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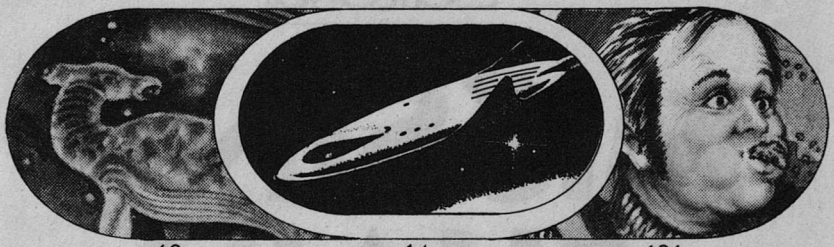

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Editorial

MISSING CHAIN

Stanley Schmidt

Throg crouched in the bushes at the edge of the clearing and scratched his neck in puzzlement. He had never before seen anything like the object standing there—something rather like a cave, but standing out in the open instead of set into a cliff. It was smoother, shinier, and more regular in shape than anything else he had seen in all his wanderings in these mountains. The four beings who had emerged from it looked something like men (or women?), but they, too, were oddly smooth and shiny and colorful, and much too tall. They made gestures and noises that sounded vaguely like talking, but none of it made any sense. Two of them stayed in the clearing while the other two disappeared into the forest. Throg felt a burning desire to watch all four of them, but he had to choose. He stayed where he was.

The two mysterious beings who remained carried unrecognizable objects in their hands, pointing them here and there in a way that reminded Throg of some of his Shaman's rituals. Throg watched and watched, hoping to make some sense of what he was seeing, but understanding never came. Finally, when the sun had set behind the trees and Throg began to crave the security of his cave and his family, the two wandering strangers returned to the clearing. They traded a few raucous sounds and gestures with the other two, then all four somehow made an opening in the wall of the shiny cave-that-wasn't, and disappeared inside.

And then the entire thing disappeared, instantly, with a sound like a thunderclap, leaving no trace of itself but some flattened grass where it had been, and the sighing and fluttering of leaves in the air that it had somehow disturbed. Throg, now terrified, ran back to his cave as fast as he could in the dying light, and crouched by the fire, holding his woman and rocking until sleep came to them both.

The next morning he returned to the clearing, emboldened by the light of day to seek any clues that the strange beings might have left behind. He found one and only one, but he found it more puzzling than enlightening. His intuition said it was a tool of some sort, but he couldn't imagine a job that it would be good for. The workmanship he could recognize and envy: he would have loved to have a dagger or a spear so hard and smooth and with a point so sharp. But what good was a sharp point when the blade was twisted into a spiral coil that would resist all efforts to push it into anything? The thing would be useless! Frustrated and disgusted, Throg tossed it into the bushes and went hunting—with a new appreciation for the qualities of his own blades.

Throg never did figure it out, poor fellow, but he can hardly be blamed. Actually, a corkscrew makes very little sense unless you have the concepts of a bottle stoppered by a cork, and the mechanical advantages obtainable from helical devices and motions. We can recognize the function of most "primitive" artifacts (or can we?) because we have at least a general, second-hand memory of the functions they were used for—and those functions are generally simple, basic ones like cutting or stabbing. We would have relatively little trouble recognizing Throg's dagger and spear, but it would be asking too much for Throg to recognize something which is only useful if you have a bottle of, say, *Chateauneuf du Pape*.

And a corkscrew is probably the *least* puzzling thing Throg's time travelers brought with them. A great many modern tools would be incomprehensible to someone from an earlier era, not just because their functions did not yet exist, but because their functions exist only in terms of interaction with *other* tools. A spear or dagger does something clearly useful all by itself: with no accessories required, it kills food or cuts it into manageable portions. A corkscrew is also a food-getting tool, but it only works in a context where other tools called bottles and corks exist to carry and protect liquids, and still other tools exist to make bottles and stoppers. The relationship between a corkscrew and the other tools which must be used in conjunction with it is relatively simple; some others are a lot more complicated and therefore even harder to explain to Throg. And such relationships are *not* a few scattered anomalies. In a culture as deeply into technology as ours, they are the rule rather than the exception. I can see a wide range of examples, from simple to complex, without leaving my chair.

Some, like the corkscrew, are relatively simple—but still way beyond

Throg's experience. A Phillips head screwdriver might look to Throg like another botched attempt at a dagger: great material, but a dull point with a peculiar shape whose fashioning obviously wasted a lot of skill and effort that might have gone into making something simpler but more effective. Without the concept of the screw as a simple machine and a fastener, he could have no inkling of its true function. If one of us learned the other's language, and laboriously got across the concept of the corkscrew, we might then show him an electric can opener and explain that it, like the corkscrew, is a tool for opening food and drink containers. But before the claim could even begin to make sense, we'd have to explain enough metallurgy to make a tin can sound believable. Even then, he couldn't believe we were babbling about anything more

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than systematized delusions unless we brought along something to plug it into for a demonstration.

An ironing board might make sense, as an awkwardly designed table—but Throg would be unlikely to guess its real purpose unless he'd seen ironable fabrics, and a hot object used to dewrinkle them. Still, that would be a lot easier to explain than an oil filter wrench, whose sole reason for existence is to change an esoteric part of a vehicle whose very existence would seem to Throg the wildest sort of fantasy. Or how about my radio alignment tool, a small plastic rod that looks like a flat-blade screwdriver on one end and an Allen wrench on the other, used for fine-tuning coils in radio receivers without introducing any magnetic interference during the process? A simple thing, but Throg's best guess might be that it was an even lousier dagger than the corkscrew or the Phillips head screwdriver, being made out of much flimsier material and having nothing even remotely resembling a decent point. Let's see you try to tell him what it's really good for, without sounding like you're raving about "magic."

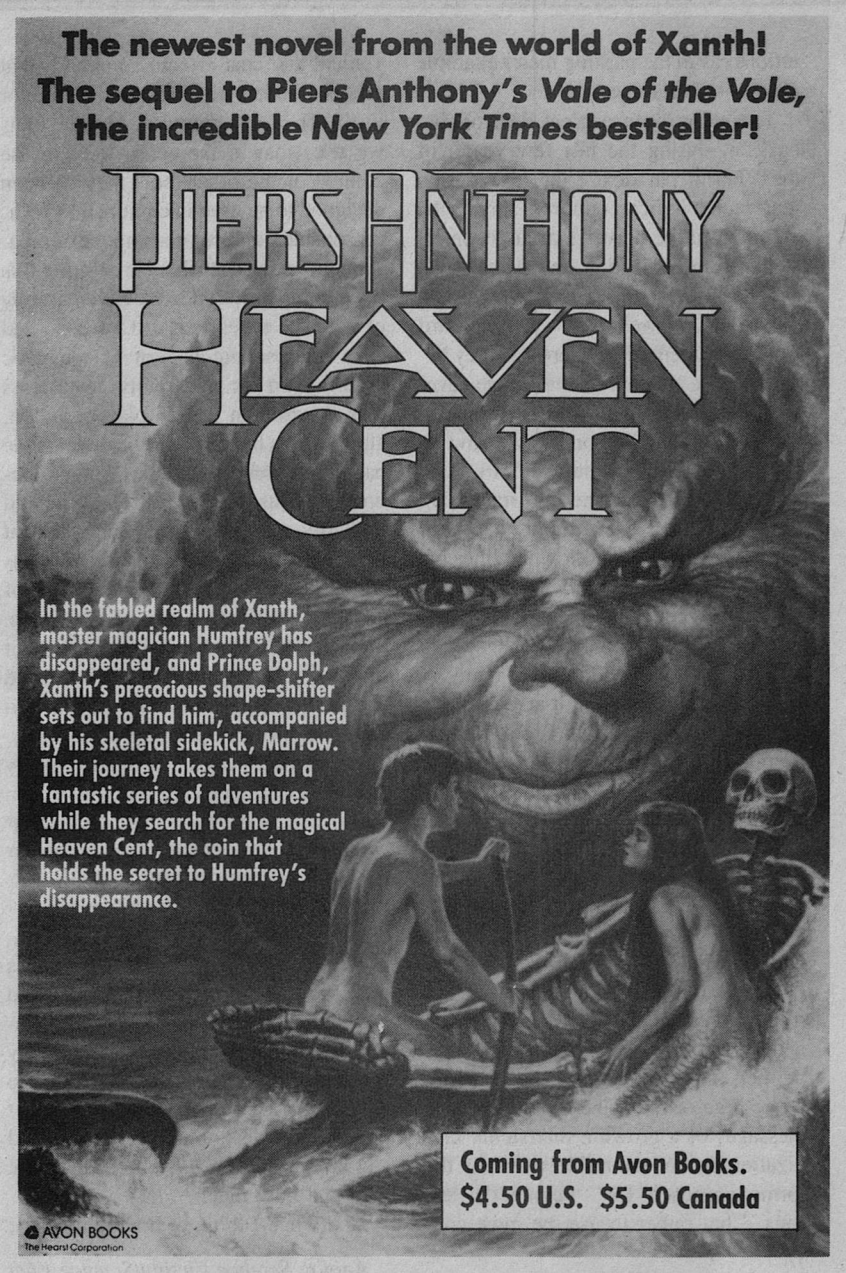
My trumpet mutes might be interpreted as water jugs of relatively impractical design. The fact that their real purpose is to produce subtle changes in the tone quality of a musical instrument would not be obvious unless the instrument itself was produced and demonstrated. That one we might be able to manage, at least approximately; Throg may well have learned to blow an animal horn with its tip broken off. A clarinet ligature might be a little harder to explain, but it, too, would probably not be *too* hard to get across.

But how about a bicycle pump? The remote control for a VCR? The surge protector attached to the computer I'm writing this on? Or a parking meter? To make any sense at all, that one has to be related not only to other mechanical devices, but to *social* inventions that are still way off in Throg's future, like land ownership, money, and centralized government.

All of these examples have one important property in common: they are all single parts of *systems* of tools and can serve their intended functions only when used in conjunction with the other parts of the system. The system may be thought of as a chain, with no two links alike. The finder from a different culture, trying to guess the function of one tool of the system, must somehow try to reconstruct the whole chain from a single (and not necessarily typical) link.

At this point, to keep things in perspective, we would do well to remind ourselves that Throg was *not* an intrinsically stupid, dull, or otherwise inferior fellow. He merely lacked several thousand years of vicarious experience that we have. We can expect to find ourselves in a very similar position if we ever find ourselves confronted with artifacts from alien (or time-machined) cultures with lots of cultural background that we don't share.

And please note carefully that "artifacts" do not have to be tooled chunks of metal or plastic. They can be insti-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tutions, as in the parking meter example above—or messages.

There has been a great deal of discussion, during the last few years, of the "Fermi paradox": the observation that technological cultures should be common in the universe at large, interstellar communication and even travel should be a lot easier than we used to think, and yet we haven't met or heard from any aliens. So where are they?

Well, the assumption that we've never seen a message implies the assumption that we'd recognize one if we saw it. I'm not so sure we would. It's true that a lot of effort has gone into imagining forms that messages might take, but these have tended to follow the lines of, "What might *we* send if we wanted to be recognized and understood by another technological civilization that we've never met?" The reasoning in many of these is such that I think it is reasonable to hope that someone Out There, finding a message we've designed along the lines proposed, would be able to decipher it. It's even reasonable to hope, though I think a shade less convincing, that somebody trying to contact us might follow sufficiently similar lines of reasoning to come up with something we could recognize.

But what if another civilization is *not* trying to contact us, but simply going about its own business in its own way, neither knowing nor caring whether we're here or not? The routine internal messages of a growing interstellar civilization do not seem likely to take the forms proposed for "beginner's lessons," but rather to use the most convenient and cost-effective methods that civilization has been able to develop for itself. The tools they use, like the tools we use, may make sense only in the context of the other tools they've been designed to be used in conjunction with.

Consider a close-to-home example. I mentioned earlier that I'm writing this on a computer. After I deliver a copy of it to the typesetter, I'll keep it filed as a microscopic pattern of magnetic ordering on an apparently featureless disk encased in a 3.5″ plastic square, along with a bunch of similarly invisible patterns representing various other documents. Our old friend Throg would probably see nothing of value in it at all. Even my own great-grandparents would have recognized the few lines of not very informative English written on the diskette's label, but I don't think it likely that they would have suspected that the disk itself contained information equivalent to a respectable-sized book. That information can be read only by a suitably equipped computer—and even if the disk is the type that a particular computer likes to use, that computer may not be able to read it if it's formatted for a different type of system.

Given information stored in that compact a form, encoded in a way that is only accessible via a complex and highly specialized technological context, I can't help wondering: how likely is it that Johann Gutenberg or Leonardo da Vinci or Isaac Newton would suspect that a floppy disk or hard disk contained any information *at all*, much less what kind and how much?

And when I think of how rapidly the

technology that uses computers and disks has evolved (and continues to evolve), I must seriously wonder how likely *we* would be to recognize the information packets used by aliens—or even our own descendants a mere century hence. ■

CLIFFORD D. SIMAK 1904-1988

Clifford D. Simak, a writer well known and fondly remembered by several generations of readers, died April 25, 1988, at Riverside Medical Center in Minneapolis, after several years of suffering from emphysema and leukemia. He was 83. Born and raised on a farm in Millville, Wisconsin, he retained a lifelong love of the land and people who lived close to it, and was perhaps best known for the warm, compassionate, "pastoral" flavor of his stories. In addition to the fiction for which he was most widely known, he did a broad range of distinguished newspaper writing, remaining active in that field for most of his life. His fiction career began in 1931 and continued to the present; he was one of the very few writers able to remain active and popular over that long a period. He was Guest of Honor at two World Science Fiction Conventions and winner of multiple Hugo and Nebula awards (his 1980 *Analog* story "Grotto of the Dancing Deer," won both), including the Grand Master Nebula in 1977.

He is survived by two children and a brother. Those who were fortunate enough to know him personally know that he built his own best memorial. What higher tribute could we give than to say that he was exactly the kind of man you would *expect* to write stories like *City* and *Way Station?*

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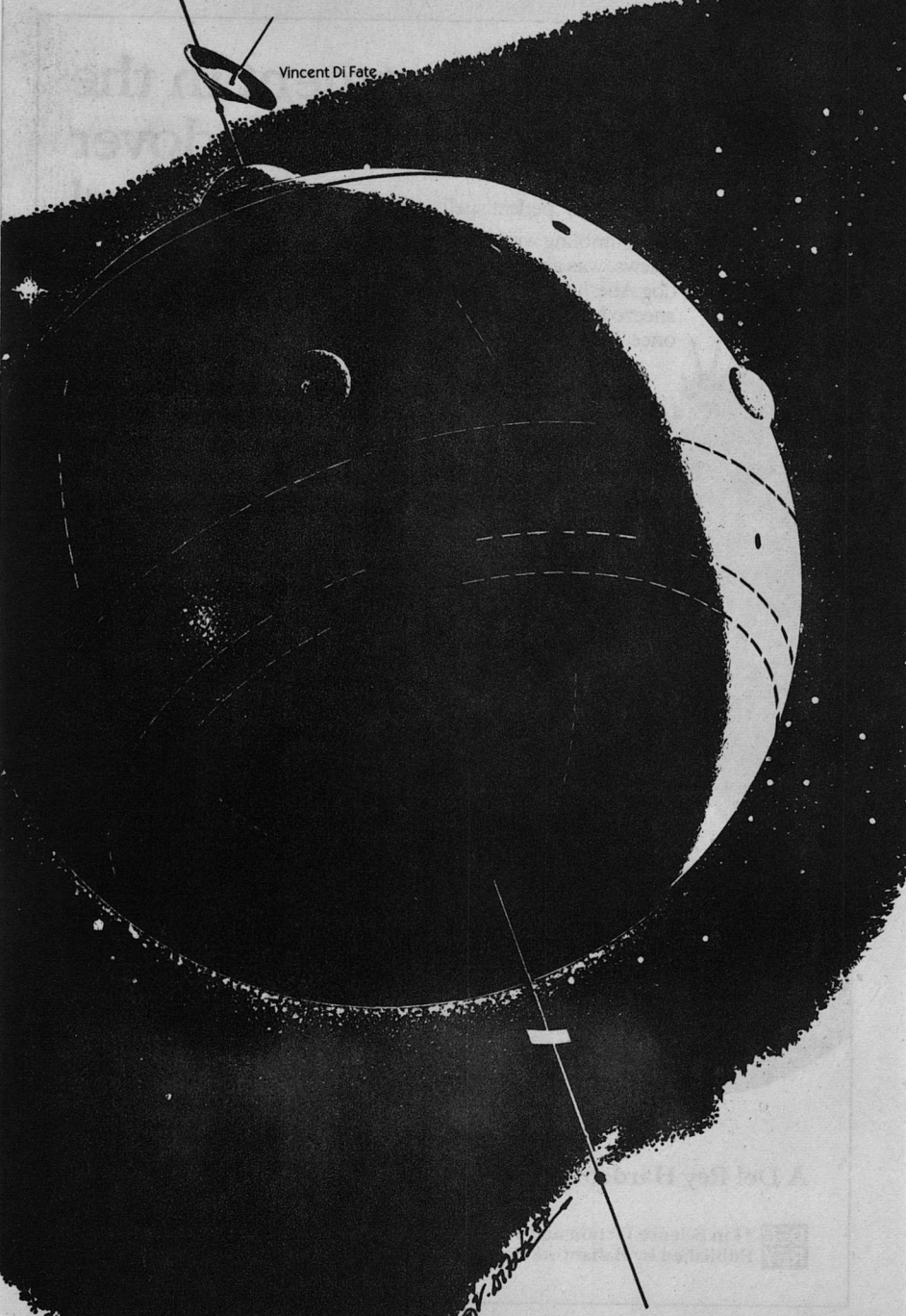
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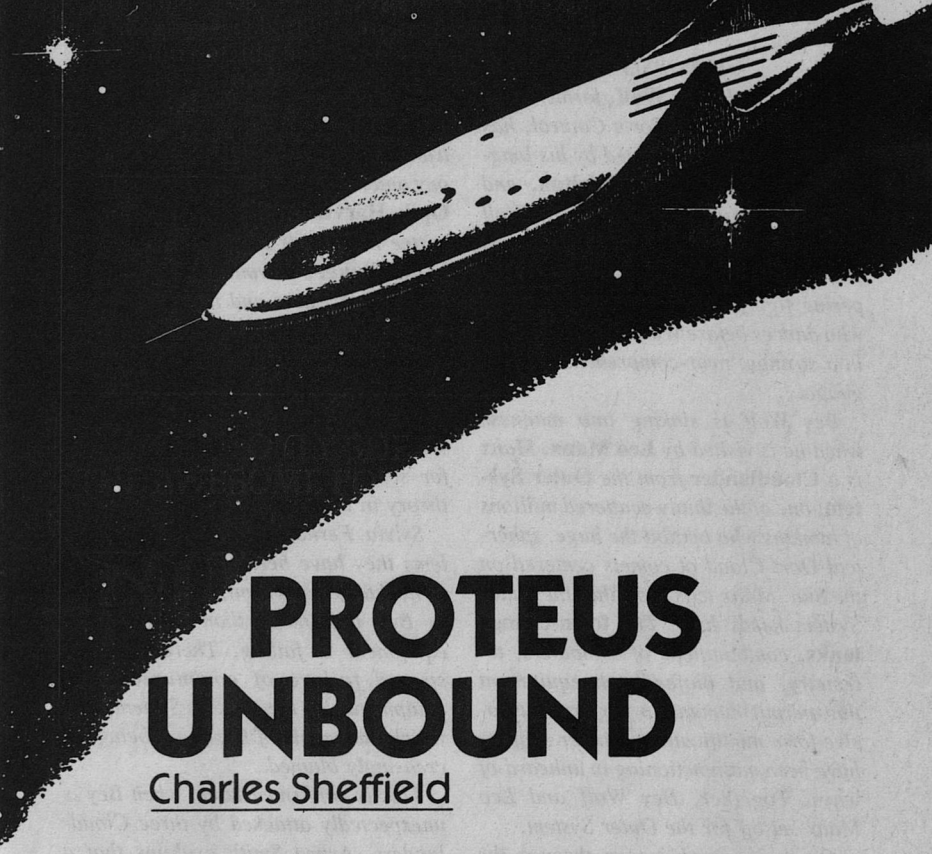


PROTEUS UNBOUND

Charles Sheffield

Conclusion

There was no doubt that Ransome had some most unusual equipment and abilities—but there were certainly questions about where they came from and what they meant.

SYNOPSIS

The life of **Behrooz Wolf,** *former head of Earth's Office of Form Control, has reached low ebb. Deserted by his longtime companion,* **Mary Walton,** *and fired from his job in Form Control, Wolf is plagued by hallucinations. He keeps seeing the* **Dancing Man,** *a jerky, capering figure invisible to anyone else, who dances before Wolf and talks to him in a strange, near-comprehensible language.*

Bey Wolf is sinking into madness when he is visited by **Leo Manx.** *Manx is a* **Cloudlander** *from the* **Outer System,** *one of the thinly-scattered millions of humans who inhabit the huge, spherical Oort Cloud of comets centered on the Sun. Manx tells Wolf that the Outer System needs help. The* **form-change tanks,** *combinations of computers, telemetry, and biofeedback equipment that permit humans to perform purposive form modification to other shapes, have been malfunctioning in unheard-of ways. Together, Bey Wolf and Leo Manx set off for the Outer System.*

On their way they pass through the **Kernel Ring,** *an annular region where the* **power kernels** *are found—Kerr-Newman black holes, used as major energy sources. The Kernel Ring is the home of rebels who prey on ships passing between the Inner and Outer Systems. Manx tells Wolf that he has evidence that Mary Walton ran off with someone from the Kernel Ring. He also warns Wolf of a powerful rebel leader known as* **Black Ransome.** *A vague legend back on Earth, Ransome is feared in the Outer System as a cunning, charismatic figure, with his own well-hidden and well-defended stronghold,* **Ransome's Hole,** *located somewhere in the Kernel Ring.*

Bey Wolf and Leo Manx make a safe transit of the Ring and arrive at the colony and major processing facility of the **Opik Harvester.** *The reception committee that meets Bey consists of* **Cinnabar Baker,** *a woman who controls all the Harvesters and is also the head of the Outer System's intelligence network;* **Apollo Belvedere** *("***Aybee***")* **Smith,** *a brash young scientific genius and Cinnabar Baker's chief science advisor; and* **Sylvia Fernald,** *responsible for software development and control theory in the Outer System.*

Sylvia Fernald describes the problems they have been having with their form-change equipment. It becomes clear to Bey that more than form-change equipment is failing. There is widespread failure of communications equipment in the Outer System, for which the people of Earth are being increasingly blamed.

This is confirmed later, when Bey is unexpectedly attacked by three Cloudlanders. Aybee Smith explains that a Harvester on the far side of the Cloud has been destroyed, and many Cloudlanders think it was done by Earth and the Inner System. Bey is in danger of mob violence, and he and Sylvia Fernald are sent to the **Sagdeyev Space Farm,** *to investigate reports of form-change problems there.*

Before they leave, Cinnabar Baker has a private session with Sylvia Fernald. Baker has with her only her constant companion, an old, bedraggled crow called **Turpin.** *Baker tells Sylvia that she does not trust Bey Wolf, and wants Fernald to try to achieve a close*

personal relationship with him. Sylvia Fernald finds Bey physically repulsive. She leaves, dreading the trip to the Sagdeyev Space Farm alone with him.

That trip turns out to be far easier on Sylvia than she expected. Before they leave, Aybee gives Bey a device he has built to allow Wolf to study his hallucinations objectively. It provides an iterated feedback, matching memories against stored scenes. Bey puts the machine headset in position, and becomes locked in an endless cycling of memories. It is only through Sylvia Fernald's intervention that the cycle is broken.

When Bey returns to normal consciousness he is exhausted, but Aybee's device has done its job. Bey's hallucinatory memories have been captured exactly and can now be studied objectively. The dancing figure can be understood by reprocessing the signal, and describes itself as the **Negentropic Man.** *Sylvia recognizes the figure as Black Ransome, the rebel from the Kernel Ring. But she cannot explain Ransome's interest in Bey, nor his attempt to drive Bey mad.*

Bey and Sylvia arrive at the Sagdeyev Space Farm before Manx and Aybee Smith. Left to themselves, they talk about Black Ransome and his recruiting of Sylvia Fernald's long-time lover, **Paul Chu.** *Before he left to join Ransome's rebel operation, Chu had told Sylvia that Ransome had a secret weapon, one that he will use for System conquest. Now Sylvia has lost track of Chu. She realizes that Bey Wolf would like to talk to him about Ransome, and Ransome's apparent desire to drive Wolf insane.*

When Bey examines the form-change anomalies on the Space Farm, he finds that the dead occupants of the form-change tanks have not been killed by hardware failure or by random errors. They were murdered by systematic spurious signals introduced into the form-change process, apparently by a data source interacting with the Space Farm's central computer.

Meanwhile, Aybee Smith and Leo Manx have arrived, and are studying the recording of Bey's hallucinatory messages from the Negentropic Man. Aybee points out the difficulty of interpreting them, and of the idea of negative entropy. He points out that "entropy" has at least four interpretations: entropy in thermodynamics, entropy in statistical mechanics, entropy in information theory, and entropy in kernel theory. Without more information, he does not know which one is relevant, but the Negentropic Man ought to be someone who decreases the entropy of a system.

Before they can discuss it further, the Space Farm is destroyed by collision with a cometary fragment. Wolf, Fernald, and Manx are injured. Aybee Smith puts them on a ship that will return them to a Harvester, while he stays to explore the reason for the "accident"—which could not happen if the control system of the Space Farm had been working correctly. More and more, it is clear that communication and control of the Outer System are being sabotaged by an external source of spurious information reaching the Cloudland computers. Aybee finds evidence that this false information is related to the power kernels, but he does not know how.

Trying to solve that mystery, Aybee gets into trouble. While he is floating

safely outside in his suit, a strange cargo vessel arrives at the ruined Space Farm. Aybee sees the power kernel of the Space Farm's main habitat replaced by another one from the new ship. When the strangers have gone, Aybee goes back into the Space Farm to investigate the kernel. He finds that it is perfectly normal—but he also finds that not all the strangers have departed. He is captured, and taken away to the cargo vessel.

Meanwhile Wolf, Fernald, and Manx have returned to the Harvester where Cinnabar Baker is located. They find a rapid worsening of form-change equipment performance there, and increased talk of war between the Inner and Outer Systems. Cinnabar Baker confirms a high-level leak of secret information within her own organization, but her efforts to track down the spy have been unsuccessful. On the positive side, the high failure rate in the form-change equipment convinces Bey that he can now track down the source of the trouble.

Before he begins work he enters a form-change tank for treatment of injuries received at the Sagdeyev Space Farm. Without his approval, Sylvia at the same time initiates a form-change to make him look like a Cloudlander. Feelings between the Inner and Outer System are running so high that anyone who looks like an Earthman will get no cooperation on the Harvester, and Bey would be in danger.

To test the acceptability of Bey's new form, he and Sylvia wander through the Harvester. They find people terrified by the breakdown in the form-change equipment, and trying desperate alternatives for medical treatments. They also encounter **Andromeda Diconis,** *an old acquaintance of Sylvia's, who makes it clear that Bey can not only pass as a Cloudlander in his new form, but he is highly attractive to her. Sylvia drags Bey away, but not before Andromeda mentions that she has seen Sylvia's boyfriend, Paul Chu, on the Harvester a few weeks ago. Sylvia knows that Chu is working for Black Ransome, and wonders if this is connected to Cinnabar Baker's information leak. She decides to try to track Chu down. She takes Bey, exhausted after form-change, to his quarters, then goes back to find Andromeda.*

Bey wakens to find his old lover, Mary Walton, in his room. She warns him not to get involved in the Outer System's problems, and tells him to go back to Earth. As Mary's image fades, Bey realizes that she was never in his room and he was seeing only a field projection of her. He falls asleep again puzzling over a major mystery. Only a couple of people knew he was back from the Space Farm; he did not know himself where he would be staying. So how could Mary find him so quickly? The high-level information leaks in Cinnabar Baker's operation must be more serious than anyone dreamed.

Back on the strange cargo vessel, Aybee manages to pass himself off as a resident of the Space Farm rather than a visitor to it. He is recruited to work with his captors, zealots who are convinced that Black Ransome is a great genius, destined to rule the whole System. Aybee is given training on the physics of kernels, an area in which he is already one of the System's leading ex-

perts. Not surprisingly, he does extremely well, and is singled out to be taken to a new location, somewhere in the Kernel Ring, for more advanced training.

Aybee and his training advisor embark on a new ship of radically novel design. When Aybee has a chance to examine it, he is amazed by its advanced features. Many of them appear to be based on entirely new physical theories, generations ahead of anything in the rest of the System. He sets out to investigate them on the journey, and hardly notices when his friendly advisor suddenly becomes cold and suspicious.

On the Harvester, Bey Wolf is busy with his own puzzles. He has analyzed all the form-change anomalies, and finds a pattern to them. Each malfunction originated in false information generated by a single sensor feeding data to the Harvester's computers; however, that sensor is inside the shields of the Harvester's power kernel, exposed to a radiation field that would kill any living organism and rapidly destroy any computer or data storage unit.

Bey wants to discuss the enigma with Aybee, but so far as anyone knows Aybee is still on the Space Farm. He looks for Sylvia, but finds that she has left the Harvester for an unknown destination. He finally locates her friend, Andromeda Diconis, and after a few days of wild wanderings with her through the Harvester, Bey learns where Sylvia has gone.

She has left to seek out Paul Chu, following up on the lead suggested through Andromeda. Sylvia has told no one details of her plans, and no one knows how long she will be gone. Chu has been engaged in a facility conversion on a remote body near the boundary of the Kernel Ring, and he will be there for another few weeks.

Sylvia arrives at that location, and is amazed when she gets there to find that Paul Chu has already left. She is quickly captured by two machines, service robots who ignore her commands, refuse to answer her questions, and set off with her to an unknown destination, where they tell her she will meet Paul Chu.

Aybee has fared little better. The ship he is on has finally reached its journey's end, which proves to be the legendary stronghold of Ransome's Hole. Aybee is surrounded at once by armed guards. Worse than that, he meets Black Ransome himself, who reveals that he knows exactly who Aybee is. He tells Aybee that he has a pipeline to everything that goes on in Cinnabar Baker's operations, and knows all the people there and what they are doing.

However, instead of being angry with Aybee for his attempted deception Ransome welcomes him warmly, and takes him into his personal custody. He explains that the System is on the brink of huge changes. Ransome will lead the development of a new society, and Aybee can play a key role in setting up the new order. All he needs to do is switch his allegiance, and become a scientific advisor to Black Ransome.

Aybee pretends to be interested. Ransome is clearly a fanatic, convinced of his own destiny, and a dangerous man to disagree with. In any case, one thing is quite clear: Aybee will be captive for a long time. There is no way to escape from Ransome's Hole.

CHAPTER TWENTY-FOUR.

"Mary, Mary, quite contrary
How does your garden grow?
With spinor fields, and kernel shields,
And pretty men all in a row."
—crèche song of the Opik Harvester.

