is driving to Scithersville, Illinois, where it is hoped they can get a look at Dr. Alban's records. Nate, playing one of the hunches for which he is renowned, is certain that these will shed light on the circumstances of Alban's death. He thinks Alban was murdered.*

*Outside of town they hear sirens. An enormous farm combine races toward them pursued by a police car. The driver, a little old man, does not even wave as he passes. The policeman does not see them and at that moment attempts to pass the combine. A sideswipe collision ends the chase.*

*The policeman, much abashed by this development, comes over to patch things up. He was pursuing* **Arthur Fensky**, *a local crazy, who periodically has delusions that he is some famous person.*

*Today Fensky is General Patton; the combine is his "tank."*

*The cop introduces himself as* **Chief LeRoy Erwin**, *Scithersville P.D. He tries to be friendly and offers to make amends by helping the reporters. He knows everybody in town, he says. They accept, and LeRoy takes them to meet* **Ceil**, *Doc's housekeeper, who still lives in Alban's house.*

*Ceil, a stunning and statuesque black woman in her early forties who many suspect was more than Alban's housekeeper, takes an immediate liking to Tyree, who is also black. Plying the reporters with pie and coffee, she begins a cautious account of some recent unsettling events. As soon as Alban was dead, she tells them, the F.B.I. came, demanded his records, and were run off the property at the end of her shotgun.*

*Tyree eventually gets Ceil to confess: not only is she Alban's lawful widow; she was also his assistant, and a competent scientist in her own right. Their relationship was not revealed for social reasons.*

*Knowing what she knows, Ceil fears for her life. She shows them some of Alban's records, which are in computer storage. Some of these he acquired from government sources in the early stages of the enzyme testing, and she thinks these are what the F.B.I. wanted. She thinks the records affect people now in power, though she cannot identify any of them.*

*The reporters, however, do. They discover that Kinney is a positive, which only reinforces Ceil's fears. Tyree offers her WBC's protection, and she accepts. But taking the physical tapes is too risky, so Tyree arranges a telephone interface and transmits to WBC's data base.*

*Ceil feeds them supper, and they start back home. On the way they hear sirens. Passing the police station, they meet LeRoy, who tells them the sirens mean a prison break nearby. There will be road blocks, so he volunteers to write them a pass.*

*They do encounter a roadblock. The two men manning it claim to be F.B.I., but behave strangely. They are obviously looking not for escaped prisoners, but for the two reporters, who are arrested and cuffed while their captors search the car. Finding T.V. tapes, which they cannot be sure are not the records they seek, they tell the reporters they will be taken in.*

*At that point a roaring noise erupts from a nearby cornfield. It is Fensky's "tank," approaching the road. The F.B.I. men fire on it and, while distracted, are overpowered by Tyree and Dave.*

*Fensky approaches; accuses the reporters at first of being "Krauts." But Tyree's color convinces him that they are G.I.s with information for Eisenhower. They will go to his "Headquarters."*

*At Fensky's farm the two discover a cropduster plane. Tyree, though he has had only a few lessons, decides a crash would be no worse way to die than getting shot. Just before dawn they fire it up to leave. At that moment people drive in and try to block the runway, but are engaged by the "tank." The two make it off, but being slightly less than proficient navigators wind up way off course in Neosho, Missouri. With his last quarter Dave gets through to Nate.*

*Nate, concerned about taps, tells him to panhandle another quarter and call him at Wu's in twenty minutes.*

*Wu's is a restaurant and bar near the U.N. Its now-dead owner was heavily involved in intrigues, particularly in Asia. As a result, it is still a hangout for spies and former spies—including Little Skinner, Nate's* **Uncle Hymie**, *who is retired from the C.I.A. After a minor encounter with* **Won Long Por**, *a knowledgeable but abrasive bartender, Nate takes the call and arranges to send the company plane.*

*Back in New York and smuggled into the WBC Building, the two tired reporters are taken to Nate's penthouse office. Being something of a ladies' man, and having the resources, Nate has had his own little love nest built on. It does not appear on the architect's plans and looks like a rooftop water tank from the outside. Inside it is plush, with (among its other features) a computer terminal connected to WBC's database. The three of them begin going over Alban's records, crossmatching what are obviously social security numbers to numbers on WBC's cable subscriber lists. They make hits:* **Freeman Moseby**, *a Supreme Court Justice;* **Patrick Gosnell**, *the F.B.I.'s regional supervisor at St. Louis. But the big surprise is* **Jason Abelard**, *U.S. Secretary of Defense. Other numbers may possibly be military serial numbers. They cannot be certain, but hope to get aid from the veterans' organizations to check these.*

*Next morning a call comes in from LeRoy. At the urging of Tyree and Dave, Nate agrees to do as LeRoy asks: come to Scithersville in person with a camera crew, and interview LeRoy on live T.V.*

*The prison break had been phony, as they suspected; but in addition Ceil Alban was burned out of her home during the distraction.*

*Leaving Dave and Tyree in the room as insurance that someone can repeat what they know, Nate and Abdul go to Scithersville, making the last leg by helicopter and landing next to the burned-out house.*

*LeRoy is there to meet them, and soon the broadcast begins. LeRoy tells a strange story while workmen with shovels dig out a doorway from the rubble.*

*When the door is clear, Ceil emerges from the sub-basement, in which she survived the fire. This is where sensitive instruments were kept and it had been well insulated. Ceil had been pursued there by F.B.I. agents who broke into the house. She shot one, then locked herself into the vault. Later she got a phone line working and called LeRoy.*

*She gives this account on camera and, as a finale, explains her theory as to why she was attacked, announcing that the president is a positive.*

*Having launched this bombshell, they all pile into the helicopter, rendezvous with a jet at Terre Haute, and proceed to Montreal, where Ceil and LeRoy seek asylum.*

*In Washington that night, Kinney calls a war council. He sacks Patrick Gosnell, who leaves in an angry mood. But Abelard he praises, telling him to secure military control over the country if he can, against the day when this might have to be used. Abelard tells him he is already moving senior non-positives out of command positions.*

*Back at WBC, the newsmen confirm this with the assistance of* **Glennadean**, *an accounting department employee who once worked for the Post Locator at Ft. Leonard Wood, Missouri, and who remembers many of the computer access codes. Tyree begins to get very nervous about his own neck.*

T.V. networks necessarily have friends, everywhere. WBC had friends, and those friendships necessarily extended to certain of its employees. Such as Raymond Dunn, the company's sleepy-eyed but well-connected general counsel.

The minute Nate had called him to say that two of his reporters might be in the dogbox with Uncle, Ray had gone to work. Owing to the nature of the problem and the general emotional condition of the country, his people had rapidly gotten the ears of those whose province it was to decide who gets prosecuted and who doesn't. The advantages of WBC's present, nearly neutral attitude had been carefully pointed out to them.

Those powers, having trouble enough as it was, and having had a demonstration of the media's effectiveness by way of Nate's "live from Scithersville" broadcast, elected to eat crow.

So Nate had two ace reporters he could once again put on the street. "Dig," he told them. "But—be discreet, and for God's sake don't put anything on the air until I've reviewed it. I don't want anybody to take the easy way out by blowing you away."

A couple of fairly quiet weeks went by, during which the Kinney government appeared to be regaining, and retaining, a fair amount of control.

The Supreme Court, as expected,

ruled on the question of whether or not elected officials who happened to be positive could be removed from office on that ground alone. The court, however, neatly sidestepped the issue; it turned out to have very little value as a precedent.

The case involved Congressman Thomas Monaghan of Pennsylvania, who was an avowed liberal in a basically conservative house and who, having few enough friends to start with, acquired no more with his abrasive personality. As a colleague from Texas put it, "We just plain don't like him." That attitude apparently was shared by the necessary two-thirds. Monaghan found himself in the street, expelled. So he went to court.

And the Court, eight to nothing with Justice Moseby abstaining, said they'd follow *Powell* v. *McCormack*, 387 U.S. 993: that the judiciary did not have the constitutional power to interfere with the resolution of expulsion. Which, of course, had the practical interpretation the house gave it: no reason is constitutionally necessary.

The governor of Pennsylvania immediately exercised his prerogative and appointed a successor, a man known to be sympathetic to Kinney, whose party had the majority.

The question of Kinney's possible removal was unaffected by the opinion. The removal of a president, unlike that of a congressman, is specifically mentioned in the Constitution; causes are limited to treason, bribery, or other high crimes and misdemeanors.

There was, however, a ripple effect. State legislatures, most of whom had modeled their constitutions after the federal version, promptly expelled a number of their own more disagreeable positive members, and for a while it looked like the positives would go on sliding, right out of the American economy and society.

Then a landmark case was decided; in *Bellasario* v. *Michigan* the Supreme Court dropped the other shoe. Picking the case up from the Michigan Supreme Court on certiorari, the U.S. Supreme Court advanced it on its docket as an emergency matter.

Bellasario was not personally important, though he was, of course, a positive. He had formerly been State Superintendent of Roads and Bridges, a highly sensitive job because of its relatively big budget and the correspondingly high risk of corruption it presented.

Bellasario had not been accused of being on the take. As in *Monaghan*, there was not a present accusation, but a potential one.

Again unanimously, and again with Justice Moseby abstaining, the court astonished the experts. "The right to hold public employment, absent some legal excuse for discharge, is constitutionally protected. The public must assume the risk that malfeasance will occur, even if that risk approaches 100 percent."

Two cases; two divergent decisions. But as a result, many previously helpless and desperate positives who were entirely innocent of any wrongdoing went back to work. Though this was essentially limited to the older, high-seniority workers in the growing positive community, private enterprise followed suit to a certain extent. Many employers who previously had been

sympathetic, but who had been under pressure from customers, bonding companies, and their other employees to lay off positives now began selective rehiring.

But by far the most important impact of the *Bellasario* decision was on the learned professions. Faced with the tough attitude the Supreme Court had displayed with respect to the rights of state employees, the state courts took another look—particularly at the legal profession.

There had been a flurry of disbarments right after the Sudano trial, because licensing authorities had naturally looked deep into the records of most positives.

In many cases this scrutiny had been justified. It had, in fact, turned up evidence of wrongdoing which could be traced to, and equated with, bad moral character. And the Alban test did seem to be a reasonable criterion for evaluating moral character. So it struck at the very soul of the profession.

Curiously enough, being positive didn't seem seriously to interfere with the attracting and retaining of clients. In many instances it appeared that John Q. Public simply didn't care if his lawyer was a crook—as long as he was *his* crook. Neither did he care if the judge was positive—as long as the ruling was in *his* favor. The public was used to thinking that justice was a commodity to be bought and sold, and it didn't matter that science had finally gotten around to confirming what they knew already.

Whether or not that impression was the driving force, the states had cleaned house; not only that of the legal profession, but that of the medical, dental, and public accounting professions too.

Now they had to backpedal. Disbarred lawyers had filed hundreds of suits; they had the skill to do so, and naturally the best of reasons. Lack of a license prevented them from being advocates, but not from being litigants.

The organized bars, now totally nonpositive but sympathetic, covertly assisted. And it was their effort, plus the *Bellasario* decision, which was largely responsible for getting these professionals back into business.

So, for a while, it looked as if the country might be headed back toward stability once again. The citizen already used to a positive president running the whole country, and who calmly sat in a chair while a positive dentist drilled on his teeth, found that he wasn't really all that upset about it anymore. He went back to thinking about what had always bothered him before he heard of Alban's syndrome: how to pay the bill when the dentist got through.

Tyree and Abdul did it again; they went back to the 41st Precinct to get another story on street crime. This time the weather was balmy, the breeze gentle, and the commentary easy.

"Too easy, boss," Tyree told Nate later, while running his tape on the monitor. "Something's wrong on the street."

"I guess I missed it, Tyree. It still looks like a pretty rough neighborhood to me. And it still looks like they've got plenty of activity."

"Oh, there's action there, boss. That's not what I mean. Most of the people still get by with their street savvy. Runners are still taking numbers, hookers

are still turning tricks, dealers are still dealing. You can still get your pocket picked or your hubcaps stolen, or your car chopped.

"But there is a difference. The street's not as physically dangerous as it used to be. It used to be mindlessly mean. Now violence seems to be—well, controlled.

"I had a talk with the precinct captain before we set up. You know what he told me? They've had whole twenty-four-hour periods without a homocide, three months running."

"That doesn't seem possible, Tyree. How come we never heard before? It seems to me that's the sort of thing a precinct commander would shout from the housetops."

"Yeah, I know, but for some reason he was shy about it. He said he wanted to wait and see if it was a trend—find out how long it'd last. And there's more: all the senseless violence seems to be gone, except for family stuff. The gang fights, the thrill murders, the bully-type assaults. Even rape's down a bit. It's like the underworld is concentrating on profit."

"What make's you say that?"

"Because I got a look at some other crime figures. Property crime is up slightly, though down in the 41st."

"Hm. You know, Tyree, I think that's your real story. Look, let's hold up on this footage for a while. Maybe later we can work it into a feature, get some nationwide mileage out of it. It might pay to start checking statistics in other cities, or at least in other neighborhoods in this one."

"One of your hunches, huh boss?"

"I don't know, Tyree. This'll take a lot of checking to confirm. What I'd like you to do is organize a news team and check out some of the other precincts real quick. You know the ones I mean: Spanish Harlem, Brooklyn; some of the others which have a reputation for being a little tough. Find out if there are any comparable developments. If there are, you have my permission to take the show on the road."

"Nationwide?"

"Everywhere."

"You're holding something back, boss."

"If I am it's your own fault, Tyree. You're out on the street; you've got ears. Tell me, have you ever heard of the 'Children of Cain'?"

"Yeah, sure I have. They're a bunch of loonies from over in the Village; panhandlers."

"They're all positives, Tyree."

"Yeah? So? Lots of positives have learned to mooch. They're doing it all over the country, all over the world, maybe. There's still an awful lot of them who can't find jobs."

"Get somebody to work checking it out anyway, Tyree. Make it a part of your team project."

"O.K., boss. Only it doesn't look to me .''

like there's any connection. I agree. But do it anyway, Tyree, because I asked you to. *Trust me*." Nate didn't dare tell Tyree his tip had come from Won. The two despised one another.

Tyree had heard these magic words before. They were Nate's trademark. Inevitably, when he used them, something happened.

At this point, Tyree didn't see any

possibilities. But he said, "Right, boss," and hurried off to hunt up his partner.

Dave Herrick stumbled out of the alley behind the "mission," his glasses hanging from one earpiece and blood from his bleeding nose running down his left elbow. Once or twice pedestrians stopped momentarily in order to step around him and, of necessity, looked at him. But as so often happens, most of the crowd simply ignored him and rushed by, neither seeing nor caring. He was just another bum in a neighborhood full of bums, to everybody except Abdul Hibib Watkins.

Abdul had been waiting in an unmarked van, this time without his camera equipment. He was here, first of all, to survey the area for future stake-out crews, and second, because he was big, to give Dave a back-up.

Dave had gone in wired. Nothing big; just a panic button hidden in his belt, in case he got into a really life-threatening situation. He hadn't pressed it, yet here he came, obviously having failed to accomplish his mission.

Abdul jumped out of the van and hurried over to him, wondering if things were as bad as they looked. There was a lot of blood, and Dave was limping slightly.

Dave spotted him and headed his way, but rushed past him. "Meet me on the other side of the block, with the van," he whispered.

Abdul, puzzled but compliant, got back in and drove the van around, to find Dave waiting.

Dave had staunched the flow of blood. He quickly hopped in.

"Bummer, huh, Dave?"

"And how! They said they wanted a little blood. I never dreamed they'd want this much, or from the nose. Somebody must've recognized me."

"What'd you expect? You think those people don't watch T.V. or something? Old clothes and a few whiskers are not much of a disguise."

"They'd have caught me anyhow, Abdul. There's a guy in there who's testing applicants, and he seems to know what he's doing. They won't accept anybody who's not positive."

"Yeah. Well, if it'd been anybody else they would simply have told you to get out. I saw them turning others away without busting them up. What are you going to try next?"

"Good question; I don't know. I don't even know that they're doing anything in there that'd make the effort worthwhile, but I can tell you this: from what I did see, these people have a lot more organization than you'd expect from bums, and more discipline than the average flake will put up with. And I'm betting that bunch is neither.

"Therefore, if we want to find out what they're up to by getting somebody inside, we'll have to find some way either to fake the Alban Test or use a real positive."

"The first sounds impossible," Abdul commented. "The second sounds foolish." He looked gloomy.

The first probably *was* impossible. Ceil Alban said as much when Dave and Tyree visited her at her new job at the University of Toronto. She looked much different from before, dressed in white lab coat and with gold-rimmed glasses instead of her contacts. She looked

—*professional*. Her decision to stay in Canada wasn't based simply on the research she was doing, however. It stemmed from a very real fear of the Kinney administration.

"It's not over yet, boys," she told them. "There's more to come. The worst, I think, is ahead. And I, for one, don't intend to go back until it's all over. Completely over. In the meantime, what can I do for the two of you?"

"Ceil, this is going to sound crazy, but I've got a good reason for asking. Could you fake a positive?" Dave watched the look of incredulity blossom on her face.

"You mean, certify someone as a positive?"

"No. More than that. I mean really fake it, so that if somebody was tested the test would show that the enzyme was present."

"I don't see how. We don't produce refined stocks, except in very small quantities, and we don't know where the body produces it. Even then, it breaks down rapidly on exposure to air. So far all we've been able to do is refine our testing techniques. The enzyme is a very small fraction of total blood volume to start with.

"But why would you want to do that? Aren't there enough positives around as it is?"

"I'm talking about making a *temporary* positive, Ceil. Is there anything you know of, besides the enzyme, that'll produce a positive test result?"

"No. What's this all about?"

"Tyree and I are investigating a sort of cult that's arisen among the positives, Ceil. We think it may have political aims. We suspect it has the potential to grow into a sort of super People's Mafia. They go in for religious-type trappings and they have an entry exam; they test their applicants to make sure only positives get by the front door. I tried arguing and got my nose flattened for the trouble. We want to infiltrate it because the evidence suggests it's getting big and dangerous."

"Sounds like you think it's pretty important, Dave."

"I do. So does Nate Roth. And Nate seems to have a feel for these things. Never yet have I seen Nate drop his toast sticky-side down. There's something malevolent about the 'Children of Cain'; that's what the organization calls itself."