The self-reproducing machines that alone made possible the rapid development of the Oort Cloud had never been so important in the Inner System. Fifteen billion humans were quite self-reproducing enough. Bey Wolf, accustomed all his life to human limits on work habits and energy levels, had not yet made his adjustment. He knew in the abstract what a group of machines could do, but their actual performance still amazed him. And they never seemed to stop work, even when Bey could see nothing useful to be done.

The odd logic of that had been explained by Leo Manx on their original trip out to the Cloud. "It's actually more economical of resources to keep them working," he said. "You see, if they're *not* working they're programmed to make more copies of themselves. And that takes more materials."

"But why not just switch them off?" said Bey.

Manx shook his head. "They're designed for continuous use. If you don't want them to decline in performance, you have to keep them busy."

Typical Outer System design philosphy, but Bey was now looking at a good example of what Manx had meant. Sylvia Fernald had approached this same destination and found the darkness and silence of a mausoleum. To Bey, close to the rendezvous just seven days later, it seemed inevitable that the body had looked then much as it did now, gaudy, bustling with activity, ablaze with internal lights. Half a dozen ships lay in the docks, and the irregular egg-like outline of the surface was blurred and softened by a tangle of free-space vines, tilting their silver and black webs to drink in the miser's dole of radiation from distant Sol. The idea that the whole body had been dark and deserted as recently as two days ago never occurred to Bey.

Its small size was a surprise. In the Inner System, a few hundred sets of orbital elements covered everything significant. The vast majority of planetoids were uninhabited, and likely to remain so except for mining operators. Travel to any of the interesting destinations took one to a body at least tens of kilometers across, with an associated population center. There would be thousands of people there, at minimum, if not the billions of Earth, the hundreds of millions of Mars, or the tens of millions of Europa and Ceres.

That Sylvia would come so far, to arrive at a body with a handful of people, was perplexing to Bey. However, it might also make his own task easier. He was seeking Sylvia, but beyond that he had another motive. He sought the trail that would lead him onward, to the right location in the Kernel Ring and the Negentropic Man himself. Whatever lay here, this was an improbable end point for Sylvia's own travels.

There was little point in trying for an inconspicuous arrival. Space radar systems would have marked his progress and projected his arrival time when he was millions of kilometers away. Bey

ignored the manual controls and allowed the docking to proceed automatically. He did not put on a suit. He was not being over-confident, nor was he a fatalist. Any dangers would derive from humanity rather than Nature, and they would call for intelligence, not speed or strength.

The lock opened. He drifted through, and found himself in the middle of a fairy tale. The interior of the body had been converted to a single chamber, hundreds of meters across. Its vaulted walls were painted in red and white and gold, and vast murals reached up to the domed ceiling. Unencumbered by gravity, needle spires and slender minarets rose bright from the outer surface next to Bey, and lacy filaments arched between them.

He looked instinctively for signs of a kernel, and headed for it right across the central chamber. No matter that he had spent much of the past week brooding on the impossible possibility of a demon inside a kernel shield, some indestructible, pachydermous, and unimaginable end product of infinite form-change that would bask and bathe in the radiation sleet within the shields. Never mind that thought. There would be a local gravity field near a kernel, and he yearned for it, even if it were a weak one—Earth habits died hard.

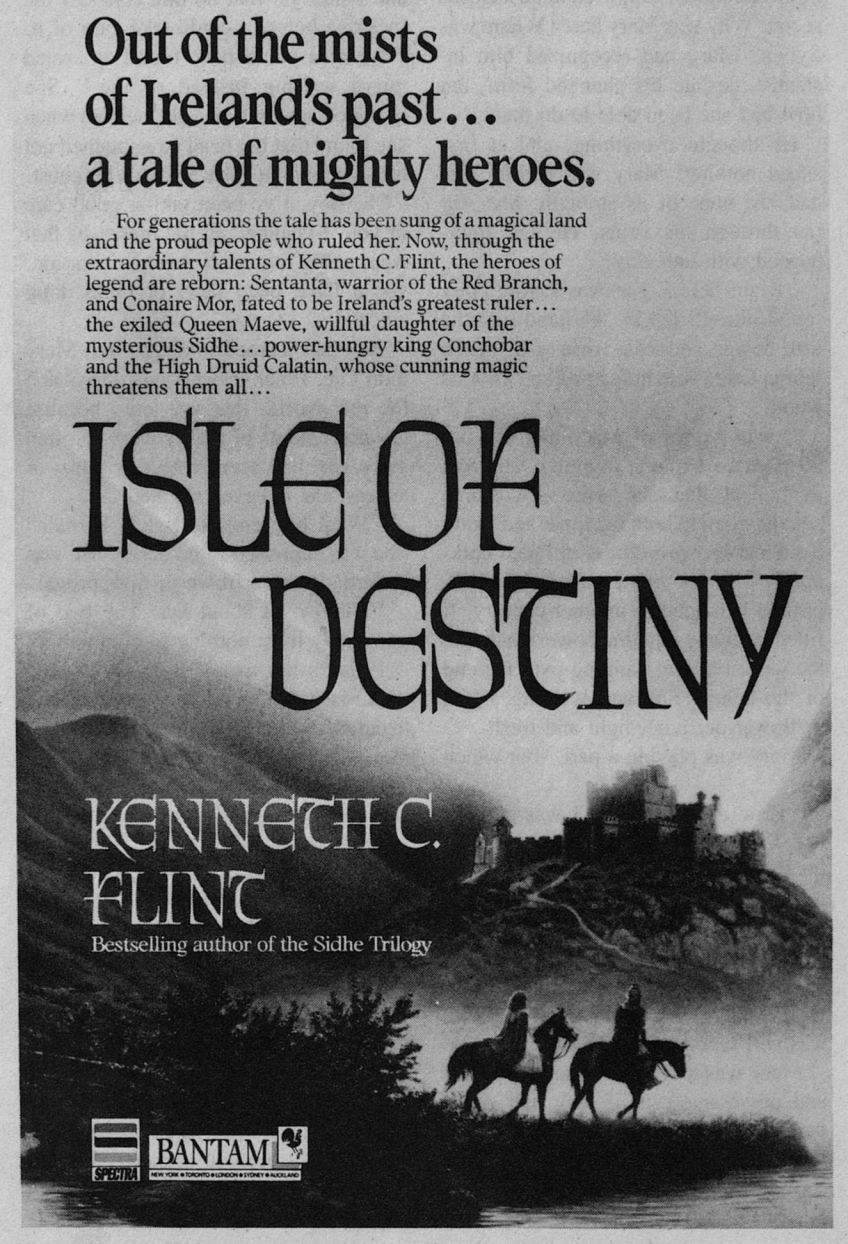
As he approached the outer kernel shield he was struck by a shocking thought. In his fascination at the sights within the lock, he had missed a central mystery. He could see almost the whole of the body's interior; and although a dozen machines were visible, there was no sign of another human being. Had he come all this way, on a wild chase that would end on a deserted pleasure sphere? He knew such things existed, created as the hideaways of wealthy and reclusive individuals of the Outer System. They were maintained by their service machines, patiently awaiting the arrival of their owners, and for ninety-nine days out of a hundred they were uninhabited. If no one at all was here, his journey would have been a complete waste of time and effort.

Down on the kernel's shield Bey saw another oddity. Amid a riot of free-growing plants, a little bower had been created there, using a woven thicket of plaited vegetation to form a living roof and walls. The sight gave him an irrational shiver of premonition along his spine.

"Sylvia?" His voice was unsteady. Logically, he had no idea what came next; but the dark recesses of his hindbrain knew it already. He floated on down towards the kernel's shield. "Sylvia," he repeated. "Are you there?"

A sudden giggle came from the inside of the bower, and a curly-haired head peeked out past the tangled leaves. "Bey? Oh, my word. What have you done to yourself?" The laugh came again, this time full-throated. " '*Bottom, thou art translated.*' You're so long and thin—and no hair! I knew it, you let them put you in one of your horrible form-change machines." It was Mary, moving out to meet him and filling his arms. "Oh, Bey, you're here at last. It's so good to see you again."

The questions had tumbled through Bey's head, one after another. How had Mary known he was coming—how had *anyone* known he was coming? That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information was supposed to be a closed secret. Why was Mary here? Where was Sylvia? Mary had recognized him instantly, despite his changed form, but how had she been able to do that?

He thought everything, and at first asked nothing. Mary was a drug that had lost none of its strength. She still ran through his veins. He felt lightheaded with unreality.

"Right here," she was saying. Bey found himself led by the hand into the little bower, and seated on a rustic bench fabricated to resemble aged and knotted wood.

It was typical of Mary that she felt no need to explain anything, and just as typical that she wore a costume equally alien to both the Inner and Outer Systems. Her print dress of faded dark-purple flowers on a pale grey background belonged to another century. It fitted perfectly with the bower, and with the woven basket hanging over the end of the bench. She was wearing a hint of flower perfume, light and fresh.

Mary was playing a part—but which one?

"How did you know I was coming here?" Bey forced himself to ask that question, and at the same moment had a suspicion of the answer. He had told Leo Manx to tell no one—but did Leo have that much self-control? All it might have taken was one short conversation with Cinnabar Baker, and telling Baker was still second nature for Leo.

Mary was smiling at him as sunnily and possessively as if they had never parted. He thought for a moment that she had ignored his question, but then she said, "it's just as well for you that I learned you were heading this way, and better yet that no one else saw the message before I could take care of it. Otherwise you'd have found an armed guard waiting instead of me." She snuggled against him, and laughed when she found that her head now touched not his shoulder but halfway down his chest. "Oh, Bey, I've been taking good care of you. I changed all the messages that were going to you. If it weren't for me, you'd have been dead or crazy long since."

Bey had learned long ago that Mary didn't lie. If her answers failed to match the real world, that was only because her perceptions of reality were so often awry. She had been protecting him—or at least she believed she had.

"What happened to Sylvia Fernald? She was supposed to be here." He was rewarded with a frown of disapproval.

"I know all about her. The two of you really have nothing in common."

"That's not true." Bey half agreed with Mary, but he felt the perverse need to defend Sylvia. "We have lots in common. She's educated. She saved my life—twice. We get on well together, and she's a—a nice, kind woman," he ended lamely.

" 'Be she meeker, kinder than, Turtle-dove or pelican, If she be not so to me, What care I how kind she be?' They used to be *your* lines, Bey. Have you changed that much?"

"I came here to find her, Mary."

"I know. And I came here to stop you from searching any more. I know where she is, and she's safe enough. But you don't want to go looking for her. It might put you in danger."

"From whom?"

Mary shook her head. Bey knew ex-

actly what she meant. She would not lie, but she would refuse to speak. They had slipped into the old relationship, just as though Mary had left Earth no more than an hour ago.

"I won't stop looking," he went on. "There's more at stake here than me or Sylvia. The whole System is coming unglued. That has to be stopped."

She turned her head and looked up into his face. "The same old Bey. Saving the world. You ought to know better. You worked half your life for that stupid Office of Form Control, and what reward did you get at the end? They threw you out, with never even a thank-you."

"They had a good reason."

"You haven't changed at all, have you? Still honor and glory and once-more-unto-the-breach, dear friends." She rubbed her hand across his chest. "Bey, if only you could stop living in the past and the future, and live in the present for a little bit, you'd have so much more fun."

If anyone in the universe lived in the present, it was Mary. The signal was clear and tempting. Bey heard all his internal voices shouting at once to justify the action. 'A few hours delay can't make any difference' . . . 'Mary will become your ally, and she can take you straight to Sylvia' . . . 'Mary scorned now would be your bitterest enemy' . . . 'You've been away from each other far too long' . . . 'All the time you thought she had forgotten you, she was *protecting* you' . . . 'Live in the present' . . .

Bey turned and leaned down toward Mary's waiting face. Her eyes had closed.

But where has Mary been all this time? And what has she been doing? Amid all the clamor of emotions, that single questioning whisper in Bey's mind was drowned out completely. It didn't stand a chance.

A few hours had stretched into a day, and then into two and three. It was a long time before Bey saw a possible approach to the problem.

Mary was immune to all forms of logic. He had known that for years. It was maddening, but it was also part of her charm, and it meant that she would be unmoved by any rational reason for taking Bey back with her to the Kernel Ring, and (ultimately) to Black Ransome. Kernel-demons and form-change anomalies and System-wide hallucinations meant nothing to her. Another motive was needed, something that went deeper than logic; Bey had lain awake for hours trying to think of one, and returned again and again to a single question. Why had Mary come to meet him here, secretly? She was apparently not trying to capture him, and she had made it clear that she did not intend for him to stay with her permanently.

He thought he had the answer. Mary had come for personal reassurance. She knew he had traveled a vast distance in pursuit of Sylvia Fernald. Mary hated to give up any man. The idea that she had been superseded by Sylvia, so that she could no longer move Bey to her whim, was intolerable. She wanted to show that she still owned him, and could still control him.

Bey looked at the sleeping form stretched out next to him. So far, the demonstration must be to her satisfac-

tion. Now he had to make use of the same fact.

The most difficult thing was to be casual and convincing enough. Mary did not lie, but she had a sixth sense that told her when others were doing it to her. The best way was to make her feel that any decision was her idea.

Bey dropped the first word while Mary was showing him around the elaborate new gardens that the machines had built under her direction in a single day. It was in answer to Mary's complaint that he was too bony now to lie next to in comfort, and it took the form of a vague comment on his part that the standards of beauty for women were very different in the Inner and Outer Systems.

"For the Cloudlanders, curves are out," he added. "And yet that doesn't mean that a Cloudlander will be unattractive to somebody from the Inner System—or that a Sunhugger disgusts somebody from the Cloud."

Mary had not reacted to the comment, but Bey knew she had registered it. He waited. It was hard to keep his own mental processes under control. Emotion and real affection for Mary competed with his long-term logical plan, and Bey knew from experience that logic could lose.

Later in the day Mary was studying a recording of one of her own old performances, as Polly Peachum in *The Beggar's Opera*. She remarked how good she had looked as a redhead.

Bey agreed enthusiastically. "My favorite hair color. As a matter of fact, naturally red hair—" He paused, and went silent. Mary also said nothing. Sylvia had red hair.

They watched the performance together. When Macheath was looking at Polly and Lucy Lockit, and singing, "How happy could I be with either, were t'other dear charmer away," Bey knew that Mary was watching him from the corner of her eye.

She was preoccupied for the rest of the day. Late in the evening she suddenly asked him if he and Sylvia Fernald had been lovers.

"Of course not!" Bey sat up. "You've seen her, you know how tall and gawky and strange she is. And she has a longtime partner of her own, back in the Cloud, so she wouldn't look at anyone else. And did you know, when I arrived at the Opik Harvester she said that I looked like a hairy little monkey? To her, I'm totally hideous. . . ."

Bey went on with his protests just a little too long. He did not need to point out to Mary that his own appearance had changed considerably since the arrival at the harvester, to a form much more pleasing to Sylvia Fernald's tastes. On matters like this, Mary's instincts reached a conclusion ten times as fast as any logic.

The next morning, Mary was very quiet. At midday, she casually announced that she would be returning to the Kernel Ring. If Bey wanted to take the risk, he could accompany Mary. Did he want to go? If he did, he ought to get ready.

Bey accepted, equally casual. However, he did not feel satisfied with the way the conversation had gone. He had achieved his objective, but his little inside voice would not keep quiet. Too easy, it said, much too easy. When a difficult goal is achieved with no effort,

it's time to be suspicious. You want to get to the Kernel Ring? Sure—and maybe someone else wants you there, too.

CHAPTER TWENTY-FIVE.

"In Ransome's Hole you'll lose your soul
(We won't come to find you).
With Ransome's breath you'll meet your death
(The Dancing Man's behind you).
Ransome takes one,
Ransome breaks one,
Out—goes—you."
—crèche song of the Marsden Harvester.

Bey had been wrong. He might be the only person who would ever know it, but still he hated the idea.

Back on the Sagdeyev space farm, he and Aybee Smith had agreed to differ. Aybee felt that a life without surprises was no fun. Bey agreed; but he pointed out that ninety-nine of any hundred conceivable surprises were unpleasant ones. That was why he tried to analyze *all* outcomes of a situation, rather than just the one he liked best. Aybee agreed—in principle; but he pointed out in turn that complete prediction was impossible in anything but abstract theory; the cussedness of the real world promised that the actual outcome would be unanticipated. Bey agreed, but he suggested that *any* chance of successful prediction was better than no chance. Aybee nodded. Honor was satisfied, and they moved on to other subjects.

Bey truly believed what he had told Aybee. When he set out to follow Sylvia Fernald into the depths of the Halo, he had foreseen and analyzed four scenarios. One, the search might reach a dead end, and he would return to the harvester. Two, he might find Sylvia, but she would have discovered nothing useful and already be at her own point of frustration, so they would *both* go back. Three, Bey might be captured and detained before he found Sylvia or reached Ransome's Hole. Fourth, he might be captured after he reached the Kernel Ring.

The idea that he would find *Mary*, rather than Sylvia, at that first location was so preposterous that it had not been in his thoughts at all.

So Aybee had been right. Bey allowed himself the luxury of a moment's irritation; then he inspected the ship that Mary had arrived in.

His reaction to it was not as strong as Aybee's. He had done little space travel, and although he knew that the ship was radically different in appearance from the ones he was used to, he didn't realize how much new science had to be in it. He also had many other things on his mind. With Mary at her sunniest, most affectionate, and most demanding, he had little time to worry about spacecraft. She was in a holiday mood. If she thought for a moment that she was taking Bey towards danger, it didn't show in her manner.

She complained only at the end, when the ship neared its destination in the central annulus of the Kernel Ring. "We're *crawling*. Why do we always have to go so *slow* when we're nearly there?"

"Safety requirement," replied the hollow voice of the ship's main computer. "Proceed with caution. Danger zone."

The computer was treating the region with great respect. They were picking their way through the maze of debris, unshielded kernels and high-density fragments that littered the central part of the Kernel Ring. Those shards were the relics of a catastrophe four billion years ago, when a toroidal region of space-time had suffered gravitational collapse and spewed high-mass elements towards the Sun. Life on Earth owed its existence to the event, but that was of no interest to the computer. Like Mary, it too lived in the present. Today this location housed the freaks of the Solar System. Here were collapsed objects invisible to deep radar and massive enough to destroy a ship, side by side with co-rotating kernel pairs whose signals played havoc with navigation systems.

Bey had never been here before, but he knew the place's reputation. The Kernel Ring had been left undeveloped for a good reason. A thousand ships had been lost in the early days, before transit vessels to the Outer System learned to fly high above the ecliptic.

Danger, said the small voice in his ear. *Danger.* Ninety-nine of any hundred conceivable surprises are unpleasant ones. But the shiver in Bey's spine was not fear. It was excitement. Ransome's Hole was visible now; or rather, it was invisible, a dark occulting disk against the continuous star-field. And it was *big,* big enough to contain anything: armies, weapons, factories, cities, monsters and treasures and mysteries unguessed at. Bey stared at nothing, and was stirred by emotions he had not felt for years. He was in the past again, pursuing illegal serpent forms into the black depths of Old City. He was eager to begin, wondering if and how he would survive. The same ineffable force was now quickening his pulse, drawing him on, tugging him down into danger.

While he was watching, brief flashes of blue-white fire sparkled on the black disk. He recognized them. Short-range drive units. Five small vessels were heading out toward them.

Bey glanced at Mary. She frowned, shook her head, and said, "Not my doing." But she did not seem too surprised.

Within a couple of minutes the five had been joined by others. Surrounded by an escort of a dozen pinnaces, the ship drifted to a docking and attached to a lock. The hatch swung wide, and Bey followed Mary out.

A dozen armed soldiers were waiting, their weapons raised and ready. Two paces to their rear stood a short, black-clad man with folded arms. His face was thin, with prominent bones, a sharp nose, and a trace of a self-confident smile. Bey stared at those piercing eyes, and after a few seconds the unmoving features before him seemed to shift and flow, reassembling themselves like an optical illusion to a different and familiar pattern.

The Dancing Man—the *Negentropic* Man; without the clown-like scarlet suit and black filed teeth, but unmistakably the same in face, body, and movement. Bey shivered. The face and burning eyes brought frightening memories from the edge of death and madness.

"Full house," said the Negentropic Man. He stepped forward, still flanked by his guards, and nodded approvingly at Wolf. "I am Ransome. I have been

curious to meet you for a long time, Mr. Wolf. When a man or woman refuses to commit suicide or to become insane, no matter what the external pressure, that person is of interest to me. And here you are, in my home." He turned, and his wave took in the whole habitat. "You see how obliging the universe can be. If I had originally set out to lure you here, I might well have failed. But by allowing you to sail freely with the winds of space, you arrive even before I am ready for you."

Ransome placed his arm possessively around Mary's waist. She did not resist, but she gave Bey a strange, uncertain look.

"So you have me. What happens now?" said Bey. He had seen eyes like that three times before in a human head, but none of their owners were living.

"For the moment, nothing." Ransome was disconcertingly at ease. "I have unfinished business with two of your friends, and then a couple of other things to take care of. You will have to bear with your own company for a little while. Later you and I must talk. I feel sure that we are going to be working together." Ransome gave Bey a dismissive, self-confident little nod, and turned to go. Mary followed without a word.

"Mary!" Bey called after her as the guards moved to separate him from them. He received a brief glance in return from lowered brows, then he was being hustled away. The guards escorted him deep into the habitat's interior, and finally stopped at an oval door. They ushered him through without comment and left at once, but as they went a bulky machine took up guard position at the entrance.

How long was the "little while" that he would be on his own? Ransome's joking tone suggested it might be quite some time. Bey turned in the doorway and stepped close to the Roguard. It stood solidly blocking his path.

"Allow me to pass. That is an order."

"The order cannot be obeyed." The voice was soft-toned and polite. "Egress is prohibited. You lack authorization."

"Who has authorization?"

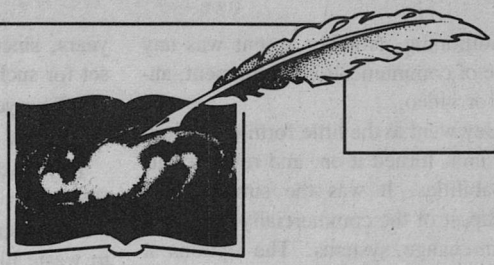
"You do not have authorization to receive information on authorizations."

Bey retreated. He had not expected a useful answer, so he was not much disappointed. He went to sit at the table in the little dining area, and pondered his situation.

Against the initial odds—and suspiciously easily—he had found his way to Ransome's Hole. He was in the middle of the enemy stronghold, unarmed, surrounded by guards, held prisoner by a probable megalomaniac with the power to destroy the Solar System; now he had to decide what to do next.

What *could* he do?

After a few minutes he stood up and made a leisurely and thorough survey of the living quarters. They were perfectly adequate for a stay (voluntary or otherwise) of weeks, months, or even years. The wall, floor and ceiling were white, seamless and solid. There was a comfortable-looking bed, a large and well-equipped washroom, a full food-production facility, a small computer with its own recreational and educational data bases, and even a small exercise unit that included simple form-



Algis Budrys on
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The Writers of The Future Contest has been extended to September 30, 1988. It's still growing.

WOTF has become a landmark feature of the SF (Speculative Fiction) scene. As founded and planned by L. Ron Hubbard, entry in the Contest is free. It's limited to new authors of science fiction or fantasy who have professionally published no more than three short stories or one novelette. Every three months, a panel of distinguished SF writers names the top three finishers for outright cash grants of $1000, $750 and $500, respectively.

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— Algis Budrys

conditioning. Notably absent was any type of communications equipment, audio or video.

Bey went to the little form-conditioning unit, turned it on, and reviewed its capabilities. It was the simplest and cheapest of the commercially packaged form-change systems. The options it offered were minimal. They included monitoring and feedback for standard muscle tone improvements, routines for minor physical repair such as sprains and bruises, and a couple of low-gee/high-gee conversion modules; that seemed to be all.

Bey opened the cover and checked the telemetry inputs and internal storage. It was a BEC unit, completely self-contained, and the hardware was standard and quite powerful. That meant the weaknesses were in the software. The programs that came with the unit lacked all the more substantial form-change functions—it did not even permit eye adjustments, which Bey had needed for near-sightedness since he was a teenager.

What was he supposed to do when everything began to look fuzzy? Squint, or make himself eyeglasses? He closed the cover of the unit in disgust. On Earth no one had used anything so primitive for over a hundred years.

Bey went once more to the open door, and this time tried to walk directly through it. The waiting Roguard again blocked him. He put his hand onto the machine's exterior, estimating its strength and sensitivity. It did not move.

"How long will I remain here?"

"That information is unavailable." There was a pause, then the machine added: "it will be no longer than two years, since the food supply has been set for such a period."

"Two years! That's terrific news."

"Thank you."

Bey closed the door in the Roguard's face, went to the bed and stretched out on it. He should have known better than to waste his time talking. No machine of that type could recognize sarcasm.

He closed his eyes, but he had no thought of sleeping. There was a job to do here, and it was a big one. The first step was a rough time estimate. How long would it need for development and testing, and then how long for the process itself to be completed? If the answers came out too high, he might as well relax and forget the whole idea.

Within ten minutes Bey had a first estimate. Five weeks, total, if he worked day and night. That was far too long. He had to cut it somehow by a factor of at least three. It was time for something rough-and-ready and less than perfect. The logic flow and accompanying condensed code for an alternative approach began to take shape in his head.

The next estimate came out at two weeks. Still too long, and he had taken all the legitimate speed-up steps. Now it was time for desperate measures. He had to begin accepting higher physical risks.

Bey lay on the bed for another four hours. At last he sat up, ready to start. As he did his last minute preparations, it occurred to him that he had one unexpected asset. Ironically, the wild card in his favor was the Negentropic Man himself.

In his lectures to the beginning class

at the Office of Form Control, Bey Wolf used an analogy:

"Purposive form-change is a *process*, a tight interaction of life-support machinery and realtime computer code." The display on the wall behind him provided a flow diagram, bewildering in its complexity. "There's a typical sample up on the screen—a straightforward one, as a matter of fact. By the time you get out of here, that will seem simple and familiar. But knowing how to read one of those schematics won't be enough to protect you. To be useful in this office, you have to see *beyond* the detail, to grasp a whole form-change picture in one swoop."

The wall display changed, to show an old-fashioned map, bright with colors and dotted with fanciful illustrations. "Each form-change is a journey, from a defined starting point to a defined end point. But those journeys all cross a part of the great ocean of form-change. Some areas of that ocean have been explored completely, and all commercial form-change programs navigate within that charted region. But beyond the safe waters lies a wilderness, unmapped and unknown. Everyone who tries a radically new form-change experiment is embarking on a trip through that unknown. And when you work in this office, you often have to follow the route of the pioneers. Dangerous work.

"Now, we can't provide an infallible pilot across that unknown sea. No one can. But what we *can* do is teach you what to look for. You'll learn to recognize—and avoid—the shoals and reefs of form-change, the whirlpools and undertows. You'll always design your programs to follow the safe, smooth trade routes. . . ."

Sound advice.

But the lessons of the classroom had not been designed for desperate emergencies. Bey had to take chances, planning an accelerated program that skirted the reefs, risked the whirlpools, ran the gauntlet of lee shores.

And now he was paying the price. A dozen times, the monitors in the form-change unit flared their warning signs. Chemical concentrations were wildly far from equilibrium, ion balances at fatal levels, synapses firing spastically out of sequence. The semi-conscious body in the tank shuddered and writhed, enduring rates of adaptation beyond all rational limits.

Slow down. Slow down. Reverse the process. Every organ in his body screamed for relief. And relief was possible. With purposive form-change, the will of the subject always played a central part. The urge to retreat became irresistible.

Endure. Hang on. Bey fought back against the urge to end it. He was in agony, feeling the scream of protest from every cell. The limit of his endurance had arrived. Pain intensified, sharpened, rose to levels that defied belief.

No more. Give in, or die. And as that thought took possession of his mind, the pressure eased.

He sagged in the retaining straps of the tank, unable to move. Every nerve of mind and body seemed on fire. He sucked the pain deep inside him, grinning in triumph. No matter what came next, he had won this stage. He had the right final form; he knew it without

looking. His tortured body had been cast up, twisted and misshapen, on a strange shore—and it was the destination he had chosen!

Bey Wolf had crossed the form-change ocean.

CHAPTER TWENTY-SIX.

Live with a man for years—and then discover that you know nothing at all about him!

Sylvia had been convinced that at the very least Paul would listen to what she had to say. She had clung to that thought, all through the long journey and docking at Ransome's Hole, and then on through a maze of corridors and slideways that took her and her Roguards deep into the habitat interior. And finally, face to face with him, she realized her mistake.

"It was very foolish for you to come here." His expression was cold, and he stared through her as though she didn't exist. He was wearing the same drab uniform as all the others she had seen in Ransome's Hole.

"Paul, I had to. Terrible things have been happening in the Cloud. Thousands of people have died, and all the time—"

"A mistake, and a total waste of time." He turned to the machines standing beside her. "Take her to living quarters K-1-25, Level 4."

"Paul!"

But he was already turning, refusing to look her way. "You had your chance to work with us," he said coldly, as he walked out. "Ransome is a once-in-a-millennium genius, the best hope for the Solar System. You wouldn't help when we needed it. Why should anyone listen to you now, when we don't need help?"

And then he was gone. Sylvia tried to run after him, and found the Roguards blocking her way. She pushed at them angrily, taking out her frustration on the resilient plastic. Endless weeks of travel to seek Paul Chu's ear—and then dismissed in one minute, without any sign that the two of them had once been lovers and close friends!

It was such an anticlimax, Sylvia was ready to burst with frustration. The machines were moving her back the way they had come, holding her lightly with their jointed arms. She fought them at first, but it was pointless. The gentle touch disguised their strength, but they could apply many tons of force with each flexible limb.

After ten more minutes of slideways travel they brought her to an open door, and guided her through it. As it slid closed behind her she spun around and cursed the silent machines.

"Helps your feelings," said a familiar and cynical voice from behind her. "Don't do much good, though. Better save your breath."

She turned. "Aybee! How in Eden did you get here?"

"Long tale—a long and a sad tale, as old Lewie C. puts it." Aybee Smith was sitting cross-legged across a high table, long limbs dangling to each side. "Wait just a minute. I already did this two days ago, but let's make sure nothing has changed." He hopped off the table and circled the room, peering at ventilator grilles and under and on all free surfaces. Finally he nodded. "I'm pretty sure we're safe to talk. No monitoring—or if there is, I can't find it."