"Yes. I've heard. Dave, there is a way. It's awfully dangerous, and the effect would wear off in a matter of hours, but if your system could stand the side effects, a test right afterward would show a somewhat weak positive."

"You sound a little grim about that suggestion, Ceil."

"I meant to. Look, the two of you saved my life. I'm grateful—and besides that, I like both of you a lot. What I have in mind could very well be fatal. I'm talking about a complete blood exchange; the kind they do on babies with Rh factors opposite to their mothers'."

"If they do it on babies, why should it be dangerous for anybody else?"

"Because in those cases they know the baby will die without it, which makes the choice easy; and a baby's immune system has less specific development than an adult's, whose has been exposed to more environmental events that trigger antibody production. That's

one of the reasons we're so very careful about transfusions, even in tiny amounts. In a complete exchange the cross-matching would have to be nearly perfect. And even if the transfusion doesn't kill or disable you, the test technician might catch you, especially if he has a lot of experience. That's why you couldn't take the test if you were obviously ill. By the way, which one of you is planning to do this?''

"I am," Tyree answered. "Dave's fame caught up with him last time he tried. I'm relatively unknown outside New York. That's the next thing we'd like from you, Ceil; we need somebody reliable in Chicago. We thought you might have some friends ."

"Yes, as a matter of fact I do. Some relatives, too, though most haven't spoken to me in years because of Nelson, you know.

"The man you want is Sam Dorsey. Sam runs a clinic down on South Wells Street. A lot of our samples come from there. And what Sam doesn't know about the blood business is simply not worth knowing. I'll call him, if you'll tell me when you'll be ready to start."

"As soon as possible, Ceil."

Abdul Hibib Watson watched the beat-up green and cream CTA bus approach right on time, headlights glaring at him through the light mist. The bus had arrived just in time to save him some hassling. Big as he was, he didn't feel safe. He knew he wasn't. The shadowy forms congregating in the alley down the street seemed only to be waiting until there were enough of them to take him.

But with the bus here, he could relax a little. He stepped aboard it, plunked his fare in the box, and looked around.

The bus was half full, giving him a good choice of seats, but he already knew which one he wanted. He didn't see Tyree and was disappointed at that, since they had been together a long time and were good friends.

But he knew that Tyree was making headway with the Children of Cain and couldn't risk being spotted making any questionable personal contacts.

Abdul, therefore, went on to plan two; he headed for the back seat of the bus, no mean feat considering how the driver was racing along and dodging Chicago's infamous potholes at the same time.

He reached the rearmost seat and turned, hanging onto a handhold, to drop his great bulk into the corner. Plan two called for a message drop under the long bench seat cushion.

"Hey! Fool! Get off my feet!" The woman screamed it out loudly enough so that everybody else on the bus could hear, and naturally they turned to look. "Go sit somewhere else. I was here first."

Abdul studied the woman, now reclining on her back and propped up on her elbows. She had a sort of "uniform" which he recognized at once: short skirt, hip-high white boots, and fake fur jacket over a thin satiny blouse. To go with it she had a certain wild-eyed look that suggested she was high on something.

Abdul didn't have time for freelance hookers, so he attempted to ignore her.

She continued to stare at him but said nothing else, while Abdul, hunching over a little to cover his moves, felt with

one long arm under his side of the cushion.

He found nothing, so he edged his hand over to her side, doing the same. He rapidly concluded that either Tyree had not made it onto this bus, or the cassette he was looking for was under the girl. He'd soon have to change his tactics unless she got off.

But she showed little inclination to do that.

Time wore on. The bus passed the central police station, heading north toward the South Loop. Congress Expressway was coming up.

Most likely, Abdul thought, this was her destination, since the area abounded with arcades, peep shows, strip joints, and pick-up bars; the natural habitat of her kind. He was confident he'd soon be rid of her.

No such thing happened. She stayed on the bus, though nearly half the other passengers got off. The bus continued into the Loop proper, where stores, restaurants and theaters replaced the seedy dives of a few blocks farther south. They picked up a few passengers at Wacker Drive, then crossed the river into the darkened shipping and commercial area that lay between the river and mile after mile of residential territory. Abdul gave up on the idea of getting rid of her and decided to go ahead and probe under her.

He started his hand over, carefully feeling under the cushion.

She turned one foot outward, so that he was forced to reach around it. Her other foot was poised to prevent him from scooting over to her side of the seat. There was also a grin on her face.

"It'll cost you fifty to play with what you're reaching for, dude. You got fifty?"

"I've got fifty," said Abdul, with resignation in his voice. "You got a spot in mind?" He thought perhaps he could get her to leave with him, and that he'd have time to make a fast search then.

"Here's fine, big boy."

"You crazy, woman? There's people on this bus."

"They ain't gonna bother us."

"Well, I don't know. Listen, switch sides, huh; I don't like it over here."

"Give me the fifty, first."

Abdul reached into his pocket, peeled off two twenties and a ten, handed them to her, and put the rest back in his pocket.

She stuck it down the top of her left boot and rose, holding her jacket open to give him a good look at the merchandise.

Abdul slid over, running his hand as he did so along the bottom of the cushion. About midway his searching fingers came upon the cassette, taped lightly to the vinyl. He pulled it loose, concealing it in his giant hand until he could sit up straight again. Then he slipped it into his pocket.

He turned to the girl, struggling briefly with reason, resisted the temptation to get his fifty bucks worth of her, and started to rise.

Her smile, by then, had vanished. As he was taking what he thought would be his last look at her, she pulled a small, pearl-handled revolver from the top of her right boot and pointed it at him. "Sit down, dude. Let's have the rest of the bankroll. And give me the stash you just picked up from under that cushion."

"I'll give you the money—put the gun down."

"I want the dope, too."

"It's not dope."

Abdul had his money out again. He held it out to her but kept a tight grip on it.

The girl grabbed it, met the unexpected resistance, and pulled. Abdul then let go, but took advantage of her split-second of distraction to clip her smartly on the jaw. She wilted, and he quickly grabbed the gun from her limp hand.

He was about to reach into her boot to retrieve the fifty dollars when his conscience started to bother him. What he'd already done would put her out of business, at least for the rest of the evening, and he was taking her gun. Certainly that would be a fair exchange for him. She'd at least have some money to eat on—or, more likely, to get her fix.

Too bad, he thought, as he looked down and surveyed his fallen sister; not a bad-looking girl. That was when he saw her earrings. They weren't the kind the street women seemed to favor. Instead of being big and gaudy, hers were tiny, flat, gold discs. But the difference didn't end there; they were inset with five pointed onyx stars, tinier still: *the mark of Cain!*

Then Abdul knew he couldn't simply leave the girl here—that unless this episode was a coincidence of the most unparalleled kind she was here by design. And, if she was, it meant the Children of Cain were on to Tyree, and he was probably in mortal danger. The girl would have to go with him.

He strained to see out the back window to get some idea of where he was. But though it was late September the warm weather had hung on this year, and the first frost had not yet stripped the leaves from the trees lining the street. These obscured most of the street signs at the intersections from someone sitting as high as Abdul was.

Finally, though, he managed to read the number off a house with a lighted porch: 3150. His van was parked at 4200 North, eleven blocks ahead. He looked again at the girl. It would be awkward enough getting her off with him if she were conscious. Unconscious, she'd be a real armful. Maybe, he thought, these people will just assume I'm her pimp and leave us alone. All the same he found himself hoping she wouldn't wake up, because he dreaded the thought of hitting her again.

At 4100 North he reached up and yanked the cord, which caused the driver immediately to decelerate. The girl moaned balefully, but the road and traffic noises covered the sound well.

Abdul stood, grabbing the girl around the waist and supporting her under his left arm. When the bus came to a halt, he carefully and cautiously half carried, half dragged her out the door.

Outside he waited, and the bus pulled off. There was a police cruiser following it, and Abdul pulled the girl's body closer, feigning an embrace, until it passed. Then he crossed the street quickly, unlocked the side hatch on the van, and dumped her in on the floor. Working in the dim light of a distant streetlight, he fumbled through his tool kit to find tape with which to bind her. He trussed her up but omitted a gag, hoping she wouldn't start screaming when she came to.

He waited there until she showed signs of consciousness. Her eyes opened, but she didn't scream. She apparently had more sense than that. Besides, she had no way of knowing that, big as he was, Abdul was a pussy cat who never would have found the resolve to belt her again.

What next? Abdul asked himself. What are you going to do with her? Turn her loose and Tyree might die for it. You can't let her get back to tell on him. You sure can't kill her, and you have no place to keep her. Anyway, it's kidnapping if you do that.

No. It's already kidnapping; you already committed that crime. And *you* can't 'zeme out of it.

Wait a minute. Who's going to believe a hooker? Especially a positive hooker. Take her out in the boonies and dump her out; trust to luck you can find Tyree before she can walk to a phone. Or maybe you can leave her tied up; that'll take her a lot longer.

Abdul struggled mightily—and uselessly. None of that would work. He didn't even know what Tyree had on the tape. He wouldn't know until he played it, and he couldn't play it with the girl listening. He'd have to keep her at least that long to see just what her relationship in the organization was. And that meant, among other things, that he'd have to get some help.

Abdul crawled up to the driver's seat, started the engine, and drove off, watching the sidestreets for signs of what he wanted. Presently he spotted a shopping center, now nearly deserted owing to the late hour, and pulled in to an in-car telephone station.

His first call to Dave went to the answering service. Dave was out. But they took Abdul's number and put it on the pager. Abdul stood by, waiting nervously, hoping that nobody else would come by.

While he waited, the girl spoke for the first time since he'd hit her. Her voice was weak, and she sounded as if she was very near to tears. "Let me go, mister. You can have your fifty back. You can even keep the gun."

"What's your name?" Abdul asked, as gruffly as he could.

"Teeny, or Tiny, or Christina. Teeny's what the people call me out on the street."

"Look, Teeny. We both know I can't let you go, and we both know why. You'll just have to stay where you are until I can figure out what to do with you."

She seemed to get bolder with that. "Who are you, mister?"

"Never mind. You're better off not knowing that." He tried to sound menacing.

"You're not a cop, are you? I can smell a cop. You smell normal." Her voice had softened and had gained strength, as though she'd decided on her strategy.

"You're wasting your time with that, too, Teeny; I'm not the kind who needs to buy it."

At that instant the phone rang. It was Dave.

"Trouble, Abdul?"

"About 110 pounds of it, Dave. Female, wearing some interesting jewelry. Looks like a certain party's being watched. Look, Dave; I need a place to crash. I have to keep this dolly out of circulation for a while."

There was a pause. Dave's voice was low, to prevent the possibility of being overheard on Abdul's end. "You know where Joliet is?"

"Southwest side—about forty miles."

Right. Take this number down; call it when you get there. Ask for Swinehart. Can you make it by midnight?"

"Yeah. I think so."

"And you know today's code word?"

"Yes."

"O.K.—tomorrow's, in case you go past midnight, is '*cloudburst*.' Got that?"

"Got it. I'm on my way. I'll scramble and transmit from there."

"Right—we'll be waiting."

The Grand Patriarch, Solemn High Justice, Guardian of The Truth and Lord Protector of the Children of Cain, sat at his desk in the headquarters building, an old converted factory on Lake Calumet's south shore. He savored his many titles, and they pleased him. And, he thought, they fit me. I look the part. That is the most satisfying thing of all.

He carefully curled the ends of his gray mustache and stroked the matching beard, which now reached almost to the collars of the splendid black ceremonial robe he wore.

He liked the robe, too. Its touch was cool, its surface sleek, its cut superb. The robe clothed him in mystery, sheathed him in power. Wearing the robe he could sense the vital rhythm of his new existence, and forget that he had ever been a part of the old. He could breathe with the feeling that the air was now pure, that it was his world and he belonged in control of it.

Maybe, in time, he'd tire of these titles and assume new, more glorious ones. Titles could pall, just as his own colorless former title had. But the beautiful robe—never. He'd always wear the robe.

He looked down at his chest, then at the massive cuffs at the ends of the robe's full sleeves. On each was emblazoned the gold circle, set in the center with the black star: the sign of things to come.

His reverie was rudely interrupted by a knock at the door.

"Enter," he said, with resignation.

The door opened. A young man, also robed, appeared. "A report, Patriarch. Shall I send the man in?"

"Man? I thought we were using the girl, Justin."

"We were, Patriarch. The girl's disappeared. Something's happened to her. The bus driver's here to explain."

"Get him in here."

Justin Sudano turned, beckoned to a nervous fat man in a Chicago Transit Authority uniform.

The man waddled in, approached the desk and, following ritual, pulled his collar down to reveal the mark tattooed on the left side of his neck: a circle with a five-pointed star.

"Report," ordered the patriarch.

"Yes, Patriarch," the man began, obviously very apprehensive. "According to instructions, I picked up the girl, Teeny, at her regular stop on State Street, just south of Cermak. When she came aboard, I directed her to the seat which had been occupied by Clifford Brown, the suspect. By the time she arrived Brown had gotten off, so I did the next best thing: passed up a couple of stops so she could get into position. And then, assuming she'd had time to

retrieve anything he might have left there, I resumed regular stops as required by passenger demands.

"But at the first stop I made, a big man, a black man, got on the bus. He went directly to the back and sat down next to the girl on the rearmost seat. I kept them both under observation from then on, because I thought the man came to pick up whatever Brown had dropped.

"I assumed at the time that the girl had found the drop and would be able to leave before the man knew it, but that evidently didn't happen. Right after the man sat down, I heard her tell him to leave.

"At that point I considered stopping the bus to help her, but then I saw him give her money, and it looked like things were going all right, that she was going into her cover as a prostitute. It did seem like that was what he was after.

"Later, after we left the Loop and got into smoother traffic, I noticed that things had gotten very quiet. Then the man got up, signalled a stop, and I assumed he'd concluded his business with her and would leave.

"He did leave. But he carried her off with him. She was unconscious. There was nothing I could do to stop him. I was unarmed, and he wasn't. I knew she had a gun. If he'd overpowered her, then he had it, and I knew somebody had to be able to report to you ."

"You just let him *take* her?"

"Patriarch, I couldn't have stopped him. I told you "

"You could at least have tried."

"I would have been killed, Patriarch, and he still would have gotten away. It wasn't my fault. I . ."

"Justin!"

"Yes, Patriarch." The door had opened at once, as if the other robed man had been standing just outside, listening and expecting to be called. He stood there, waiting for orders.

"Take this spineless coward away from here. Execute him at once."

"Yes, Patriarch." A flat automatic pistol appeared in Justin's hand, and a demonic smile washed across his face. Justin would do what Justin did best.

Nate Roth's office duplicated many of the electronic features of the news room. For instance, it had a fully operational scrambler-descrambler telephone connection and ultra-high-speed tape machines. When the call came through from Swinehart's place, he and Dave were waiting anxiously, fully alert, even though it was the middle of the night.

In order to make sure they had the tape it was run through twice, but even so the total transmission time was only twenty seconds.

Dave had been worried about interception until Nate assured him that though interception was possible, deciphering and tracing would not be.

"Uncle Hymie set up Swinehart's system, not Ma Bell," he said. "He tapped through half a dozen pay stations by radio link. Hurry up with that tape."

"Ready now, Nate. Here goes."

Though clearly understandable, Tyree's voice was hushed, as though he'd been afraid of someone overhearing him. It also sounded as if he'd made the tape outdoors; distant traffic noises were recorded in the background.

"I've come a long way since graduation. That's been almost two weeks

ago. The second transfusion got me through fine, but I was sick for a long time afterwards, with hives. Fortunately, nobody got suspicious, and they gave me my tattoo.

"Get ready for a shock: the Inner Circle, the people who really run things —they're organized like the Ku Klux Klan, robes and all. They've also got all kinds of fancy titles and rituals. I haven't found out who Mr. Big is yet, but get this: there was a guy at the ceremony, all dolled up in a drawn hood, who sounded just like Justin Sudano. I tried to get a look at him, but the one time he had his hood down his back was to me.

"The graduation was really something. It was a regular orgy. Lots of grass and coke around, I mean. The leadership frowns on harder stuff, and steady use, but seems to make exceptions for special occasions. I guess they wanted this to be remembered.

"While I was out on the street I couldn't do much snooping. But I did become a really good panhandler, and a lot of the organization's funds come from that sort of thing. However, we were told after graduation that the real job of the street people is to observe and report: who's got money, who's pushing, where the good scores are.

"The *graduates* get into everything. There are regular schools for them which teach pocket picking, mugging, drunk rolling, gambling techniques, and that sort of thing. Higher education is there, too. It's reserved for people of special ability, experience, or training, or promising neophytes who work their way up. For these there are *colleges*, where a student can learn burglary, safe-cracking, hijacking; all the regular hard-core criminal specialities.

"The *professors* need credentials, too, and they have them. For instance, a stretch in a place like Stateville is equivalent to a degree. For their really good students, rumor has it that there's a computer and bank fraud graduate school, but to get into that you really have to be top-notch.

"Naturally, now that I'm getting known as Clifford Brown, formerly of Sing Sing, I'll be able to learn a whole lot more about their operation. I can tell you this right now, though: it's big. And it's not confined to large cities anymore, either. Every town of more than 50,000 has a Children of Cain Mission. Here in Chicago, a lot of new recruits come in from downstate, which seems to belie Alban's theory that this is a big-city phenomenon, although the fact that our population is so mobile may account for some of this.

"I mentioned graduation a while back. Maybe I should talk some more about that, because I think it may be very important. It's obvious that only a small number of positives ever make the grade and graduate into the real organization. Most don't get the offer I did, and most of these will simply go on believing that panhandling and selling trinkets to support positive relief work is all there is to it. The Children don't tell the truth, even to their own.

"So the key to the inner circle seems to be the ability and willingness to commit serious crimes. If your rap sheet's good enough, and if it's verifiable, you have an opportunity to rise fast, particularly if you acquired your record in pre-test times. Brown's time for car

theft wasn't really big stuff, but it showed his initiative and it beats such things as rape, child molesting, and psychopathic violence. The inner circle isn't impressed with violence, though they often use it. Their passion is *profit*.

"While I'm on that subject—though again, a lot of it is my own conjecture—the Children seem to be raking it in. Some of the guys in hijacking school, for instance, have bragged about the big scores they're planning to make. They talk about grabbing cargos worth millions.

"It occurs to me that if they're really doing all that well, then they'd have to have a way to turn what they steal into cash. And that would mean there must also be large-scale fencing operations —which in turn means police cooperation. There's simply no way an effort like these people seem to be making could function without dirty cops around to protect it. And when I say dirty, I mean dirty from top to bottom.

"My meter tells me the tape will run out in a minute, so I'll make this fast; I don't know when I'll be able to get another tape out. I'll try to get word to you in the regular way. But now I want to say this: there are indications that we don't have the only undercover operation inside the organization. There are signs here, some of them quite tiny; but if something happens to me at least it's good to know somebody else may be able to get information out."

The tape ended.

Nate and Dave took turns looking at each other. Neither spoke. It was obvious that any listener would feel Tyree had said nothing important, with the possible exception of his reference to Sudano. And even that wasn't confirmed as a fact.

Finally Nate had to say it. "You know him better than I do, Dave. Why would he take such a risk to give us this?"

"Maybe he thinks he's under suspicion. Maybe he *knows* he's under suspicion and is afraid to tell us outright. That last reference to another covert operation seemed to be important to him."

"Then why didn't he just bail out, make a run for it?"

"Like you said, Nate, I know Tyree. There's a lot of ham in him. I think he gave us what he'd give the public: a commentary. He may have more facts, but not crucial facts, and he may know somebody who can get at the real goodies."

At that instant the phone rang. Nate answered it. Horribly mangled sounds came out; both he and Dave reached for the descrambler control. Dave was faster. He threw the switch.

"O.K.," Nate said into the speaker, "go ahead."

"Mr. Roth? Abdul Watkins. Have you heard the tape yet?"

"We just played it, Abdul. What's up?"

"We just played it, too, twice. Once for her."

"Her?"

"Yeh. Tiny—er—Teeny. The woman. Boss, can you talk to her for a minute?"

"O.K., Abdul, but I don't

"Mr. Roth?" It was a female voice this time.

"Yes."

"Let me hear you say something."

"What?"

"Anything—anything at all; whatever comes to mind."

"O.K." Nate recited "Mary Had A Little Lamb," feeling foolish to admit that this was what had first come to mind. But then, the hour was late.

"You *are* him: Nate Roth, WBC."

"Um-huh. Who'm I supposed to be?"

"I had to be sure. Look, I don't know exactly how all this happened; it's been sort of a comedy of errors, I guess—but I seem to be a prisoner of your network. Meanwhile Clifford Brown, alias Tyree Hosey, is probably up to his neck in trouble."

"Now wait a minute, lady. What are you talking about?"

"Stop it, Mr. Roth. Listen to me. I'm the 'Tiny' Tyree was talking about. I knew Tyree when we were children. We lived on the same street. I lost my virginity to him when I was fourteen, before he became a TV star and before I went into the Navy. I work for ONI, Mr. Roth; *Office of Naval Intelligence*."

Nate was stunned. "I didn't know. Why ."

"Why was I trying to intercept Tyree's message to you? Because those were my orders, Mr. Roth. Orders from the Patriarch. I thought I was fortunate that they picked me to do it. They suspect he was passing information, Mr. Roth, and if they test him again they'll know for sure he's not a positive. And they *will* test him, Mr. Roth, without warning; and when they discover his present antibody titers won't cross-match with the first two tests, then they'll kill him."

"But how would your intercepting the message have helped?"

"Because I would have destroyed it; then I would have told them there was no message, and they'd have believed me."

"Why?"

"Because I really *am* a positive, Mr. Roth. I could take a dozen tests and pass them all, and I've got an impressive record; a record that cost me and the Navy dearly. I'm a convicted spy. There was a price on my head *before* the Alban syndrome was identified. I spent years building that image, carefully and credibly, so that I could do my country some real good. Now look."

"I'm sorry. We didn't know. But what about Tyree—where is he?"

"I don't know. I haven't seen him since early this afternoon. Yesterday afternoon, that is. I didn't learn about any of this until I was about to go out on the street."

"Out on the street?"

"Not for what you think, Mr. Roth. They have a better use for me. I'm the advance for the pickups at the honky-tonks down on South State Street. I know who's who, so we don't pay off the wrong people. When Gosnell got word that ."

"Who? —Did you say what I think you said?"

"When Gosnell—Patrick Gosnell, who is exactly who you think he is—got word that Tyree was taking a bus ride, he called me at Lucio's, where I make my first I.D. Somebody had seen Tyree in the park with a tape recorder, but couldn't stop him from getting on the bus. Whoever it was called the bus number into headquarters. They tipped the

driver off on the CTA band and then got in touch with me, because I was the closest Child who was both armed and would know him on sight. I was supposed to blow him away if I had to, to keep him from getting where he was going."

*"Gosnell is Mr. Big?"*

"In Chicago he is. That's how come they trust me so completely. Gosnell knows all about my record. He thinks it's all on the level. But getting back to Tyree: he got off the bus before I could get on. Since I've heard the tape in the meantime, I'm assuming Tyree knew he'd been spotted in the park. He must have been afraid to say too much; afraid to even mention Gosnell. I hope that means he was planning to light out.

"He left a clue about me—for you—in case he didn't make it, so you'd know somebody he trusted was looking into things. Now it's all for nothing, if that was what he thought, and my cover's blown, too."

"I'm sorry. Abdul didn't know who you were."

"I realize that. I knew who he was, though, from Tyree. When he came back and sat down, I hadn't found the cassette yet. When he started looking too, I knew who he had to be. If I'd had time I'd have found a way to tell him, but he was single-minded and I had to act it out. I knew that the driver was a Child, because he spends a lot of his off-duty time at the arcades. And I also knew he'd watch me, and later he'd report.

"Abdul just wouldn't play the game. He found the tape and started to leave. If I'd let him do it, and the driver reported it, I'd be in trouble and they'd have to assume Tyree was passing information. So I pulled my gun and went on with the act. That didn't work either. Nothing's working anymore." She started to sniffle.

Nate was silent. He didn't know what to say. He really felt bad.

But in the next instant his mood changed to elation. Abdul was back on the line, shouting, "Mr. Roth—Dave. Tyree's here. He's all right."

Nate had spent the night in his office boudoir, and was shaving the next morning, when the phone rang. He wiped his hands and answered. "Hello?"

"Boss—it's Max, up on the roof. There's a chopper comin' down on our pad. I thought you'd want to know."

"Whose?"

"It's got Navy markings. But that doesn't necessarily mean it's them."

"I'm buzzing Security now, Max. Hang in there until they come. Don't do anything to get yourself hurt in the meantime." Ordinarily Nate wouldn't have been upset by a visit from the Navy, but after that business last night, well

"Security," a voice on the intercom boomed.

"On the roof. Get some people up there to check out a strange chopper."

"On the way, sir."

Nate finished shaving and put on his shirt. He was working on his tie when there was a knock at the door. He rushed to open it.

In walked an elderly-looking man in a naval captain's uniform. His manner was cool and calm, as though he always had two men with drawn weapons escorting him around. Clear blue eyes

peered out from beneath bushy white brows which turned up at their outer ends. Though the man was short, those brows gave him an aura of power.

"Flynn's the name; Daniel Flynn. I work for ONI. So do you, Mr. Roth, starting now."

"What?"

"I do not jest, Mr. Roth. Last night you cost us the one operative we'd managed to get into the Children of Cain organization. You're about to take her place."

"Uh—now wait a minute. Just who do you think you are, and who do you think you're talking to?"

Flynn's voice remained steady; his tone did not change. But he had gone from mere belligerence to furious anger all the same. Nate realized that as soon as he saw the finger pointing at him.

"Teeny Barlow represented a unique opportunity to us, Roth. Having her available was a real stroke of good fortune. It was almost as though we'd been grooming her for that very job. And she was doing fine, Roth, making real progress—until you came along with your amateurs and meddled. Just what did you hope to accomplish?"

"My man went in to get a story. That was *his* job. He didn't know the Navy was interested. And by the way, what's the Navy doing conducting domestic intelligence operations, anyway? That's illegal."

"So's assault and kidnapping. You want to bring charges against my department? Go ahead."

In the face of that remark, Nate backed off a little. He knew very well Flynn wasn't offering a serious threat, but he didn't doubt for a moment that the Navy could hit back if he got pushy.

"What is it you want of me, Captain?"

"I told you; you're going to take Teeny's place."

"Are you insane?"

"No, you are, Mr. Roth."

"I'd have to be to try a thing like that. I'm the president of WBC. Eight out of ten people in North America recognize me on sight, and *you* want *me* to play spy?"

"Sit down, Mr. Roth. Let me tell you a story. I'm sure you'll find it interesting. Go on, Mr. Roth; sit."

Not many people even tried to push Nate Roth. Fewer still managed to budge him. Captain Flynn's quiet authority was something Nate found not only hard to fight but, in the end, irresistible. So he wound up seated in one of the upholstered chairs which faced each other in front of his desk.

Flynn sat in the other. He removed his hat, set it carefully on the corner of the desk, and folded his arms across his chest. "Once upon a time, Mr. Roth, there was a certain diplomat. In 1961 he went to Manila, to work at the U.S. Embassy there. Of course his family went along, including his little boy. And the boy got sick there.

"Naturally the man wanted the best possible treatment; he wanted his little boy to get well. So he took the boy to the Navy Hospital at Subic Bay.

"The little boy, as you know, did get well, and the Navy still has the records of his treatment. And that's how we know you're a positive, Mr. Roth."

Nate simply stared. He said nothing.

"You've never been tested, have you, Mr. Roth? You're in good company. Lots of people who aren't com-

pelled to be tested simply don't want to know. They feel better if they don't know. They'd rather retain the confidence they have in themselves.

"I'm sorry I had to burst your bubble, but you see, we did substantially the same thing you did to Dr. Alban's records. We tapped into your transmission, and eventually our cryptographers broke the access codes. Funny thing about the enzyme: medical people recognized its presence for almost two whole generations, but ignored it because its effects weren't suspected until Alban did his work. Now that its function is known, these old records may help save this country."

"I don't seem to *feel* any different," Nate said, weakly.

"Of course you don't, Mr. Roth. You're the same person you always were. You weren't a crook before I told you and you won't be a crook now, unless that's what you want to be. I, personally, think that Alban went way overboard with his theory. He scared a lot of people, pushed a lot of them over the brink with his gloomy forecasts. Some of them would have had no disposition toward abnormality if it hadn't been for that. You, yourself, are a prime example of the law-abiding positive, and I'm asking you to help undo the evil."

"Somehow this doesn't make me feel any better."

"Well, maybe hearing more of the story will improve your understanding, Mr. Roth. You asked me what the Navy was doing in domestic espionage. We're in it for a very good reason, Mr. Roth: we think the present civil government intends to try a constitutional coup, to stay in power beyond the end of Kinney's lawful term. You're aware, no doubt, that Jason Abelard is a positive, just like the president is?"

"Yes. We knew that. We also know that Abelard has systematically placed most of the East Coast Army installations under positive command."

"And you find that a little puzzling, don't you?"

"Yes, I do. I can't see how he could hope to get away with a thing like that. This country is just not that vulnerable to a military takeover. The American people are a different breed. They haven't got any tradition of military rule. They're completely adapted to independent thinking and civilian supremacy."

"Abelard's bunch has a reason. It may not be apparent to you, because of your lack of military schooling, but it's a good one.

"You have to remember that in a country like ours, the use of armed force represents the last resort. But when it is used in a civil crisis, it's infantry and armor that count. Air and naval forces play little part in suppressing rebellion, because they're basically offensive; fine for use against a foreign enemy, but not much good for riot control, where you just want to hold the line.

"This is one of two reasons why Abelard left my service alone. The other is that tampering with it would seriously interfere with this country's defensive capability, and that has to be in tip-top shape. Any civil disturbance of the magnitude they contemplate would inevitably represent opportunity to the nation's enemies. Credible offensive capability

on our part will help those enemies resist temptation.''

''Captain, you've mentioned rebellion a couple of times already; do you infer that the Children of Cain are part of it, and that they are under Kinney's control?''

''Not necessarily Kinney's; but certainly Abelard's involved with them, as are many people in the Kinney administration. Teeny was just beginning to get a line on that part of it. We can't be sure, of course, but we feel that there may still be some independents. We are sure, though, that Abelard's striving for control.

''You see, the movement—the initial movement—was meant as a humanitarian thing. The origins have been traced to a man named Wilfred Lewis, who was a physician. When the panic came, right after the Sudano trial, Lewis was running a clinic in Greenwich Village. The New York State Medical Board shut the clinic down and jerked Lewis's license because he was a positive. That didn't stop him. He opened up again the next day, as a mission.

''He began collecting data on the enzyme. Accidently he began collecting people, too, and his mission became a rallying point for displaced positives, who collectivized in order to survive.

''From a rallying point it evolved into a cult. It also evolved a philosophy. At that point it needed a name. Lewis himself contributed that; he called them the Children of Cain because, like those biblical personages, they were outcasts. The acquisition of the name was followed by the acquisition of the symbol: they marked themselves with a black star. There's power in symbols, Mr. Roth.

''The members had gone out into the streets, first to beg and then to sell trinkets. In the beginning their objective was simple survival and some measure of social justice. Lewis probably never intended the Children to become more than that, but he did intend the movement to spread. He began to start chapters of the Children in other cities, and by the time he died there were more than a dozen of them. Chicago had the second one.

''His death changed things, and for a time leadership became fragmented, as it always does when a strong revolutionary leader passes. Some people have compared the situation to Islam's after the death of Mohammed. In any event, considering the country's mood at the time, it was inevitable that it become what it is today.''

''I know a little about that part,'' Nate replied. ''Tyree Hosey once called the organization a *Super People's Mafia*.''

''And that's essentially what it has become, Mr. Roth, with ritual and pageantry and ceremony thrown in. Every political movement seems to need that.''

''Political movement? Seems to me they're in it for the money.''

''Sure they are. They need money. Because, especially in America, money is the key to political power, and that's where the Kinney administration comes in to it. They woo the Children with their protection; they supply useful information. This makes it possible for the Children to expand their operation at the same time they're tightening their internal control. All of these things have happened in record time; something that

couldn't have been accomplished without official help."

"Why? Why would Kinney get himself mixed up in a thing like that?"

"Why? For a very good reason, Mr. Roth. Kinney's afraid. He thinks the only safety for him is to possess absolute power, and this must look like an opportunity to have it. There are precedents —in this century, in fact. You're a Jew. You know how the Nazis did it."

Nate nodded.

"This is no different, and it follows the same plan the Nazis used, the same plan Lenin's followers used, the same plan every successful revolutionary uses.

"First you need a social issue. The positives certainly had that. Then you need organization and leadership. They developed that, too. After that, and the strength it brings, it's time for the philosophy, and the theorists move in. They establish the organizational goal. From then on it's only a matter of getting the attention of a strong man, or a group of strong men.

"The strong man fits in; but unlike the followers, he has personal motives, and he seeks to head the organization in the direction of his own goals. So he creates a mystique, generally with the aid of symbolism. In the Nazis' case it was the ancient swastika; in the case of the communists, the hammer and sickle. The Children use another old symbol: the star.

"There's more to it, of course. The Children know it's not enough to overthrow the existing authority. You have to have something ready to take its place. There's no other way to really seize power. I don't think they really want revolution in the streets; I think they want to keep much of the basic structure of the existing system and discard what they don't need while building what they do.

"Kinney, at this point, seems to be in the same position Hitler was in in 1932: in power, legally, but not yet possessed of the absolute authority he wants. He's still subject to legal restraint. I think he'll use the opportunity he has to promote social unrest, to follow the blueprint and make his grab."

"You think it's coming to that—that it's really that bad?"

"Every bit of it, Mr. Roth. You see, the way things are it's absolutely essential to the plan for Kinney to gain and keep control of the Children of Cain, because the Children can provide the civil strife to make a coup work. They'll be the covert arm of the revolution, the enemy within.

"And there's just a little more than a year for them to get the job done. I don't think they'll wait until the last minute to start, either. They'll move as soon as they can."

"What do you mean?"

"I mean the next election campaign is going to be a hard one, Mr. Roth. Both major parties are going to be highly sensitive to the problem of the positives—and positives, along with their friends and families, will represent a huge bloc of votes. Emotions will run high, and violence, with its fragmenting effect, will play a big part in political activity from now on."

"O.K., then what? How do you expect me to do anything about that?"

"I'll get to that in a minute, Mr.

Roth. First let me throw a couple of forecasts at you. The Navy sees two possibilities. First, open rebellion during the closing stages of the campaign—which Kinney will, of course, put down by using emergency powers and military force, and after which he will simply extend the emergency indefinitely. Or, second, if he has the clout to name his party's candidate and that candidate does well, there may be another assassination, and that may be followed with an emergency military takeover."

Nate gave a sigh. "I can't believe such things could happen here, or that anybody could seriously consider trying that."

"Yes, you can, Mr. Roth. Our system of government is nowhere near as natural a state as most people think. In the past it's always been public apathy that saved us from tyranny. People were so satisfied with the way things already worked, and our population was so big, that it just wasn't moveable. Minority revolutionaries just couldn't forcibly overcome social inertia. The last time the country got worked up enough to do that we had the Civil War—and that, by the way, involved a social issue almost identical to that the positives present. It could happen again, and I don't doubt that this is the direction we're heading in."

"Well, if you think so, why isn't the military doing something to stop it? You've got the manpower."

"We are doing something: we're gathering information, trying to organize what opposition we can. By and large that opposition includes most of the Army Commands, too. But we have to be very careful; we have to be 100 percent right. We operate under a system of strict military justice. Soldiers *believe* in military justice, Mr. Roth, and mutiny is a particularly heinous crime to them. Putting down mutiny is second nature to a soldier, a reflex action. He'll do it instinctively, enthusiastically, and completely, unless he has the best of reasons not to. Providing him with those reasons, Mr. Roth, is going to be your job."

The patriarch strove to preserve an outward calm. Inside he fumed, and his first impulse was simply to give the man to Justin for whatever diversion this might provide his homicidal aide.

But reason, such as it was, prevailed, though it was reason born of both frustration and curiosity. What was the man doing here?