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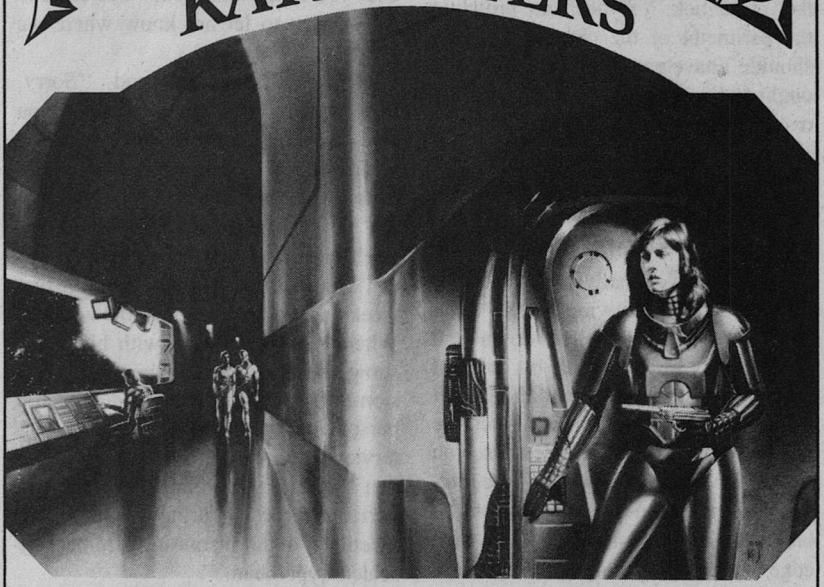

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He pointed to a chair and returned to sit again on the table. "All right, Sylv, let's play catch up. Who first?"

His scowling face had made Sylvia feel better already. She described everything that had happened since she left the ruined space farm, then heard of Aybee's own zig-zag passage from there to Ransome's Hole.

"At least you had no choice," she said. "I'm the stupid one—I set out looking for trouble. And now the whole System's ready to be blown apart, and neither of us can do a thing."

"Not right now. But every day I'm here, I learn more about what makes this place tick." Aybee was prowling the perimeter of the chamber. "They shouldn't have put us together, and they ought to be monitoring us. Ransome is over-confident."

"Over-confident! Right, and with plenty to be over-confident about. We're in a mess. I don't know why you're looking so pleased with yourself."

"Because we finally have a chance to learn what's screwing up the Solar System." Aybee squatted down and wrapped his arms around his crossed legs. "I'll tell you one good thing your friend the Wolfman told me, when we were on the Space Farm. He says, you solve problems by getting into the *middle* of 'em. When we were out on the harvesters we were sitting on the outside edge of things. We only felt Black Ransome's effect at third-hand. Now we're right at the heart of his power."

"And we're totally powerless! Aybee, even if we got out of these rooms, I'm not sure we could do anything. Ransome controls everything. We couldn't get a message to Bey Wolf or Cinnabar Baker."

"We might get one to the Wolfman, but it wouldn't help. Last time I saw Ransome he told me Wolf is here, too. He pointed out how convenient it was, all three of us coming to him."

"Bey's in Ransome's Hole? However did he find his way?"

"Same as you and me, I'll bet—a little bad luck and a big lump of stupidity. Ransome is hoping to make Wolf a convert to his cause, same as he's trying to convert me. You, too, if you let him."

"Then Baker's our only hope. Aybee, you're the smart one. You have to find a way to let her know where we are."

He was shaking his head. "Sorry, Sylv. It's worse than that. When you said Ransome controls everything you were closer than you realized. He controls Cinnabar Baker."

"Never! The Cloud is her whole life. She'd never sell out to Ransome."

"That's what I'd have said, two weeks ago. But Ransome *showed* me. When you get to meet with him he'll show you, too. He has direct transmissions of meetings from inside Baker's personal quarters. Secret papers and interviews, too, from the Opik and Marsden Harvesters. She must be running a portable recorder during her important meetings, and transmitting 'em here by sealed hyperbeam."

"Aybee, I think you're crazy. But if you happen to be right it's an absolute disaster. You tell me that, and still you don't think that Ransome has everything under his control?"

"Maybe he does—for the moment.

But he can't have corrupted every person in the Outer System. And he's been winning for too long. It's time for *our* run of luck."

"Aybee, if I said anything like that you'd tell me it's statistical gibberish. According to Paul Chu—damn that man—Ransome has been winning because he's a genius. Are you going to disagree with that, too?"

"Funny you should say that." Aybee stood up and stretched. "I do disagree. I came to Ransome's Hole in a hell of a ship, too advanced to be believed. New drive, new nav system, new technology all over it. First thing I asked when I got here, who's the genius? Ransome, everybody says, all the ideas come from him. He's the one."

"But you think not?" Sylvia knew Aybee's weaknesses, and evaluating the abilities of others was not one of them.

"Hell, I *know* not. Ransome can snow most people here with physics, maybe all of them. He knows a lot, and he talks a great line. But he's not the real thing."

"How do you know that?"

Aybee gave her a sinister smile. "Because, Sylv, I *am* the real thing. Take it from one who knows, Black Ransome didn't invent that new drive and that new ship. He says he's the Negentropic Man, and something's sure feeding bad information to the Cloud's control systems. But Ransome's not the genius who dreamed up the entropy reduction and signal generation system. No way."

"Then who *is* the inventor? Are you saying Ransome has some super-genius working for him here? And how does the entropy reduction system work?"

"I was afraid you'd ask me that." Aybee smiled more horribly than ever. "You see, Sylv, I don't have the answers. But let me loose for a day or two in this place—and I'll get 'em."

"Oh, Aybee." Sylvia slumped down on the chair. "I don't believe in giving up, but be a realist. We'll never get out of here. Black Ransome may not be your super-genius, but he's certainly smart enough not to trust us."

"Speak of the devil." Aybee gestured behind Sylvia. The door had opened and standing there was Ransome himself, as cold-eyed and commanding as he had been when Sylvia saw that first video message for Paul Chu. He was unarmed and wearing a simple black tunic. His face was pale and showed signs of some unusual strain.

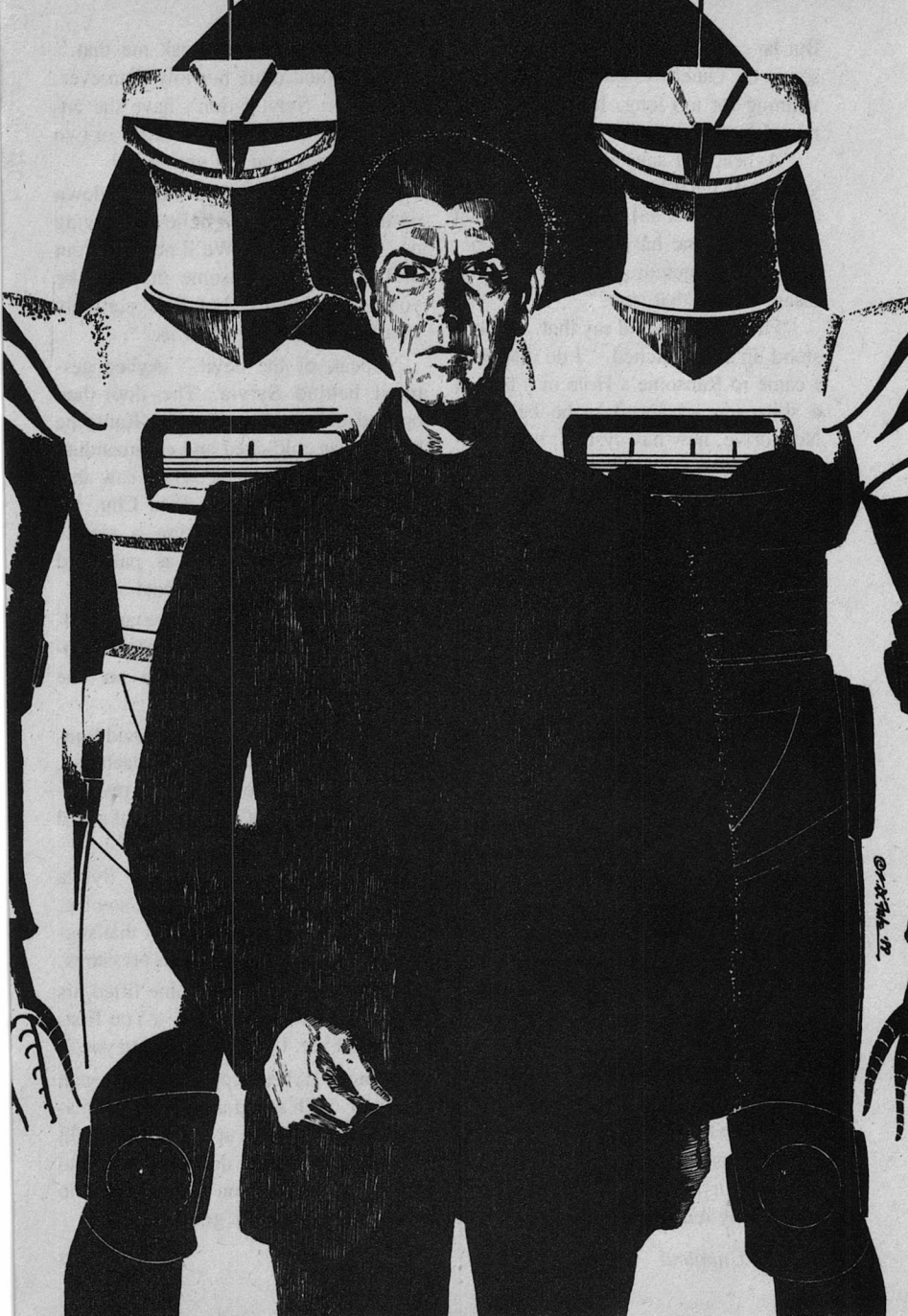
Ransome nodded to Aybee and Sylvia. Behind him stood two of the Roguards. For twenty seconds no one moved.

"You will come with me," said Ransome at last. And then, to the machines, "These two people are now in my personal custody. You are relieved of guard duties until I return them here."

"Where are you taking us?" Sylvia didn't like the tone in Ransome's voice. There was a strident edge to it that suggested a man under enormous pressures.

"Wait and see." Ransome lifted his arm and pointed to Aybee. "You first, in front of her. I'll be right behind you."

"Sure." Aybee stepped easily through the door, with a nod at the waiting machines. "Don't wait up for us, we might be back late. Where do you want me to walk, Ransome? You're the one who knows where we are going."



"Follow the gravity vector. Always up."

They started along the left-hand corridor, heading away from the nearest kernels. In forty yards they had reached the first branch, and passed a group of armed humans. Everyone nodded respectfully at Ransome and moved to allow the trio to pass on to another segment of passageway. Aybee walked on until he came to a spherical chamber and another fork in the path.

He paused and turned again to Ransome. "I don't know which one of these leads outward. Take your pick."

"Left. Keep going." The voice was gruff, and Aybee could see beads of sweat on the other man's face. They moved slowly forward, to a curved part of the corridor screened both ahead and behind them. An open door leading to an empty maintenance chamber stood on the right-hand side.

"Through there." Ransome nodded his head. "Both of you."

Aybee tensed himself as he went through. Sylvia was between him and Ransome—if he turned now to grapple with him, would she be able to get out of the way fast enough?

He had to try. He was spinning around, reaching out his long arms, when the man behind him groaned and sagged forward against the inner wall of the room.

"Aybee! Get him!" Aybee heard Sylvia's shout, but Ransome had fallen forward. His torso flexed itself, then straightened in a painful stretching movement that dropped it to the floor and jerked it two meters into the room.

"Close the door. Keep watch for people," said an agonized voice. "I can't hold any longer."

Then Ransome was twitching on the smooth floor, while Aybee and Sylvia looked on in astonishment.

"Ransome. Are you all right?" Sylvia was crouching down next to him.

"Ransome may be fine." The voice was down to a whisper. "But I'm Bey Wolf. Help me, Sylvia. I need five minutes clear."

The body was jerking into violent spasm. The contorted face that looked up at Sylvia was still Black Ransome's, but at the back of the pained eyes she saw something else. "Bey! Is it really you? What's happening?"

The body had uncurled to full extension. Now it looked nine inches longer. The torso shivered. "I did what I told—my classes at Office of Form Control—never to do. Most stupid and dangerous thing in the world. Accelerated form-change, badly-defined end-form—programmed from scratch—no chance to do parametric variations. I'm outside—region of stability. Size reduction through muscular contraction. Only have partial muscle contol." Ransome's face worked to a twisted smile. "Five minutes more."

"Hey, Wolfman, take your time." Aybee had looked out along the corridor, and now he slid the door closed. "We're safe here. I'll watch this. Sylv, see if you can help."

"Don't touch me. I'm getting there." An internal crisis had passed, and the twists and jerks in Wolf/Ransome's body were easing. "Aybee, you seem to know your way—around this place. How far—from the main communications center?"

"Half a kilometer. Back along the corridor, and then head out towards the periphery. The place will be guarded, though, and it's not far from Ransome's own quarters. Ransome might be there."

"I don't think so—I think he's been off-habitat. Anyway, we have to take the risk. I have maybe—one hour, before I have to get back to a tank. This form's a *disaster*." Wolf was grunting with pain and effort, forcing his body back to the shorter, more compact shape of Black Ransome. "We should be able to get into the Com Center. No one here argues with Ransome—not even the Roguards. They told me how to find you without a question. Help me up, Sylvia."

"You look terrible. Take more time."

"We don't have time. We've got to get to the communications center and send a message to the Cloud, saying where we are, before Ransome shows up again. Or someone does a random chromosomal check on me. Or I fall apart. Once the coordinates of this place are known, it doesn't matter so much if we're captured again. Right. Any time."

The tics and twitches were subsiding, and the face had again smoothed to the pale, decisive countenance of Black Ransome. With Aybee leading the way and Sylvia ready to support Wolf if he needed it, they walked quietly on through the habitat and then made a turn outwards. The twisting corridors were deserted, allowing Wolf to pause and rest along the way. During the final fifty yards Sylvia felt her face tighten with anticipation and tension, and was sure she would be noticed. But the guards at the entrance to the communications facility merely stiffened to attention, stepped back a pace, and saluted as the three passed. Wolf/Ransome stood on the threshold and looked around. The center was empty. He nodded back casually to the guards and closed the door.

"That's the most dangerous part over, at least for the moment." Bey sighed and moved across to the hyperbeam unit. "I knew just what Ransome looked like, even how he moved and sounded—I saw more than enough of the Negentropic Man—but I didn't know his speech patterns, or the way he greets people."

"Bey, we got troubles you don't even know about." Aybee held out a hand to prevent Wolf from touching the hyperbeam communication console. "It's not safe to send a message to the Cloud—Ransome has Cinnabar Baker in his pocket. I've seen messages from her."

Wolf shook his head and turned on the communications set. "It's not news to me, I suspected as much. I didn't like the idea when I had it myself, but I knew there was a leak—and I didn't see how it could be anybody but Baker."

"But if we can't trust her, who can we trust?" said Sylvia.

"We don't trust anyone. We send the message everywhere, spray it across the Inner and Outer Systems. Aybee, can you take over all the communications channels?"

"For a general broadcast?" Aybee glared at the panel for a few seconds, then slowly nodded. "Guess so. Takes a few minutes to set it up—and if I grab 'em all, we'll be noticed. I'll have to push a hundred other users right off the

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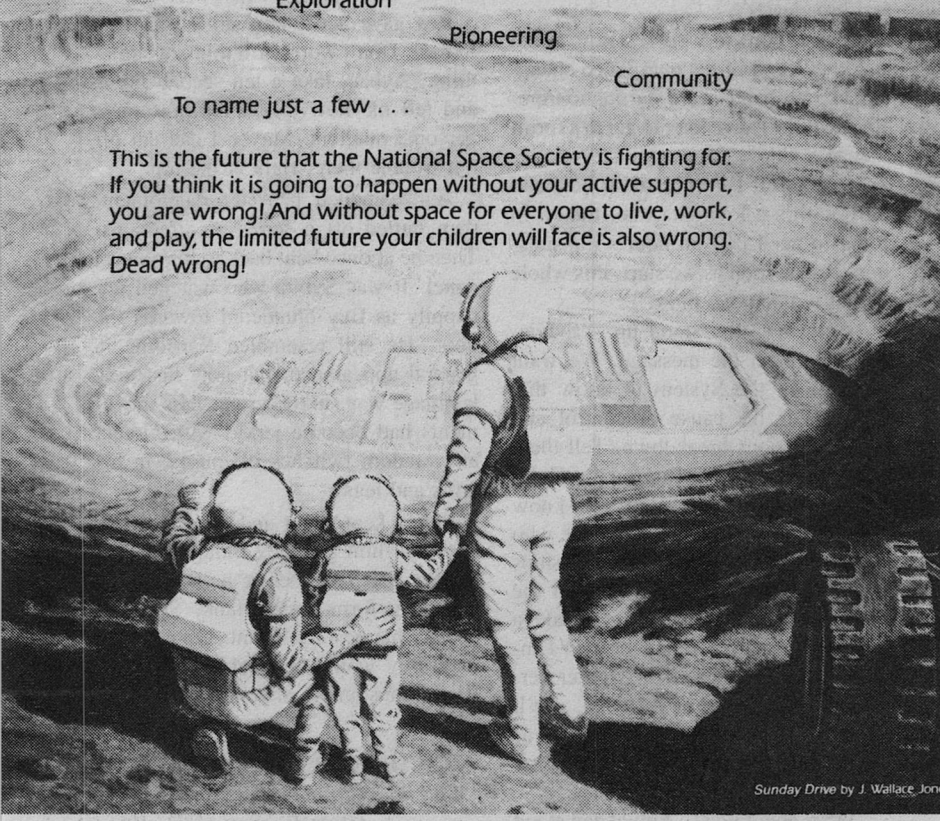

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system. Everyone in Ransome's Hole will head this way."

"That's a different worry. Get the com system ready. Sylvia and I will work on the message."

"Give me five. Make me a formatted data set, all ready to send." Aybee bent over the panel and began to work. After a few minutes he swore and looked up. "Problem. System's not set up for general broadcast."

"Can't you jury-rig?" Bey could hear the sound of his own voice changing, and his hands were starting to tremble. He didn't have long to get to a form-change tank.

"I can. But I'll have to sit here and baby it. It's a low data rate, too—I'm going to need half an hour's transmission. But as soon as we start, this whole habitat will start to buzz."

"Agreed." Bey stood up. "Sylvia, you can finish the message. We want everyone in the System to know that Ransome is the cause of control and communications breakdown. Tell them the location data for Ransome's Hole, what he's been doing, all you know about him. Ask help from anyone who can give it. Say we need a hundred ships or a thousand, from anywhere in the System, and while you're at it add a note saying that there's a leak in Cinnabar Baker's office. If it's Baker herself, that takes care of it. If not, she'll do something fast. And you, Aybee, as soon as you're ready, grab the outgoing circuits and send the message."

"What about you?" Sylvia had stood up when Bey did, supporting him as he swayed to his feet.

"I've got to guarantee Aybee his thirty minutes. Hold the fort here. Don't try to leave, even if you finish sending the message. Just lie low until I get back."

"Bey, you look terrible." Sylvia could feel his arm trembling. "I ought to come with you."

"No. You couldn't help me, and sending that message is top priority. Get it ready, then help Aybee to send it."

"What are you going to do?"

Bey gave her a wan smile. "I wish I knew. Don't worry, I'll think of something. Aybee, take a ten second break and tell me how to get to Ransome's personal quarters. Maybe I can cut off our trouble there, right at the top."

Aybee nodded, paused for a moment, then rattled off a series of directions. Then he at once bent back to his control panel. It was Sylvia who watched unhappily as Bey blundered towards the door. He still resembled Ransome in general appearance, but now his body language was subtly wrong. His movements had become jerky, with violent and random twitches of muscle in his arms and legs.

Sylvia kept silent and forced herself to watch him go. Bey thought he had another half hour before he was forced to find a form-change tank. She suspected that was irrelevant. Long before that, Bey would be unable to pass as Black Ransome to anyone with eyes or ears.

CHAPTER TWENTY-SEVEN.

"God does not play dice."

—Albert Einstein (1879-1955)

"God not only plays dice, but also sometimes throws them where they cannot be seen."

—Stephen Hawking (1942-)

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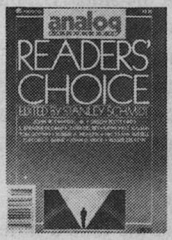

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"God knows what God does."
—Apollo Belvedere Smith (2217-)

There was silence in the communications center for five minutes after Bey left. Sylvia had quickly completed the formatted message and defined a directory reference for it, but then she was reluctant to speak and break Aybee's concentration. He was setting up the master sequence that would take over in one swoop every outgoing message circuit in Ransome's Hole, and it was important to provide no hint of that intention until the moment came for override.

Finally he glanced across to Sylvia and nodded. "Ready as I'll ever be. Where's the message?"

"I put it into a restricted access bank for safety—so no one can take a peek by accident."

"Right idea. Password?"

" 'LUCKY.' "

"Yeah. Let's hope." Aybee entered the final call sequence and sat back in his chair. There was a moment's pause, then a flicker of lights across the full display. He nodded. "OK. We're in business. Now the fun starts—people are being bounced off com circuits all over the habitat."

"Will they know the command came from here?"

"Dunno. Probably. I couldn't see any way to stop it—but I did my best to make 'em freeze. I slapped Ransome's name on everything, so it looks like he's the one grabbing circuits." He stood up. "Keep your eye on that readout. If it goes to zero, yell. It means I'll have to take over. We'll be all done when it hits two eighty. Then we can release the channels."

"What are you going to do?"

"Still don't know. Bey said lie low, but we don't want to just sit here. We need to be useful." Aybee went to the door, opened it a fraction, and peered out. At once he drew back and allowed the door to close.

"What's wrong?"

"Guys outside. Four of 'em."

"Heading this way?"

"No. Not even looking. Just standing there. Bey's doing, for a bet. He sent 'em here to stop anybody getting *in*. But it means we're stuck." Aybee stared around the communications center, then walked across to a horizontal trap-door set in the curved floor. He lifted it and peered through.

"That won't help." Sylvia had followed his actions. "There's only a kernel down there. The door just gives access to the outside of the shields. You won't be able to get out that way."

"I know. I just want to take a look. I've been itching to get close to a live kernel ever since I arrived here." He paused with the trapdoor half-open. "How's that counter?"

"Up to one seventy."

"Going smooth. Let me take a little peek here." Aybee lay down with his head through the opening of the trapdoor. "It's a live one all right. Whopping cable for the sensors. Big junction box, too—just like it was on the Space Farm's kernel." He craned farther into the opening, wriggling his body forward across the floor until only his hips and legs were visible to Sylvia. "*And* its own computer console." His voice was muffled. "Seems like there's a direct

link from the kernel sensors to the habitat's central computer. Now why do that, unless . . . '' Another eighteen inches of Aybee disappeared through the trapdoor.

The count in front of Sylvia had been climbing steadily. It finally reached two hundred and eighty and froze there, lights blinking softly. A ''MESSAGE COMPLETE'' indicator flashed on. She released all the com circuits, and walked across to the trapdoor. She tapped Aybee on the thigh.

''What's up?'' His body twisted round so he could look at her.

''Nothing bad, but we're all done with the message. If you want to go down there, you'll find it easier feet first.'' She waited as he turned, and followed him down the narrow ladder until they were both standing on the outer shield of a kernel. Sylvia stared down at the black, polished surface.

''How do you know this is an active kernel?''

Aybee pointed. ''There's the control unit for angular momentum. I've checked a bunch of 'em, this last couple of weeks. Most of them aren't connected to spin-up/spin-down systems, so they're not ready as energy sources or energy storage. Matter of fact, I'm not sure just what they *are* doing.'' He paused. ''This is a live one, though. Hooked up and active and ready to roll.''

The kernel's control panel was a compact unit sitting on the curved shield surface. Aybee squatted down by it. ''So far, so good. Want first crack at it?''

''I wouldn't know where to start. But if you know a way to tell what's inside the shields, you can check what Bey suggested to me when we were working on the message. He thinks there's some new form-change product in there, something that can survive near a kernel. He tried to scan the shield interior back on the Marsden Harvester, looking for something unusual, but he didn't find a thing. He wasn't sure he was doing it right, though. Leo Manx told him to ask you, because this is your line of work. But you were off having fun on the Space Farm.''

''Yeah. Had a great time there. Real pleasure trip.'' Aybee was already at the control panel, staring vacantly at its complicated console. ''This layout's a strange one for a power kernel console. Too many functions. *And* it's directly linked with the habitat's central computer.''

''Can you scan the interior?''

''Dunno.'' Aybee listed the control function menu and studied that for a few seconds. ''Guess I can. Only thing inside the kernel shield—apart from the kernel—should be the radiation monitors. I'll use them to do an interior scan, and output it to the screen. We'll pick up an image of anything inside the shields. But I'll bet my butt that we don't find anything in there.''

He turned on the display and set the interior monitors to perform a slow scan within the innermost kernel shield. The kernel itself, pouring out gigawatts of radiation and particles, appeared as a tiny, intense point of light on the monitor. The triple shields, reflecting back that sleet of energy, showed on the same monitor as a softer, continuous glow.

They both stared at the screen, waiting in vain for any anomalous pattern. When the scan had finished Sylvia

shook her head. "That does Bey in. He was sure there had to be something inside. What now?"

"We gotta use pure logic." Aybee was back at the controls. "One: there's an information source inside the kernel shields. Two: there's nothing inside the shield but the kernel. Therefore—nice clean syllogism—*the kernel must be the information source*. I've been skirting that for weeks, wondering if I'm off my head—but no one would let me get near a kernel and find out!"

"Aybee, let's not get too ridiculous. A kernel is a *power* source. It isn't an *information* source. And how can there be anything inside a kernel? It's only billionths of a centimeter across. And even if there were anything inside, it couldn't even get a message out. A kernel is a black hole!"

Aybee was shaking his head and changing the scale on the output display. He had zoomed in to the area around the kernel itself. "Come off it, Sylv. Black holes stopped being black in the 1970s, two hundred and fifty years ago! Hell, you know that—why else do you need shields? You know black holes pump out particles and radiation. Every kernel has its own radiation temperature and its own entropy. Maybe its own *signal*."

"But it's too small! You couldn't possibly pack a signal generator in such a tiny volume."

"We don't know how much space there is *inside*, or what the inside of a kernel is like—no idea at all. The interior has its own geometry, its own space-time signature, probably its own physical laws. Hell, people have been saying for centuries that the inside of a black hole is a 'separate universe,' but we never bother to think through the *implication* of that. If the inside of each kernel is a separate universe, *anything* could be in there—including somebody capable of communication."

"Somebody? You mean something *alive?* How did it get in there?"

"Hey, you'd better define life for me. If you mean something capable of generating non-random signals, then yeah, I mean *alive*. As for how it got there—it's been in there all along."

"But *how?* And what could something inside a kernel possibly want to say?"

"One question at a time, Sylv. Do you want to find out what's going on, or do you want to run a debate? Remember, thermodynamics only tells what's happening on *average* for a kernel's radiation. It doesn't say what gets emitted at any particular moment—so let's take a look at this." Aybee turned on a second screen. "We don't see a thing when we just monitor the total radiation output of the kernel, because the average level is so high. But I can display the time-variation of the radiation—the deviation from the average. See that fluctuation? Now it could be a *signal*. Information, coming from the kernel —from nowhere. Just what Bey was looking for, as bad inputs to the form-change process. And I'll bet this could be responsible for breakdown of communications, all through the System. Don't forget there are active kernels in all the important places, everywhere from the Harvesters to the Space Farms. It could be the cause of the snake wrapped around the Kernel Ring, the giant woman walking across

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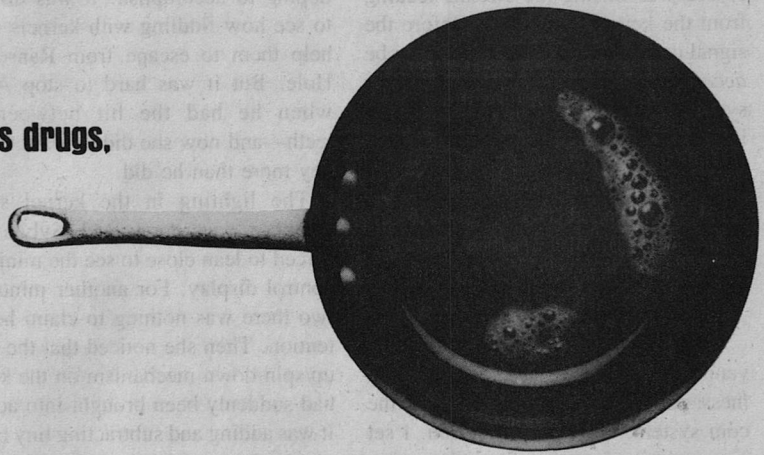
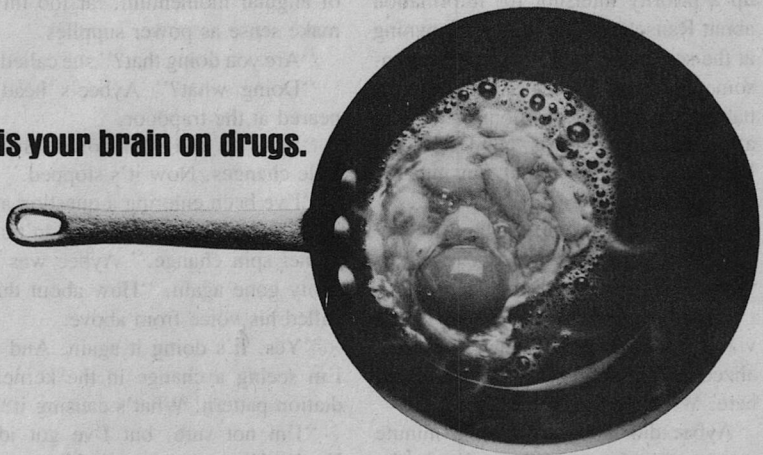
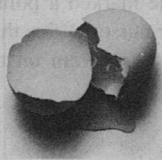


this is your brain on drugs.





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the Space Farm collector, flaming blue swords, giant red space-hounds—you name it."

Sylvia was studying the rise and fall of the radiation pattern. "But it doesn't *look* like a signal. It's like pure noise."

"A perfectly efficient signal looks like noise—until you know the rules." Aybee was tracing the circuits leading from the kernel monitors. "Before the signal can be interpreted, it needs to be *decoded*. And that's where the computer systems must come in. See, this signal is fed as an input data stream to the computer—the central computer for Ransome's Hole. Let's have a look at what the computer thinks it is seeing. It starts by—uh-oh." He was staring at a new signal on the screen.

"What's wrong?"

"Bad news for Bey." The alert signal vanished and was replaced by a flashing message. "While I was playing with the com system, I took a precaution. I set up a priority interrupt for information about Ransome." Aybee was frowning at the screen. "According to this, Ransome is in two places at once on the habitat. I asked for positional fixes, but all I get as an answer is 'NO DEFINED LOCATION.' Bey might run into the real Ransome."

"Can you do anything about it?"

"Not one thing. We don't even know where he is."

"Then we have to keep going." Sylvia was more intrigued than she had realized. "Let's find out what we've got here. What's the next step?"

Aybee did not answer for a minute or two, then he marked a point on the screen with the cursor. "See that trace? It says there's a program on the main computer system, one designed as an interface with this kernel. It ought to be the code/decode algorithm. We can try it. You stay right here, Sylv, and tell me what happens. I'll go to the upper console and execute that module."

Aybee scampered back up the ladder, leaving Sylvia to wonder what they were hoping to accomplish. It was difficult to see how fiddling with kernels could help them to escape from Ransome's Hole. But it was hard to stop Aybee when he had the bit between his teeth—and now she didn't want to stop any more than he did.