"You play a dangerous game, stranger," he said to the man in front of his desk.

"It's not a game, Gosnell, and I'm not a stranger. You know who I am. Test me; you'll find I'm a positive just like you and the others. Then we'll talk."

Nate did not really feel the confidence he projected. He knew Gosnell was off-balance, in more than one sense, and he hoped his own audacity would temper Gosnell's reaction. So far, it had.

Nate had walked into the scrapyard that served as a front for the Childrens' Chicago headquarters, approached the nearest person who had an appearance of being in authority, and calmly announced that Nathan Roth, president of the World Broadcasting Company, was here to see Patriarch Gosnell.

Then he had floated perilously in a sea of drawn weapons for what seemed an eternity. But he *was* in Gosnell's office.

"We certainly *will* test you, Roth, but that doesn't necessarily mean you'll be alive when we do."

"Cut that out, Gosnell; trust me. Would I be here at all if I didn't think we all had something to gain by it? I came to make a deal."

"Why? From what I can see, you've always done all right without any help from the rest of us, even if you are a positive."

"I'd like to do better, Gosnell. I know something's up, and I want in on it. It's a simple matter of preference; I'd rather be on the inside than on the outside."

"That's big talk."

"Certainly; I think big, just as you do." Nate watched the other's expression. There wasn't much change, but there was enough to tell him that flattery would work just fine on Gosnell. "Look," he said, "I went to a lot of trouble to bust in here. I put people into your organization. I had to find a way to talk to you."

"Why?"

"Because you're a man of action. Anybody can see that. You've got good training, top contacts. You're a man who's going places. Think what you could do with my organization behind you; your own personal TV network. Think what we could do for each other."

"Justin?"

Nate felt his heart thumping and a cold sweat rose in him, but he didn't move.

Sudano had been standing at the door, watching in fascination. He was intrigued by what he'd overheard, and it showed all over him. "Yes, Patriarch," he answered.

"Get a blood team up here to test this guy. I want a real thorough job."

Gosnell turned to Nate. "We're on to that blood exchange trick. If you're counting on that, then you're so much dog meat."

"Can I sit down?" Nate asked.

"You may."

Nothing more was said for a full minute. Gosnell simply sat and stared at Nate, and Nate stared back.

Then a couple of men came into the room. One of them had a needle in his hand. He motioned for Nate to take off his jacket.

Nate did, and rolled up his sleeve in anticipation of the next command.

The needle slid in; dark, venous blood flowed into its barrel. Then Nate was given an alcohol-soaked cotton ball to hold over the puncture, and the men left.

"Assuming, Roth, that your status is on the level, what makes you think something's going to happen?"

"Something has to happen. The signs all point toward revolution. The positives have formal control of the government, but not real control. Congress and the Army have that. Kinney ?"

"Kinney doesn't tell me what to do, Roth. Kinney never will. Remember that. I run Chicago, and Chicago's an autonomous chapter.

"Wait a minute; was that the idea, that you'd barge in here and take over for him, or use me to get in on whatever he's planning? Well, forget it; we never did get along. He fired me; kicked me

out of the bureau after twenty-one years of service."

*Oh-oh, think fast*, Nate told himself. That reaction was a surprise.

"Give me credit for more brains than that, Gosnell. I know all about that bunch; that's why I came to you. They're pansies; you, on the other hand, are a tiger. They can't possibly pull it off. You can, if you listen to good advice and if you use your head. You could wind up running everything, but you still need my help."

"Yes." A strange smile washed over Gosnell's face. Nate had struck the proper chord. "You're right; I can see how you'd be useful, too. You're an ambitious man, Roth. You have spirit. I like that. But tell me: just what is it you had in mind for yourself?"

Nate relaxed a little. "You're a man who can appreciate the value of information, Gosnell. Me? I'm an information specialist. I know how to collect it and I know what to do with it. I get in on everything, because WBC's a big organization with a worldwide web of contacts and sources.

"We can use the information that's gathered. We can use it to keep track of what the government is doing, we can use it to take control of the other chapters and force Kinney's people out of control. Why should Kinney be Mr. Big?"

"He isn't—Jason Abelard is. Kinney's just a front, a patsy. Didn't you know that?"

"Nobody's perfect," Nate said, aloud. Inside he cautioned himself, *slow it down*.

"I guess it's all right to tell you, Roth. You're either in or out. If you're in you'll need to know. If you're out you won't be telling anybody else, anyhow.

"The fact is, Kinney had his chance but he lost his nerve, way back. He just wanted to ride out his term. But when he thought Alban planned to expose him as a positive, he went ape; he called Abelard in. Abelard sent for me, and I took care of it.

"I should have known what Abelard would do next: use this to blackmail Kinney, to lever Kinney around. That's just what he's been doing ever since. Abelard's the one we have to get."

"Hmm. I agree—but not just yet, Gosnell. For a while you'll need him; you must use him. If Abelard really runs the show, then you and he have to bury the hatchet. You have to establish a friendly enough relationship with him to go national. If you don't you'll sit here in Chicago until you rot."

At that moment Sudano reentered the room. He had a slip of paper in his hand, a computer printout. He gave it to Gosnell, who read it and smiled.

"You passed," Gosnell said.

Nate, of course, had entertained no doubts that he would, but he still felt relieved.

Hours later, having demonstrated his further good faith by feeding Gosnell virtually all the information he had gained from his long briefing session the day before with Naval Intelligence, Nate walked out the gate and stepped into Tyree's car. "We're in," he said. "Head for O'Hare."

Tyree started the car and drove off. "I don't get it, boss. Why do we have to mess around with this routine? Why

not just tell the public what we already know? We've certainly got the goods on enough people."

"Have we, Tyree? Oh, we know things, sure; but knowing something is one thing, and translating it into courtroom proof is something else again. And in my estimation none of our allegations—that's what they'd be—would stand up. The reason is, our sources are all positives. Who's going to believe a positive? Who'd believe me, or Teeny? Or suppose we got Gosnell to go on TV and tell the whole story—who'd believe him?

"Take it a step further; let's assume we exposed each and every insider in the Children of Cain, the whole organization, for what they are, and tell everything they've done. Include Abelard and everybody else who had a hand in it. What could the rest of society then do to punish them, or even to stop them? And what would prevent other positives from moving in to take their places once whatever we did had been done?

"No, Tyree, it has to be some other way, some way that'll end the whole problem once and for all."

"Yeh? Like what, boss?"

"I was sort of hoping you might tell me."

"God! I can't believe it, Nate. They're raking it in by the boatload. The Mafia must be green with envy." Flynn was impressed by what he'd just seen.

"What Mafia? There's no Mafia any more. They were pikers compared to this bunch. Everybody they had who had any smarts went over to the Children of Cain, where the pay's better and promotion is faster. All that's left of the mob is a bunch of old geezers sitting in their restaurants trying to figure out what went wrong."

"Where're you getting all these figures, Nate?"

"From the Children—they gave them to me. They had to have a way to keep track of everything, so I volunteered to use WBC's computer capacity."

"That's crazy, Nate."

"I know it, but they don't seem to care."

Flynn picked up the long tongue of paper that had just printed out. He started to read from it aloud, selecting names at random: "Lucian Abernathy, $5,400. Baldemar Caranza, $3,100. Gerald Klein, $2,800. Tarzan Sims, $1,300. Stephen Wojchiehowski, $11,480. Are these guys all cops?"

"Yep; New York City's finest. That's the payoff list for last month at the 12th Precinct. The Children of Cain believe in spreading the wealth around."

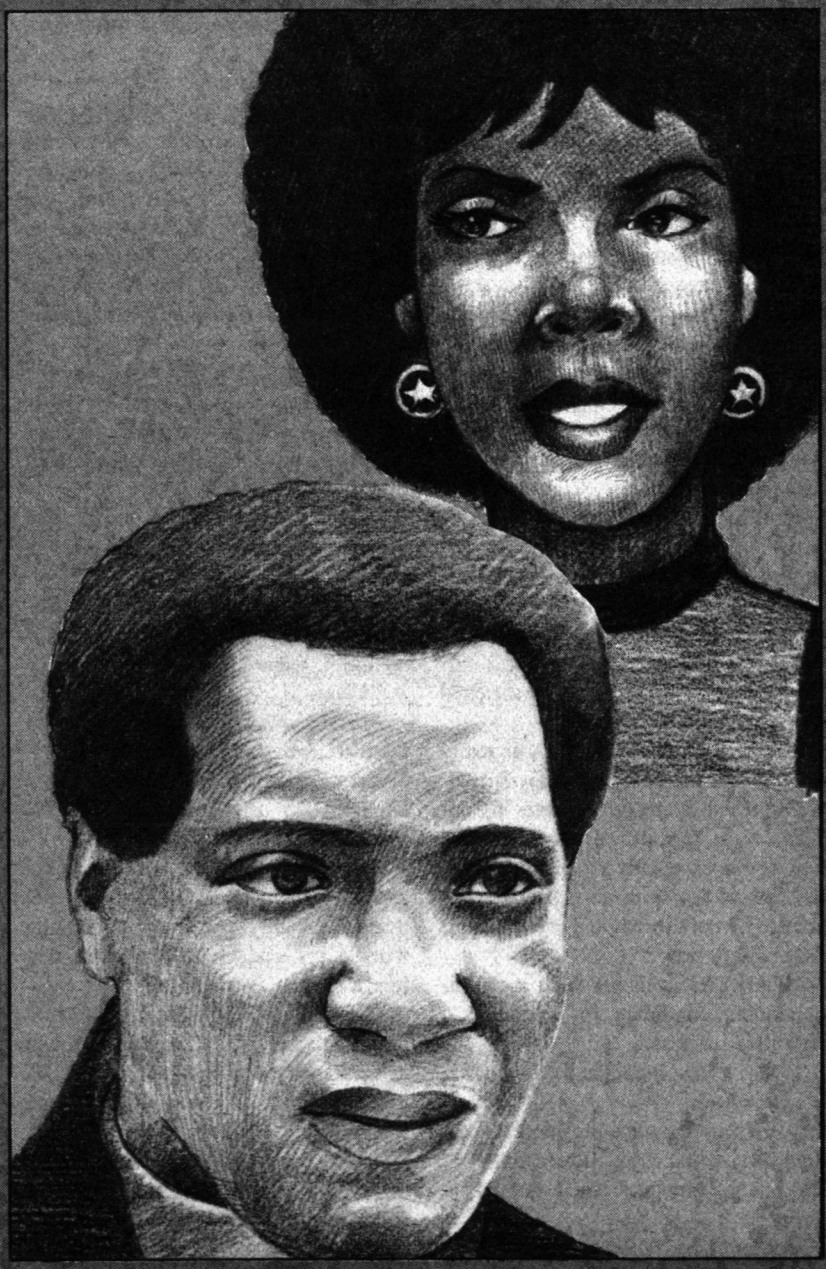
"These people can't all be positives!"

"They're not. Mostly they're just normal, greedy people, who saw corruption all around them and decided to get in on a good thing."

"Then they can be prosecuted!"

"Theoretically, yes; practically, no. What would you use for evidence—this list? Tell one of them his name's on the D.A.'s grand jury list and he'd say, 'So what? All you've got is the word of a nut, who cares what a nut says?' It'd work, too. They'd have to make a personal investigation of every one of them, and they still might not find any usable evidence."

"Then what good is the information to us?"



"I'll tell you something about information, Dan; my kind, anyway, though you may have had the same experience in your line of work. What I mean is this: if you have a fact and you wait long enough, and you're alert enough, sooner or later you can exploit it. It'll prove its value."

"I'll concede that's usually true, but time works against us. The political situation's heating up. The first primary's next month, and every day that passes brings this country that much closer to disaster."

"I see it differently, Dan. I see every day as bringing us a few more bits of data we can put to use. Right now I'm curious to see what else is going to happen to this huge torrent of money. Power follows money, Dan. When I see where the money goes, I'll know where the power resides."

"He what?!" Jason Abelard shrieked into the telephone.

The man on the other end was really nobody special; he was Wesley Brightwell, the patriarch of the chapter in Concord, New Hampshire, and Concord was not an especially prosperous chapter. It had not been an especially important part of the national organization, either, until now.

"Patrick Gosnell has filed as an independent candidate for president," Brightwell repeated.

"That's what I thought you said. And it's ridiculous."

"He beat the vice-president to the State House by a full fifteen minutes, and the newspeople taped the whole thing."

"God!"

"You haven't heard the worst part; he was robed."

"What! —Why didn't you stop him?"

"How? With what? I didn't even know what he looked like, and I surely never thought anybody'd do a thing like that. The first I heard of it was when I got a call from one of our people who happened to work there. That wasn't ten minutes ago. By that time Gosnell and Vice-President Hanrahan were glaring at each other on camera."

"Was WBC there?"

"Sure; they were all there, Mr. Abelard. The newspapers and wire services had people there, too. What do you want me to do?"

"Don't do anything, Brightwell. Just keep an eye on things and make sure I hear about any new developments. Don't start anything. Don't make any statements yourself; just report to me and I'll handle it. Clear?"

"Clear."

Abelard broke the connection. He sat there at his desk, his head in his hands. Sweat was beading on his bald pate and beginning to drip down his face. He mopped it away with his sleeve.

Gosnell, he reflected, was becoming a real problem. He should have been dusted a long time ago, before he worked his way up to control of that bunch of crazies in Chicago.

The man was a puzzling combination of paranoia and gullibility: wacky enough to keep a guy like Sudano around, and trusting enough to make deals with Nate Roth.

Abelard himself had mixed feelings about Roth. He wanted to be able to make use of him but he was afraid of him.

Roth had wormed his way into a position of influence in Gosnell's organization; how was not entirely clear to Abelard. Abelard had been tolerant of that at first because it tempered his own relationship with Gosnell. Gosnell's cooperation had enabled him to plug a great big organizational hole which had formerly existed and seriously interfered with continuity of operations in cities such as Milwaukee, Des Moines, and Peoria. With Chicago inside the system instead of out, they gained a certain solidarity, particularly after getting the use of WBC facilities for coordination.

But lately Gosnell's aloof attitude toward his neighboring chapters had disappeared and he had begun trying to exert personal regional influence, which disturbed Abelard a lot.

Abelard also found it difficult not to be suspicious of Roth's motives, even though the man did in fact seem to be keeping his promises. But Roth refused to become part of any particular chapter of the Children. He preferred the overall view and his own private fiefdom at WBC—which, of course, provided him with a personal power base. And that, in Abelard's estimation, furnished his own faction some control; shut down WBC, he believed, and you shut down Nate Roth.

But back to the immediate problem: shutting down Gosnell, crazy Gosnell, who was strutting around blabbing the sect's secrets to national audiences. Abelard could picture it in his mind: Gosnell, all dolled up in dress robes, spouting his nonsensical ideas into open microphones and totally destroying any credibility the Children of Cain had had with the voters.

Then it occurred to him that there was a way to find out, in advance of any broadcast, just what Gosnell had said.

He snatched up the phone and dialed Roth's private number.

Roth answered on the first ring. "Roth."

"Roth—Abelard here."

"I was just about to call you. I assume somebody told you about Gosnell."

"Yes. Brightwell called me from Concord. What did Gosnell say?"

"I can give you the audio part over the phone in just a second. Actually it's not as bad as you might imagine, once you've thought about it. I'll explain after you hear it—here goes."

Abelard listened intently, wishing he'd had the presence of mind to use the extension in the next office, which had a recorder hookup. No matter; he could tape it from the broadcast if he needed it.

He decided he might not. Gosnell came off like a kook, a clown. He launched into a tirade about the positives being a special, superior breed of man: a disjointed, illogical masterpiece of fuzzy thinking. Abelard realized that Gosnell had intended himself to appear menacing, but it hadn't worked. Instead he sounded pathetic.

"See what I mean, Jason?" Roth remarked, when the tape was over.

"Yes. His use of the ritual robes disturbs me, though. That won't sit at all well with the members."

"Maybe not. But it adds to the clown effect. And how important is it really, these days? Ritual was fine when the

Children were in the formative stages, but most chapters aren't into it that heavily anymore. And in those that are, it'll probably be curtailed because of this until the campaign's over.

"Let Gosnell play if he likes. When the big push comes, it might even be advantageous to have him so visible."

Suddenly Abelard was sweating worse than ever. He didn't like the implication of Nate's last remark.

"I don't know what you mean by 'push,' Roth, but we've got a good thing going and I don't want to see it get messed up."

"It'll work out, Jason; trust me." Nate hung up.

Hosey, Herrick, and Roth sat around the work table which Nate had added to his office to augment his already extensive workspace. The results of the latest presidential preference poll had just come in.

"Looks like Hanrahan is losing a little ground, boss."

"Nobody has a clear shot yet, Tyree. Hanrahan's got what—38%; Busby, the Republican, has 34%—those two are close. I'd call it a standard horserace if it wasn't for Monaghan. He's got 19%; not bad for an independent. Gosnell's buried someplace in the residual 9% in spite of the money he's spending."

"He's not doing so hot, is he, Nate? He must be frustrated over that."

"He is, Dave. He's wild. He just bought an hour for a taped speech. It's supposed to run on Monday night, right after the Democratic convention ends. The boys downstairs tell me it's creepy. He warns the American people about the Abelard conspiracy."

"Abelard is sitting still for that?"

"Sure. What else can he do? Besides, the people don't seem to know who Abelard is. He's always been like a mole, working in a tunnel. He never does anything to get public attention. And the insiders, who do know who he is, are either true insiders who are in on it or they're credulous enough to think he's just Kinney's errand boy. Abelard's just not the kind of person who looks scary."

"You still don't see any sign of what they might be planning, huh boss?"

"Nothing seems to be moving much, Tyree. Everything is calm. As close as we've been watching, there is absolutely nothing yet that I could call a clue. Either we've failed to recognize the signs, or there aren't any yet, in which case the move would have to come *after* election day.

"There's another thing we could do, though; we could check to see if we can spot any trends in the congressional and local races."

"This poll won't help us much then, Nate," said Dave. There's a few biggies in congressional opposition, but none of them are positives. In fact, positives don't seem to me to be doing much in national politics. The only really serious one seems to be Monaghan."

"Dave, let's play another one of my hunches; let's check something else out." Nate's manner had suddenly changed. He had that look on his face again.

Dave had learned from experience that the boss was worth listening to whenever that look appeared. "What shall we check first, Nate?"

"Local stuff."

"Nobody bothers with that. There won't be any figures available."

"Get some. Use our affiliates; bankroll it with network funds. Let's find out how many positives are running for governor, for mayor, sheriff, D.A., dogcatcher, or any other public office. Let's find out how those that are are projecting."

"O.K., Nate. But it'll take some time, and we won't be able to keep it up to date. What happens when we get it?"

"We get down to cases." Nate elaborated no further. He never did when he played a hunch. He simply had it, acted on it, and then clammed up.

Nate was spending one of his rare solitary afternoons in his office, trying to catch up on the political news. Lately more and more of his time was being consumed trying to keep track of what the Children of Cain were doing, which meant he had to do a lot of local traveling. Because of this he'd pretty well turned the news desk back to Pete Ferricuti, to whom it rightfully belonged anyhow, and tried to take his other tasks in stride.

He looked at the latest forecasts. Monaghan was moving up fast; faster and farther than anybody had ever expected he would, and making real political hay out of the fact that he was the only serious candidate who possessed real insight into the positive question. The two major party candidates were doing what they had always done, making rash promises and flinging recriminations at one another.

Monaghan was up to 32% in the polls, which put him only a point or two below Busby. And Hanrahan was down to only 30%. The remaining 4% wasn't broken down, but somewhere along with the Communist and Socialist candidates was Gosnell, who now ceased to matter.

Suddenly the intercom buzzed. Nate looked up from his papers long enough to find and push the "talk" button. "Yes, Becky."

"Mrs. Alban here to see you, Mr. Roth."

Nate was hardly expecting her. He hadn't even thought about her in weeks. Still, it would be nice to see her. *And*, he wondered, *what is the occasion?*

He pushed the button again. "Ceil —send her in, Becky."

"Yes, sir."

With one pass of his hand Nate swept the papers aside and stood up. He started around the desk just as the door opened.

"Hello, Mr. Roth."

"Ceil. It's good to see you. But I thought you were afraid to come back. Sit down, please."

Ceil seemed to wilt into one of the chairs. She sat nervously on the edge of the seat, holding her purse over one knee.

"I'm not really all that comfortable being here, Mr. Roth. Now that sounds awful, doesn't it? Of course I'm glad to see you again, but I still feel menaced."

"We've made certain advances in our understanding of the situation since I saw you last. I don't think you have any cause for concern; not for the moment, at least."

"I fought a long battle with my better judgment just to get myself onto the plane, Mr. Roth. I had to keep remind-

ing myself that I had an important reason for coming—that I had to tell you something that might be really crucial, even though it would be very embarassing to Nelson if he were alive; something that might make me pretty unpopular when the news gets out. I've sort of been hoping you could help with that part." Ceil's eyes turned down and it looked as if she might start crying any moment.

Nate realized that the discussion, whatever it was going to be about, would be delicate. He tried to inject reassurance into his tone. "These are bad times for everybody, Ceil. Whatever it is, it can't be all that bad."

Ceil's tears did come, however much she fought them. "Nelson tried so hard," she sobbed. "He was a man who had to battle mediocrity all his life. He never got the attention his ability deserved, partly because of me. He always felt that our relationship completely foreclosed most customary professional pursuits. So, instead, he buried himself in his research, and he started writing that book."

"Dr. Alban wasn't mediocre, Ceil." Nate tried to say that soothingly.

"No. He wasn't, but his colleagues thought so, and that was what counted to Nelson. He hated the thought of obscurity; he was elated when he thought he'd identified the true function of the enzyme, because to him it represented a way out of the obscurity: it was a medical breakthrough, a stroke of intuitive genius that history would record and his colleagues would envy.

"I shared his elation. I was eager to see him vindicated."

"Wait a minute, Ceil: it sounds like you're trying to tell me there's something wrong with the test."

"There is—well, no, that's not entirely accurate. The test itself is valid. It'll demonstrate the presence of the enzyme all right, and the enzyme does do what he thought it did—most of the time, that is."

"*Most* of the time?"

Ceil struggled for control of herself, finally got a grip, and continued. "Well, maybe that's not a completely accurate statement either. I know what I want to say but I'm having trouble saying it."

"Then start over, Ceil. That always helps."

"What I meant to say is, he — we —should have waited a little to say anything, tested a little more. But at the time we were both so certain that we'd find the enzyme behaved catalytically and specifically, the way all enzymes are supposed to."

Nate grunted ambiguously to coax her along. "Doesn't it?"

"Not always, and that's wrong. An enzyme is supposed to be a biological catalyst, Mr. Roth. A catalyst causes or aids a chemical reaction to occur, but it isn't supposed to be a part of the reaction. This is why the body needs only tiny amounts of them, and why the composition of an enzyme is not nearly so interesting to medicine as what it does in the body. Composition becomes important only if the enzyme has to be synthesized, and this is sometimes enormously difficult.

"Enzymes are proteins, often extremely complex ones. That added to the error; that, plus the fact that we didn't have any reason to try synthesis. We didn't pay much attention to its

molecular structure; we simply observed its effect and went on from there. At the time, statistical evidence supported the observations, and Nelson believed he was right. But there was a flaw in his theory." she paused.

"Go on, Ceil. I'm following you so far.".

She broke down again.

For an instant, Nate watched, impotent, frozen in inaction by whatever it is in the male makeup that turns muscle into jelly when women cry.

He overcame it, fished around in a desk drawer until he found a pack of tissues, and handed them to her.

Ceil wiped her eyes and continued. "Nelson's name will be disgraced," she managed to say.

"*Why*, Ceil? You've got to tell me *why*."

She raised her head and rubbed a tissue across her eyes, then paused to remove her contacts. "I can't see," she explained.

"It's O.K. Take your time, but tell me."

"Well, up at the University of Toronto I've continued Nelson's work. We finally managed to trace the source of enzyme production. It turned out to be one of thousands which originate in the liver, so we didn't get any surprises there. But that did enable us to get at relatively large concentrations of it, before it was diluted in the bloodstream.

"There's a molecular biologist at the University of Toronto, Dr. P.Y. Chee, and Chee went to work with me to diagram the protein. It took him all these months to get it.

"The reason was that the molecule sometimes changed slightly, so Chee thought he was doing something wrong. He checked and rechecked, and he finally came to the conclusion that the enzyme didn't always follow the same structural pattern.

"So we went back to the liver. We haunted hospital emergency rooms to get at fresh corpses. We worked day and night, and we found the common denominator."

"And what was that, Ceil?"

"Fluorinated hydrocarbon."

"I don't get it."

"Fluorinated hydrocarbons are very, very stable combinations of fluorine, hydrogen, and carbon. They're locked in so tight that almost nothing can break any element loose, and they're so bound up with one another that they won't combine with anything else. At least, scientists always thought so. In the normal environment the molecule was so stable it didn't matter if it got into the human body, because it was too inert to undergo any further reaction. The only way it could be dangerous is if you had enough of it to drown in.

"Because they were considered so safe, and because they had so many other useful properties, they were used for all kinds of things. But the principal use was in refrigeration, air-conditioning, and for aerosol propellants, although the plastics industry used a lot of them too.

"Well, the evidence Chee and I have now suggests that maybe they aren't quite so inert as we once thought. We've discovered that they sometimes can react, that sometimes they can enter the chain of the enzyme molecule with the help of certain radicals. I won't go into the details because you wouldn't un-

derstand, but the effect seems to be that the enzyme behaves in a slightly different manner.

"When these compounds enter the molecule the bond is quite weak, and we think that when it reaches the brain capillaries it then frequently breaks out, and the effect of the enzyme being what it is, it passes through the barrier."

"What happens to it then, Ceil?"

"We don't know. At least, we don't know for sure. Chee does have a theory. He thinks it's the size of the molecule which makes the difference, coupled with the fact that the brain has no way of either breaking it down or getting rid of it. Whether it then begins blocking, or perhaps changing, some vital secretion such as one of the endorphins, or whether it undergoes some further change itself, we don't know."

"Let me see if I've got this straight, Ceil; people pick up this fluoro—"

"Fluorocarbon."

"—fluorocarbon, it goes to the brain and . ."

"Only if the enzyme's present. The enzyme's the vehicle."

"O.K. Somehow it gets in there, and it makes people goofy."

"Sometimes, Mr. Roth; only sometimes. That's the horrible part of it. Nelson thought he had a foolproof test, but now it looks as if he didn't. It would now appear that a positive enzyme reaction doesn't mean a thing unless first, you've been exposed to the substance; second, that a particular and probably fairly rare reaction takes place; and third, that you also possess certain other unknown characteristics within your individual brain."

"But how, Ceil? How could a man with Dr. Alban's experience be fooled so easily?"

"Because he relied on the statistics instead of further research. The study he was making was perfect for that sort of analysis. He could, and did, prove that a statistically valid trend existed among the prison population.

"Had he looked far enough he would have found out why, because statistical analysis also shows that the rise of positives with criminal records began in the early '40s, when these compounds began coming into use in large quantities."

"But that doesn't explain why some people produce the enzyme in the first place or why others don't."

"No. It doesn't. But we're working on that, too. And we've found another statistic that fooled Nelson; he was convinced it had an environmental connection. I'm not, and neither is Chee."

"Why not?"

"Because nature isn't wasteful, Mr. Roth. It doesn't produce what the body doesn't need, and there's simply no biological mechanism whereby the human body could be coerced into reacting by environmental pressure against an individual. Against a specific population, in the normal course of evolution, yes; but not in an individual.

"Even as an evolutionary development, the mutation would be required to have some use, even if the use was individually harmful. This is not an overnight thing, and that's why we think whatever causes the production of the enzyme is probably as old, or older, than man himself.

"Enzyme producers occur in almost worldwide distribution."

"You mean, some places don't have positives?"

"A few human populations don't have them; others don't have many. Data is scarce."

"Give me a for-instance."

"Well, let's see; certain American Indian groups and Eskimo communities have almost none. It's rare in India, rural Mexico, parts of Minnesota, Indonesia . . ."

"Did you say *Minnesota?*"

"Yes. Wisconsin, too. There are small, spotty, almost enzyme-free areas all over the world. We haven't been able to draw any valid conclusions from that yet, though. Remember, any new theory will have to account for the effects of the fluorocarbons, and for our purposes they'd have to be present to provide the exposure."

"No, Ceil. I don't think they do. You said the enzyme was a vehicle, which leads me to believe its association with the fluorocarbons is just coincidental."

"Yes, I did, didn't I?"

"I'm getting a hunch, Ceil; let me explain that. Suppose everybody has the enzyme to begin with. Suppose they're born with it, but that something happens later on and most people's bodies stop producing it."

"We've already checked that, Mr. Roth. We've tested some, and we've never found a positive reaction in a child under three."

Nate swallówed, hard. This hunch had come on *strong!* It was powerful. He was so used to trusting his hunches that he found it difficult not to. But then, he thought, Ceil was the expert. She'd know best. Besides, he hadn't fully digested the effect of the other news she'd brought. And that news, when it hit, was going to upset the applecart again.

More discussion didn't help, either. It wasn't any clearer to him by the time she left.

"Ceil was here. I'm sorry you boys missed her."

"You could have called us, boss. How is she?"

"She's fine, Tyree. But I didn't have time to call you. She came in like a bolt of lightning—and with just about the same effect, I might add. I'll tell you about it later. Right now, I want to see the spread on the polls you guys took."

"Glennadean's crew is still feeding it in, Nate," said Dave. "But we can put some of it through."

"Let's do it."

They used one of the big terminals, to take advantage of the larger screen. Naturally Nate wanted to see New York first, so he punched it in. The surprise was immediate.

The Children didn't have a gubernatorial candidate, as he'd expected. When he started checking mayoral races, however, he found they had somebody running almost everywhere. New York City he already knew about, since it was his bailiwick.

Checking county posts, he found that positives were running strongly for every important post, most notably sheriff and district attorney.

He began checking states at random, and a trend began to appear: everywhere he looked, the positives were aiming at the grass-roots jobs and hitting it hard on the campaign trail.

"I don't like the looks of this," he told Dave. "Let's pull a few names out

and see whether the computer can match any of them to those on the Childrens' financial records."

He punched in the first name that caught his eye: Casimer Cymek, a candidate for county council in Lake County, Illinois. There was a hit. The Waukegan Chapter had kicked in a total of $180,000 toward his campaign. "WOW, that's a bundle," Nate shouted.

More followed, and Nate soon came to the conclusion that the positives were making an all-out effort to control big, important metropolitan areas in the leading industrial states. In less important areas they were concentrating on candidates for sheriff, district and county attorney, and the local bench.

"Well, what do you think, boss?"

"Abelard is smarter than I thought, Tyree. He knows how to take over without a rumble: do it from the bottom, not the top. He's right, too; seize the national capital and all you've got is a few hostages and civil war. Seize enough city halls and county courthouses and you've got the whole country by the throat, especially when you've also got a lot of money and you spend it wisely to corrupt the rest of the system. I think we need to talk to Dan Flynn and bring him up to date."

The meeting took place outdoors, on a lonely road in south Jersey. Flynn, dressed in civilian clothes for the first time in Roth's memory, still managed to look like a sailor instead of the tycoon whose part he played. They sat together in the back seat of Dan's limousine and talked quietly.

Nate had just finished covering the results of the polls and had started relating the details of the visit from Ceil when there was a loud buzz. He didn't know what it was, and it startled him.

"My phone," Dan explained. "You can't get away from them." He took the cigar he'd been chewing out of his mouth, opened a panel in the seat-back ahead of him, and removed the handset inside. "Flynn," he answered.

Nate could hear almost nothing of the conversation, so he watched Flynn's face, hoping to read something from the expressions. He read horror.

Dan's eyebrows arched, then dropped, and the captain's face took on that pinched look which reflects emotional pain.

Then he spoke into the mouthpiece. "I'll get back as soon as I can. Tell me, does the president know?" Pause. "No? Well, bypass Abelard. Call the president direct." He broke the connection.

Turning to Nate, he said, "General Gatheral's been assassinated. That was George Pellitier on the phone."

"Who did it?"

"They don't know. They haven't caught him yet. Al was on the reviewing stand, watching the retreat parade; that's a ceremony held on Fridays. They play 'Retreat' on the bugle, lower the flag, and fire a fieldpiece as the troops march by. This time somebody heaved a fragmentation grenade into the stand and got away in the confusion when it went off."

"Do you think this means something's about to start, Dan?"

"I would have thought so before I talked to you; but considering what you've told me, this doesn't look like Abelard's style. It wouldn't be to his advantage to stir things up now, if that's

his plan. A month from now, yes, the election would be over; but I don't think even then he'd try a military move."

"Who will this leave in command at Meade?"

"Mel Stump, temporarily, until the chief of staff gets around to replacing him."

"Stump's a positive, Dan."

"I know. He's also a friend of mine, and in my opinion he's not the sort of person who'd have any part in mutiny. I'll bet he's one of those false positives you were just talking about. I'll bet *you* are, too. And now I'm wondering about Kinney; that's why I told George to call him personally. I want to see what he's going to do about this.

"Now I have to get going, Nate. I'll keep in touch."

Nate got out of Flynn's car and into his own. As he drove off, he was feeling quite unsettled over the news of Gatheral's death. Like Dan, he couldn't see where Abelard had anything to gain by it.

That night he became even more puzzled, as he sat in his office watching the evening news on his private monitor. The assassin had been identified, but had turned out not to be a positive. Autopsy had proven that, after the M.P.s had run him down and killed him in a shoot-out. His name was Harvey Grimes. He was a cook, and they'd probably never know why he'd done it.

Later Nate and Dan talked about it over the scrambler phone. The military, Dan reported, was pretty nervous about the incident; he personally put it down to coincidence. Nevertheless, it was his opinion that the next few weeks would be a time for extreme vigilance.

* * *

Nate and his staff continued to be puzzled by something else; Monaghan's meteoric rise to equality in a three-man race. It was obvious now that he had massive financial backing, but a search through the enormous data base they'd built up on the Children's financial records failed to disclose any indication that the Children were the donors. Instead, from other sources, they'd gleaned sufficient information to conclude that some of the big labor unions were responsible. And these organizations weren't traditional supporters of independent candidates.

"Monaghan's the only one who doesn't fit in, Nate," Dave observed. "He's the only positive candidate of any importance who doesn't have some kind of connection either to the Children or to Jason Abelard."

"There must be one, Dave. Monaghan's got a reputation as a big mouth, the kind of candidate blue-collar voters spit on. His old constituency in Pennsylvania was predominantly liberal, with its biggest bloc of voters coming from the campus of the State University. That's the reason he got elected in the first place, but being what he was he probably wouldn't have been re-elected.

"Granted, there's been a big, sympathetic reaction because of the way the House treated him, but not enough to gain him the kind of support he's got. No, somehow that rascal's *buying* votes. We've got to find out how: find his pipeline and trace it. Then maybe we can establish a connection between him and Abelard."

Pete Ferricuti entered the room and stood for long seconds behind Nate be-

fore he was noticed. He had heard the tail end of this discussion. Then Nate noticed him, and turned.

"You can forget about Monaghan's part in this now, Nate. Monaghan's been shot."

"Shot! Is he dead?"

"We don't know. It just happened. We picked it up from our Chicago affiliate. Somebody fired four shots at him. Two hit him: one in the lower abdomen, one in the head. These days they always have an ambulance following presidential candidates, and they rushed him off to a hospital right away."

"Let's get down to the newsroom, Pete."

With Nate in the lead they tore down the stairway to the floor below, where frenetic activity, always the norm, had risen to a new peak.

Nate pushed and shoved his way up to the nearest monitor and gaped at the picture. He immediately recognized the reporter: Kay Matusek, a ripe-looking redhead he'd always promised himself he'd meet personally someday.

She was giving a running commentary: ". o'clock this afternoon. Just a couple of minutes ago, we learned that the ambulance team reached Silver Cross Hospital and that Monaghan was taken directly to surgery.

"At this moment we have no further information as to his condition, but sources at the hospital have been quoted as saying that he was alive at the time of arrival."

The camera then panned the scene around Kay, where a sea of other cameras, microphones, police cars, and vans contributed to the general confusion.