The lighting in the kernel shield chamber was poor, and Sylvia was forced to lean close to see the miniature control display. For another minute or two there was nothing to claim her attention. Then she noticed that the spin-up/spin-down mechanism on the kernel had suddenly been brought into action. It was adding and subtracting tiny bursts of angular momentum, far too little to make sense as power supplies.

"Are you doing that?" she called out.

"Doing what?" Aybee's head appeared at the trapdoor.

"Spin up and spin down. But just little changes. Now it's stopped."

"I've been entering a question about kernel operation. But it shouldn't cause kernel spin change." Aybee was suddenly gone again. "How about that?" called his voice from above.

"Yes. It's doing it again. And now I'm seeing a change in the kernel radiation pattern. What's causing it?"

"I'm not sure, but I've got ideas. Hey!" His voice rose half an octave "Did you just poke something down there? Touch the sensor leads, maybe?"

"I'm nowhere near them."

"Well, I'm getting something wild on the display here. Come up and look at this."

Sylvia hurried up the stairs and went across to Aybee at the console. The display was flickering with random lights. While they watched it moved suddenly to a distorted pattern of letters. Sylvia gaped as the screen steadied and an intelligible message began to scroll in.

QUERY . . . QUERY . . . QUERY: ARE YOU READY TO RECEIVE?

"Ready," said Aybee, and added softly to Sylvia, "Let's hope we are."

MESSAGE TRANSFER: DEGREE OF TRANSMITTED SIGNAL REDUNDANCY HAS BEEN REDUCED. ENCODING ENTROPY PER UNIT NOW DIFFERENT FROM ALL PREVIOUS RECEIVED COMMUNICATIONS. DEDUCE PRESENCE OF NEW SIGNAL-GENERATOR IN SENDING SYSTEM. QUERY: WHO ARE YOU?

Aybee blinked and stared at the panel. After a moment he shrugged. "My name is Aybee Smith." His voice was suddenly husky and uncertain, and there was a moment's pause before the vocoder could make the adaptation and a transcript of his words appeared on the display screen. "I am special assistant to Cinnabar Baker, General Coordinator of the Outer System. I have with me Sylvia Fernald, responsible for control systems in the Cloud. Hey. More to the point—Query: who the hell are *YOU?*"

CHAPTER TWENTY-EIGHT.

" . . . he felt for the first time the dull and angry helplessness which is the first warning stroke of the triumph of mutability. Like the poisoned Athulf in the Fools' Tragedy, he could have cried, 'Oh, I am changing, changing, fearfully changing.' "

The interior of Ransome's Hole reminded Bey of some great, cluttered warehouse. Scattered through it, seemingly at random, were hundreds of kernels, each enough to power a structure twice the total size. The minute singularities were distributed through the whole structure, held in position by electromagnetic harnesses and floating within their triple spherical shields.

With no other masses to provide gravity, the kernels defined the whole internal field of the habitat. Corridors curled and twisted, following the local horizontal; free-hanging cables snaked their anfractuous and eye-disturbing paths across open spaces, bending to follow invisible equipotentials. The floor of a corridor could veer through a right angle in a hundred feet, and still provide a constant-gravity environment.

In Bey's present condition the journey through the interior was one episode in a surrealistic nightmare. The spiraling geometry around him matched perfectly the reeling condition inside his own head. He concentrated his attention on following Aybee's instructions, and staggered forward. Fortunately the interior tunnels were almost deserted. He was beginning to hope that he would reach Ransome's quarters unseen when he saw ahead of him an armed group of four security officers. Two of them were facing his way. There was no way he could now avoid their attention, and in any case he knew no other way to his destination.

Bey put all his strength into standing upright and walking smoothly forward. When he was five paces from the group he gave them a curt nod. "Busy?"

"No, sir." The reply was prompt and respectful. "Not particularly."

"Good. There's an important message going out from Com Central, and I don't want anything to disturb it. I want you to go there and make sure there are no interruptions until I return."

It sounded feeble—*he* sounded feeble. But all he saw was a deferential nodding of heads. As the men moved past him, Bey risked his luck one more time. He reached out to take the hand weapon from the last man's belt. "Let me borrow this. I'll return it to you."

He had gone too far—he was sure of it. But the man did no more than nod, say, "Yes, sir," and hurry along after the others.

Bey stood without moving until they were all out of sight, then allowed himself to sag against the wall of the corridor. Standing erect and talking had been an enormous drain on his energy. He took one step forward, and felt in mid-pace a shock through his whole body. It was an internal vibration, a tremor of catabolism from every muscle and every nerve. Some inner barrier to destructive change had suddenly crumbled.

He set his mind on the turn in the corridor, twenty meters farther on, and thought of nothing beyond that point. He took one step. His body responded reluctantly and imprecisely to his will; but it moved. Another. One more. One more . . .

He was at the turn. How long had it taken? The next goal was . . . what? A change in color of the corridor, thirty paces away. He had to get to that, there was nothing beyond that. Another step, and then another.

He guided himself along the wall with one outstretched hand. There at last. His eyes sought out and recorded the next objective.

One more effort—twenty steps. Surely he could do that much?

And then one more. Don't think, just move.

On the final approach to Ransome's personal quarters, Bey caught sight of his own reflection in a silvered wall panel. He thought at first that he was facing a distorting mirror. His limbs hung stiff and awkward from his body, his eyes stared bloodshot from their sockets, and there was a grey, pasty look to his face. He tried Ransome's confident and commanding smile, and it was a madman's leer.

He stepped closer to the shining surface. It was perfectly smooth and flat, producing no hint of distortion. And the closer he came, the less he looked anything like Black Ransome. He stretched his arms wide and flexed his shoulders. There was the click and crack of frozen joints. His muscles were on fire, and every sign of mobility was leaving him. More and more, he was a poorly-made, ungainly scarecrow, hung on a misshapen frame. He staggered on.

Bey had been prepared to bluff, lie, or fight his way in to Ransome's quarters, and equally sure he had passed the point where he could do it. But those measures proved unnecessary. Perhaps Ransome was so confident of his own power to command loyalty that he scorned protection, or perhaps this area

was protected only when Ransome was there. Whatever the reason, Bey was able to pass unchallenged through the entrance.

Aybee had told him about the rococo style of the first chamber, with its great water-globe filled with exotic fish. Otherwise, Bey would have been prepared to add that to his growing list of hallucinations. He went on, toward the inner suite of rooms. He had no idea how much time had gone by since he left Sylvia and Aybee, but they needed every minute he could give them. In the back of his mind he still held the unvoiced hope that if somehow he could capture or neutralize Ransome himself, the chance of escape from Ransome's Hole still existed. He knew they could not wait for reinforcements. That would take weeks, even with an instant response to Aybee's signal from the fastest ships.

At the door of the inner chambers he hesitated for a moment. Surely the message would have been completed. In any case, he dared not wait. He could feel the changes coursing through every part of his body. His long training allowed him to compensate for some of them, but he was close to the limits.

The weapon he was holding was at a lethal setting. He raised it, opened the door, and stepped through. And saw, no more than twenty feet from him, not Ransome but Mary.

She turned at the sound of the sliding door. The gun was trained on her midriff. She ignored it and moved to put both her arms around him.

"Bey!" (So much for the idea that he still resembled Ransome.) "My poor sweet, what happened to you."

"Where is Ransome?" His voice was failing, curdled in his throat.

"Bey, what are you *doing* here? I wanted to come and see you last week, but I was told you were no longer on the habitat. When did you get back."

"I never left. Where is Ransome?"

"My poor love." Mary was holding him away from her and inspecting him closely, touching beneath his eyes with a gentle finger. Bey realized for the first time that he was crying. "I don't know what you've been doing, but I know what we have to do next. You look so sick. We've got to get you to a form-change tank—right this minute."

"Soon. Not yet. Where's Ransome?"

"Bey, you shouldn't even be thinking of Ransome in your condition." She was supporting him, holding him close. "You're shivering all over. I have to look after you."

"Where is Ransome?"

"I don't—" began Mary. She was interrupted.

"If you are so very interested in my whereabouts, Mr. Wolf, you might at least look at me." The voice came from over to Bey's left, from a shadowed part of the room. He jerked to face in that direction. Ransome was standing there. As Bey raised the gun, the black-clad figure took two steps forward.

"No closer," said Bey. "This is on its maximum setting."

"How very unfriendly." Ransome sounded as calm and rational as ever. "You know, Mr. Wolf, this is the third time that I have underestimated you. Really unforgivable on my part. But it makes me more convinced than ever of your value to my operations. The old

order of the Solar System will soon be gone forever. You and I must talk."

"I'm past talking."

"No, listen to him, Bey." Mary clutched his arm, but she did not try to interfere with his aim. "He's right. I've followed the reports from the Inner System. It's a total mess."

"Sure. Because he"— Bey tried to gesture at Ransome, and found his arm taking on a spastic movement of its own—"he has been doing his best to make it a mess. I don't have any interest in talking, Ransome. Get back up against the wall."

"Don't be silly, Mr. Wolf. You escaped from your quarters here. An unusual achievement, and one that I am quite willing to recognize. But beyond that you are powerless to influence events. You are in desperate physical condition, and you do not seem to understand reality. I can have a hundred people here in a few minutes. That will be the end of all your efforts."

"No." Bey's throat was tightening. He had little time for more words. "You are the one who doesn't know reality. A message was sent from here a few minutes ago. All circuits, and it went to both Inner and Outer System. People know where you are and what you are."

Ransome's face showed a moment of anger and astonishment. "That was a grave mistake," he said. "An intolerable act." Then he was walking forward toward Bey.

"Back." Bey waved the weapon. "Last warning."

Ransome did not even slow down. Bey pointed the gun squarely at his head. At the last moment he changed the power level to a stun setting, and fired.

There was the usual dazzling flash of blue. When the Cherenkov radiation pattern had died away Ransome was still standing there, totally unaffected. He shook his head, and his face had filled with cold anger. "I'm afraid I overestimated you after all, Wolf. You're no better than any of the others. Do you seriously believe that I would expose myself to possible death, when my life's work is unfinished?" He turned to Mary. "Leave this fool here and follow me. He deserves to die. From the look of it he hasn't long to wait."

Bey could not stop staring at Ransome. Even in his condition, he could not possibly have missed. Which meant that . . .

Cherenkov field interference effects began. As Bey watched, Ransome's face turned yellow and began to bubble. The skin evaporated in bursting pockets of light, exposing the wall behind as their color swirls faded.

"What an idiot you must be, Wolf, if you imagine that I would not have taken precautions against discovery." Ransome's uniform was becoming transparent. His smile showed a black mouth, black teeth, as he turned to face Mary. "As for you, my dear, you must hurry. We are forced to assume that Wolf is not lying about his betrayal. Leave now."

The bubbles of Ransome's face seemed to be bursting in Bey's own brain. He dropped the gun, and sagged against Mary. "A holograph!"

"Of course." Ransome was fading, and only his voice seemed to hover clear in the air. "How else could I appear to

you when I am far away? It is over for you, Wolf. But for me, and what I am going to do, it is just beginning. I have tools available to me beyond your imagining."

The air around Ransome was turning black. Bey could not tell if it were anything more than his own failing consciousness. He struggled to stand upright, to lean away from Mary. She was staring at him, holding him, her eyes wide and her face close to his.

"Bey! Can you hear me?"

Grim, grinning king. Ransome was gone. His head was dissolved, faded to black. *Fade far away, dissolve, and quite forget . . .* Bey tried to nod, failed, felt his legs lose all their strength.

"Bey!" The voice was Mary, his Mary, infinitely sorrowful and far away. He could no longer see her. He tried to grip her hand, but as he did so all feelings withered from his fingertips.

Mary, dressed in white and strewing flowers. (*"There's rosemary, that's for remembrance."*) As he watched she grew, thinned, paled, became Sylvia, frowned at him in disapproval. *Too little, Bey Wolf, too hairy. Hideous.* Without warning her features flowed, became those of Andromeda Diconis. Her lower lip was full, her face flushed with passion, her red hair—red hair?—Mary's hair, Mary's husky voice saying, "There's beggary in the love that can be measured," a pale face beneath flowing dark hair and an elaborate headdress. He had seen *that* costume before, many times.

Bey's mind was a chaos of quantum states, transitions without warning or control, words and fragmented images intertwined.

"I am dying, Egypt, dying; only I here importune death awhile, until of many thousand kisses the poor last I lay upon thy lips." He heard Mary speaking in his mind, saw again the cotton robe, the dark coiled hair, the tall headdress, fought against her grasp. But you're not, Mary. I'm the one that's dying. *I have a rendezvous with death, at midnight on some flaming hill.* But that's not quite right, I'm remembering wrong. And this isn't Earth. I'm dying here, far from Earth. Far from night and morning, and yon twelve-winded sky.

I was always sure that I would die on Earth. In the evening, at the end of some perfect summer's day. *Sunset and evening star, and one clear call for me . . .*

He felt Mary's arms tightening around him, holding him in the world. Then that sensation too was going. In the end there was nothing left, nothing to hold on to. The whole Universe was blinking out of existence.

'Thy hand, great Anarch, lets the curtain fall, And universal darkness buries all.'

Bey was gone.

CHAPTER TWENTY-NINE.

"Nothing endures but change."

Bey had fought hard against it, but the pressure was at last irresistible. He was driven up, reluctantly up; up to life, up to consciousness, up to discomfort, up as firmly and finally as a cork in a tidal wave.

He washed ashore to wakefulness, and for a while he lay with his eyes closed, rejecting the world. But he could not block out the sounds. Close to him was a clogged, asthmatic wheeze, the

rattling breath of a human being close to death.

After two minutes Bey could stand it no longer. He allowed his eyes to open, and at once came fully awake.

Perched on the open door of the form-change tank, no more than six inches from his face, stood Turpin. The crow's head was tilted to one side and its beady black eyes glared unblinkingly at Bey. It again produced a dreadful groaning wheeze, and followed it with a gurgling cough.

That was echoed by a more distant throat-clearing. Ten feet beyond Turpin sat Leo Manx, his face angry and reproachful. When he saw that Bey's eyes were open he nodded. "At last. Good. I will inform the others."

He stood up and hurried out, before Bey could ask the first of his dozens of questions.

Perhaps it was just as well. Bey could not speak. He leaned forward in the tank, and coughed his lungs clear of dark, clotted phlegm as Turpin shuffled out of the way with a squawk of rage,

By the time that he could breathe, Manx was back with Aybee.

Aybee stared at the spotted floor in front of Bey. "You got me here to see that? Gross, Leo. Truly gross."

Bey ended a final coughing fit. "How long?" he asked. "How long was I—" He ran out of air.

But he already had some idea of the answer. A trip from the Outer System took weeks. If he and Leo were in the same room, a long time had passed. Even before he saw Leo, Bey knew that he had been in the tank for an extended session. He could feel it, in the mutability of every cell.

"Thirty-six days." Aybee looked accusingly at Bey. "Sleeping your head off, Wolfman. *And* you missed all the fun."

"You were in desperate shape," said Manx. "The form-change that you did . . . unmonitored . . . most ill-advised—"

"I know. I'm supposed to be dead. You caught Ransome?"

"No." Leo Manx was still looking annoyed. "He got clear away. We have no idea where he went, where he is, what he's doing. Naturally, we're still looking."

"Mary?" Bey's wind had gone again, and he was wheezing. He suddenly realized where Turpin had found the inspiration for that tortured breathing.

"She's here." Aybee paused, then caught the next question in Bey's look. "On Ransome's Hole, I mean. We're still on the habitat." He grinned. "Us and more people than I ever wanted to see in my life. Everybody you ever heard of is here."

"Answering our message?"

"Yeah—and another one I sent a bit later. That one pulled 'em here in droves. Sylvia's about ready to go into hiding. Hey, can you walk better than you talk? If so, you can see for yourself why things are running wild."

"I can walk." Bey considered the prospect. "Maybe."

"Then let's do it. You have to see this for yourself."

Bey stood up, almost toppled over, and realized as he did so that he was back in his old Earth shape. "How the devil . . . "

"Mary Walton," said Aybee. "She didn't really know how to do it, but

when you collapsed she grabbed you and stuffed you any-old-how into a form-change tank. Set you up short and hairy—the way she knew best. Just in time, too. Sylvia saw the monitors when she got there. Five more minutes, you'd have been fertilizer."

"That's what I feel like." Bey slowly followed Aybee out of the room, allowing his body to drift along in the low gravity. So Mary was here, and so was Sylvia. Between them they had dragged him back from the edge.

He was glad to be alive. But no one else seemed too pleased.

"What's making Leo so angry?"

"He was locked up for a week. He blames you." Aybee was leading the way into the central communications area. "Cinnabar's even madder. Sit down there."

Bey looked slowly round him. He had sat in this chair before. He remembered coming here with Sylvia and Aybee — just. He must have been far gone.

"Why are they mad?"

"They'll tell you." Aybee wasn't listening. He was at the console, long body tight with excitement. "Lock in and hold onto your skull. We're going online." He spoke into the vocoder. "RINI connect. Identification: Apollo Belvedere Smith. Reference: Anomalous signal generation, defined in session 302. Query: What is status?"

He turned to Bey. "Takes a few seconds. Far as I can see, that's for encoding and decoding at this end. Their replies are instantaneous. Someday we'll know how."

"*Whose* replies?"

Before Bey could get an answer the screen was filling. The words on it echoed through the lock into Bey's ears.

THIS ACCESS POINT CONTINUES. ALL OTHER SIGNAL GENERATION TERMINATED *NO EQUIVALENT*. QUERY: STATUS OF ANGULAR MOMENTUM CHANGES?

"Computer still can't translate times," said Aybee to Bey. "That's what 'no equivalent' probably means. I'm wondering if the Rinis *have* times in our sense. If not, this next bit won't mean much to them, either." He said to the vocoder. "All angular momentum changes for identified kernels will cease in three more days. Query: Can you confirm we have complete list?"

LIST CONFIRMED. REQUEST INFORMATION ON ALL OTHER KERNELS. MASS, CHARGE, ANGULAR MOMENTUM, *NO EQUIVALENT*, LOCATION YOUR REFERENCE FRAME.

"We will provide. Request that the following message be sent to access point 073. Transfer message begins: 'Cinnabar Baker leaving Ransome's Hole in four hours. Expect arrival at Brouwer Harvester nine days from now.' Transfer message ends."

DESIRED TRANSMISSION PERFORMED. REQUEST: CONTINUED TRANSFER SHOULD PROCEED FROM GENERAL DATA BANKS.

"We will provide all the general data banks." Aybee grimaced at Bey. "Want to say anything? No. All right, let's cut it. Request: Session end."

SESSION END.

"Offline." Aybee turned away from the vocoder, grinning with mad satisfaction.

"What the hell was that all about?" Bey was feeling angry, but he recognized it as one of the mood swings that accompanied emergence from the tanks. "I assume you're willing to tell me."

"Sure. Just a minute." Aybee set up a control sequence. "Got to give them the data—they want the general system data bank sent through, it's a hell of a job. Going to take months." He leaned back. "You had it half-right, you see. The source of spurious information that was screwing up form-change and everything else is inside the kernel shields."

"But not a changed form, the way I thought it had to be?"

"No. It's something inside the kernels themselves. It—or they—sends out the standard radiation stream, but it's modulated to carry messages. It's your source of negative entropy."

Aybee spoke casually, but he couldn't hide his excitement. From anyone else, Bey wouldn't even have listened. With Aybee, he had to take it seriously. "You know that what you're saying sounds impossible."

"Sure does. That's why it's so interesting. Wolfman, I keep telling the Coordinators, but they still can't grasp the importance of this. Nor could Ransome. Even though he was using the Rinis for his own purposes, he missed the real point."

"He was the one who discovered this."

"Not proven. Somebody in the Kernel Ring stumbled across it, but I'll bet it wasn't Ransome himself. They were spinning-up and spinning-down kernels. Routine stuff, the usual energy storage and extraction. But the things inside one of the kernels could detect the change in angular momentum. They hated it, it affected their inertial reference frames. But they're *smart*. They figured out the cause, and modulated the radiation emission in reply—sent a signal, in effect. After that it was a straight programming job at this end, signal encode and decode. The trick was to spot first that it *was* a signal."

"*Inside* the kernel." Bey stared down at the floor. A billion ton kernel had an event horizon only a few billionths of a nanometer across. The ultimate hidden signal source. "They call themselves 'Rinis'?"

"No. They don't call themselves anything at all, far as I can tell. That's the code name I gave them. The computer answer to anything I asked at first seemed to be R.I.N.I.—'Received Information Not Interpretable'—so I stuck 'em with it. I'm getting better at questions now, though."

"Who are they, Aybee?"

"Can't give you one answer. Everybody asks me, but I say it's too early for that sort of question. Intelligent, sure. Smarter than us, could be. A species, maybe. But it's more like they're a new universe. A whole cosmos. I'm not ready to worry that. I'm still getting my head around a bit of their science. They gave Ransome a bundle of things—new drives, new communications—but there's a lot more than he realized. We're going to get some wild theories out of this."

"They're more advanced than we are?"

"Yeah." Aybee paused. "Or maybe I mean maybe. I don't know how to compare. If I wanted to talk fancy like

Leo, I'd say it's like their science is *orthogonal* to ours. They move along a completely different axis of understanding. It's easy to use their ideas, and hell to understand 'em. I'm still having trouble with the basics. Like, are the Rinis a single entity, or a finite—or an infinite—number of entities? That sounds weird, but from what I can see of their counting it's based on non-denumerable sets instead of integers."

"They can't be a single entity. There has to be at least three of them."

"Why?"

"Because I've seen that many kernels putting out false form-change information."

"That would be true if each kernel was totally separate. We used to think that, now I'm sure it's wrong. The kernels—at least the kernels involving the Rinis—"

"Isn't that all of them?"

"No. That's why Ransome had to switch kernels on the Space Farm. He wanted to get one of his special kernels out when it had done its job. But the Rini kernels are connected somehow. What's known by one is known by all of them. At once, no matter how far away. That's what brought so many ships here. I sent a message saying I might have a system for instantaneous communication, across any distance."

"But if they all connect, they're only one object."

"Not to us. We think they're separate objects. But to *them,* their space could still be singly-connected. It's like Flatland. To a being living in two dimensions, on a flat floor, each leg of a chair meets the floor separately and must be a separate object. That's the way the kernels seem to us. But in a higher-dimensional world—their world—they are all connected, all parts of one chair."

"But then you shouldn't be able to supply energy and angular momentum to each kernel separately."

"Why not? You can paint one leg of a chair." Aybee turned to Bey. "Hey, I'm glad you're back in circulation. I've been wanting talks like this for weeks, but nobody seems to care. Cinnabar and Leo and the rest of 'em are all too busy running around talking politics and stopping wars, and there's all this really good stuff needs looking at. Do you know how the drive the Rinis gave Ransome works?"

"No. But it can wait until tomorrow." Bey stood up. "I'm tired now. Don't bother to get up, I can make it out of here on my own."

He was being sarcastic. Aybee had shown no sign of moving. In fact, as soon as Bey said he was leaving Aybee nodded and turned the computer on again.

Bey's own feelings were more complicated. Everything that Aybee said was fascinating, but Bey was getting tired. More than that, he was restless, to the point where sleep was out of the question. Without any conscious plan he set out to follow a familiar path, drifting along the corridors that led from the communications center to Ransome's private quarters.

When he opened the door he thought that the outer chamber was unoccupied. Then he noticed Sylvia Fernald standing around by the side of the great water globe, staring in at the fish. Next to her was Cinnabar Baker, even thinner than when Bey had last seen her.

They had their backs turned, but Baker somehow sensed his approach and swung around. When she recognized him she produced a sound somewhere between a snort and a laugh. "At last. I've waited a month to be rude to you."

"You and Leo both." Bey wasn't getting the praise he had expected. You'd think that when somebody nearly killed himself, to make sure an important message got out . . . "I guess you weren't the information leak out of the harvesters."

"Of course I wasn't. But I had quite a time proving it. You made it sound as though the only ones who could be leaking information to Ransome were me or Leo—and then you ruled out Leo."

"That's the way it looked. It had to be somebody close to you, and it had to be someone who moved with you from one harvester to another. And Leo and Aybee were away with us on the Space Farm."

"True."

"So that means—"

But Cinnabar Baker had spun around and was heading for the door. "Figure it out," she said over her shoulder. "Or if you can't, Sylvia can tell you about it."

Bey stared after her. "She is *mad*. I wouldn't want to argue with her when she's like that."

"She's been furious for weeks. I've never seen her so angry. But not at you. At Ransome. He did the unforgivable thing."

"Worse than trying to take over the System?"

"Much worse, if you're Cinnabar Baker." Sylvia sat down on a long bench by the side of the water globe and patted the seat next to her. "Sit down, before you fall down. You look exhausted."

"What did Ransome do?"

"Baker wouldn't have minded as much if he had done it to her, personally. But Ransome's people got hold of *Turpin*. They put an audio-visual tap into his head. Everything the crow saw and heard was transmitted straight to Ransome; and Baker never went anywhere without Turpin—he even slept in her bedroom. She realized what was happening when she saw the viewing angle of some of the shots. Worst of all, the tap hurt, and the feed for it made poor old Turpin nearly blind and deaf. When Baker found that out she wanted to wring Ransome's neck with her own hands."

"Where is he?"

"We don't know yet. But we'll track him down."

"I'm not sure of that." Bey finally sat down next to Sylvia. He had become used to being tall, and it was disconcerting to find that his head again came only to her shoulder. His hands were feeling numb, and he rubbed them together. "Ransome was clever enough to make a bolt-hole for himself. He's still as charismatic as ever, and he'll always be able to draw people to him."

"I know. Paul thinks Ransome makes the sun shine. But next time he tries anything, we'll be ready. Ransome's finished, but he doesn't know it yet. I almost feel sorry for him. Mary told me—"

"Where is she? I wanted to thank the two of you for saving me."

Sylvia looked at him and put her hand gently on his shoulder. "She didn't leave a message, Bey? She said she would."

"I didn't check."

"I'm sorry. Mary left Ransome's Hole. Yesterday, and secretly. I knew she was going to do it, and I suppose I should have tried to stop her. But I didn't. She's going to look for Ransome, wherever he is."

The numb feeling was spreading from his hands through his whole body. Mary had gone. Left him again. He accepted the fact instantly. It was something he had sensed when he entered the chamber and did not find her.

"That's terrible." He took a deep breath. "I thought she really loved me."

"She does, she always will. She told me that, and she had no reason to lie."

"But she prefers Ransome."

"She didn't say that. But she said that Ransome needs her more than you do."

"How can she possibly think that?"

"The last time I talked to Mary, she told me to ask you something."

"She seems to have told you an awful lot."

"She did. But here's her question. Before Bey tells you his heart is broken, she said, ask him this: of all the things that have happened to him since he left Earth, which has been the most exciting and satisfying? And ask him to *think* before he answers."

"The most exciting—"

"You're not doing what Mary asked. Think first."

"I *am* thinking."

And he was. *The most exciting*. Was it looking out of the ship, for his first sight of a Harvester . . . or the strange, perverse pleasure of the first meal with Sylvia . . . the satisfaction when he learned that the Dancing Man was not a dream of his own unstable mind . . . the Space Farm rescue . . . the giddy time with Andromeda Diconis, sampling the pleasure centers of a hedonistic habitat . . . the thrill of Mary's voice where he had never expected it. Making love to her. Or . . . a memory flooded in, total and satiating. Bright yellow tracers ran again in his mind.

"It was when—" He paused, then the words were wrung out of him, reluctantly, one at a time. "It was when I was looking for the reason for the wrong form-changes. And when I realized that the source of the problems must be inside the kernel shields. But I could never describe that feeling to anyone. And there's no way that Mary could have known it."

"Of course not. She doesn't think that way. She didn't know about the form-changes, and she didn't know about the Rinis. But she sensed what *sort* of answer you had to give, if you were truthful. Because she understands you, very well. Don't you see it, Bey?" Sylvia put her arms around him. "Mary needs to be needed. When *you* needed her, she saved you—even when you were still back on Earth and didn't *know* you needed her. Ransome wanted to cause chaos and stir up trouble between the Inner and Outer Systems. He knew that form-change equipment would be more sensitive than anything else to the Rini effects on information flow, so trouble would show up there first. Anyone who might understand what was happening had to be dead, insane, or

converted, and it seemed easier to drive you crazy than to kill or convert you. But Mary found out what he was doing. She scrambled their signals, so that the images you received were distorted and less effective."

"They were almost too much."

"But they weren't. You stayed sane. She would have taken any risk for you. And Ransome needs her now and she'll take risks for him. You *want* Mary—but Ransome *needs* her."

"I almost died for Mary, back on Earth."

"Did you? Leo told me that you had the Dream Machine on a medium setting—low enough to break out of it when you decided you wanted to."

Bey stared mindlessly into the great water globe. A small, red-throated fish had come drifting lazily towards them and was poised at the curved transparent wall. It stared goggle-eyed at the two humans, looking at the universe beyond the barrier. That had been Bey, before he came out here. Tucked away in his own little fishbowl, safe and warm below a blanket of atmosphere. *Earth.* Suddenly he had a great longing to be back there, to see blue sky and drifting clouds.

"I'm going back, Sylvia. My job here is finished. The Rinis are interesting, and they're going to change our whole universe, but they will be Aybee's lifework, not mine."

"I know." Sylvia was still holding Bey. "Aybee's going to miss you. He'd never say it, but you're his idol, you know."

"Hard luck for Aybee."

"He could do a lot worse. Mary told me one other thing. She said that when you met her out in the Halo you talked a lot about me. She didn't speculate why, but I think you were trying to make her bring you here."

"I was. It was the only way I could think of to do it. I wanted to make her jealous, so she would want to bring me along and see I preferred her to you. I don't mean that I *do* prefer her to you, but . . . "

Sylvia was shaking her head. "Bey, when I hear you say things like that I wonder if you know anything about women at all. If Mary had been the least jealous, or thought for a moment that you were interested in me, the last thing she'd do is encourage a meeting."

"But that's exactly what she did."

"Do you need it written out for you? You didn't talk Mary into bringing you with her to Ransome's Hole—she was intending to do that all along!"

"But you said there was no way she would—"

"Not so you could see if you liked Mary better than me." Sylvia's voice was warm. "You hairy, self-centered little ape. Mary did it for *her* purposes, not yours. She wanted to see if she liked you better than Ransome. But after she heard you talk about me, she said she felt less guilty about leaving to follow him."

Bey sat for a few seconds in silence, staring into the blue-green depths of the water. He was feeling tired, but not the slightest bit heartbroken. Even the revelation of Mary's motives didn't upset him.

"I'm a total idiot, you know," he said at last.

"We're all idiots."

"I'm the worst. I thought I was being

so clever with Mary. I'm going back, Sylvia. Back to Earth, back to something I'm good at. To the Office of Form Control again, if they'll have me. But I'm really going to miss you and Aybee and Leo. I'm even going to miss Cinnabar and old Turpin, but I'll miss you most of all. Would you come and visit me—see the Inner System for yourself?''