Suddenly there was a shout, and people stopped milling around long enough to listen. Kay then pointed her microphone at a police captain who stood, one foot in a car, with a hand microphone in front of his face. The TV mike didn't pick up what he was saying into it.

Kay put her own microphone back into speaking position. "Sorry, I don't think any of that got through. What he's saying, though, is that the police believe the shots came from a building at the top of the hill you can see just to my left, and they're moving forces in there now to check it out. We . . sir, would you stand aside, please? Sir! ."

Suddenly Kay was on the ground, and a man was bending over her, trying to pull the mike out of her hand. When she didn't let go, he twisted her wrist with his other hand. The microphone fell away.

He grabbed it and turned to the camera just as two burly policemen rushed up and seized him.

The man, though restrained, managed to raise the mike and began shouting into it: "I have just freed the world of another tyrant! Death to tyrants! Long live the Patri—"

A fist smashed the microphone from his hand. Another flung his jaw away at an odd angle, and the camera then followed the struggling trio toward the squadrol.

Kay regained her feet, picked up the fallen microphone, and shouted into it, "The police have just arrested a man who looks like Justin Sudano, and he seemed to be saying that he shot Monaghan."

Nate had recognized Sudano at

once—as had, no doubt, everyone else who was watching. The mystery of it all was how he'd managed to get anywhere near the scene without somebody stopping him.

"Pete."

"Yeah, Nate?"

"Where was all that? Kay never did say."

"Lockport—Lockport, Illinois. It's south of Chicago, just outside Joliet. You know, the prison town. It's in—uh, let's see; uh, Will County."

"Get hold of Tyree—uh—did Dave leave? No, ah, good." Now he was talking to both of them. "We want our own network team there right away. Pete—get Glennadean to run some profiles; find out who's who in that county. Run them all against our own records. Find out how reliable the prosecutor's likely to be."

"O.K., Nate. But I don't think they'll try to prosecute Sudano. What's the point? They might kill him, but they won't prosecute him."

"Trust me," said Nate.

Nate rushed back to his office. On the way he stopped to tell Becky to get hold of Kay Matusek. "The station should be able to patch you through."

While he waited for the call to be completed, he drummed his fingers on the top of his desk. Seldom was he this nervous, but seldom had he had such a good reason to be. Finally Becky buzzed him.

"She's on the line, Mr. Roth."

Nate snatched up the phone. "Kay, this is Nathan Roth, WBC. Are you all right?"

"Y-yes, Mr. Roth. Did I do something wrong?"

"No, no. You did fine. Listen; you know who that man was, don't you?"

"Yes. I was right. It was Justin Sudano. He—he was just there, out of nowhere; I didn't see him coming."

"I know, Kay. Look, we all saw what happened. He attacked you, didn't he?"

"S-sure, but . . ."

"And that's called battery, Kay; it's a crime. I want you to file a criminal complaint against him."

"But why? I mean, he's crazy. They'll just turn him loose."

"Maybe not . anyway, will you do it?"

"Why?"

"Trust me; indulge me. This is a big organization, with lots of room in it for bright girls who know how to follow orders."

"O.K., Mr. Roth. I'll do it. I don't understand, but I'll do it."

"Fine; you're a good girl. Talk to you, later. Bye."

Ha! Two birds with one stone. Nate stood there rubbing his hands together. The sooner later comes, the better, he told himself. She's the real prize.

Then he tried calling Dan. Dan's private line didn't answer right away. He tried three more times over the next forty-five minutes before he finally got through.

"Dan? Nate. Scramble."

"Done. I figured you'd be calling. I've been busy. Things are in a turmoil. I couldn't reach Teeny until just a couple of minutes ago. She's trying to line up our contacts in the Chicago area."

"Then you know all about it; the assassination attempt, I mean."

"Yes, but you mean 'the assassination'—Monaghan's dead. And what an

effect this is having on Abelard; Abelard's indisposed—he can't be reached for comment.

"Personally I think that removes any doubt that he owned Monaghan. I'll bet Gosnell knew this, and ordered the hit. The trouble is, it's hard to see how this development is going to do this country any good."

"Let me fill you in on what's happened on my end, Dan. Then maybe you can give me an opinion. This is one time when I really need a wise old head to check out my own theory. And if that theory's right, we might just be able to crack the problem for good."

"I'm all ears, Nate."

State's Attorney Harry Factor, big, gangly, and tow-headed even at thirty-six, sat back in his chair and wished Nate Roth would leave. That would give him a few minutes, at least, to get his head together for the upcoming trial; a trial he was by no means sure was going to come out the way Nate believed it would.

Nate's presence in the office was a little irregular anyhow. Harry had meant for his secretary to admit only Kay, so that they could make some last-minute touch-ups to her testimony. But Nate had slipped in with her and had stayed, though Kay herself had since escaped to the ladies' room.

Harry was not a coward. Had he been, he wouldn't have been handling this matter himself; he would have given it to some young assistant with no political feathers to lose, someone who would have had the passion for victory that Harry couldn't find in himself today.

Harry would have much preferred to have kept out of it. He'd had enough trouble when this positive thing had opened the doors of the nearby prison and dumped its positives on the streets of his county seat, where most of them stayed far too long.

He would have preferred that the attention of the whole country, if not the whole world, not be focused on the makeshift courtroom he'd enter in a few minutes to try a case that most people were betting he couldn't win: before old Judge John Burkman, never the world's most amiable jurist, against that pompous Frank Drumm, whose reputation, frankly, scared him a little.

Harry was the kind of a man who liked things normal: laid out in an orderly manner and in a familiar format. He wouldn't even have that because, for the sake of the press, the regular courtrooms, being too small, would be abandoned for the bigger County Boardroom. And as it was on the lobby floor with street-level windows, their nervous sheriff, Walter Miller, had built a boiler-plate tunnel from one elevator across the west half of the lobby and covered the windows with the same material. Miller didn't want to lose a prisoner to assassination and Harry didn't blame him for the precautions he took, but they did contribute to the alien effect.

Harry looked at his watch: 8:45 A.M. Old John would start at nine right on the dot, if he knew the judge. He hoped His Honor had slept well. Burkman was a temperamental old coot who sometimes went completely wild when he got on the bench, but who was a completely different guy socially. He was at his best when trying jury cases. He handled

them superbly, probably because his own rigidly stratified mind knew exactly what fit where.

Drumm, however, had waived a jury, since he expected to rely solely on the issue of insanity. No doubt he confidently expected that he would prevail. After all, he had a client everybody on Earth knew was as crazy as a bedbug.

Harry at last looked up at Nate Roth, who sat there as cool as only the ignorant and uninitiated can, waiting to see what would happen. He couldn't resist the remark he uttered next: "There's still time for you people to quit, Mr. Roth. Maybe save me from having to take a fall."

"We know how you feel, Harry, and we understand. Don't lose hope."

"If it wasn't my constitutional duty, none of this would be happening. You people put me in a position where I couldn't refuse to take action."

"Think of where it'll put you if we make it, Harry. Now that'd be worthwhile, wouldn't it?"

"You know what people are saying about me, Mr. Roth? They're saying I'm an egomaniac, and that's not the worst. There are others who say your network bought me to make news, or that I'm romantically connected to the prosecuting witness. And it's now well known you're a positive yourself, Mr. Roth. Some people think that's what got us here."

"Harry, do you believe I have any such evil motivations?"

"No. But I can't say I'm all that enthused with the testimony you expect me to put on, either. We don't have any assurance that it's going to work. The best we can get is a chance to make a long, slow trip back to where the law used to be."

"And that's not worth the gamble, Harry?"

"Of course it is; that's not the point. The point is, it's me who's got to do it. I'm not sure I'm up to it."

"Of course you are, Harry. Trust me. And what's more important, trust yourself. Ah, Kay's back."

"Let's get started then." Harry got up, grabbed his file, and led the way out of his third-floor office and to the elevator for the courtroom.

Harry had Kay Matusek on cross, and was ripping through the People's case in rapid fashion, using boiler-plate questions.

"Now, Miss Matusek; you've testified that on the date in question you were at the scene of the Monaghan assassination covering that story. Was that location within the confines of this county?"

"Yes sir."

"I'll call your attention to that time and place and ask you what, if anything, unusual happened while you were there?"

"Well,.I'd just heard a policeman say they thought the assassin was in a nearby building, and "

Drumm was on his feet with a hearsay objection.

Harry's argument prevailed with the Court who, finding it wasn't offered to establish the truth of the statement, let it in.

"Anyway, just at the time I was looking over in that direction a man ran over and tried to take the microphone away from me."

"Do you see that man in the courtroom, Miss Matusek?"

"Yes, sir, I do. He's the man sitting at the defense table wearing a blue suit; the defendant, Justin Sudano."

"Let the record reflect that the witness has identified Justin Sudano."

"The record will so reflect, Mr. Factor," said Burkman. "Continue."

Harry turned back to the witness. "You said he tried to take your microphone?"

"Yes sir."

"Whose microphone is it, if you know?"

"It belongs to the television station I work for." She gave the call letters.

"Was it entrusted to your care, and did you have a right to its possession?"

"Yes sir."

"As far as you know, did the defendant have any claim ."

Drumm was on his feet. "Your Honor, counsel is obviously being very careful to cover all the elements of his case, but since, under the circumstances, this can only waste the Court's time, we'll help him by stipulating that my client had no right to possession of the mike."

The Court looked at Harry. "Counsel's right. This would help get things moving."

"Agreed, Your Honor. Of course, it could also be said that a plea of guilty would eliminate the need for this trial too . ."

"Your Honor, now he's completely out of order. My client's entitled to trial. Moreover, even if he were otherwise willing, it's common knowledge that the complaining witness has a civil suit pending against him in which his mental state is not a defense, whereas a guilty plea in this case would be admissible."

"Mr. Factor," said the Court, "take advantage of defense counsel's generosity but don't get too greedy, and let's get moving."

Harry felt like a fool, and he knew that Drumm, who thought himself a showman, anticipated good press from the episode. He resolved to keep going in his careful manner, but to get his vengeance at the end.

"Miss Matusek, were you holding the mike in your hand?"

"Yes sir."

"And you said the defendant tried to take it from you."

"He did take it from me."

"Did he touch you?"

"Yes."

"Did he do so against your will?"

"Yes. I didn't give him permission if that's what you mean."

"Did you find this touching offensive?"

"Well, yes. It hurt."

"Did it cause you pain?"

"Yes sir."

"Did the contact cause marks and bruises to appear on your body?"

"Yes sir."

"Tell the court what parts of your body were injured."

"Well, my arms, of course; and I was knocked to the ground, so I got some scrapes and cuts and contusions from that. We don't know about perman—"

"That's sufficient, Miss Matusek; your witness, Counsel."

Drumm waived cross. Not only with Kay, but with her cameraman, who was the People's next witness. He was qual-

ified, and the tape he'd taken was introduced and played for the court.

Harry next called two city police officers, Mulcahy and Hischer, who testified that they had subdued Sudano after his attack on Kay and that they had witnessed the attack. Both, of course, identified Sudano.

Beyond a few questions intended to generate sympathy—as though that were possible—and directed to develop police treatment or mistreatment of his client at the time of the arrest, Drumm laid off them, too. It wasn't yet time for him to put on his ringmaster suit.

Harry rested, and Drumm then made the usual and customary motion to dismiss the complaint.

Burkman denied it, dictating his reasons into the record. People, he noted, had proved the elements and established a prima facie case of battery which had taken place within the county, and upon which, should he have no evidence in rebuttal, he would find the defendant guilty.

When advised, as of course he expected to be, that such evidence would be offered, he adjourned until 1:30 P.M. and told all parties to be ready.

Nate used the time to take Kay out to lunch, during which time he was his charming self, though he acted more like a spectator in the proceedings than a vitally interested party.

When they came back, Kay sat with him in the press section of the courtroom, where he embarrassed her by insisting on holding her hand.

The curtain went up on act two. Drumm called forth from the anteroom a stunning silver-blond woman who made all eyes in the courtroom light up, including His Honor's. She was sworn and led to the stand, where she sat demurely and waited for Drumm's first question.

At first Nate didn't recognize her; then, with a start, he realized who she was: Delores O'Reilley, darling of the morning talk shows. He didn't go in much for them in the first place, and didn't have the time in the second.

He watched and listened, at the beginning.

"Please tell the Court your name and occupation," Drumm lead.

"Delores O'Reilley. I'm a psychiatrist."

"Do you hold the degree of Doctor of Medicine?"

"I do. I earned my doctorate at the University of Illinois, graduating in 1987. Then I interned at Michael Reece Hospital in Chicago, after which I completed a residency in psychiatric medicine."

"How long have you practiced psychiatric medicine, Dr. O'Reilley?"

"Altogether, counting my residency, fourteen years."

"Where is your office located at the present time?"

"I'm not taking outside patients at the moment, Mr. Drumm. I'm a full-time staff member of the State Hospital in Kankakee, Illinois. I'm doing research there on the condition known as Alban's syndrome."

Harry knew what was coming next. Everybody in the courtroom did. He felt uneasy about it too, since it meant that he was about to be "zemed" right out of the courthouse, in spite of Nate's

assurance of "trust me." It would be just as he had feared.

"Now, Dr. O'Reilley, I ask you if, on Friday of last week, in anticipation of the testimony which you would give here today, you went to the Will County jail for the purpose of testing Justin Sudano, the defendant, for reaction to the Alban Test."

"Yes, Mr. Drumm." She smiled at him.

Nate found himself wondering if the two had something going. He hoped the judge noticed.

"And did the test elicit a response?"

"Yes sir; the test was positive."

"Dr. O'Reilley, you have considerable experience with this test, don't you?"

When he asked that question he was looking at Harry out of the corner of his eye, wondering if Harry would jump up, objecting, because he hadn't bothered to qualify her. But Harry didn't turn a hair; and Drumm then believed, erroneously, that the fight was over, that from now on he could get away with murder.

"Yes, I do," came the answer.

"Would you please describe to the court that experience, and tell the court what conclusions you, as an expert, can draw from your examination of Justin Sudano with regard to his mental state."

Nate closed his eyes, and for a while he listened. Later he napped. Dr. O'Reilley's testimony was, in essence, a repetition of Dr. Alban's testimony at Sudano's first trial. It was as if she were following a script.

The same observation apparently was made by Harry, who couldn't resist a couple of cross questions dealing with her TV experience. If he did so to enlighten and influence Burkman, however, he failed. The old man never took his eyes off her, and never once did a look of disapproval cross his face. Not, at least, until Drumm accused Harry of asking frivolous and improper questions in an effort to impeach her credibility. Then Burkman came down on him like a big bird.

Court then adjourned, to reconvene next morning at 9:30 A.M.

Lots of people wondered why they should even bother, in view of what was being pleaded in bar. But, as Harry explained to the newsmen, it wasn't really over yet; not procedurally, anyway.

"Insanity's an affirmative defense in this state," he explained. "A defendant is presumed to be sane unless he raises it. And, unlike in the federal system, he has the burden of proving it, not us. So, when he pleads it and introduces evidence to support the plea, we get an opportunity to rebut whatever and whoever he puts on. This is what will happen when court reconvenes."

Harry wouldn't take the explanation any further or say just what he planned to do, explaining that this would take him beyond the bounds of ethical conduct because the case was still undecided by the court.

But Nate knew, and when court did reconvene, he earnestly hoped that they were ready.

"You may proceed, Mr. Factor. Call your next."

"Thank you, Your Honor. The People call P.Y. Chee."

Deputy Tony Hernandez, standing just inside the courtroom door, opened

it and gestured. In seconds a small oriental man in gray pinstripes entered, passed through the gate in the inner rail, and stood before the minute clerk.

She administered the witness oath and directed him to the stand.

"Will you please state your name, address, and occupation."

"P.Y. Chee. I reside on campus, in McKensie Hall, at the University of Toronto, Canada. I'm a molecular biologist."

Nate looked over at Drumm, who appeared puzzled. Harry had suggested that might happen. Drumm, of course, had looked at Harry's subpoena list, but apparently he'd assumed Dr. Chee was a shrink. And he obviously wasn't sure what Harry planned to do with this guy. It was just the first of Old Blowhard's surprises, thought Nate.

Factor spent the next few questions qualifying his witness as an expert, and Chee came off splendidly. He'd gotten his education at all the right places. Moreover, he made a good, sober, attentive, and articulate witness, the kind you want on your side.

Harry went into the merits: "Dr. Chee, are you familiar with the so-called Alban syndrome?"

"Exhaustively."

"Have you, yourself, done any scientific research with the particular enzyme that is believed to cause Alban's syndrome?"

"Yes, sir. I've done almost nothing else for over a year."

"Has this research resulted in the formation of and opinion as to the— Strike that." Drumm had been in the act of rising to make an objection, one that Harry knew would be sustained.

Drumm, frustrated, settled back and contented himself by preening his silver-white mane of hair.

"I'll rephrase, Dr. Chee: please tell the court what a molecular biologist does."

"It's a fairly broad field, Mr. Factor. My specialty, however, is synthesis: the artificial construction or reconstitution of organic molecules, principally proteins; including, of course, various enzymes."

"How does this synthesis begin, Dr. Chee?"

"Usually with an extremely gross test, such as spectroscopy or sometimes gas chromatography, to identify the constituent elements."

"Assume you've done that. Then assume the substance is an enzyme, such as that in Alban's syndrome. What's the next step?"

"The next step is difficult. That would consist of an attempt to diagram the molecule—in this case, a protein—determine which atoms occupy what position in the structural pattern. The constitutents of protein molecules form chains, normally with distinct and regular relationships to one another within the chain. In turn, these chains conform to predetermined configurations within the molecule. It is the patterns which make one protein different from another. Naturally, the number of possible arrangements is large, perhaps infinite."

"Have you managed to diagram the molecule of Alban's enzyme?"

"Yes. But only just recently. However, I've prepared a paper on it, and several of my colleagues have con-

firmed my results by duplication of my techniques.''

''Objection,'' snorted the offended Drumm; ''that's clearly hearsay.''

''The Court will sustain, and disregard, Mr. Drumm. The Court is familiar with the rule; hearsay, if inadvertently admitted, is entitled to no weight. Bear in mind there's no jury. Proceed, Mr. Factor.''

''You used the word 'normal' a moment ago, Dr. Chee. Does that imply that there are abnormal arrangements, too?''