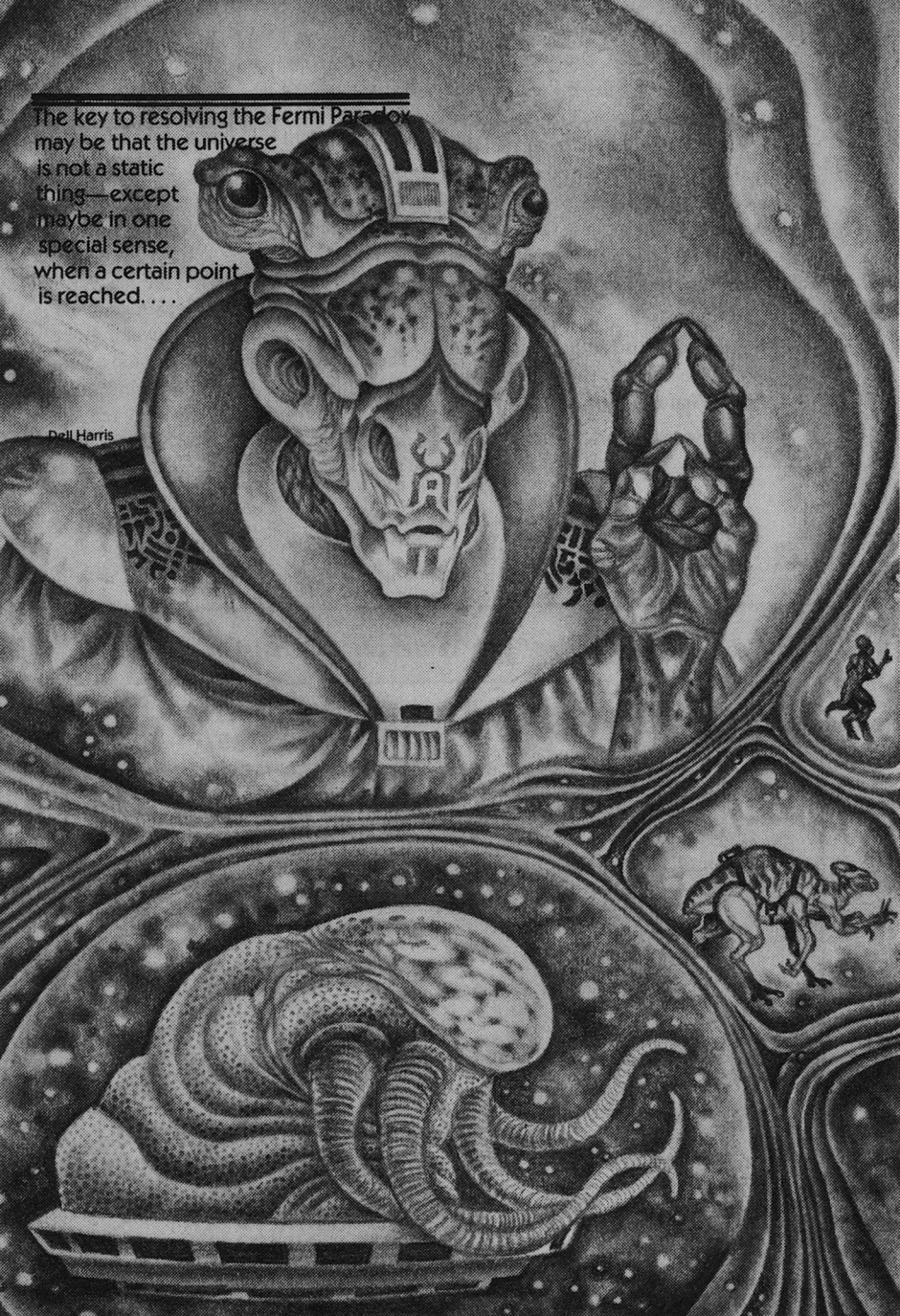
''Among all those little, hairy, Sunhuggers?'' He knew it, she was laughing at him. ''What do you think I am?''

''I think you're a big, heartless skeleton that pretends to be a woman. Earth's not as bad as you think. I think you'd like it. Will you do it? Come and visit?''

''I'm not sure.'' She ran her finger along the hair on his wrist and refused to look at him. ''No promises. But we'll see.''

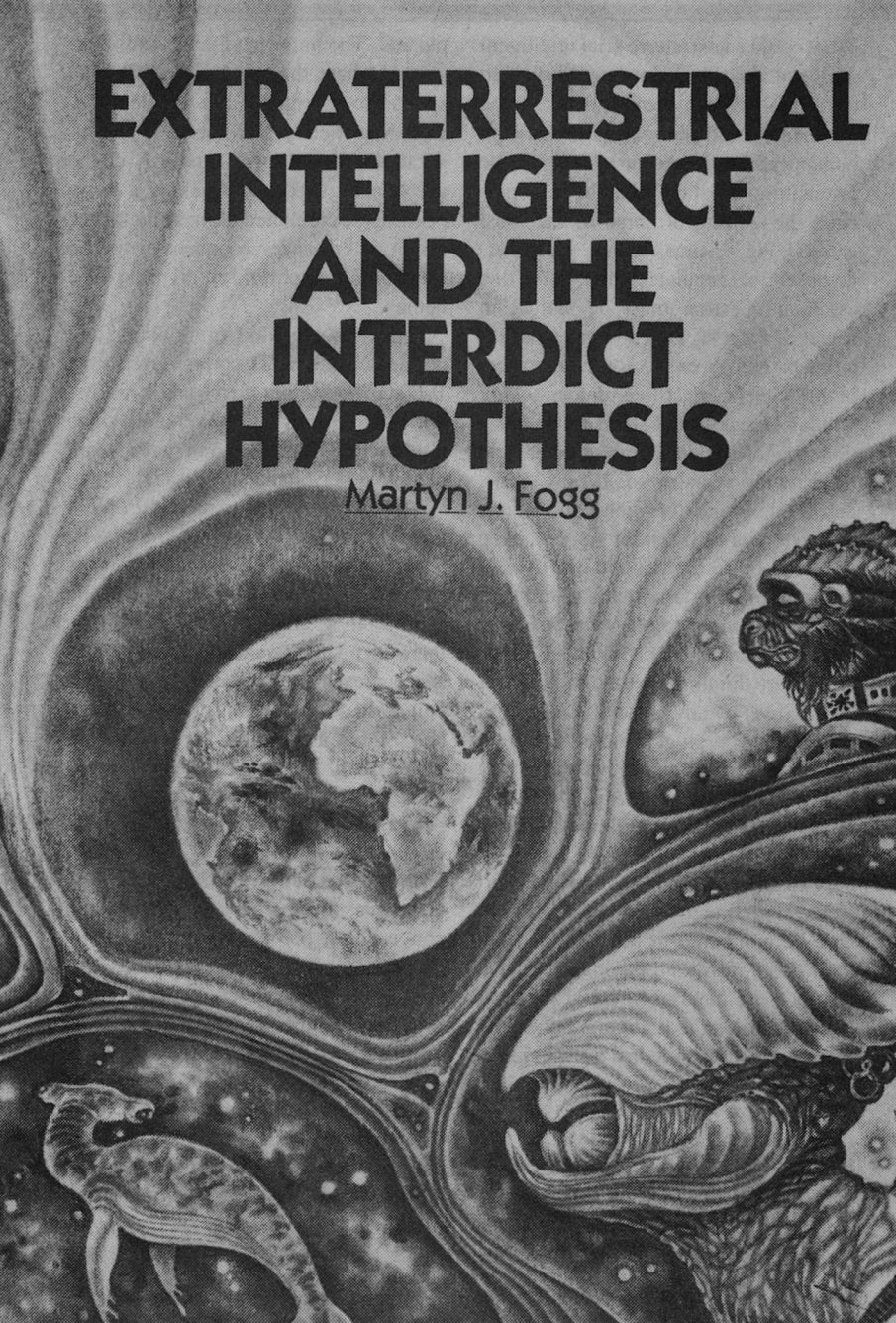
Bey nodded. It was all the answer he could expect, but it was enough.

He looked again into the water globe. The little red-throated fish was up against the wall, and it was still staring out at him. It had no eyelids, but Bey felt sure that it was trying to wink. ■


The key to resolving the Fermi Paradox may be that the universe is not a static thing—except maybe in one special sense, when a certain point is reached. . . .
Dell Harris

EXTRATERRESTRIAL INTELLIGENCE AND THE INTERDICT HYPOTHESIS

Martyn J. Fogg



What could an extraterrestrial intelligent life form look like? How would such an alien think? What would it be like to be one? How could alien races interact with humanity? These are just some of the fascinating questions that have stimulated the writing of some of the most entertaining science fiction. However, in order to speculate realistically one essential question must be slotted in ahead of the rest. Do extraterrestrial intelligent beings exist? Regular readers of the "Science Fact" column in *Analog* will know that the debate over this question has gotten considerably hotter over the past ten years or so. It now seems that the existence of alien civilizations can no longer be taken for granted, even though our Galaxy contains over a hundred million stars, many millions of which are similar to our own Sun.

The ranks of the "Contact Optimists" are thinning, but the camp is not deserted yet by any means. Some of my recent research on galactic colonization has led me to conclude that there may be an "Interdict Hypothesis," with implications regarding the abundance and distribution of intelligent life which go beyond even the speculations of Carl Sagan and Frank Drake. Civilizations may be numbered in not millions, but in *billions*, nearly all having originated from a mere handful of racial progenitors born when the Earth and Solar System were nothing but dust drifting in the star lanes.

FERMI'S PARADOX.

Our Sun appears to be a perfectly ordinary single star, and most theories of planetary formation predict that many of such stars should be accompanied by planets. The number of sites within our galaxy where there is a chance for the spontaneous origin of life is potentially vast. Statistically, millions of alien civilizations should have existed over the age of the galaxy, even taking a fairly pessimistic combined probability for the origin of life and subsequent evolution to produce technologically capable beings.

This was the kind of thinking that dominated the SETI community in the 1960s. They're out there, and if we listen hard enough we'll eventually tune into their conversation, and maybe even receive a personalized message!

This complacency exploded in 1975 when Michael Hart published a classic paper entitled "An Explanation for the Absence of Extraterrestrials on the Earth." In it, Hart concluded that since there are no intelligent beings from outer space present on the Earth now, such beings do not exist. This proposition can be posed as a question. "If they are out there, then why aren't they already here?" Simple, isn't it? Simple, and potentially deadly to the old optimist's arguments. In 1950, physicist Enrico Fermi had posed a similar question to colleagues during a casual lunchtime conversation on the topic of ETs. Its power remained unappreciated for twenty-five years, nevertheless the credit has been firmly back dated and the "Where is everybody?" argument is now referred to as "Fermi's Paradox." The apparent contradiction between expectation and evidence has split the scientific community between the "Contact Optimists" and the "Geocentrists" and has since led to a flurry of papers denying that ETs exist and claiming that

ours is the first civilization to arise in the galaxy.

I must admit when I first heard Fermi's Paradox stated I scoffed, "Huh! There must be plenty of loopholes in that argument!" Then I proceeded to read through Hart's reasoning and soon found my self-assurance melting away.

Hart categorized explanations for the Paradox under four headings:

Physical explanations: these state that the physical, biological, or engineering problems associated with interstellar travel are so great as to render interstellar colonization impossible.

Few people now consider this view to be valid. Starship designs abound in the technical journals. If we can design interstellar transports now, then we should be able to start building them in the next few centuries.

Physical explanations then won't wash.

Temporal explanations: these state that the galaxy is so large and interstellar colonization so gradual that the ETs are out there but haven't had time to reach us yet.

This is not a realistic objection to Fermi's Paradox, either. The galactic disc is about ten billion years old and that means that the oldest Population I stars to exist are about double the age of our own Sun. Population I stars are the ones to have formed with "metals," the astronomer's term for all elements other than hydrogen and helium, and are the stars likely to have planets. It is true that these earliest Population I stars would not have been as metal rich as the Sun—the rate of increase of metallicity with time is not precisely known and depends on which model of galactic evolution you choose. Simulations that I have run of the formation of very ancient planetary systems have turned up life bearing planets nine billion years old. Even if these results are optimistic, it would still seem highly likely that there exist numerous planetary systems of greater age than the Solar System, and therefore also numerous ancient civilizations.

Simulations of the interstellar expansion of a single colonizing culture have been performed by Eric Jones and by William Newman and Carl Sagan. Their estimates of the time required to saturate the entire galaxy range from about five million to eight hundred million years—only small fractions of the age of the Galaxy. My own simulations of galactic colonization by a multitude of civilizations evolving in isolation, cut these estimates down considerably.

If they are out there, then it should not be time or distance that has prevented them from visiting us.

Sociological explanations: these propose that some aspect of ET culture has prevented them from colonizing the Earth.

There are more explanations in this category than in any other. ETs may lack interest, organization, or motivation to undertake large scale interstellar settlement.

Frank Drake believes that powerful economic disincentives may prevent the building of starships—expansion into space may peter out and fail because of the sheer cost of it.

An old favorite is the nuclear destruction scenario, in which all emerging

civilizations blow themselves up shortly after discovering how to unlock power from the atom.

Allied to this is the resource depletion scenario. If the ETs don't nuke themselves first, then all their civilizations collapse shortly afterwards, fighting over the dwindling and finite resources of the home planet.

A less unsavory prospect is the "Zoo Hypothesis" of John Ball where terrestrial civilization is being observed by benevolent aliens who intend to keep us in ignorance until our cultural maturity renders us eligible for admittance into the "Galactic Club." (Keep the Zoo Hypothesis in mind, because we'll come back to it.)

A weakness with all sociological explanations is *universality*— the explanation must apply to every civilization, during every period of galactic history. For example, every civilization must forever find interstellar travel too expensive. Every civilization that has ever existed has either perished in a nuclear war or has collapsed into barbarism before space resources became available (not a very good prospect for us if this is true!). Aliens may be watching us now, but why did they not colonize the Earth long ago before there was any sign of developing intelligent life?

A sociological explanation for Fermi's Paradox is the hope that most contact optimists still cling to. However, universality is essential—and I will return to this topic later.

Maybe they have come: this was the last of Hart's categories of explanation, which he rejected because of the lack of any hard evidence for a past ET presence on the Earth.

Any sane and educated individual who looks into the so called subject of "Ufology," is rapidly disillusioned by the wide variety of pseudo-scientific and pseudo-religious cranks that are drawn to the field. It is true that it merely requires one UFO sighting out of millions to have been a genuine alien spaceship to change the entire character of the ET debate. However, no hard evidence exists, and an attempt to extract any meaningful clues at all from the obscuring mass of delusion, fraud, and misidentification is doomed to failure.

Even with no evidence, the "maybe they have come" explanation suffers from a deeper problem; it requires a sociological explanation as to why they didn't stay.

This outline of the various arguments concerning Fermi's Paradox has been brief and incomplete (for a comprehensive review read the articles by David Brin quoted in the reference list), but I think I have written enough to demonstrate that there remains a very real problem. In the words of T.B. Tang, "*Absence of evidence of ETs may make little sense, but absence of ETs makes no sense at all!*"

If ETs exist and interstellar space travel is practical, then life and intelligence must be very abundant. The Galaxy must be largely settled. Is our apparent isolation neccessarily in conflict with this view?

GALACTIC DEMOGRAPHICS.

To examine alternatives, I decided to model this apparently paradoxical situ-

ation on a computer. Details of my "Outreach" simulation of the expansion and interaction of the first galactic civilizations were published in the February 1987 edition of the planetary science journal *Icarus*. Outreach drew heavily from the previous simulations of interstellar colonization that I have already mentioned, but was different in its treatment of scale and time.

What I wanted to do was to generate a plausible chronology of civilization in the Galaxy. Thus, the entire Galaxy, rather than a sphere of individual stars with no particular location, had to be included in the simulation.

Many expanding civilizations, rather than just one, also had to be taken into account. A model for the origin of new civilizations at isolated foci was derived from previous work of mine concerned with the abundance of extra-solar life bearing planetary systems. I obtained a civilization birth rate of one per thousand years, and made the assumption that only one in a hundred such civilizations would both survive technological adolescence and attempt sustained interstellar colonization. Originally, I named such expansionist civilizations "Empires," although the rules of a relativistic universe would prevent any group from dominating another at interstellar distances. The term "Clade" is perhaps better, and is used here: in this context it might be defined as a group of civilizations that includes all the descendants of a single common progenitor.

To put my "history" into context the introduction of a temporal dimension — dates—was essential. It has already been mentioned that the first Population I stars, and therefore the first planetary systems, were born about ten billion years BP (before present). Thus it is likely, unless the origin of life is an extremely improbable phenomenon, that the genesis of the first life forms in our Galaxy occurred between ten and nine billion years ago.

When would the first civilizations have arisen? This is of course guess work, as we only have our own example to guide us. The appearance of a diverse fauna of complex organisms had to await four billion years of Earth history. The subsequent six hundred million years that it took to produce us witnessed a veritable explosion of evolution compared to the long aeons that had gone before. We have no means of knowing whether evolution on the Earth has been unusually fast or slow; it would seem reasonable, however, to assume our own evolutionary history to be "middle of the road" and to choose a fixed period of four billion years for the origin of complex life forms on any planet. It seems that the first civilizations in the Galaxy might have appeared when the galactic disc was about half its present age. The date chosen for the start of the Outreach simulation was therefore set at five billion years BP.

A simulation cannot run without rules. The kind of interstellar colonization envisaged by Eric Jones was used as a general model, although modified for the more grandiose galactic stage. Each Clade progenitor sends out colonization missions in all directions and settlements spring up in a rough sphere centered upon the ancestral star system. The boundary between settled and unsettled space can be viewed as a spherical

wave, expanding at a certain fixed velocity. Once the radius of the settled region reaches about a thousand light years, further expansion above and below the galactic plane is prevented and hence the wave front is distorted into the shape of a cylinder. Faced with an empty Galaxy and conditions demanding growth, the philosophy of such early civilizations was assumed to be highly opportunistic; intelligent species, and other life forms carried with them, eventually colonize every star system with useable resources. No planet escapes their attention and natural evolution on worlds with the potential to produce intelligent life is upset. Future civilizations are preempted out of existence —something that is supposed to have happened to us.

A TYPICAL RUN.

Imagine a map of the Galaxy as it was five billion years ago spread before you. Imagine also that you can witness five thousand years worth of events compressed into one second.

Now we are ready to start the computer.

Right after hitting the button, tiny sparks start appearing at random, one every fifth of a second. These are the very first civilizations to arrive in an empty Galaxy. Some civilizations extinguish themselves, some suffer a slow decline before death, some attain stability and live within their means. Twenty seconds after the start of the simulation, one civilization leaves its own star system. The first Clade progenitor is born, the Expectant Era of galactic history is over, the Colonization Era has begun.

By two minutes, six hundred sparks litter the map. Six of these are embryonic clades—the first has already swollen to a noticeable dot a thousand light years across.

Ten minutes later, the Colonization Era is now nearly four million years old and the map has changed. Three and a half thousand civilizations have come into being, 35 Clades are racing into space. The settlement rate is growing exponentially and 15% of galactic disc space has been taken over. Two wave fronts have just met and come to a halt along a ragged front—a first physical contact between Clade races.

We take a break and return after a further eight minutes, some six million years into the run. Once again, the change has been amazing. Now, half the Galaxy has been settled, some five thousand primordial civilizations have entered the stage, 47 of them Clade progenitors. Lack of room in some regions is slowing exponential growth, the first Clade stops expanding altogether, as its local area of the Galaxy becomes saturated.

At T plus 30 minutes, the number of Clades has increased to 53. Over 85% of the Galaxy is colonized and a continuous settled region extends from one end of the Galaxy to the other. Frontiers are much reduced and thus the colonization rate is slowing dramatically. A majority of Clades are now boxed in within their own kilo-light year boundaries and have entered a period of enforced stasis—for some, the remaining action is now spiral arms away. The number of untouched star systems has dwindled, and with it the birth rate of new civilizations.

Forty minutes, twelve million years

into the run, the colonization process is almost complete. Ninety-eight percent of the Galaxy is settled. Only the occasional Clade is still involved in active expansion—the last isolated pockets of space are being filled in.

By 45 minutes, after almost fourteen million years, it's finished, all growth has ceased. Further interstellar settlement is limited strictly to clusters of new born stars and systems where civilizations have become extinct. The map shows about five thousand six hundred primordial civilizations, and fifty-five Clades. Each Clade has taken possession of an average of almost two billion stars, about three quarters of which would be stable main sequence Population I, and hence useable for settlement. Planet dwelling has become a minority taste; the most common lifestyle in the Galaxy is within clouds of space habitats orbiting red dwarf primaries. The Clade daughter civilizations number in their billions. In a relative blink of time, the Galaxy has flipped from one equilibrium state to another: from a situation where it was devoid of life to one where it is now saturated.

The Colonization Era is over, the long aeons of the Steady State Era are at hand.

That was a description of a run of the Outreach program with an input wavespeed of 0.0067 c (c = the velocity of light), Eric Jones's preferred value. Other wavespeeds were also tested, from Michael Hart's 0.1 c, where wavespeed equals ship speed, to William Newman's and Carl Sagan's geriatric 0.00014 c. The qualitative results of all the runs were similar, but obviously the time to fill the galaxy, and the number of primordial civilizations produced varied. Two empirical formulae fitted the data quite well.

The time taken to saturate the Galaxy approximated to:

$$T_{fill} \sim 7 \times 10^5 (T/10^6)^{0.724}$$

where T equals the diameter of the Galaxy in light years divided by the wavespeed in c.

The number of Clades produced was approximately:

$$N_{cl} \sim 4 (T/10^6)^{0.635}$$

What are the implications of these results? Well, for a start it is obvious that the temporal explanation for the Fermi Paradox is even more unlikely. In the run described, a single civilization would have taken sixty million years to saturate the Galaxy, multi civilization colonization cuts this by three-quarters. Reducing the wavespeed does not help much, as more Clades arise to contribute to colonization. Runs with an input wavespeed of 0.00014 c terminated after only a tenth of the time determined by Newman and Sagan.

What is most significant, however, and what did cause my jaw to drop at the time, was that in every case, even with the most pessimistic of wavespeeds, *the Galaxy was fully settled hundreds of millions of years before our Solar System was even formed.* Whilst all the drama of the Colonization Era was in full swing, the atoms that make up you and me were cooking within the cores of giant stars now long extinct.

How can we square the above version of the history of galactic life and intelligence with our own existence?

* * *

THE INTERDICT HYPOTHESIS.

The principal objection to Ball's Zoo Hypothesis is that it gives no explanation as to why the more expansionist civilizations left the Earth undisturbed. Postulating a universal respect for life-bearing planets without good reason is not enough. Geocentrists would say that our Solar System would have eventually been reached by the colonization wavefront of an expanding interstellar civilization. The Earth would have been settled and the evolution of the human race preempted.

This objection, however, is now relaxed. An implicit assumption behind it is that mass interstellar colonization begins *after* Solar System formation. However I have just demonstrated above that this may not be the case—had the galaxy been settled *before* the Solar System even existed, so that there was no more real estate up for grabs, then the vigorous and adventurous civilizations that might have colonized the Earth would have long disappeared. Thus there may well be a valid sociological explanation for Fermi's Paradox, one that has its origins in galactic history.

My attempt to render opposing arguments compatible with each other and to provide a logical resolution of the paradox has lead me to propose an "Interdict Hypothesis." In *Icarus*, I put it thus: *If preemption ends after the Colonization Era, once civilizations become largely static and participants in the galactic communication network, then the separate origin of new life and intelligence in star systems born subsequently is still possible (e.g. around the Sun).*

Hold on, I can hear you saying! Just why is it likely that preemption should end, and what's this about a galactic communication network?

Well, let's try to imagine how a civilization might evolve once all the useful star systems in the Galaxy are settled —when there is nowhere else to go. Granted, new stars are being born all the time, but the chance of any individual civilization being near an active star forming region is low. The billions of races evolved over the last few million years would be faced with the reality of an eternity of stasis, or as I prefer to call it—"steady state," as the word stasis is associated by many with words such as "stagnation" or "decadence." Cultures unable to adapt to living within their means would soon disappear from the galactic scene, collapsing in a chaos of competition for finite resources. Those that remained would have to outgrow the instinct of life to ceaselessly expand and compete and adopt alternative, more sublime values. Raw materials and "lebensraum" would be the currency of the past, information would be the most valuable resource of the future. A universal communication network would be expected to arise spontaneously, for the transmission and trade of all concievable forms of information. Such a network could have carried communications from one edge of the galaxy to the other fifty thousand times since its creation five billion years ago. It would seem that there has been ample time for those steady state races to have undergone a convergent mental evolution and to have agreed on a number of common policies for common interests; the "Codex Galactica" as Carl Sagan has called it.

Might one of these common policies be a universal respect for life bearing planets? Yes, indeed! Every new life-bearing world born after the Colonization Era would be a complex new information system, a source of continuing variety. To maximize the value of such a world to galactic society as a whole, especially where there is native intelligent life, any observation must avoid perturbing the free development and evolution of the information system away from its natural course. Thus observers might also decide to leave the entire stellar system of the planet they are studying uncolonized, as it would be possible for any sentient life forms that originated on the planet to achieve a high degree of civilization, and interplanetary space travel, before becoming aware of their true place in the Galaxy.

Might not the material resources of such life containing star systems outweigh their information value? After all new stars could be colonized just as well by old civilizations as by young ones. I really don't think so. Computer simulations I have performed to estimate the prevalence of life-bearing planets suggests that only about 0.6% of galactic disc stars may possess a life bearing planet, and so 99.4% of suitable new born stars could indeed be colonized, should the nearest civilizations wish to tolerate a brief relapse from their steady state existence. A sacrifice of less than one percent of new stars, so that natural biological evolution could continue, seems so very minor and well worthwhile, it is entirely possible that our Sun is one of those set aside.

In the Galaxy outlined by the Interdict Hypothesis, all new-born stars with potential life-bearing planets are left fallow for about a billion years. After this time, all those systems where life has not originated are opened up for whichever race wants to settle; those systems where the genesis of life has occurred are placed under interdict. Here's how the Earth might fit into my galactic chronology:

(1) First Population I stars formed in the galactic disc ($\sim 10^{10}$ yr BP).

(2) Origin of the first primitive forms of life ($\sim 9 \times 10^{9}$ yr BP).

(3) Origin of the first galactic civilizations and the onset of the Colonization Era ($\sim 5 \times 10^{9}$ yr BP).

(4) Galaxy is colonized, Steady State Era begins ($\sim 4.9 \times 10^{9}$ yr. BP).

(5) Information is the most valuable resource, transgalactic communication is established, common policy for common interests, agreement on "Codex Galactica."

(6) Formation of the Solar System ($\sim 4.6 \times 10^{9}$ yr. BP).

(7) Earth is visited, primitive organisms discovered ($\sim 3.5 \times 10^{9}$ yr BP).

(8) Solar System placed under interdict.

IMPLICATIONS FOR AN INTERDICTED SOLAR SYSTEM.

How would we expect the sort of ancient galactic society envisaged by the Interdict Hypothesis to effect us on the Earth?

If communications between civilizations are transmitted via tight beams, such as lasers, then in the short term there would be no effects at all. The likelihood of the Sun being so precisely aligned that it occults a message beam connecting two stars is very low. The

sky seems silent and the best efforts of SETI researchers may prove fruitless. Should the information gathering probes that are observing the Earth cover their tracks well, then as the human race begins to migrate into and settle the Solar System, little or no trace of alien activities will be found. Thus the interdict will ensure that the development of human civilization remains uninfluenced by outside factors for as long as possible.

In the long term, however, and depending on your point of view, the prospects are mixed. Massive interstellar exploration and settlement would not be an option as most local star systems would be occupied. One can imagine the human race being handed a mere handful of young stars to settle, many of them located at great distances and none of them accompanied by a beautiful second Earth. Terraforming locations in the Solar System would keep us busy for many millennia, but for ultimate survival we would have to join galactic society as a full member by accepting the doctrine of steady state.

What are the advantages, once the interdict is lifted? Well, for a start we certainly would never be lonely. Integration into the galactic network would give access to five billion years worth of information, a tiny fraction of which would be the Earth's own unwitting contribution. There would be treasures that none of us here and now could even begin to conceive of. Who can say where human destiny is headed, other than towards some ill-defined transcendence? For to quote Francis Bacon, *"Nam et ipsa scientia potestas est"*; knowledge itself is power.

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Martyn Fogg is a researcher in astronomy and geology associated with the Extra-Mural Department of London University. He is also a Fellow of both the Royal Astronomical and British Interplanetary Societies. His research interests include planetary formation, cometary impact cycles and SETI. One of Fogg's current projects, a study of the possible origin of life early in the history of the Universe (even before the formation of the galactic disc) is a continuation of the work outlined in this article.

on gaming

Matthew J. Costello

I just have to applaud a company that can, in this day and age, create its own gaming licenses. You see, these days most game companies eagerly seek some licensed property, with some name recognition, to help sell a game. It's a relatively recent phenomenon, but it's become a dominant factor in just what new games get made.

Now FASA Corporation has never shied away from the attraction of licensing. They obtained the license to *Star Trek* for a role-playing game, and just recently released a quartet of games based on four novels of James Clavell's —*Noble House, Shogun, Tai-Pan,* and his latest, *Whirlwind.*

But they've done something else too. They've created their own hot license with their *Battletech* series involving battling man-like robots. There are Battletech games, supplements, novels, and lead figures. There will even be a Battletech computer game.

Now, they are attempting to do the same thing with a brand new series of games under the umbrella title, Renegade Legion. And from everything I can see, it should be a great success.

The world of Renegade Legion is familiar space opera territory—an evil Imperial Government (called the Terran Overlord Government) is being resisted by a rebellious coalition. FASA, though, has provided a wealth of detail in both the background and game design, to make the series of games worth looking forward to. The first release, *Interceptor,* was notable for its clever combat system and 3-D fighters, that you could embellish as they grew in prowess. . . . much like the emblazoned fighters of World War II.

Just received is *Centurion.* This game deals with the land-based clashes of Grav Vehicles—floating tanks loaded to the gills with powerful weaponry and armor. The game covers territory familiar to players of Steve Jackson Games' classic, *Ogre.* But while *Ogre,* with its missile launchers and Ground Effects Vehicles against a lone super-tank, put its emphasis on fast-moving playability, Centurion is filled with a wealth of detail. The clear rules cover all aspects of vehicle movement, including acceleration, velocity, stacking, and traveling up slopes.

But it's the combat system that has the most innovations. Lasers can be used to "paint" a target, making it easier to hit. Regular weapons fire is then initiated, one vehicle at a time . . . but all combat is considered simultaneous. Damage is taken first to armor, and then to the internal systems of the Grav Vehicle.

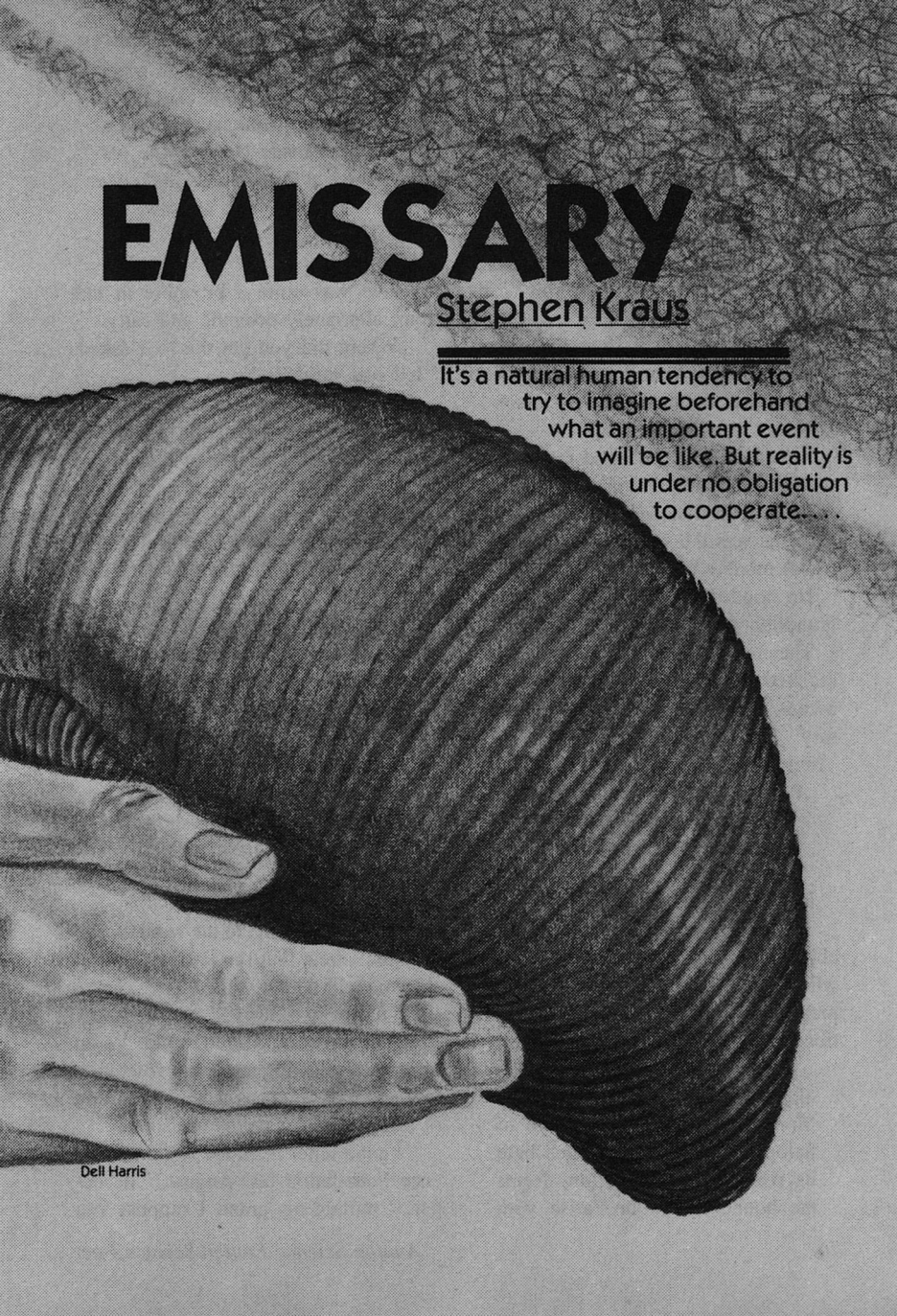
As in *Interceptor,* the damage system offers all the realism that a future warrior could want. Each vehicle has a dense record sheet to monitor the status of its weapons, armor, ammunition, and active infantry on board. Templates are provided for a dizzying supply of weap-

(Continued on page 105)

EMISSARY

Stephen Kraus

It's a natural human tendency to try to imagine beforehand what an important event will be like. But reality is under no obligation to cooperate. . . .



Dell Harris

Roger shed his backpack and collapsed into one of my dining room chairs. He looked dilapidated—long hair tangled, face sunken and colorless. But he was alive, anyway. After months without a word from him I had begun to think otherwise.

He dug through his backpack and produced a worn, leather-bound book.

"What do you make of this?" he asked.

A brief phone call from the airport excepted, those were his first words to me in three months.

Roger was like that.

I played along. I opened the book to the flyleaf, which was inscribed "Capn Jn Knowles," in an assertive hand. The surname was the same as Roger's.

"A relative of yours?"

He nodded. "My three-times-great-grandfather."

The text was written in a faint, crabbed hand clearly not that of its owner. The legend was self-explanatory:

Memoryes of the Parish of Birwood
Written by: Dnl. Meese, Rector
Anno scriv. 1781

"A parish history?"

Roger nodded again.

The writing was old-fashioned—quaint abbreviations, misspellings, curly f's where s's ought to be. Heavy going. I picked my way through the introduction:

> Birwood stands at the crossing of the Peirce Highwaye and the Marle Brooke in the Countye of Salop. Marle Brooke, which hath its rise head near Marton, forms the boundrye of our Parish with Onslow, and there a stone bridge passes across this brooke at whose foote our Church stands. The bridge is now sorely ruinous, but repairs cannot be made because the parishioniers of Onslow saye the bridge is on our lande and we saye it is on theirs.

There was quite a bit more in that vein, alternately pedantic and catty.

"Where did you get this?" I asked. "It looks valuable."

"From my uncle Claude. He died, I ended up with it. I found it in a cookie tin, along with a bunch of papers and photographs—genealogical stuff. The photographs were all of these somber, dark-suited fellows with identical beaked noses." Roger felt his own nose. "Quite a lot like mine, actually.

"The papers were certificates, clippings—that sort of thing. They traced my family back ten generations to a tiny village in the English midlands."

"Birwood?" I guessed.

"Right. That's where I've been." He brushed his hair back nervously. "Thanks for putting me up on such short notice, by the way." He hesitated. "I really need to talk to you."

"No problem."

He looked past me to the window and the quiet street that ran past my house. "This could take a while."

"I'm not in a hurry."

Roger gave me a tired smile. When he started speaking again his voice was low and measured, as if he were afraid of running out of words too soon.

"I got a letter from the National Science Foundation last August," he began, "pulling my grant. I suppose you

heard about that—everyone else in the department seemed to know within hours. I couldn't believe it. One sheet of cheap government stationary and all my soft money was gone." He snapped his fingers. "Just like that.

"I sat in my office all afternoon, staring at the letter. That project was my life." He stopped for a moment and shook his head. "That must sound really stupid, but it's true.

"I went home after a while, passed out on my couch. When I woke up the next morning I found three suitcases waiting on my front step. There was a note from an attorney taped to one explaining that my uncle had died and naming me as his next of kin.

"I started going through his stuff. I was pretty clinical about it—I hadn't seen Uncle Claude in ten years. I ended up giving almost everything to Goodwill. None of it had any personal flavor. It was just stuff. Useful to him, I suppose, useless to me.

"Then I found the cookie tin with the book and the photographs. Beneath that were a locket, some pressed flowers, and an odd sort of plastic part—black, with a disk at one end and four hollow tubes at the other. Heirlooms, I guessed, though the plastic part certainly didn't fit.

"I ended up reading the Birwood manuscript all the way through that night. I'd never been much interested in history, but that old Reverend Meese had a nasty streak in him that kept me turning those brittle pages.

"He had it in for my family in particular. There's a chapter devoted to us near the end—see if you can find it."

I did, after a few minutes of squinting at the gnarled script. The section began:

The Familye of Wm. Knowles
of the Mill Farme.

Wm. Knowles was the first of his lineage to dwell at Birwood, living verie poorely at the outset in the ruines of Blanthorne Castel.

While still a younge man, Wm. Knowles left the countrye to fight with the Duke of Marlborough and did not return to the Parish until some yeares later. He then built a mill by the Marle Brooke and a goode house with monies he had got somewhere.

Then followed a long account of a lawsuit between William Knowles and a Mr. Oakely. They were fighting about the right to sit in a particular church "piew," of all things. Roger's ancestor won. Then events became more dramatic:

Wm. Knowles begat manye other disputes, but his last was with a Thomas Norris, who was an alehouse companion. They finallye brawled (over a woman, witnesses saye) and Mr. Norris was cut on the arme, which he lost the use of, but Mr. Knowles was stabbed to the harte.

Roger grinned. The effect was a bit cadaverous. "I never would have believed my family started out that way. I mean, look at us now—we're all accountants or chemists or whatever. Keep going, it gets better."

The next section read:

W. Knowles had isshue by Anne Newcombe, a son Martin, who in-

herited the Mill Farme. Martin Knowles styled himself a gentleman and went down to Cambridge to reade the classicks, but he returned on his father's death with two fingers missynge on his right hand from some mischiefe he had played.

A short time later Martin Knowles found a vein of a goode ore of leade (called Galena) at the bottom of a marle pit on his propertye. This was accompted strange (if fortunate) for leade is otherwise only known in Wales and manye leagues distant. Mr. Knowles hired men from Birwood and elsewhere to work the myne and proffited greatlye.

But in the ende the myne led to a dispute with one Jn. Bender, who worked it on Martin Knowles's behalf. Mr. Bender, who is a stout and able man even today, broke a picke of Mr. Knowles's. Mr. Bender saide he would not paye for the toole, maintaining that it broke because it was not adequate to the taske rather than through any fault of his owne (he still says that there was something in the ore too harde for the toole).

The two men fell to fighting over this difference, with the result that Mr. Bender cracked his hip and now walks onlye with a sticke. He later tooke up the trade of wheelwright, and so is more fortunate than manye of his fellowes who lost their livelihoods when Martin Knowles closed down the mynes soon after.

* * *

That incident seemed to end Martin Knowles's career. I found only one more reference to him:

> Martin Knowles is now little seen in publick, nor at the alehouses he used to frequent. Those who visit the Mill Farme saye he sits by a window with a small object in his ruined hand and tosses it repeatedly into the aire. I have seen him do this myself and asked him where he got the thing (which is the color of coale and has four small projections on it) and he will onlye saye he got it in the mynes.

I looked up, startled.

Roger nodded. "The same thing occurred to me when I read that section. I dug through the cookie tin until I found that plastic part. Black, four projections—there was no mistaking it. My class ring had a small diamond set in it. I dragged the ring across the part's surface, and the diamond ground itself into dust."

Roger leaned across the table and looked straight into my eyes.

"I put the part in my pocket and drove down to my lab. I tried to grind off a bit to analyze. No luck. Finally I was able to boil away a few molecules with a dye laser and blow them through my mass spectrometer.

"The material turned out to be a boron ceramic with some molybdenum and a few rare earths mixed in. Somehow that added up to a substance so hard I had no way of measuring just *how* hard.

"I looked up the Welsh lead deposits the manuscript referred to. They were Cretaceous in age; presumably the Bir-

wood deposits were similar. If Martin Knowles really found the artifact in his mine, the material had to be tough enough to survive beneath the earth for a hundred million years.

"I wasn't quite ready to believe *that*, but I kept running the facts back and forth in my head. I could safely assume that Martin Knowles found the thing—he couldn't have *made* it, the technology to make it doesn't exist *now*. I could further assume that it was part of something larger, something an unfortunate miner named John Bender broke one of his employer's picks on.

"Then, a short time later, Martin Knowles shut down a profitable mine, throwing half the town out of work, and for the rest of his life he stayed scrupulously clear of his beloved alehouses. Why? To assure his own silence? Or was it just superstition?

"I did some more checking. I found Birwood on a contemporary map, and I talked to the local tourist bureau, one Irene Adams. She was only too glad to tell me about the town, but she had never heard about any old lead mines —seemed horrified at the idea, actually.

"Right about then the chairman called into his office. He told me that I'd have to leave the department at the end of the summer. I'd been expecting that; I didn't say anything. We discussed what would happen to my equipment, and so on. Then he asked about my immediate plans.

"I told him that I was about to take a short trip to England to complete a side project. The idea just sort of popped into my head as I answered.

"I wasn't planning to be gone long, maybe two or three weeks. But I took the precaution of putting all my stuff in storage and giving notice on my apartment. I really should have told you where I was going—I almost called you three or four times. But I wouldn't have known what to say if you'd asked why.

"I left the next day. I only spent one night in London before heading north by train. I didn't want to stop moving. I bought an old bicycle in Shrewsbury, and pedaled the rest of the way. Very pleasant, really. Lovely countryside: thatched cottages, rolling green hills with hedgerows and sheep.

"I reached Birwood in a couple of hours, and Irene found me a bed and breakfast in the middle of town. I told my landlady that I was a naturalist.

"I had this curious sense of *déjà vu* about the town. Besides the single paved road and a few row houses, I don't think anything has changed there since 1781. The church is still standing by the Marle Brook, and the stone bridge still hasn't been repaired.

"I looked up some records of my family at the church and the town hall. The minister was very helpful once he found out who I was: tenth generation descendent of Birwood stock and all that.

"William Knowles—the first Knowles mentioned in the manuscript—died in 1734. I never found any record of his birth. Martin Knowles lived from 1713 to 1788. And Captain John—the owner of the book—was his great-great-grandson. Everything checked, right down to the pew William Knowles and Mr. Oakley fought over. I sat there during a Sunday service at the minister's insistence.

"Locating the Knowles property was

more of a problem. I had to dig a century deep into the town records. I finally found the surveyor's boundaries of the Mill Farm on an old tract chart: 'In longitude from the Meridian of the Isles of the Azores (or Fortunate Islands) 21 deg. 37 min. 12 sec. and in latitude 52 deg. 53 min. 14 sec. northwards from the world's equator.'

"The area is completely wild now; even sheep don't graze there. But I recognized the remnants of the farm easily enough. The mill used to straddle the brook—the stone tower on the Birwood side is still standing. And behind the charred foundations of one of the outbuildings I found a small plot with half a dozen tilted headstones. One of them belonged to Martin Knowles, died in 1788, aged seventy-five years.

"I spent the rest of the afternoon down by the brook, knee deep in marle. I looked up the word in my landlady's dictionary afterwards: it's a crumbly soil with a high carbonate content, used for fertilizer and bricks. Good stuff to have on a farm, I suppose. Dreadful to walk through. After an hour I felt as if someone had poured concrete on my boots. But the manuscript said that Martin Knowles had found his vein of lead at the bottom of a marle pit, so I kept looking.

"I located the mine on the third day. Nothing dramatic. I slogged across another marsh and through another patch of thistles, and suddenly, right in front of me, was a pit with an obvious tailing pile on the side nearest the brook.

"Rusted equipment was piled in front, but the entrance was unguarded. What stopped me was the darkness. Light just wouldn't penetrate more than a foot or two past the timbers that bracketed the opening. There were no signs of recent exploration, no bottles or empty beer cans. The place just seemed to have been forgotten.

"I took a train to Birmingham that afternoon and spent a small fortune on rock-climbing gear. I was back at the mine the next morning, hammering in expansion bolts for anchors and rigging carabiners and abrasion pads. I hadn't used stuff like that in years, but the skills came back quickly.

"The rappel was easy enough—maybe fifty feet of descent through cobwebs and bat droppings before the shaft flattened out. After that I could walk, sort of, bent in half at the waist.

"The books tell you not to fool around in old mine shafts, but this one seemed solid enough. I checked the roof and supporting pillars frequently, but I never found anything to worry about.

"I moved as quickly as I could at first—whatever John Bender found, I figured it would be near the end of the shaft. But my back began to ache after a few hundred yards, and I kept hitting my head against the low ceiling. Half an hour later I had to drop to my hands and knees.

"I crawled along, listening to my ragged breathing reflecting back from infinity, until I found my hands trying to rest on empty air. I scrambled backwards, then aimed my headlamp straight down into a vertical pit ten feet deep. I had to wait until I stopped shaking before I could rig for the descent.

"I took the next section very slowly; the passage was terribly narrow. After a short distance it turned a sharp corner and ended at a rectangular cross-section

of glossy grey ore. There was no sign of an artifact.

"I remember sitting perfectly still, swallowing sour air. What had I been thinking? Did I really believe that some forgotten manuscript was going to prevent the extinction of my career? Was I that desperate?

"I wasn't sure I wanted to know. But too much fitted together. The black part was real enough, certainly. There *had* to be something down there.

"I began to crawl back towards the surface. Every step sent a jolt of pain through my knees and my arms. After I reached the base of the pit I'd nearly fallen into on the way down, I had to stop to rest.

"The air circulation in the shaft was especially strong there. The mine seemed to be taking long, slow breaths. Dampness dripped down the stone faces. And I found myself looking into a side passage I hadn't noticed on the way in.

"The timbers framing the entrance had collapsed; rubble blocked it almost entirely. I wondered why the supports had fallen—hundreds of others stood firmly in place along a mile or more of mine shaft. I could only imagine that someone had pulled them down to discourage access to the passage.

"I began rolling rocks to one side. I tied a rope around one of the timbers and yanked until it was out of the way. I wiped sweat out of my eyes and kept at it until I had cleared a hole just the width of my shoulders.

"I waited for the dust to settle, then I swept my light along the passage. It extended back only a few yards. At the end, still embedded in a slanting vein of ore, was a black, refrigerator-sized mass. It had rounded corners and smooth flanks that were opalescent in the harsh white glare of my lamp."

"The black radiance reminded me of the part I'd found in my uncle's trunk, and the object seemed completely intact except for some deep scratches in the top surface.

"As I inched closer through the rubble, I noticed that the scratches on the top were very regular; closer still I decided that they were markings of some kind, repeated in a hexagonal array. I braced myself against the back wall of the passage and tried to catch my breath. From there I could just touch one of the artifact's sides. The surface felt as smooth as glass. I moved close enough to brush the dust out of the figures on the top. They seemed to form a diagram, but it was like a puzzle, meaningless, lines in interlocking hexagonal patterns. . . .

"I stared until my head hurt. Then I closed my eyes for a moment. When I opened them again, the meaning leaped right off the surface. The diagram was telling me—in the clearest possible way—how to open the top of the artifact.

"Eight fasteners were indicated: threaded cylinders that fitted flush and screwed in at a slight angle. Each had six depressions that were slightly smaller than the ends of my fingers.

"I tore several fingernails before I had the idea of making a wrench out of bolts pounded through a piece of wood. Once I realized that the threads were left-handed, the cylinders turned easily. That astonished me more than anything else. Any mechanism trapped in a vein

of Cretaceous ore should have welded solid millions of years ago.

"I was ready to pry off the top within five minutes. As the lid started to come up, I suddenly realized how much the artifact resembled a sarcophagus. I hesitated before looking inside, half afraid that I'd see the remains of . . . I don't know what. A time traveler? A squat alien creature with six tiny fingers?

"I aimed my lamp inside and took a deep breath. No bones or rotted clothing. Just diagrams and hundreds and hundreds of marvelously precise interlocking parts.

"I studied the diagrams first. I had the knack of interpreting them quickly by then. Everything had a deeply rooted six-sided symmetry. The figures and their groupings all formed partial or complete hexagons. But it wasn't so much the patterns that were organized that way, I realized, as the brain of whoever had made them.

"There was one diagram all the others branched from, a sort of table with diverging columns. In the center was a single hexagon, then a space, then two hexagons, then three. Each group of hexagons was paired with a symbol—a number system.

"Then I found a periodic table. The six inert gases formed a hexagon at the center; the elements with partially filled shells swirled outwards. A table of molecules surrounded that. Each item was assigned its own symbol, modified by other symbols that indicated isomers or ionic states.

"I followed one of the branches of the interior diagram, loosening cylinder screws as I went. I found that an assembly about a foot square and a couple of inches thick swung up and to one side. Below it were more instructions, more assemblies.

"I was bent over in an impossibly awkward position working by entirely inadequate light. But I couldn't leave. I kept disassembling and cataloguing, copying, drawing, reassembling.

"The primary elements were tiny chambers—sometimes just widenings in pinhole channels—each attached to a sort of valve. Hexagonal tubes the thickness of a hair were fused to all the surfaces, constantly branching and joining. I thought at first they were electrical connections, then I decided they were optical. Later, very deep in the clockwork, I found a nest of icosahedral crystals that fit flush against the polished faces of thousands of those hexagonal tubes.

"I didn't return to the surface until my backup lamp began to dim. I stood at the mine entrance and stared at the daylight until my retinas burned. I had almost forgotten what it looked like.

"I was too tired to invent excuses concerning my torn clothes or eccentric hours. Fortunately, my landlady was polite enough not to inquire. She made me scones and orange marmalade while I tried to make up my mind.

"Who should I tell? The police? The newspapers? I decided that I'd feel more comfortable contacting somebody at a university. But I was still uneasy. If only I had a better idea of what the artifact was *for*.

"Eventually, I decided on sleep and another visit.

"The second descent went quickly—my climbing gear was still in place, and I knew what to expect. But I was

more daunted than ever by the artifact's complexity. I tried to copy down some of the simpler diagrams to study later, but I realized right away that I'd be drawing for days. Then I had the idea of making rubbings, like people do with gravestones. That worked beautifully, even for the smallest figures. I returned with a notebook full of them."

Roger reached into his pack and produced a sheaf of papers. He tore one out and handed it to me. Spidery white lines stood out in relief against thick black pencil marks. The markings were incomprehensible. All I could discern was a six-sided symmetry.

"Can I keep this?" I asked.

Roger waved as if it were a matter of the least possible importance.

"The figures were mostly warnings," he said. "It could all operate as long as water was a liquid—indicated by pictures of water in different states. The proper environment was nitrogen and oxygen with traces of water vapor and some other components. As far as I could remember, Earth's atmosphere qualified with no trouble.

"Starting the thing up involved filling several chambers with chemicals — simple organics mostly: amino acids, lipids, monosaccharides, plus some trace metals, water, sodium hydroxide. The power requirements were marvelously simple: just plenty of light.

"Ultimately, the instructions told me everything except what the artifact *did*. I spent quite a bit of time thinking about that. My best guess was a piece of survival equipment from an alien colony—a safe food source, say, for use in a strange ecosystem. But then why didn't I find other artifacts in the vicinity? And why build an auto-kitchen to last for a hundred million years?

"After four trips I'd examined a dozen assemblies. I expected them to get simpler as I reached deeper into the artifact, with bigger chambers to accommodate steaming slabs of alien rump roast, or whatever. Nothing of the sort. The components became smaller and more intricate. I couldn't even make out most of them.

"For a while I tried to follow the pathways, guess at the reactions. Two or three levels deep I had to give up. About all I could do was estimate the number of connections. I came up with 200,000 reaction products, give or take a factor or two. That's when I knew my auto-kitchen hypothesis wouldn't hold up. It was much too complicated.

"The diagrams terminated at the right front corner of the box. The directions there had me remove and inspect a long conical assembly that ran almost to the bottom of the artifact. It ended in a hollow needle and a very fine screen connected to the main body by a dozen tubes.

"I pointed my lamp into the cavity left by the assembly's absence. The chamber was spherical, a few inches across, right up against the front. On one side was a smaller cavity with a very familiar shape. I reached into my pack and took out the part that Martin Knowles had passed down to me. Then I slid it back into place for the first time in two hundred years.

"I remember sitting quietly on a broken timber after that, wondering what kind of man my seven-times-great-grandfather was. Of course it might have been someone else who first dis-

mantled the artifact. But I doubted it. Who else would have dared touch the thing? The blackness, the depth below the earth—it must have seemed the devil's handiwork to the miners who found it.

"For a moment I could feel Martin Knowles in the shaft beside me, looking over my shoulder at the diagrams, shivering in his frock coat and buckle shoes. He was an educated man. He could read the instructions as well as I. But he was born a century too early to make sense out of the chemistry.

"Can you imagine his frustration? I could see him pulling down the timbers himself—he had his family's violent temper. Something was trying to speak to him across an unimaginable gulf of time and space, but he couldn't quite understand, couldn't quite answer.

"I wonder if he guessed at the artifact's purpose. I knew for certain by then. It was a machine for manufacturing aliens. All those thousands of reactions just sufficed to synthesize a fertilized ovum and implant it in that spherical black womb."

Roger closed his eyes. He looked very tired.

"I couldn't tell anyone. Can you see that? If I did, the British government would almost certainly seal off the mine as a matter of national security.

"I couldn't risk it. I needed to publish. I needed that very badly.

"I heard somewhere that the chemicals in a man are only worth thirty dollars or so. I can vouch for the fact that alien chemistry is a *lot* more expensive. Between the reagents and the laser I needed as a light source, the project started to push the limits of my credit cards.

"My biggest problem was the generator—it weighed nearly a hundred pounds. I ended up disassembling it and hauling it down in sections. But everything else was simple enough. I was ready to go in a few days. Starting the mechanism up was just a matter of moving a few cylinder screws. The operation was automatic after that—and completely silent. I had a hard time believing that anything was happening at all.

"The indicated gestation period, or whatever, was five weeks—it seemed like five years. Mornings I hauled gasoline for the generator into the mine; my hands smelled perpetually of the stuff. Otherwise I walked around the village, read, ate. There were two pubs in town that dated back to the days of my ancestors. I stayed well clear of both.

"I spent the last night in the mine, sitting with my arms around my shins, facing the box. My landlady had baked some extra scones for me, and I swallowed one mechanically every hour or so. At some point I must have fallen asleep.

"I woke to the sensation of something nuzzling my foot. It felt slick and warm, not quite wet. My eyes snapped open. A stray bit of light reflected off a shape about a foot long and six inches high, a smooth, continuous curve.

"I jumped up and scrambled backwards into a corner. I heard a snuffling noise and smelled a faint, sweet odor overlaying the usual mildew.

"The smooth shape waddled towards me. It was more or less ellipsoidal, no feet. Its skin was jet black and slightly corrugated. The only distinctive feature

was an inquisitive, tapering protrusion in front.

"I edged around to the artifact. A door had slid open near the bottom, exposing the spherical chamber I had seen earlier from above. The chamber was empty except for a pool of moisture at the bottom.

"I looked at the creature again. It was feeling aimlessly at the ground with its snout-like protrusion. Helpless. And hungry. It just *radiated* hunger.

"I didn't know what to do. All I had were the scones. I dug one out of my pack and rolled it towards the creature. The snout found it after a while. The creature snuffled again—the noise seemed to be caused by the contraction of its body when it moved. Eventually it climbed on top of the scone. After a few minutes and considerable snuffling it got off again. There was a damp spot where the scone had been.

"My knowledge of zoology is practically nil, but I was quite sure that nothing native to Earth ate that way.

"I sat down on a rock and stared at the thing. After a while I scooped it up and dropped it into my backpack.

"I got to think of the creature as a him, despite the absence of any distinguishing sexual features—any features at all, really, except for the snout. Sort of a minimalist's animal. I named him Martin, after Martin Knowles.

"He needed lots of water, I discovered—he absorbed it through his skin. And he was quite sensitive to light. Otherwise he was easy enough to take care of. He ate everything, even the kippers I pocketed at breakfast so as not to hurt my landlady's feelings. He liked being scratched just behind his snout.

"I watched Martin all that first day and night. He sensed my presence somehow, and he tried to follow wherever I went. He could move surprisingly quickly when he wanted to.

"I finally fell asleep late during the second day. I dreamt in bright colors and woke to find Martin patiently unraveling the hooked rug with his snout. I dissuaded him gently, then spent the rest of the morning wondering what to do with him.

"The situation had clearly changed. A hulking black artifact of unknown function was one thing, but Martin . . . well, who could possibly see him as a threat to national security? He fit more naturally into the soft toy category. I wondered idly if I could claim the residual rights.

"But I still wanted to contact someone at a university first. I flipped through the journals I'd brought until I happened on a reference to Richard Burns, a Cambridge physical chemist I remembered from a conference. He seemed like the political sort; he probably knew his way around the infrastructure. I called his office and made an appointment for the following week.

"The clock had started ticking. In a few days, I told myself, the world would become a very different place. And NSF would no doubt treat my next proposal with new-found respect. . . .

"I moved around my room in a sort of delirium. Then I'd look at Martin and come right back to my senses. The truth was that I didn't know any more than on the day Uncle Claude's trunk arrived at my apartment. What *was* Martin, anyway? Could my cosmic kitchen hypothesis have been right all along? Mar-

tin might be an alien cow-equivalent, a protein source. He seemed smarter than a cow, but that didn't prove anything. The aliens who ate him were probably smarter than us, too.

"The problem was that his species couldn't possibly have built the artifact. The dolphin's fate: no hands. Of course, he might be an early stage in some complex alien life cycle, or telekinetic, or something.

"None of that really mattered, of course. Martin's existence was the most important fact. We could study his metabolism, cell structure, molecular biology. I told myself that, but I didn't believe it. I wanted to make *contact*.

"The next day was a quiet one; inclement weather kept us indoors. I taught Martin how to play baseball. I tossed a wadded-up piece of paper towards him, and he batted it back with his snout. Silly, but we played for a couple of hours.

"In the afternoon I sat in the shabby armchair in my room and watched the rain. The irony of my situation impressed me mightily. I would soon be the most famous person on Earth—after so long being one of its most obscure. I wondered about my clothes. Did I own anything suitable for meeting presidents in? No doubt some picture of me in my torn jeans and flannel shirt would show up in elementary school texts for the rest of eternity. I thought about book contracts, TV appearances, interviews. What would I talk about? All I knew was chemistry.

"At some point I fell asleep in the chair, and I had the most extraordinary dream.

"I didn't have the fuzzy, unworldly sensation I usually associate with dreams. Everything was clear and hard and definite, as if I'd simply woken up in a different place. The time was dawn or twilight, and I was surrounded by a sort of ingeniously organized junkyard that stretched out of sight in every direction. And it all seemed to be moving.

"A sliver of red sun poked above the horizon, drowning the brilliant night sky and throwing long, leaping shadows. As my eyes adjusted, I could tell that I was standing on an gigantic brass gear that kept trying to slide out from beneath my feet. It moved irregularly, in jumps, with a ghastly screeching. The air smelled of burning oil.

"I started moving carefully—almost shuffling—towards a high, distant point that looked stationary. I hopped from the gear to a pinion that was impaled on a shaft the diameter of a tree trunk. Its end was sunk in an elegantly faceted jewel.

"The pinion swung me around to the edge of a shelf. I grabbed it and pulled myself up. The shelf was toothed along its other edge. A hundred yards away in the dim red light I could see a huge, fitfully spinning worm gear that meshed with the rack I was clinging to. The sun remained fixed on the horizon.

"I crawled along until I was directly across from the stable spot I had seen from below. I took a running start, jumped over three meters of black space and rolled to a stop.

"I was on a sort of stainless steel mesa, the highest point in the landscape of sprockets and armatures and escapements—all clanking and tearing and grinding against each other. Something was terribly wrong.

"After a while the logic of mechanism became clearer to me. There were groups of components, and groups of groups, and so on to the fifth or sixth order. At a great distance, among the less immediately related groups, the gears seemed to be spinning more regularly. The disorder grew with proximity to my position. The focal point seemed to be somewhere in the shadows directly beneath my feet. I studied the situation for a few more minutes, then I lowered myself from the ledge into the chaos below.

"I worked my way around a spring and a halted flywheel to a point where black smoke was rising and the screeching sounded continuously. I could just make out a machine head screw the size of a oil drum jammed between two gears.