''In the case of Alban's enzyme, yes.''

''Please tell the court what you mean by 'abnormal.' ''

''Yes sir. I have encountered two distinct varieties of the enzyme in Alban's syndrome. One variety contains traces of a class of chemicals known as fluorinated hydrocarbons within its molecular matrix; the other doesn't.''

''Does the test for Alban's syndrome, as it is customarily and presently administered, detect the difference you have just described?''

''No sir. It does not. To detect the fluorinated variety, additional tests are required and, I might add, would have to be periodically repeated.''

''Why, Dr. Chee?''

''Because we have discovered both varieties in the same individual at different test times.''

''Dr. Chee. Do you know what the effect of the fluorine compounds is upon the body whose enzyme contains them?''

''Objection,'' Drumm roared. ''This witness is not a physician, and therefore not qualified to state such an opinion.''

Harry started to open his mouth to argue, realized Drumm was right, and let the Court sustain it without argument.

''Dr. Chee, have you found these substances elsewhere in the human body besides in the blood?''

Again Drumm objected, using the same grounds and arguing that the question was too broad. Burkman didn't buy it that time.

''Yes sir. We found them in the liver. The liver appears to be the source of both the enzyme production and its contamination with these compounds.''

''Where did you obtain your test specimens?''

''As I said, from all parts of the body—or do you mean?—well, hospitals, morgues, wherever fresh cadavers were available.''

Harry didn't like it when a witness interpreted his questions. There was too much danger of losing control that way. ''If you don't understand a question, Dr. Chee, say so. Now, did your samples include anything besides the enzymes?''

''Oh yes. We took all kinds of tissue samples, from all parts of the body. We carefully catalogued each sample, and later tested thousands of them.''

''Did the samples include brain tissue?''

''Yes sir.''

''Did it include brain tissue from individuals positive to the Alban test?''

''Yes.''

''Did you find evidence of fluorocarbons in any of these?''

''Yes sir. Sometimes in substantial amounts.''

''Do you know whether or not the presence of these fluorine compounds, either in the enzyme or the brain tissue,

has anything to do with psychiatric illness?''

A resounding objection was heard from Drumm, who leaped up and pranced around indignantly just as if he had a jury there to impress. Burkman wasn't impressed with the performance, but he did sustain the objection on the grounds that it was beyond Chee's qualifications.

''One more question, Doctor: there's no doubt in your mind about three things—first, there are two kinds of Alban's enzyme; second, the existing test cannot differentiate; and third, as far as you know they may not affect the body in the same way?''

''Yes, to all three,'' Chee answered, simultaneous with Drumm's objection.

Burkman overruled it. He was the trier of both law and fact, without a jury, and he used the discretion the law gave him in this instance.

Drumm then got Chee on cross, but was unable to do much with him. He gave up early, when it became obvious to him he lacked the expertise to shake this one. Then, having failed to do his homework, he tried to stall, insisting that Burkman give him a recess to find his own expert. Burkman wouldn't do it. ''You knew who was going to be called for the People, Mr. Drumm; if you assumed the 'Dr.' meant psychiatrist, that's *your* problem. Your request is denied.''

Ceil testified next. Her testimony closely paralleled her confession to Nate; it reinforced what Chee had said, and did it nicely. Factor had put her on in the first place so that the development of the Alban test could be graphically traced.

From the Defense standpoint, the dynamite witness was M.S. Radcliffe, M.D., a neuropsychiatrist, whose sole contribution to the People's case was to demonstrate that any foreign substance which gains entry to the brain could cause trouble but that, at this point in time, science, as he knew it, was not qualified to say, and he, therefore, wouldn't say what that trouble might be. He did say, in commenting on Chee's findings, that he agreed with those three conclusions. In view of the fact that it had been demonstrated all enzymes involved in testing were of the mixed group, without differentiation in the test, the test itself was meaningless.

''Dr. Alban,'' he testified, ''for all his good intentions, blundered. He jumped the gun and relied on superficial, statistical data, when he should have performed clinical tests.''

''Is it your opinion, Dr. Radcliffe, as an expert in the brain and its diseases, that the Alban Test is not a useful and definitive indication that mental disease afflicts an individual?''

''That is my opinion.''

Sudano could not rebut this evidence, and had not, Burkman said. ''The defense of mental incapacity is the burden of the defendant. He must introduce sufficient evidence that he is so incapacitated. The accused relies on the presence of the so-called Alban enzyme to meet this burden. He introduced no other testimony bearing on the issue.

''The Court has, on the other hand, heard the testimony of three credible experts that the test is unreliable. Therefore there exists in the Court's mind a reasonable doubt that the defendant is

incompetent; and that being the case, and the Court being satisfied that the People have proven each and every element of the crime charged beyond a reasonable doubt, the Court finds the defendant guilty as charged. Does the defense wish to have a hearing for formal sentencing?''

Nate did not wait for the answer. Risking Burkman's wrath, he rushed out along with the other newspeople, dragging Kay by the hand.

He took her with him to New York, though in the next few days he had little time for her. News was breaking fast, all around him.

Sudano was sentenced to a year in jail. He stayed there, without bail, while grand juries met in several counties to consider indictments against him. He was immediately indicted for Monaghan's murder.

But he was the least of the news. Word of the outcome of what many had considered a nuisance case, an exercise in futility, had put backbone into the president. He declared a state of emergency as soon as the verdict was in.

Thousands of people were arrested, Abelard among them. The declaration of the state of emergency had legitimatized the participation of the military intelligence agencies, whose carefully gathered evidence was utilized at once to round up those ''positives'' who were considered most dangerous. Those not believed to be active in the revolutionary plot were left for later, since even in these most trying of times nobody wanted to think of America as a police state. Constitutional guarantees were rigidly respected, despite the cries of the former positives that they were not.

Some of those people unquestionably were insane. The vast majority probably weren't. They were simply opportunists who saw apparent immunity and took it; used it because it was there for the taking. They became the creatures immunity always creates; they became monsters.

Once in a while while all this was going on, Nate found himself thinking about Kinney; who, for whatever reason in the end, had done as his oath commanded: defended the Constitution of the United States. Nate found himself hoping also that history would be kind to Kinney, despite his earlier failings. Possible impeachment still lay in Kinney's future, and once having left office he might find himself called into account for his part in Dr. Alban's death.

Perhaps, he thought, precedent might prevail; perhaps Kinney's successor would exercise his prerogative of clemency.

But what about me, Nate thought. Where do I go from here? What about this time bomb ticking away in my own liver? What about the enzyme it's pumping out, that's going into my own head?

He and Ceil discussed it later, when she visited him on the way back to Toronto.

''We'll find the cure, Mr. Roth. We're working hard. If it's got a cause, it's got a cure. And even if it takes a long time to find, chance may still favor you.''

''It's sort of hard to be patient when you're so personally involved. I get the willies every time I open the refrigerator

door. I'm back to shaving with a mug and brush."

"There could be a breakthrough any day now. The research that's going on is absolutely fantastic. Every possibility is being tried. I know one guy who thinks he's found a connection between the enzyme and milk."

"Milk?"

"Yes. Of course, it's just one possibility out of thousands, but there is some reason to suspect it. Look at the worldwide distribution we once discussed: lots of those areas are places where breast feeding is still widely practiced, or where lots of raw cow's milk is consumed. Tell me, Mr. Roth, were you a breast baby?"

"I don't know, Ceil. Maybe I should try to find out."

"We'll have to try everything, and this time there'll be real pressure to make certain the conclusions are correct. Nobody wants a repetition of these last two years.

"You know, we didn't really solve the problem. All we did was give ourselves a little more time. We have to make good use of it and hope that, in the meantime, nobody else comes up with a 'foolproof' test. The thing that saved us was the presence of that little bitty doubt in one old judge's mind. What would we have done without him?

"We owe him facts, Mr. Roth. No more statistical 'certainties.' "

"Statistics was misused, Ceil. And everything has its limitations. Everything except one thing."

"What's that?"

"The mind of man. Uh—and, of course, the mind of woman. Humanity's come so close, so many times, to doing itself in; but in the end man always hangs in long enough to wiggle his way out again. And out of all the people there are, ours are the best at doing that. The system worked again."

"The reason it worked is that so many people who were told they were crazy simply didn't believe it. Yourself, for instance."

"*ME?*—I really am crazy, Ceil. Why else would I be in the news business?"

She laughed, and let it go at that.

Nate didn't. He asked himself if it was really true—but closed his ears to the answer. He didn't really want to hear it.

It was a small thing, true, but now he knew how really important small things were; how, if not painstakingly watched and investigated, they could grow up into Frankenstein monsters. No, he said to himself, I'll stay where I am, do what I seem to do best, and hope I never witness such a creation again. ■

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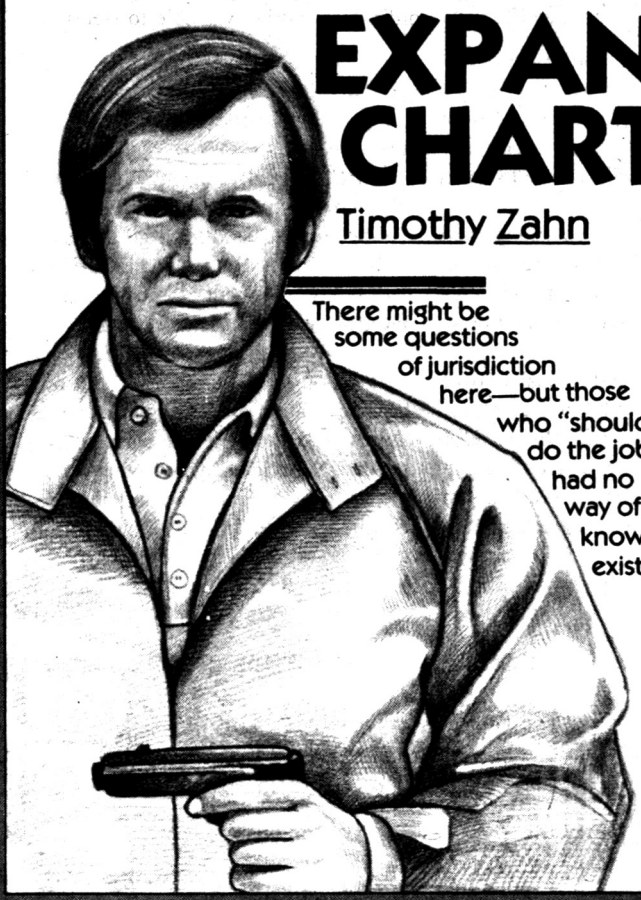
● It is a faith (not always justified) of theoretical physics that if man proposes what is sufficiently elegant, nature, pleased and flattered, will say yes.

Leon N Cooper, *An Introduction to the Meaning and Structure of Physics*

The summons to the Secret Service chief's office had come with the kind of low-key urgency Alex Cord had long since learned to recognize, and from the look on Hale's face he knew the problem was indeed a big one. "Assassin?" he hazarded as he slid into a chair.

Hale nodded grimly. "The FBI called it in five minutes ago—CRIMESTOP gives it a ninety-eight percent probability. The full data pack should be—ah; here it comes."

One of the screens on his desk had lit up with a photo of a scrawny-looking man in his late twenties. Joe Crowly, the ID read. Cord raised his left wrist, pushed a button on the tiny computer strapped there, and felt the answering vibration as the device began recording the data the desktop unit was feeding



# EXPANDED CHARTER

## Timothy Zahn

There might be some questions of jurisdiction here—but those who "should" do the job had no way of knowing it existed.

it. "We know where and when this guy Crowly's going to try it?"

"Pretty sure." Hale pushed a button and Crowly's face was replaced by some names and numbers. "He was in Seattle this morning and somehow got access to the Bounzer Tube there. I guess he didn't realize the thing keeps records."

"Or didn't give a damn." Cord frowned. "Kansas City. The president's old school?"

"Bingo," Hale said heavily. "Some kind of big ceremony—not a dedication; I forget what it's called. The mayor will be there and I think the governor of Missouri, too."

"Election-year politicking."

"By any other name," Hale agreed. "CRIMESTOP thinks Crowly's going to claim he was actually aiming for the mayor and hit the president by mistake."

"You're sure he *is* after the president? That computer's been wrong before."

"I think it's pretty clear. That Welfare Reform Act he signed yesterday? Crowly's been fighting passionately against it for the past two years. We have a witness who says Crowly was acting like a madman last night, and was still going strong when he left her this morning."

Cord grimaced. "Great. Got a team in place?"

"Yes, but I want you to go there and take charge. You're one of the best there is at this kind of operation."

"Okay." Why, Cord thought, did the compliments *always* come glued to the real chestnut-roasters? "I'll do my best."

He stopped at the locker room to change and then picked up a gun from the armory on his way downstairs to the Bounzer Tube facilities. The techs there had already been given the proper coordinates, and he was able to step into

Brad Hamann

the giant steel test-tube without delay. Three minutes later the curved wall vanished and he found himself across the street from a modest three-story brick building that was already beginning to collect a fair-sized crowd.

"Cord?"

Cord turned to see a sloppy-looking man leaning against a street light a few feet away. "Right," he acknowledged, stepping closer.

"Dietrich. You bring us any good pictures?"

"Complete set." Cord held his wrist up and displayed the face he'd seen in Hale's office. "Didn't they send you any?"

"Yeah, but the transmission was lousy and I didn't want to trust it." The other reached down and tapped the record key on his own computer. "You cut things a little fine—we've got maybe five minutes before the motorcade arrives."

"I didn't have much of a choice." Cord glanced at the still-growing crowd. "Crowly's taking a chance on getting torn apart with that smokescreen about aiming for the mayor."

"Better than going up on a federal assassination charge." Dietrich nodded past the school building. "I've got my men positioned where they can theoretically see everywhere in the crowd and also watch all approaches. There's a robot scanner on the school roof keeping watch on the windows in the surrounding buildings. Two men are on the president directly, of course."

Cord nodded. "I think I'll start mingling, then; see if our man isn't standing quietly behind someone taller in the crowd. See you later—and make sure your men get that clearer picture."

"Already sent it. Beep if you need help."

Cord set off across the street, eyes giving the edges of the crowd a quick check. It was too bad that robot scanners weren't capable of good identification in crowds this densely packed; but they weren't, and there wasn't anything he could do about it. Pausing once, he surreptitiously raised his computer and had it rotate Crowly's picture for him, letting him see what the potential assassin looked like from all directions. Then, conscious of the pistol nestled beneath his left arm, he continued on.

Ahead, a car pulled to a rapid halt in front of the school building. Cord looked up, but it was just a TV crew, running ahead of the main cars to get their minicams in position. He kept moving, forcing his eyes to maintain their methodical sweep. Panicking was the worst thing that an agent could do at a time like this.

There was a swell of anticipation from the crowd and a long black limousine pulled smoothly to the curb.

The mayor got out first, waving and smiling at the people as his bodyguards took positions flanking the door. Behind him the governor wriggled out of the seat, his bulk making the operation look awkward. From the school's front door a group of children appeared—an honor guard of sorts, Cord decided—and walked two by two toward the waiting dignitaries. Cord craned his neck for one last sweep and spotted Crowly.

He was, almost exactly as Cord had predicted, peering out from behind a taller, bulkier bystander on the far side of the crowd. His right hand was buried

in a side coat pocket, his face a mask of hatred and fear. He leaned out a bit further, edging between two others for a clearer view.

Cord fired.

Nothing spectacular happened at his end, of course; Secret Service weapons were totally silent and flashless. At Crowly's end well, someone paying close attention might have noticed the slight jerk caused by the impacting capsule, or the look of pure terror that erupted on the young man's face and was quickly frozen in place. The tiny jerking motions as he tried to tear free of the "living plastic" film that was rapidly overgrowing him were too small even to bother those standing beside him.

He was just starting to lose his balance when Dietrich's men appeared on either side of him and carried him quietly out of the crowd.

"Well, chalk up another one for the good guys," Dietrich commented as they watched Crowly being loaded into a car a hundred feet away from the unnoticing crowd. The plastic over Crowly's nose and around his rib cage had been removed to let him breathe, but even at their distance Cord could see that the terrified expression was still plastered across his face.

"I suppose so," he told Dietrich. "We got Crowly without causing any fuss, if that's what you mean. But if we were doing our jobs *really* properly he'd never have gotten to the Bounzer Tube in the first place."

Dietrich shrugged. "You can't hold back the tide with your hands," he said philosophically. "Progress is progress and you can't stop it. Who knows? If they ever get the fine-tune bugs worked out of the method, the Bounzer Tube might actually make our jobs easier."

Cord shrugged, and his eyes strayed to the ceremonies still taking place on the school's front walk. The mayor was shaking hands with each of the children in the honor guard now, and Cord couldn't help but notice the natural dignity one of the boys displayed, the ease with which he faced the politicians. *Even at the age of nine he looks presidential*, he thought. *I wonder if he's decided yet on his life's ambition.*

"Maybe it will, someday," he said aloud to Dietrich. "But it'll never be as easy as in the old days, when we only had to protect a president *after* he was elected." He shook his head. "I wish to hell Bounzer had never invented his damn time-travel machine." ■

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● Of all forms of mental activity, the most difficult to induce is the act of handling the same bundle of data as before, but placing them in a new system of relations with one another by giving them a different framework, all of which virtually means putting on a different kind of thinking cap for the moment.

Herbert Butterfield

# brass tacks

Dear Dr. Schmidt:

I was very pleased to see Richard Lyon's story, "New York Versus the Great Apes," in the March issue. Your inclusion of this story gave me an additional reason to believe that *Analog* readers are interested in man/animal communications (it seems only natural for science fiction readers to approve of studies into inter-species communications—the research might prove very helpful when the real BEMs arrive!).

I work as a volunteer for the Gorilla Foundation in Woodside, California, where the only two gorillas in the world to learn a human language (American Sign Language) are presently being studied and cared for. I know at first hand the extreme pressures put on a research project by drastic budget cuts, as the Gorilla Foundation's National Geographic grant for 1983 has been reduced to half the amount granted in previous years. The prospects for further National Geographic funding seem dim —they apparently have an upper limit for ongoing projects such as this, and the foundation has reached it.