"I don't remember the next few minutes very well—just the sounds of machinery tearing itself apart, and shifting shadows and plumes of sparks that flew each time the gears ground against the screw. I crawled down into the mechanism—I don't know why exactly, but it seemed very important that I do so. I braced myself against something and pushed at the screw until it jumped free and went skittering across a field of polished chrome.

"I stood up, breathing deeply. The clamor softened, became more rhythmic and tonal. After a few minutes I could distinguish notes, then melodies, then antiphonal responses from more distant parts of the mechanism. As I climbed back onto the mesa, the music synchronized and resonated and interwove until it became something I could almost feel and taste.

"I stood on a ledge, head thrown back, consumed by the music, while, haltingly at first, then more surely, the sun began to rise.

I closed my eyes, and when I opened them again I was back in my room. I saw Martin sitting near me with his snout extended. Something in his posture exuded pride and pleasure."

"The rain stopped just after dark, and Martin and I went for a walk on a back lane bordered by dripping trees. Grouse rushed through the heather from time to time as we passed. Otherwise, the world was perfectly still. Martin moved quickly. I puffed a bit trying to keep up.

"After an hour or so, the fields on either side of us began to turn translucent. The effect seemed perfectly natural to me—I took only the most casual notice of it. I had the sensation of stars rushing by overhead.

"We crested a hill, and Martin grew more excited. At the top I could just make out the dark silhouette of a large, angular house.

"A cobbled pathway led up to the entrance. Martin shuffled forward expectantly. I stopped short of the front door—I didn't want to alarm the residents. Each of the cobbles, I noticed, had a figure inscribed into it. I had my notebook in my back pocket; I knelt over and made a quick rubbing. When I looked up, Martin was knocking on the front door with his snout.

"The wind off the plowed fields began to bite. I observed peripherally that the stars had slowed and stopped in unfamiliar patterns. I shifted my weight from one foot to the other. Martin

seemed very sure of himself. He knocked again.

"At the second knock the door swung heavily inwards. The entryway was very dark, very empty—just a long expanse of bare wall and odd, twisted floorboard. What held my attention was the figure at the door. It was a squat shape about three feet high, enveloped in a loose black cloak. The cloak hid all its features, but I could distinguish a rounded projection at floor level, like the head of a beetle. The shape rose up slowly, and the cloak fell back.

"The night was very dark. Even the starlight was dim, almost red, as if the stars themselves had grown terribly old. But I could see the creature's face well enough. It was a circle of six lidless, compound eyes surrounding a mass of waving tentacles with a black, glistening hole in the center.

"I stood frozen in the doorway for a moment. Then . . . I turned and walked away. I remember the night being terribly quiet. The only sounds were my footsteps striking the incised cobbles in front of the house and the splashing of huge wet drops falling from the trees. After a few yards I tripped over a root and fell heavily. I scrambled to my feet and ran.

"I didn't slow down until I could see the lights of the village. I leaned against a tree and gulped air until my chest stopped burning. I finally remembered to look around for Martin. He was at my feet, shivering."

"I didn't sleep that night. I paced around my room, replaying the scene at the door. I tried to recall more details. I couldn't be sure—the house was so dark, and I was so startled by that alien figure—but I thought I remembered more of the black creatures huddled at the end of the corridor.

"The next morning—as soon as the sun was up—I dropped Martin in my pack and went looking for the house. The roads looked different in the daylight, and I wasn't entirely sure of the route I'd taken. I must have criss-crossed the countryside a dozen times. I went again the next night, letting Martin walk alongside me, then again the night after that.

"I never found it.

"Very early one morning—we'd been out all night—we had to walk back through the village green on the way home. I let Martin play on the lawn for a while. He seemed to enjoy that. He rolled in the grass, poked at it with his snout, ate some. I could tell where he'd been from the faint hexagonal patterns he left behind.

He was nosing around a sign post when an elderly gentleman with a splendid white mustache popped out of the shadows right in front of us.

"I smiled weakly and said good evening—I didn't know what else to do.

"The old fellow came gradually to a stop and looked us over. His eyesight, I suspected, wasn't what it had once been.

" 'That's a fine looking animal you have there,' he said. He tended to shout a bit.

"I thanked him.

" 'Ah, what is it exactly?'

"I thought for a while. 'A jabberwock?' I meant it as a lame sort of joke.

" 'A sort of terrier then?'

" 'Exactly.'

"He nodded in a knowledgeable way. 'American breed?'

" 'Right.'

" 'A fine specimen. Well, see that you curb him, sir.' With that he pushed on.

"I nearly expired on the spot."

"That was enough. The next day I said goodbye to my landlady and caught the train to London. I took the first plane home, called you from the airport." He shrugged. "And here I am."

Roger's voice had faded almost to extinction. He seemed desperately tired. But I couldn't let him stop.

"Go on," I said.

"That's all."

I shook my head. "What happened to Martin?"

"Martin's in my backpack."

I tried to say something, failed. I looked at his pack. "He's *here?*"

"Of course. Did you think I'd left him behind? I was a little concerned about customs, but they didn't inspect my bag, so there wasn't a problem. Would you like to see him?"

A truck drove by, rumbling through half a dozen gears as it rounded a corner.

"Now?" I asked.

"It's a little bright in here . . . "

Roger waited while I turned out the lights, then he unzipped the bottom compartment of his pack and reached inside. I noticed a tart smell, rather pleasant, with strains of cinnamon and an earthier tone I couldn't identify.

He took out something elongated and blackly iridescent and put it on the floor. It moved towards me with a sound like rustling silk.

I took an involuntary step backwards.

"Jesus, Roger . . . what *is* it?"

"It's an instrument, like the thing my ancestor found. Only this one is organic. The artifact in the mine had to last for millions of years, so it was built out of a material that served that purpose. But ceramic couldn't do Martin's job."

The creature—there was no doubting that it was alive—moved closer. As my eyes adjusted to the dark, I could see the tapering projection that Roger referred to as its snout. It uncoiled to a length of eight inches or more and sought one of my shoes. I nearly fell over getting out of the way. Roger steadied me.

"Really, there's nothing to be afraid of."

I took a deep breath. "All right. But what *is* it? Something like . . . that can't be space-faring."

"No, of course not. Martin isn't a sentient alien. He's a machine. Very specialized. His function is to help me contact his people."

I held out my hand tentatively and let the creature probe it with its snout. The touch was slightly electric.

"The information was stored in his genetic material somehow. And he was able to pass it directly into my brain, like copying a computer file. His job amounted to establishing a communications protocol, then performing a tricky format conversion—translating his data into our neural idioms. I wish I understood how he did it."

I rubbed my forehead. "Roger, stop. What are you talking about?"

"The dark house, that's what this is all about. I think it was Martin's idiom for his home planet. He took me there somehow—I don't know if we moved

physically or what. But I'm sure the house only existed within Birwood city limits on that one night."

I shook my head. "I still don't understand. It sounds so complicated. Why not just leave . . . I don't know, a transmitter or a spaceship or something?"

Roger picked Martin up, scratched him gently behind the snout. "I thought about that. Too risky. You don't want just anyone knowing where you are. One of Martin's jobs must have been to test us, me—that's what the clockwork dream was for. Were we smart enough? Harmless enough? I suppose we were. He tried to take me home.

"But I only got the one chance. We never went back, and I haven't had any more dreams."

His voice was like broken glass.

"It all sounds so . . . ephemeral," I said. "Are you sure the house was real?"

Roger reached into a pocket and took out a sheet of paper covered with pencil rubbings. He unfolded it carefully.

"I found this in my notebook the morning after I visited the house—the inscription on the cobble."

The revealed figure showed a striking, stylized design: a ring of six small circles surrounding a radiating swirl of short, wavy lines. A face.

My hands trembled a bit. "What are you going to do? Call a press conference?"

Roger shook his head. "Would you mind if I went to sleep first? You can't begin to imagine how tired I am."

The smell of fresh coffee mixed with the faintest of cinnamon scents early the next morning. I called to Roger. No answer. With the curtains drawn, the living room was quite dark. Even so, I knew immediately that he was gone.

There was a familiar leather-bound book on the coffee table with a note tucked inside its front cover. I picked up the note; I had to push the curtains apart before I could make it out. I was struck by how similar the handwriting was to Captain John Knowles's inscription on the flyleaf. The voice, though, was very much Roger's:

> I'm sorry I evaded your question last night. No, I won't be giving a press conference. *You* will. I've left you with enough evidence, I think, to convince anyone. You'll be able to handle the reporters much better than I could.
>
> I'm not really much of a hero.
>
> That's a subject I've had occasion to think considerably on during the last few days. Mostly I've been trying to understand why I walked away from that dark house at the top of the hill. I was terrified, of course; but I could control that. I also felt, rationally or otherwise, that if I walked through the door, I wouldn't be coming back. I can honestly say that frightened me even less.
>
> But I'd been so secretive. I hadn't told *anyone*. I had reasons at the time. Still, if I'd accepted the creature's invitation, the artifact and Martin and everything else would have vanished along with me. I really couldn't let that happen—even an unemployed scientist has some professional responsibilities. And, to be honest, there

was more to it than that. I wanted people to know who I was, what I'd done.

You'll tell them won't you?

And I'll ask one more favor. I need two months. That's why I came back instead of keeping my appointment in Cambridge. I needed someone I could trust.

As you read this I'm on my way to England. I've already bought the chemicals. The artifact is intact; I can make another Martin, find that house again.

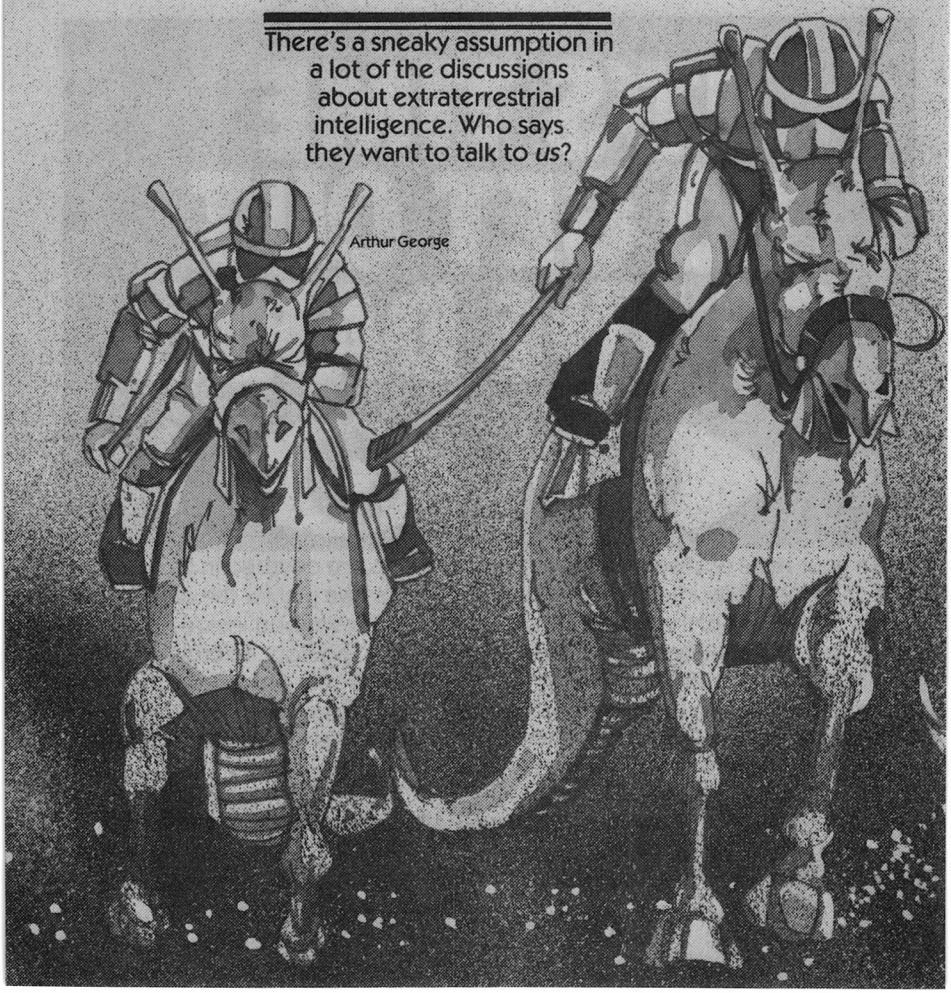
I won't run this time.

Roger's glyph was scrawled at the bottom. I put the note down and drew the curtain shut. Martin's snout curled towards me inquisitively from beneath the table. He looked *very* hungry. ■

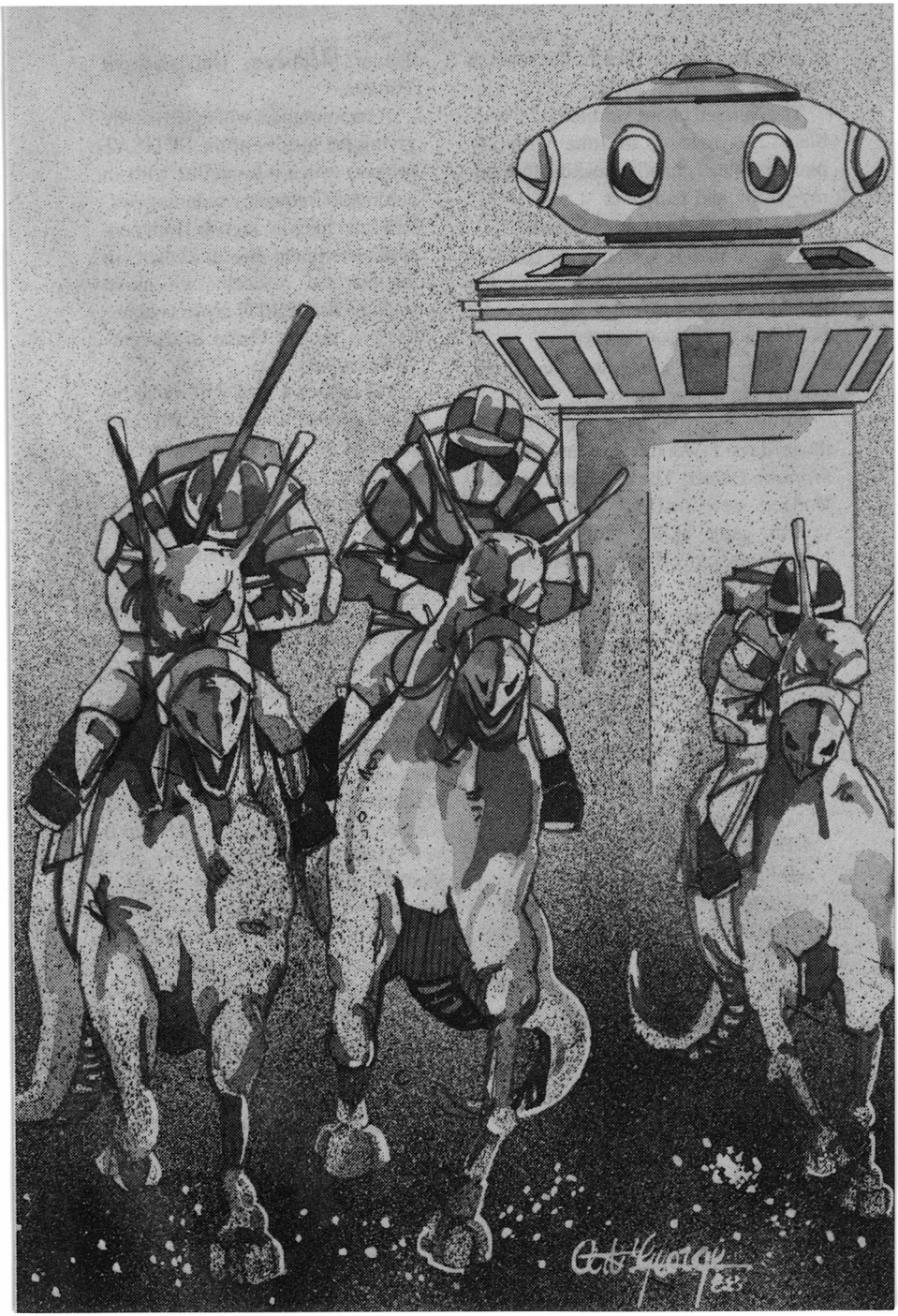
WAIT TILL NEXT YEAR

Robin F. Rowland

There's a sneaky assumption in a lot of the discussions about extraterrestrial intelligence. Who says they want to talk to *us*?



Arthur George



It all started the day before the seventh game of the World Series . . .

The damned phone warbled . . . warbled . . . *warbled*, in time with my pounding head, finally breaking through my jet lag and hangover.

I picked up the phone. "Yeah?"

"Doug, this is Cosburn on the National Desk, can you cover a newser for us?"

"What?" I wasn't awake.

"Look, there's a news conference over at the Setisat offices."

"I'm a sports writer," I told him. In those days I worked for the Toronto *Morning Planet*. The Blue Jays and the Dodgers were tied 3-3 going into the seventh game of the World Series in L.A. It was an off day. I had wanted to sleep in.

"Is your screen on?" Cosburn asked.

"Just a minute." I thumbed on the tiny screen, part of the hotel phone system. The sick green dazzled my poor eyes.

"Downloading." Cosburn said.

The message came on the screen.

URGENT . . .""""
ADVISORY

The International SETI SAT (Search for Extraterrestrial Intelligence) Satellite Coordinator's office has called a news conference for 10 A.M. today, pacific time, in their Los Angeles offices.

Sources indicate that a "major announcement" will be made as a result of discoveries by the coordinator, Dr. Denise Howard, and two associates Dr. Michael Singh, Cambridge University, and Dr. Trevor Matthews, University of Toronto.

A backgrounder will move shortly giving the history of the SETISAT project, which is a satellite with an automatic frequency scanning system searching for signals from possible intelligent life elsewhere in the universe. A sidebar will move giving a list of SETI projects going back to Project Ozma in the previous century.

We expect a lead will move by 10:45 pacific time, with adds and reaction as warranted throughout the day.

AP LOS ANGELES

0815 ET 17/10/2048

"What do I know about little green men from Alpha Centauri?" I croaked at him.

"If the green men from Alpha Centauri are sending us messages, we'll get it off the wires," Cosburn answered, "but one of the scientists is Trevor Matthews from U. of T. We'll get more science than we need from AP and the *New York Times* service. You corner Matthews, get the local angle—it's a natural for page one—and then you can go down to New Dodger Stadium and find out how Kitigawa's arm is for tomorrow's game. . . . by the way how is his arm? He is rested?"

I was awake, my head still pounding, so I threw off the sheet and pushed two complaining legs over the edge of the bed. "Oh, Kitigawa's fine. Did you say Trevor Matthews?"

"Yeah."

I remembered a tall, skinny kid with

messy black hair and matching black glasses.

"I went to high school with him. Haven't seen him in fifteen years." I told Cosburn.

"Great. Buy him a drink. Talk over old times, but get the story." Cosburn hung up.

I punched a coffee, it was hot, very bitter, with the metallic taste from the room dispenser, then spent ten minutes under a hot, hot shower. I stuffed down sausages, granola, and more coffee and then took a cab to the metallic green offices of the SetiSat Corp. I got there at 9:25.

If the air conditioning was working in the lecture theatre, I didn't notice. The two major U.S. networks, the two cable news services, the European satellite news group and the five satellite syndication services were all ready to go live with a phalanx of tri-deeo cameras and microphones. In the front seats, Reuter, AP, and Internet were ready with satlinked Microwire units. The seats were packed with locals, network correspondents, stringers, reporters and technicians. Others stood along the walls. There were three other sports guys there, Max from the Toronto *Sun*, Joe from *Canadian Press*, and Maria who was covering the news side of the Series for the CBC.

"I've been drafted on the story of the century," said she, Canada's hottest sports scribe.

"Did you get any sleep?" asked Max.

"Not enough," I said.

The newser began late. At 10:47, Denise Howard, she was in her late forties then, walked up to the podium. And she began talking, talking, talking. The high points I still remember.

" . . . routine priority seven scanning picked up what appeared to be an artificial signal from the direction of a G type star about seven hundred light years from Earth in the general direction of the Pleiades star cluster. . . .

By then almost every tri-deeeo set on the planet was tuned into that short, dumpy woman with thinning blonde and grey hair, wearing a Paul original (That's why she was late. She had just bought it that morning on Rodeo Drive). She stopped every two minutes to grab another sip of water. Her voice kept dropping as she looked down at her notes and the sound men kept pushing their mikes closer.

" . . . the signals were what the computer had been programmed to find, an on-off set of binary signals . . . but in what we believed was a obscure high frequency . . . unfortunately, we were unable to establish if there was any pictographic transmission such as that proposed by Frank Drake in 1961. . . . however, whoever these intelligent beings are, they are apparently using a similar system to ours, an eight-bit binary code, which Dr. Matthews will explain is a logical development in the history of computer communications. . . . again the logic of computer communications means the 256 characters of the alien code are quite close to the world standard computer communications code . . . therefore, we expect the top cryptographic computers will take

a first crack at the alphabet/ language quite soon. . . . ''

It ended after a hot hour. My shirt was soaked. The American reporters zeroed in on Denise Howard, the Europeans on Michael Singh. Three guys who missed out on the larger scrums were talking to Trevor Matthews. I sat back, waited ten minutes and then sauntered down the steps and waited as Trevor fielded a couple of questions about cryptanalysis.

''Hiya Treetop,'' I said.

He jumped a bit. Trevor was still tall, a little heavier, but living in L.A. had apparently kept him healthy. His hair was perfect.

''Reid,'' he smiled, ''what are you doing here? Don't tell me you're bored with the Blue Jays?''

''The Jays never bore me,'' I said, ''but this will drive them off the front page, at least for a day. The desk wants the T.O. angle, got time?'' Some of the techs were already packing up.

He led me out a side door, down a hall and up some stairs.

''Why did you give up acting?'' That was the last question I'd thought he'd ask.

I laughed. ''I didn't, I direct a community theater group in the winter—the off season. But sports writing is a steady job. There's always a baseball season.''

Matthew's office was the usual mess of books, journals and piles of various photocopies and computer printouts.

''My main courses were in programming and systems analysis, and I took the Anthropology courses for fun, including one on linguistics. That led to my work with National Research Council and eventually this came up.''

''So who are you supporting, the Jays or the Dodgers?'' I asked.

''I'm going for the Jays and so is Craig, but Terry, he's seven, he's wild for the Dodgers . . . ''

''So, what about the aliens?''

''Well, it doesn't seem to be an attempt to communicate with us, or anyone else out there. I think it's leakage of some kind, a freak broadcast, the kind the scanner was built for, but just what it is I don't know. . . . ''

I downloaded the interview with Trevor from the press box at New Dodger Stadium as the Jays worked out.

The interview with Trevor Matthews was page one in the *Morning Planet* the next day. That afternoon, Nadeau homered in the eighth, drove two men in, and the Jays beat the Dodgers 6-3, to win the World Series. The follow-ups to the satellite discovery were on page two.

The story died after a day or two. After all, the message just wasn't ''Hi there!'' it was a jumble of letters and numbers. Three kinds of people were fascinated by it. The first, of course, were the cryptographers. The second, not surprising when you think about it, where crossword fanatics. The third group were represented by a tall, dark and dreamy Californian who called himself Nimbus the Numerologist. Nimbus got on the tri-deeeo circuit very quickly to interpret the signals. The one thing Nimbus did do was stop the Mid-Century Evangelical Revival in its tracks. Nimbus actually replaced the tri-deeeo preachers in fifteen major markets.

That winter, I covered the usual off-season stories and directed a revival of a Sankar comedy from the year 2005. Trevor Matthews turned up on opening night.

"How's it going?" I asked.

"Lots of information, but we can't figure it out yet." Matthews replied. "By the way, I'm moving back to Toronto, mind if I audition next season?"

"I'll give you the lead if you can tell me the secret of the universe."

"I can't; it's classified."

"Classified? Don't tell me the military is in on this?"

"Yeah, they are, but they didn't classify it, the aliens did, or at least that's the joke around the office."

In September, the Blue Jays were once again in first place in the American League East. They were playing a three game series against the White Sox at Comisky Park, now a carefully restored historic site. The Detroit Tigers were three games behind. The White Sox were hot and lead the AL West by four games. The Jays won the first game 8-5, but the Tigers also won, beating the Yankees 3-2.

There's one problem with a historic park. The second game was rained out. The Jays were staying in a new, luxurious hotel "floating" on Lake Michigan. I was wandering through the lobby when I spotted Trevor Matthews.

"Hiya Treetop," I yelled.

Matthews grinned. "So what ya' doin' in Chicago?" I asked.

"The First International Symposium on the signals from our alien friends. Learned papers on all kinds of interpretations of the various signals wending their way across the galaxy toward us. Care to join us?"

"No thanks, once was enough. Remember, it was you who did my math homework for me half the time."

"I remember. But it was you who coached me so I could make the junior basketball team."

"I do have time for a beer."

The beers led to lunch and afterward I did join Matthews in the meeting hall for the plenary session. I thought I could do one of those "a year later" stories.

Denise Howard was the chairman. A year on the tri-deeeo circuit and the best L.A. coaches had improved her delivery.

"We have established that there is a definite technological civilization on what we now call Digital Radio Source Number Two; Earth, of course, being Source Number One. The digital signal we first received is fairly constant allowing for fluctuations in background noise. We also know that there are none of the expected variations that would result from planetary rotation, and we therefore surmise that the signals come from some sort of satellite or station. There is evidence, however, of various modulated signals, picked up occasionally through heavy background noise, which we conclude are from commercial or other radio and television signals. We are, in fact, attempting to decode those signals in hopes of reconstructing a television picture but there are extreme difficulties in this with the present SETISAT and the backup ground based radio telescope arrays. We will be asking for funds to design and launch a new generation SETISAT that would con-

centrate on decoding all signals from DRS 2. . . . "

"Isn't that Nimbus the Numerologist?" I asked Trevor, pointing to the white cloaked figure in the next row.

"You bet." said Trevor.

"Why's he here?" I asked.

"He's a subscriber to *Setisig*. How else does he get his numbers? Anyway, he and his followers contribute 38.7 percent of our income." Trevor shrugged. "We need him. You should have been at his session. There was a debate over the number of the beast, the evangelicals claiming it was the sign of Revelations, Nimbus came back with a 'channeled' answer, saying it was time for an era of peace and harmony."

Once Howard was finished, she turned over to General Valerie Gillman who worked for the U.S. National Security Agency. I remember the two gold stars on the black designer U.S. Space Force uniform reflecting the TV lights.

"In our view, since we have been unable to crack the alphabet, it is our belief that the signals are in a military code of some sort, with the variable encoding factors first pioneered by the Germans and the British with the Enigma coding system in the Second World War. . . . Some repetition of certain words or phrases have been noted in the earlier working sessions and it is our belief these are code words which identify various command structures and bases. It is highly probable that we are facing a militaristic culture and that they will be receiving our first signals within a century or so. We must take appropriate measures for defence despite the distance, while learning all we can from their communications."

Dr. Francis X. Nguyen, the mathematician, followed.

"I didn't even know he was still around," I whispered. "How old is he anyway?"

"Ninety-five. He came out of retirement once the signals came in."

"The repetition of signals, in my view, is not an indication of any form of military communications. Rather, I believe that this is a major attempt at extraterrestrial communication. It is sort of like a high school textbook in advanced mathematics, with the answers in the back. It may even be a learning program for a computer of some sort with the answers to the mathematical questions stored in the program for later retrieval."

The rest of it was science political and boring, so Trevor and I went back to the bar for another beer. Max joined us. The discussion turned from space to spit balls and Trevor excused himself.

"I better take off myself," I told Max after a second beer. It was then I noticed Trevor had left his copy of the conference working data papers on his chair. I brought them up to my room, took a moment and thumbed through page after page of unintelligible letters, numbers and symbols, then went to bed.

The next morning Trevor had already checked out, so I stuck the papers in my suitcase.

That afternoon, the Jays beat the Sox in both games of the makeup doubleheader. The Tigers lost their game to the Yankees. The Dodgers, however, lost their last games to the Vancouver Namus. So, the Blue Jays met the

Washington Senators who were playing in their first World Series since the team was revived in the international expansion of 2008. The Jays took the series in four games straight. I was feeling pretty good and wrote the stupid story recalling the Yankees of the previous century and their string of victories.

I was still in Washington the day after the series ended, when the U.S. Congress, which had taken the time off during the games, passed the appropriation for the new SETISAT.

Act Two starts on a sleety November Sunday in Toronto. I was taking it easy. It was one of those days when I couldn't bother even reading the paper or turning on the tri-deeeo unit. I thumbed through a couple of plays but that day they couldn't interest me. Then I picked up the thick printed book of computer printouts from that Chicago conference. It was hanging around the apartment gathering dust.

I began to thumb through it, and for some reason I got a little interested. I made a cup of coffee, then skimmed the introduction which noted that the most common eight-bit codes had been converted to their statistical Terran equivilent for ease of decoding. After that there was page after page of letters, numbers and figures, a rambling jumble of matrix printout turned black by the electronic printing process.

Wet snow was sliding down the window. It was one of those dull, grey, depressing days. I was getting very bored looking through the book but I was too lazy to do anything else.

I opened the book to page 345. At the top of the page was the group "QRL]#VE14." I jumped back a few pages and suddenly, on page 312, I noted again "QRL]#VE14." I flipped back to 345, glanced briefly at both and skimmed a few more pages. By then I was really bored. I dropped the book and picked up the Sunday paper.

An hour later, I was stirring some cream of chicken soup, when it hit me. No, it couldn't be, I thought. Then I thought, it couldn't be anything else. I dropped the spoon, went into the living room and picked up the book, opened it to 312, then flipped it to 345, and sat staring at the two pages as the soup burned.

I saved the soup, but it left a brown stain on the bottom of the pot. I wolfed down dinner, pork chops and beans—it was quick and easy.

First thing next morning, I called Trevor's University of Toronto office. I know I had the biggest grin on my face as I heard his phone ring.

"Hiya Treetop," I told him, "I got to talk about those signals from little green men on DRS 2."

"Oh, have you solved the problem?" Trevor chuckled.

"As a matter of fact, I think I have," I told him.

He came over for drinks after dinner Monday night. As I opened the door I saw he had one of those "so show me" expressions on his face. The first thing I did was hand him a twelve-year-old malt on the rocks. "You'll need it, Treetop."

"You see, it was this repetition of QRL]#VE14," I told him. "It happens once every 26 and a half hours, which your colleagues assumed was the rota-

tion of the planet. Dr. Nguyen said it was the answers in the back of the book. General Gillman assumed it was military codes. It's neither." I chuckled and took a sip of the scotch.

"At first I thought it was a box score."

"A box score. Come on. You've got baseball on the brain."

" 'At first,' I said, remember?"

"So what is your solution?"

"But then I figured it couldn't be a box score. Then I saw it."

I picked up the *Planet* and opened it to the Sports section. "Here's the selections and results from Woodbine racetrack. The selections are for today's race, in order of the handicapper's choice. The other column is yesterday's race."

I had the *Setisig* book open and waiting.

"Now look at this column here, then a list of figures, on page 312. That's the handicap. Now, on page 345, here's the results of the race on 312. The next day's race is on 451 with the results on 503."