In other kinds of research the scientists involved can put their work on hold while they look for funding. When research involves living creatures, especially such highly intelligent ones as the great apes, it's not that simple. Koko and Michael (the gorillas) couldn't adapt to living without their human family or without the power over their environment that they are able to exert by using sign language. Members of the foundation are determined to keep the project going and will consider almost any means to do so (although the idea of Koko driving a taxi for her keep hadn't come up before!). We currently have a contributing membership of nearly 2,000 and could probably continue to exist without large grants (at least for a while) if this number could be quadrupled. Obviously, we don't have the funds for a media campaign and must rely on low-budget methods for achieving any increase.

Our search for funds is complicated by the fact that our research is highly controversial. Many psychologists and linguists seem to feel threatened by the mere idea that any being other than a human can use language. As soon as a chimp or gorilla achieves a new level of linguistic competence, these scientists either change their definition of language so that the ape is once again excluded or they resort to point-blank denial that the ape has actually performed as claimed by those working with it. I appreciated the Thomas Huxley quote in your March editorial—"It is the customary fate of new truths to begin as heresies." At the Gorilla Foundation, we believe the "previously sacred truth" that humans are the only creatures capable of real language is demonstrably false. We will have a hard time demonstrating it, however, if our low budget prevents us from spending the personnel hours needed to put our collected data into a useful form.

Anyone interested in furthering the survival of this fascinating and important project can write the foundation for more information or for a sample issue

of our semi-annual journal, *Gorilla*. The address is: The Gorilla Foundation, A-2, 17820 Skyline Boulevard, Woodside, CA 94062. We welcome any suggestions you might have for funding, and we certainly welcome new members!

KATHLEEN PETERSON

---

Dear Sir:

Passionate admiration expressed for D.R. Palmer's "Seeking." Brilliant narrative style. Excellent characterization of protagonist. *Seductive* narrative style, is, truly!

One *teensy* flaw.

On matter of assessment, repair of injured boy's severed femoral artery, Candidia granted high marks for beginner, but would flop as first-year surgical resident. Did not *debride* severed artery to remove crushed tissue. Did straightforward end-to-end anastomosis, sans consideration of scarring, stricture.

Furthermore, used (omigawd!) absorbable fine catgut suture (probably on cutting needle) instead of tough vascular silk or monofilament. Kid's femoral artery should have ruptured, leaking thick red stuff all over van, unconscious protagonist, site of triple incineration (Terry not forgotten).

Spent *much* time as med student, intern, with idiot-sticks in hand, second-assisting on major vascular cases. While Old Broken-Down G.P. at present, still retain vestiges of knowledge. Irks to see little thing like this mar otherwise good story. Where did author get surgical info, anyway? From some psychiatrist?

Incidentally, *this* Old-etcetera-G.P. did *not* retain First Microscope. Personal interpupillary diameter exceeds 76mm, and binocular scopes do not spread eyepieces enough to permit simultaneous vision O.U. unless able to move head at FTL rate. *Sold* multiple-damned First Microscope as soon as possible, and Good Riddance!

Wishing for more stories by Palmer (check, reverse, resume:) *demanding* more stories by Palmer, remain, sincerely,

RICH BARTUCCI, D.O.

*David Palmer replies:*

I rechecked with my medical consulting staff at the University and —surprise!—Dr. Bartucci is eminently correct: catgut is a no-no for arterial repair. There are three slightly red-faced physicians around here, not one of whom caught the mistake. The consensus, from those three and five others, is that *probably* it would hold long enough to for the artery to heal sufficiently. Maybe. But if they ever had to do it themselves, they'd much rather their malpractice insurance agents not hear about it. I'll do something about it in the novel; but I'm undecided at this point whether to change the word to "coated silk" or *leave* it as "catgut," but with Candy aware of the problem and fretting, to heighten tension.

However, in rebuttal otherwise: Candy described the damage to the femoral artery as a clean slit—*not* severed—no crushed tissue; no debridement necessary. And to those who wondered, through gritted teeth, why Candy didn't valve down her tires while crossing the rail trestle: Those tires are fifteen inches across the tread face; they're the same giant doughnuts recently seen on Lee Majors's flashy pickup truck in TV's "Fall Guy." (The Good Ole Boys in this neighborhood snicker about this "recent" stuff; they've been running them for years—never can tell when a fella might need extra four-wheel-drive traction pulling out of the ABC Lounge parking lot on a Saturday night, you know.) Valved down too far, they're likely to ball up and roll right off the

rim. This would not improve her prospects materially.

---

Dear Dr. Schmidt:

I have been an *Analog* reader for some thirty years, immensely enjoying the whole of each issue. Now I find myself writing you a sort of "Dear Abby" letter. The tradition of the Editorials has been to encourage open minds and creative thinking and invention. You have been open enough to print fiction on paranormal events like ESP, telekinesis, and recently dolphins as "healers." Because of this tradition of openness, I ask help from you or your readers in solving a credibility problem I have.

Having a background in engineering and considered to be liberal, rational, and sane, I am a United Methodist minister who is a paranormal "healer." Sixteen years ago at the age of 30 I was praying with a dying man, who became immediately well following the prayer, amazing the doctor and shocking me, especially since I knew the universe just didn't work that way. The event was repeatable but not at that time predictable, happening several times a year during prayer. I told no one for six years. It's like being the only one to observe a flying saucer or a BEM. Who would have believed me?

But through the years I researched this unexplainable phenomenon by readings in the field of psychic/spiritual healing and by observing the conditions in myself, the healee, and our relationship. I have become a very consistent healer and have taught others to create the conditions under which paranormal healing takes place.

Now the "problem" to solve is this: Of those who are healed of chronic and terminal diseases, less than twenty percent attribute the healing to paranormal possibilities. Of my fellow professional clergy, I am considered "flipped" by most, with an impossibility wall between us. As one ill clergy friend said, in refusing my healing offer, "First, I don't believe you can do it, and second, if you do do it, I don't believe I can handle it." I have learned to live with that skepticism, mental gymnastics, selective amnesia which protects persons from having to rethink how the universe operates, but now it is impeding my research. I have contacted a number of medical doctors, seeking to enlist them in clinical research with patients in a disease area that is relatively free of psychosomatic factors, such as broken bones, spinal damage, and arthritis, but am being steadily evaded, avoided, and treated like I am making an insane request.

By this time, you may be treating this letter as a hoax. But if you will accept the possibility that this letter is completely true, how would you persuade one member of the medical profession to do some quiet and confidential research in paranormal healing in the area of Cleveland, Ohio?

WALTER L. WESTON
19761 S. Sagamore
Fairview Park, OH 44126

*Anybody reading this want to help? Personally, I find this area fascinating and worth a good deal of investigation. Both I myself and several medical people of my acquaintance have seen quite a bit of evidence that psychological factors can play a very significant role in both causing and curing "physical" ailments. The placebo effect is well known (though not so well understood), and what you're describing may differ from it not so much in kind as in degree. I'm also reminded of an article I saw in a reputable scientific journal several years ago about medical practice in*

*South Africa, where European-style medicine had a strong foothold but tribal beliefs associated with witch doctors were still quite prevalent. It seems both the M.D.s and the witch doctors had come to recognize that certain types of problems could be better treated by the other type of practitioner, and cross-referrals both ways were common —though officially frowned upon by both groups' counterparts of the AMA.*

---

Dear Mr. Schmidt,

Within the last year, *Analog* has printed two stories, "Rails Across the Galaxy" and "Rocheworld," in both of which light pressure from a laser is used as a space drive.

There is no such thing as light pressure!!

Photons cannot have momentum since they are massless particles, and there is no transfer of energy in any form when they are reflected. The reflected light is identical in both frequency and velocity to the incident light. Losses by absorption in the reflector affect the intensity of the reflected light but not the energy of the reflected photons. Even on absorption there is no transfer of momentum from the photon to the absorbing atom, which is merely raised to a higher temperature by the energy of the photon. A moment's reflection (mental) will show that this must be so. Photons can exist only at the speed of light in any transparent medium and therefore can neither be accelerated nor decelerated. At the instant of formation they are travelling at lightspeed and on passing from one medium to another instantly travel at the speed of light for that medium.

The Theory of Relativity explains this phenomenon by postulating that photons do not travel in straight lines but along geodesics in space-time. The presence of matter produces curvature in space-time and therefore lengthens the path of photons giving the apparent change in the velocity of light. Similarly it is the distortion of space-time in the vicinity of very intense gravity fields that bends light rays and not the effect of gravity on the photons themselves.

The fallacious idea of light pressure appears to have arisen through semantic confusion with radiation pressure and a basic misunderstanding of the properties of elementary particles. Radiation pressure refers to phenomena such as electron beams and the solar wind, which are composed of particles that can be accelerated and decelerated, have positive rest mass, and can never attain the speed of light (tardyons). These particles do have momentum and exert a pressure on absorbing or reflecting mediums, and therefore *solar wind* sailing *is* a possibility, though it would be of little use in interstellar travel, since the solar wind does not reach solar escape velocity.

I am surprised and somewhat disappointed that *Analog* should publish stories based on such "bad science," as I have come to expect better of you. You could be forgiven for publishing one such story if it had special literary merit provided you apologised for the scientific error. But two serials and no disclaimer. Shame on you.

D.F. LASCELLES
Mareeba, Queensland,
Australia

*Nope; I must respectfully decline. I'd be happy to apologize had the authors or I made a mistake, but the only error here is yours. A hand-waving argument full of qualitatively correct jargon can sound impressively erudite, but it's no substitute for learning* exactly *what the terms mean and how they are related.*

*There* is *light pressure, there is transfer of energy when photons are reflected, and both are precisely calculable and experimentally verifiable (though the energy transfer is usually so small that it's extremely difficult to detect). Your basic fallacy is that photons cannot have momentum because they are massless particles—a particularly interesting contention in view of your later citing the theory of relativity. Relativity is a* mathematical *theory, and one of its specific consequences is that a photon of energy E has momentum E/c, where c is the speed of light. This also implies that it has a* relativistic *mass $E/c^2$—only the* rest *mass is zero. (And since it's never at rest, that is not an observable quantity.)*

*To really understand relativity, I know no way to avoid the necessity to start with the basics and work methodically through the mathematical development of the consequences. There are many books which can help you do this; one which many people have found particularly helpful is Taylor and Wheeler's* Spacetime Physics.

---

Dear Stan,

Stephen Goldin's guest editorial in the November 1982 issue was, I think, one of the most interesting and nicely done approaches to the young-Earth/old-Earth argument that I've ever had the privilege of reading. However, I also saw in the article (or, more accurately, in part of my reaction to it) a hint of what I feel is a dangerous trend of late.

Mr. Goldin begins by stating that "creation science" is not science at all, and then proceeds to logically show why, assuming scientific consistency, the universe must be more than the ten thousand years claimed by "creationists." This is all well and good *if* your definition of "creationist" includes *only* those who hold the young-Earth view. However, if your definition includes a much broader spectrum of opinion (as mine does), the editorial seems at first blush to be picking on the least defensible edge of the spectrum and applying the criticism equally to everyone.

Let me quickly say that I am NOT accusing Mr. Goldin of deliberately doing this. I am perfectly willing to assume that his definition of "creation scientist" really *does* include only those at whom his article is addressed; and he is certainly not responsible for knowing how I or anyone else uses the term "creationist." However, it is also clear from my own example that anyone who uses such a loaded term without laying out explicit boundaries runs the risk of being misunderstood.

Which brings me to the dangerous trend I mentioned earlier. It seems to me that there are an uncomfortably great number of these blanket terms being tossed around (or hurled with great force) these days. *Creationist, pro-abortion, anti-nuke, women's libber* —none of these labels means exactly the same to any two people, and yet they are often used as if they were as well defined as the word *green*.

The first problem this immediately generates is that the conscientious writer using one of these labels can never be *quite* sure he's communicating what he intended to communicate. The other problem—which bothers me far more—is that either side of an issue can use this inherent vagueness to unfairly attack the other side. We've all seen this in action: the pro-(blank) advocates point to the most radical group of anti-(blank) advocates or to their most indefensible statement and try to make the general public believe that *everyone* who is anti-(blank) is that stupid/uncaring/dangerous.

If the public buys it, you've scored a victory.

Why is this so worrisome? To me, the increase in this tactic seems an indication that pros and antis are seeing their conflicts more and more in quasi-military terms; that their opponents are to be destroyed by whatever means possible. There seems, correspondingly, to be a *de*crease in the approach of winning by conversion. True, winning your opponents over to your side is a slower process, but it's one that *should* yield far better results in the long run —*provided you think you* have *a long run*. It's as if both sides of all these issues are so afraid the fickle public will turn against them completely that they feel they *have* to go for the quick kill. Picture all these groups feeling themselves backed dangerously into corners and I think you'll understand my concern.

So what can we do? The most obvious step is for people on both sides of any of these conflicts to start talking to and—even more importantly—*listening* to each other. If there is anything beyond the day's date you can agree on, you'll have the basis for negotiation; and if agreement or compromise are ultimately impossible, you'll at least have learned to see each other as human beings instead of as caricatures. Secondly, as readers we must be aware of these attempts (deliberate and otherwise) to unfairly paint large groups of people with brushes really meant only for a few.

Thanks for your patience (this letter turned out longer than I expected it to, and I *still* left things out). It seems to me you've done editorials that touched on these semantic problems in the past, but another one might be in order. I, for one, would be interested in seeing your views on the subject.

TIM ZAHN

*It's a problem that bothers me, too; I don't think I've expressed quite this aspect of it as well as you have, but I have no doubt I'll be returning to it in one form or another. Meanwhile, since I doubt that Mr. Goldin meant to give that impression, I've asked him to respond to your comments.*

*Stephen Goldin replies:*

Admittedly I chose what may be an extreme example of a "creation science" assumption, and I apologize to anyone who feels slurred by the generality. Nevertheless, I feel my main point still holds—each branch of science *must* be consistent with every other branch. The theory of evolution is consistent with everything else we know about the universe. Anyone supporting a contradictory theory had better be prepared to prove that his theory is also consistent all the way down the line. *Any* creationist theory must be consistent with lightbulbs, or I'll refuse to believe it. ■

---

● While one should not brood about the possibility of life after death, one might as well consider it. If there is none, one should redouble efforts for hanging on as long as possible; if there is, one should try to learn the entrance requirements.

Kelvin Throop III

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# a calendar of analog upcoming events

**1–5 September**
CONSTELLATION (41st World Science Fiction Convention) at Baltimore Convention Center, Baltimore Md. Guest of Honor—John Brunner; Fan Guest of Honor—Dave Kyle; TM—Jack Chalker. Registration—$15 supporting at all times. Attending—$40 until 15 July 1983, more at the door. 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. Info: Con-Stellation, 41st World Science Fiction Convention, Box 1046, Baltimore MD 21203.

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**12–14 September**
IEEE International Conference on Computer-Aided Design at Santa Clara, Cal. Info: IEEE, 445 Hoes Avenue, Piscataway NJ 08854.

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**12–14 September**
36th Annual Conference on Engineering in Medicine and Biology at Columbus, Ohio. Info: Patricia J. Horner, A.E.M.B., 4405 East-West Highway, Suite 210, Bethesda MD 20814. 301–657–4142.

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**23–25 September**
INVENTION (Glasgow SF conference) at Central Hotel, Glasgow. Guest of Honour—Chris Boyce; Fan Guest of Honour—Jim Barker. Registration £11 attending, £5 supporting. Info: 10 Woodlands Gardens, Bothwell, Glasgow, G71 8NU, Scotland, U.K. (use airmail).

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**23–25 September**
AD ASTRA III (Toronto-area SF conference) at Cara Inn, Toronto, Ont. Pro Guest of Honour—Ben Bova; Fan Guest of Honour—Ken Fletcher. Info: AD ASTRA III, Box 7276, Station 'A', Toronto, Ontario, Canada M5W 1X9.

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**24–25 September**
VALLEY CON VIII (Mixed media SF/Fsy conference) at Ramada Inn, Moorhead, Minn. Banquet, speakers, art show, films, gaming, computers, comix. Info: Valley Con VIII, Box 1264, Fargo ND 58107.

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**26–29 September**
Compcom Fall '83 at Arlington, Va. Info: Compcom Fall 83, Box 639, Silver Spring MD 20901. 301–589–8142.

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**30 September—2 October**
Star Trek Dallas (ST-oriented conference) at Regency Hotel, Dallas, Texas. Guest of Honor—James Doohan ("Scottie"). Registration—$7/day, $15/3-days. Info: Syndicate, Inc., Box 31309, Dallas TX 75231.

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**7–9 October**
ARMADILLO CON 5, at Villa Capri, Austin, Texas. Guest of Honor—Howard Waldrop; Fan Guest of Honor—Becky Matthews; TM—Neal Barrett, Jr. Info: Armadillo Con 5, P.O. Box 9612, Austin TX 78766.

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**7–10 October**
EARTHCON III (Cleveland-area SF conference) at the Charter House Inn, Euclid, Ohio. Guests—Marion Zimmer Bradley, Katherine Kurtz, Jacqueline Lichtenberg, Jean Lorrah. Art show, masquerade, banquet, films, video, hucksters, games. Info: Earthcon Three, Box 22041, Beachwood OH 44122 (enclose two 20¢ stamps).

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**14–16 October**
NOVACON (Central Penn. SF conference) at Treadway Resort Inn, Lancaster, Penn. Guest of Honor—David Gerrold; Featured Artist—Teanna Byerts. Panels, poetry, art show, hucksters, gaming, etc. Registration—$8 until 30 September, $10 at the door. Info: NovaCon '83, Box 41, Marietta PA 17547.

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—Anthony Lewis

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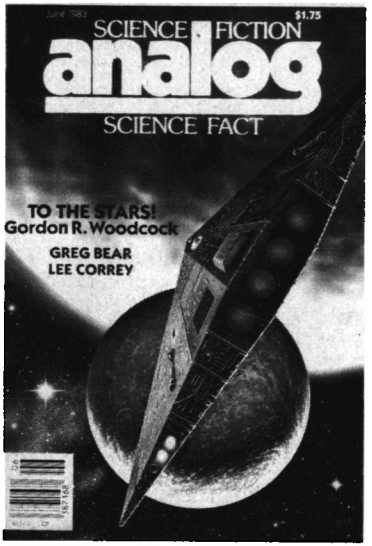


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