"You're telling me this is DRS 2's sports wire."

"You betcha." I laughed.

Trevor sat down. "Oh boy. This is too much."

"There's more."

"What?"

"What if it's a betting wire?"

"A what?"

"A betting wire. To get information to the bookies. All the other DRS 2 signals are muddled. This is a set on a weird frequency, one that no one else uses. I'll bet that this is the alien equivalent of a bookie wire. That depends on one thing, of course."

"And that is?"

"If the powers that be on DRS 2 are as stupid as they are here in North America and have outlawed bookies."

"So how do we find out."

"If they're stupid? Ask them."

"No, if this is a racing wire?"

"Well, I can call in an expert."

"An expert?"

"My bookie."

Trevor gulped his scotch.

Now, let me explain. Benny Smith isn't exactly *my* bookie. I actually met him when I directed *Guys and Dolls* in '41. His daughter was one of the Dolls. In fact, I wish he'd turned up before opening night, I would have cast him right there. A roly-poly guy wearing a flashy tunic and a couple of diamond rings. Benny claims his great grandfather ran the book for Rocco Perri, Canada's King of the Bootleggers back in Prohibition. You know, Damon Runyon based his horseplayer "Regret" on a real character who was a mathematical genius with a talent for handicapping. Just like Benny, except Benny, of course, is helped by his own A.I. XVII computer.

"Whatcha mean it's a bookie wire?" Benny asked me. "I mean all these signals have done is increase the market for science fiction and numberologists. It's been on the back pages for months. Nobody cares. Those aliens ain't nothing but a bunch of hackers."

"Yeah, just like you."

So a day later, I brought Benny to Matthew's office.

"Meet Benny," I said.

"Hi. Just Benny?" Matthews asked.

"Yup," said Benny.

"Benny is a consultant. . . . for a group of businessmen," I explained. "The software he wrote is useful in predicting . . . uhm . . . certain trends."

We went over the latest download figures, then Benny took a silvery compadisk and loaded it into the desktop. Trevor downloaded all the "QRL]#VE14" lists in the database.

"The way I figure it," I told Trevor. "You gotta know what you're lookin' for. Everyone thought it would be a Drake pictograph or the secret of pi or a military code or a message from God. That's why it hasn't worked. Up 'til now."

"First we assume that the second list is in order of finish," Benny began, "then we have to figure out if the first list is in order of post position or handicapper's choice. If it is handicapping and their . . . ah . . . guys are any good, there should be a statistical correlation between the two lists.

Three hours later Benny announced the first list did appear to be in order of handicapper's choice.

"Now," he said. "This letter "I" appears in the middle of every one of this third set of figures. I'll bet you—and I don't do that very often—that it's not "I" but an oblique stroke, and those other figures are the odds."

We downloaded more "race results."

"Well?" I asked.

"You could be right, Dougie, allowing that we don't have all the figures decoded and we couldn't figure out what exactly the odds were but I'd wouldn't be worried too much about betting on R-T-E-B-S-F to show at the next time he, she or it races at Querl-ugh-vee-ee-eye-four."

"Keep this under your hat, won't you, Benny?" I asked.

"Sure, kid. You think I wanta look crazy?"

Three days later, the latest recording of signals from DRS 2 was downloaded to Toronto. Matthews hadn't sounded this excited since he scored the winning point in a junior basketball.

"Rtibisif came in second."

"Now what?" I asked.

"We ask for time on the A.I. XXXIII at the National Research Council. Can you get Benny and come to Ottawa?"

I called Benny.

"And I didn't have a bet down," he snorted.

I found later that Benny then called his business associate, who was the central lay-off man for bookies in Ontario. "You mean all this stuff is a bet wire?" his boss asked. "Yup," Benny said. The business associate called his boss. Benny got the OK.

"OK Dougie, I'll come to Ottawa," he laughed.

Within a week, (we found out later) small scientific consulting firms were founded in Toronto, New York, Chicago, Los Angeles, Las Vegas and London, England. They began subscribing to the scientific papers and data provided by SETISAT and the group's newsletter *SetiSig*.

Our time on the AI unit was booked at night, after most of the other work was done.

"OK," Benny said as he swigged a can of beer, "we tell this lunkhead (he meant the AI) to take my software and then assume that DRS 2 is a bets wire." He took a gulp, then pushed the compadisk into its slot. Trevor tapped in a last instruction.

"Now what?" I asked.

"We wait." Trevor said.

Benny took out some cards. "Care for a game," he asked.

"Yeah." Trevor said. "Five cent limit."

"Five cents." Benny snorted. "Ah, it's gonna be a long night. Why not?"

"What time is it?" Trevor asked a while later.

I glanced at the console. "Four-twenty thirty-one."

"Another game?" Benny asked.

"You're already two hundred dollars ahead." Trevor had lost most of it.

The computer beeped. The high speed printer began to burp out floods of paper.

Trevor was already grabbing sheet after sheet.

"It's done it. It's done it. It's identified numbers!"

Benny picked one up. "Man, will you look at this. Watzamanker won at forty to three. Now, how do they get those odds and . . . "

"They have six fingers," Trevor announced.

"Why?" I asked.

"It's a duodecimal system. Base 12."

"So now what happens?"

"We know which signals in that alien bit code are numbers, now we go for the vowels."

"So," Benny said. "We go lookin' for the letter "E" but how do we know they pronounce something 'eee.' "

"We don't, but we will program the AI to recognize the most used letter as "E," Trevor replied.

On the way back to the hotel, Trevor went to a bank machine and cleared his marker with Benny.

"No poker tonight. All business," Trevor announced as the security guard ushered us into the room.

By that morning we had an alphabet of thirty letters.

A week later we had "translated" almost of all of the signals from DRS 2. Benny and I had to go back to Toronto and we left Trevor to complete the work.

I briefed my boss at the *Planet*.

"You mean we wait a century for contact from aliens from outer space and all they say is, 'Place your bets, ladies and gentlemen?' "

"Yup," was all I said.

Meanwhile, Benny was meeting with a gentlemen with considerable influence, who I'll call Frank. Now Frank was very interested in the signals from DRS 2 and instructed Benny to keep him personally informed.

A week later, we had more printouts spread out over Trevor's dining room table.

"This one's a low-scoring game. Let's call it Star Hockey," I suggested.

"It's this one I like," Benny said, rubbing his rather large hands together. "It's high scoring, with boxscores, and

a probability table. And I'll lay you five to one, this column is the point spread. Our little green men seem to have combined both baseball and football."

"So," Trevor said. "I've already sent in my application and abstract to the next international conference. Everyone's quite excited. It's quite a scientific breakthrough."

"And I'll get to break the story, the moment you start speaking," I laughed. "What about you, Benny?"

"Well guys, figure it out. It's perfect. We get raw data from outer space on games nobody knows nothing about. It's a game no one can rig—at least no one on Earth. But we can take bets on it. And we're gonna."

"What?" Trevor's face fell about a meter.

"Whatcha expect, kid?" said Benny.

"That there would be lots of discussion in the journals and then, perhaps, I could host a popular public tri-deeeo series."

"Well, you might, kid, but my business associates are already subscribing to the *Setisig* services."

"You mean . . . "

"Kid. The day after you give your paper there'll be a Vegas book on this game called "Oporlorgtook."

The next conference on the signals was in early March in New York. I wasn't in Dunedin for the Jays's spring training. I was in Toronto putting together a special edition. That day, at Dunedin, the Blue Jays won their first grapefruit league game, 3-0 over a split squad from the Baltimore Orioles.

Trevor Matthews began to read the official paper, *DRS 2 Signals as a Wagering System, A Statistical Interpretation,* (by Trevor Matthews, Douglas Reid and Benjamin Smith) at 10 A.M. At that moment, a *Morning Planet* extra rolled off the presses in Toronto headlined SETISIG IS STAR'S SPORTS SHEET, copyright 2050. The issue sold out in an hour. Internet had so many retrievals on its service in one fifteen minute period that the home mainframe crashed and the backup went crazy. The stockmarket also went batty, the Dow Jones went down thirty points, the Tokyo exchange was up fifty.

At noon—not a day later as Benny had thought—the Nevada and London bookmakers announced that they would begin taking bets on DRS 2 races in thirty days.

I won the National Newspaper Award and a special Pulitzer. . . .

"You mean they're giving the Nobel Prize for Economics to a sportswriter!" Francis Xavier Nguyen complained to Denise Howard. "And a bookie."

"Well, it's the only thing that fits, since cryptography is a branch of mathematics and wagering is a form of economics. There was a debate over physics or economics. Economics won or lost, depending on your point of view."

"Why physics?"

"The signals came from outer space, right?"

"Oh."

"What I'm wondering is, will the bookie, 'Benjamin Smith,' show up?"

Benny Smith did show up at the Nobel ceremony, with his daughter, who looked gorgeous. (His name really is Smith). And his speech. Funny.

"I want to thank the Nobel Commit-

tee not only on behalf of my colleagues but because through me you honor all those mathematicians who have calculated the odds ever since some Assyrian chariot racers decided to wager a little gold on the outcome. . . . ''

Afterward, Benny, he set up his own tipsheet, financed by the Nobel's cash prize and the even larger bonus he received from his business associates. The subscriptions alone made him a millionaire.

I quit the *Morning Planet* and began my own syndicated column, reporting on sports from DRS 2.

Trevor Matthews was named full professor and appointed to a new chair of Extraterrestrial Studies at the University of Toronto. Students still flock in from around the world.

The SETI SAT group set up a subsidiary group, SETISIG Sports Services, with offices in Los Angeles, Las Vegas, Atlantic City, New York, Toronto, Nassau, London and Melbourne. Subscriptions paid the entire cost of a new scanner satellite.

The two major U.S. networks, the five satellite nets and the Canadian Broadcasting Corporation announced they would form a consortium to design, build and launch their own satellite that would attempt to detect sports broadcasts from DRS 2 so they could be watched by fans back on Earth.

It was the Brits who went nuts over it. After all, they can bet legally. In London, a chap walked into his corner betting shop and asked to put down a wager on ''DaRass,'' just as a tri-deeo crew was there to record it. The name stuck.

After a year, business for the British bookies went up 534 percent. As you know, our bookies don't publish their business figures . . .

And Nimbus? He's still in business. In fact, he's better at picking winners than he was at numerology. He's Bennie's number one competition and he's still got his core of followers, two dollars a day for a tip sheet.

So I was wrong about the Blue Jays. No dynasty this time. They went into a midseason slump and finished six games out of first place. The Milwaukee Brewers defeated the Mexico City Eagles to win the World Series four games to two.

Asteroid Alpha won the Kentucky Derby and the Preakness but came fourth in the Belmont.

I was better on my DaRass picks.

In the ''Ceodghorshat,'' the long shot ''Redhsaeq'' beat ''Fotnaschka'' by an ''umbr'' (a nose?). Redhsaeq paid ($) 230 and Fotnaschka ($) 13.

Then, ''Redhsaeq,'' who was still listed as a 50 to 4 underdog, won the ''Kiloertv'' by 55 ''wortamu.'' The sentimental small long shot bettors cleaned up.

Now in ''UortoA . . . ''

The ''Yoeertsha'' went all nine games. ''Gorasjidor'' came from behind in the last 5 (?) minutes (?) when ''Casgfhwyusnbhksow'' scored 31 ''uras'' to beat ''Tolsoursn'' 1,234 to 1,203.

Here's what I said in my last column. . . .

The box score from the Yoeertsha shows that Casgfhwyusnbhksow

has great potential. He had a 543 RFC and a 219 Azy with an average ura per game of 174. I hope for the day when we will all see Casgfhwyusnbhksow romp across those far off playing fields. In the meantime, as they're saying (or were saying seven hundred years ago) on DaRass, the same as they're saying here in Toronto, "Wait till next year."

I just wish I knew what the hell they're playing up there. ■

ON GAMING

(Continued from page 73)

onry: mass drive cannons, infantry weapons fire, missiles, anti-personnel lasers, and more. The templates are lowered until they hit still-untouched armor. As the armor is blown away the ships vital internal systems, such as shields and gravity drive, are destroyed.

And despite the complexity of the rules, the system is well-explained and plays smoothly.

But the design team of Jordan Weisman and Sam Lewis have also taken the opportunity to expand the world of Renegade Legions. A booklet is included, called "Legions," that gives background on the make-up of the Terran Overlord Government (TOG) and the Renegades fighting forces.

Both follow the format of the Roman Legion, with each legion consisting of ten cohorts, broken down to assigned tasks such as engineering, military police, and combat.

There are also pages describing some of the alien allies of the TOG and the renegades. The Ssora are dinosaur-like aliens, allied to the TOG, who favor a strong, centralized government. The Renegades are assisted by six-legged Kessriths who are described as having, "the appearance of an alligator, the demeanor of a rhinoceros (though I'm not sure just what *that* might be) and a highly advanced intelligence . . ." The Baufrin, also part of the Renegades's Commonwealth, are insectoid creatures who are also very family-oriented. Their sex drive is dormant except when they molt. . . . and then their carapace becomes iridescent red.

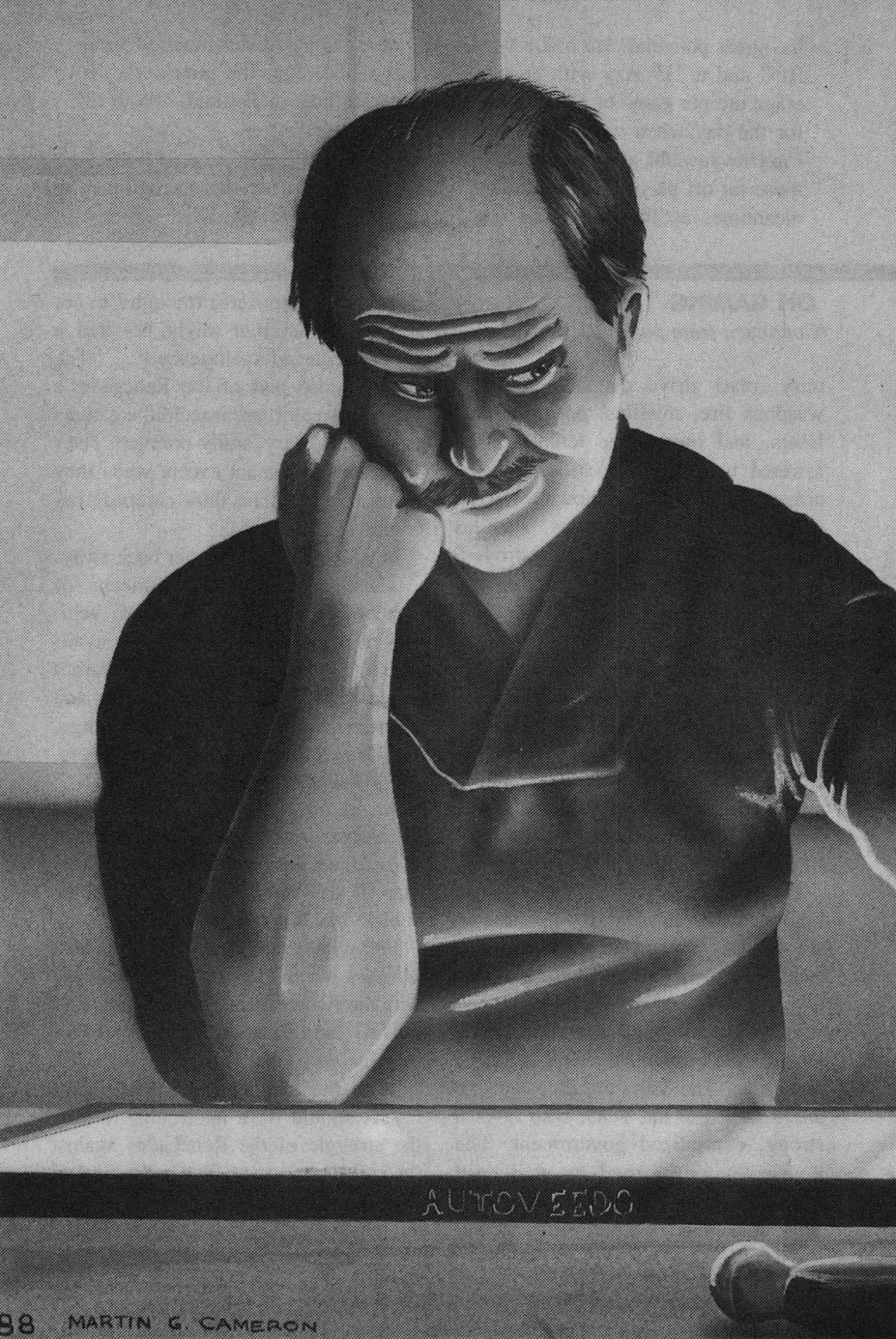
In which case, you better back away.

There are, of course, dozens of sketches of Renegade and TOG vehicles, and miniatures will also be available. The game comes with two large-hexed terrain maps, and markers and counters for shell holes, buildings, shrubbery, infantry, smoke counters, and missiles.

As in *Interceptor*, the Grav Tanks themselves fold into small boxes, which makes them easy to handle on the large map. It also helps determine where the vehicle has been hit.

FASA has already released *The Golden Medusa*, an adventure packet for use with the fighter game, *Interceptor*. And a TOG Ship Recognition Manual will be released soon.

With the careful groundwork here, FASA should have no trouble turning the struggle of the Renegades against the evil Emp . . . er, TOG . . . into an exciting series of state-of-the-art games. ■

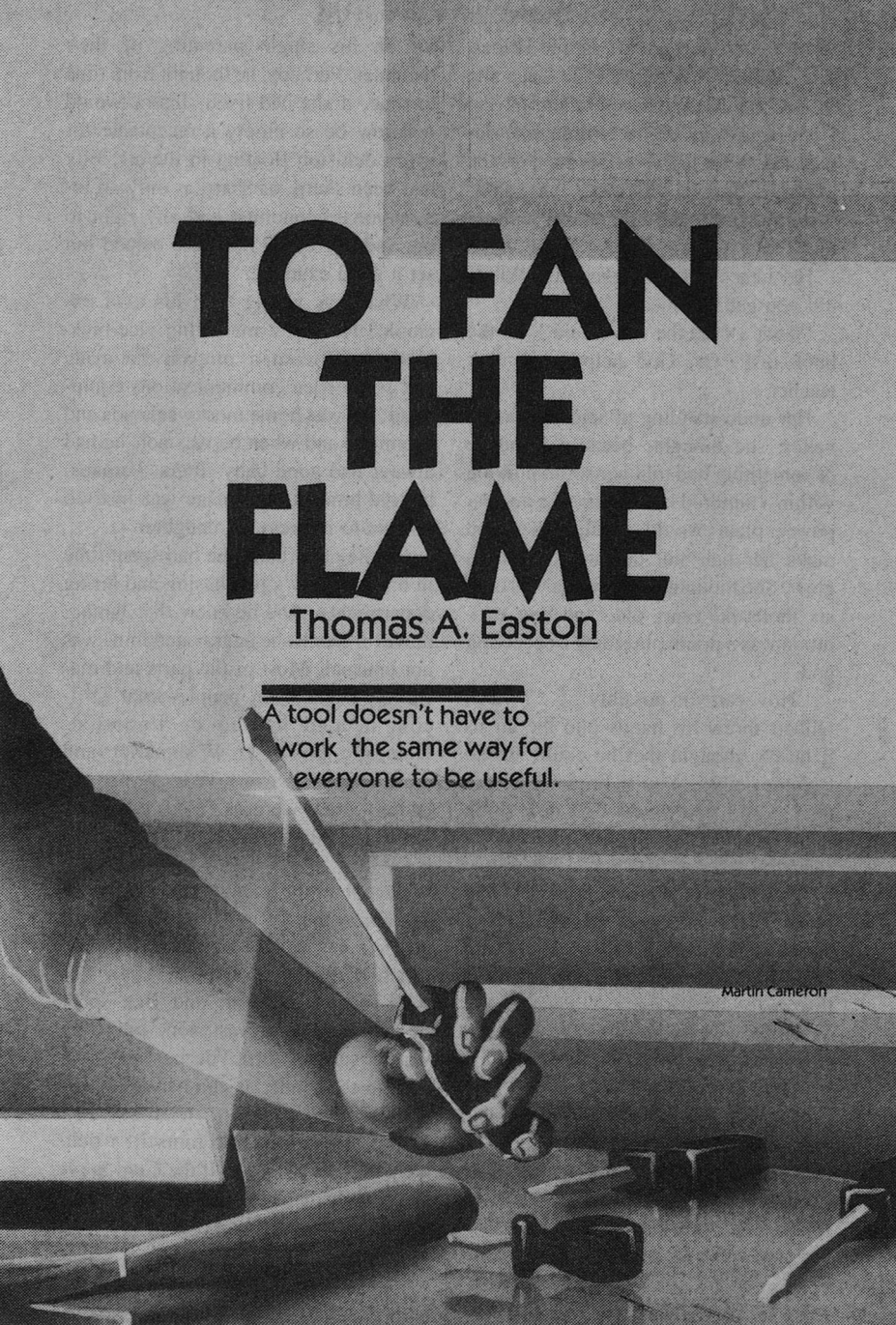


98 MARTIN G. CAMERON

TO FAN THE FLAME

Thomas A. Easton

A tool doesn't have to work the same way for everyone to be useful.



Martin Cameron

"It never happened," Janine Hilbert said, shaking her dark head. Once she meant the Nazi extermination of the *Untermenschen*. Another time, she denied that men had ever set foot on the moon. "Special effects," she said. "Studio shots, and animation, and actors."

Her father was flabbergasted. "Where did you get that idea?"

"That's what the veedo said." Or the book disk. Or, God help us all, her teacher.

Her understanding of science was no better: she thought, because someone or something had told her so, that living within a hundred kilometers of a nuclear power plant would sterilize her and make her hair fall out and her bones glow. She thought the universe was only six thousand years old, and that evolution was a prank played by a deceiving god.

"How can you possibly . . . ?" Ben Hilbert threw his hands into the air as if he too thought that he could appeal to some deity. "You're bright. You can read. Can't you *think?* The next thing I know you'll be saying Nixon was a saint!"

"Oh?" Her jaw moved around a wad of gum. Ben tried not to react to that as well. She was, in many ways, too typical a teenager. "What book disk is that on?"

He threw his hands into the air again. "I would not tell you if I knew!"

Ben Hilbert was not sure that Janine remembered her mother. Elly had died in a plane crash when the girl was only two, and he still missed her, for herself, for himself, for what he knew was missing in his single parenting of their daughter. Perhaps, he thought from time to time, if she had lived, Janine would not now be so empty a receptacle for every delusion floating in the air. Elly had been sharp, as sharp as only an international economist had any right to be, and she could not have helped but set a good example.

What was wrong with his own example? He was a marketing vice-president for Officom, a company that made and sold office communications equipment. He was home most weekends and evenings, and when he was not, he had always had good baby-sitters. Perhaps, he told himself, his image was just too prosaic to impress his daughter.

On the other hand, he had spent time in his company's purchasing and hiring departments. And he knew that Janine, however much she aggravated him, was not unusual. Most of the parts and machinery—and even people—that Officom needed had to be imported. Domestic goods grew shoddier and more expensive every year. As for the people—they were as filled with nonsense as Janine. Most were useless.

Except in the muggy summers, Ben was happy that Officom had set its headquarters in the District of Columbia. Much of the company's business was with the government, and Ben spent many hours in the vast stone piles that yearly sank a little deeper into the swamp that underlay the nation's capital.

Those hours, he told himself, would have been many fewer if the Civil Service only had the sense to hire abroad, too, like most major corporations. He

had hoped to get the go-ahead today on the GSA modem contract, but . . .

"Mr. Hilbert," said the slender man before him. He was young, despite the evidence of the bald spot over which he ran a nervous hand. "You do realize that we specify domestic sourcing, except in cases where there *is* no domestic source?"

He nodded. He had dealt with Robert Dorking before. He was a GSA purchasing agent who had never given Ben the least hint that he was not content with the thick book of regulations the bureaucracy provided for him.

"You do realize that there are dozens of domestic modem sources? And that we have bids from those sources?" He paused to let this ominous news sink in. "Perhaps you can tell me why we should take your bid seriously? When even the paint on your product is imported?"

Ben Hilbert nodded again. "You know," he said. "And I know, that most of those 'domestic' modems are frauds. They may have domestic paint and domestic labels. They may even have domestic cases. But their chips and circuit boards are just as foreign as mine. The two brands that are made here do not work."

Dorking leaned back in his padded chair. "But the labels . . ."

And you believe what you are told, Ben thought. Aloud, he said, "We've gone round on this before, but I'll say it again." Briefly, he stroked the air as if he were soothing a nervous animal. "There *is* no truly domestic source for the price and quality we are offering."

Dorking shook his head. "Price is not the object. We should support . . ."

"It should be," Ben interrupted. "So should quality, if you really want the IRS to get its money and the DOD and CIA to know what is going on in distant places." He did not add that if Dorking went with another bidder, Officom would appeal. The company had done it before, and won. Appeals officers seemed more flexible and realistic. Perhaps they understood what might happen if the government really had to rely on American goods. Or, worse, what would happen if Officom went to the papers.

As he had in the past, Dorking nodded grudgingly. "We've got to give you credit for honesty," he said. He sighed, hinting that perhaps, after all, he did feel some frustration when regulations and reality conflicted. "And you are the low bidder. You'll get the contract."

"C'mon, Janine! They're waiting for us!"

"We're going to the track, Daddy!"

Ben Hilbert lived in a Virginia suburb, where the streets were lined with shade trees, sprinklers kept wide lawns green in summer, and every backyard had its pool. Now the leaves—oak, hickory, chestnut, tulip poplar—were turning, and the red brick of his house sat warm amidst a sea of color. The roses that climbed the trellis beside the front stoop were white, as was the woodwork that edged the roof and windows. The shrubbery was yew and laurel and lignum vitae.

The nearby houses differed only in the colors of their trim and the placement of their shrubs, but Ben never noticed. More to the point was the houses' contents: On the right, three houses down, lived the two teenagers who had

screamed for Janine. He presumed that there were parents, too, but he had never met them. The children dominated that household, as Janine did his, and when they all left together, roaring in an antique Corvette down the leafy streets to lay their money on the horses, the quiet was, for a time, hard to accept as real.

"Hello, Ben." A tall man in a worn brown cardigan stepped carefully through the bushes that separated Ben's yard from that on the left. He had a beer in each hand. "Sometimes I think the whole city must be quieter than a single adolescent."

"You've never had one, Walter. But I am glad I'm not at the track." Ben slipped the pruning shears he had been using on the roses into a hip pocket. He accepted the bottle the other offered, raising it in a silent toast. Walter Meader had been in his house when the Hilberts had moved into the neighborhood, and he had been a friend ever since. An artist who ran a gallery in Washington, he had no technical mind, but Ben sometimes thought that only improved the quality of their friendship. They *couldn't* talk shop with each other and were thereby forced to diversify their interests.

"This year's fad sport. You look annoyed."

Ben snorted. "People believe what they are told too damned easily." He told Walter about his daughter's gullibility, and then about bureaucrats who wanted bidders to lie about their sourcing. "I wish I knew why." He shook his head like an old bull bedeviled by a horde of flies, or of wolves.

"We used to be hot."

"I know."

"So did the Japanese. And now look at them. They're being shoved aside by hungry up-and-comers. Korea's on top now. But China's coming, and Manchuria, and Vietnam."

Ben nodded and tipped the beer back. "I have some more inside."

Walter followed him in the side door to the kitchen. "We were hungry, too, right after the Second World War." Ben thought of the history he had studied, of the deprivations of the Depression years and of wartime shortages, and nodded again as he passed his friend a beer. "When peace came, there was a lot of pent-up demand, and the energy, the sheer optimism, the saved-up war pay, to go for it. There was plenty of motivation, and it showed. We got everything we could ever dream of wanting. Even the moon."

"Maybe that was the problem." Ben paused. "We relaxed, and we taught our kids to relax. So they never had to push. They never learned to study, or to work. And test scores fell, of course. Why didn't we see it happening?"

Walter shrugged. "We did. But we blamed everything else. It was not fashionable to blame the kids, or their parents. The experts preferred to point their fingers at crime rates, TV, drugs, welfare statistics, the divorce rate. The educators decided we were asking kids to do things that were too hard and started dumbing down the readings, simplifying the math and history, dropping languages, editing out sexism and racism and . . ."

Ben snorted. "They should have been looking for ways to get folks hungry again."

"Take away the veedos. Tax us into the poorhouse. Make us hump for our

goodies. Or hand us another depression."

"That wouldn't have made them very popular."

"They would have lost their pulpits."

Ben reached into the fridge for the other pair of beers he had promised. Then he led the way outside again. "Be nice if there was another way."

"Time will do it. First us, then Japan, now Korea, next Manchuria. Eventually we'll see the rest of the world rolling in goodies and feel deprived once more. *Then* we'll get our asses in gear again."

Ben shook his head. He did not think that any nation's prosperity should be built on some driving sense of inferiority. Granted, such a sense could make a very effective motivator. It had, in fact, been responsible for much of history's upward spiral of progress. But was endless progress really the point? Could it not be possible to reach some level of technology or wealth that let people say, "Enough"?

He said as much to his friend, who paused to sip his beer before adding in a quiet voice, "You'd still have to have that hunger for learning. Without it, you lose the skilled technicians you need to maintain your 'enough,' and then, Poof! Decline."

"And government can't do much, can it? It can't make people hungry for learning when they think school should be made as easy as possible."

"The real problem," said Walter, "may be that people have abdicated the responsibility to think for themselves, to understand whatever lands in front of them, to take charge of their own learning. I see it every day at the gallery. People come in and look at a painting. Then they shake their heads and say, 'I don't get it. The artist must be a genius. At least, he's a lot smarter than I am.' "

"The artists love it, don't they? And poets, songwriters . . ."

Walter, nodding, stopped the motion abruptly. "Yeah . . . But, y'know, that's partly because there *is* someone there. An artist or poet, someone whose perceptiveness and sensitivity are proven just by being in the gallery or magazine." He laughed. "But what if you took the artist out of the picture? Hang a veedo screen on the wall, with a graphics computer generating random images, like flames in a fireplace. Let people see whatever they can, without being told what to think, and maybe they could start thinking for themselves."

"In a small way, anyway." Ben sounded skeptical.

Walter shrugged as if to say that his idea was small indeed. "From little acorns . . ."

Usually, Ben put his conversations with Walter promptly out of mind. They had nothing to do with his life, except for that valued niche his friend happened to occupy. But this time, he could not forget. The automated veedo came back on the way to the office the next morning, and then again when he was supposed to be working on a proposal. Finally, he gave up trying to block the idea out of his consciousness. He got a Styrofoam cup of coffee from the coffee maker in the corner and let his mind go where it wished.

That veedo, he thought, would be a

far cry from actually creating art. But if it really helped enough people learn to take responsibility for their own thinking and perception, even in such a small way, it might indeed help the nation. It probably would not make anyone hungry for learning. It might make them itch to *do* something on their own.

Perhaps more to the point, it might help combat the helpless attitude of many to technology. Someone had once said that high enough technology is indistinguishable from magic. But that, he thought, was true only if you did not believe you had the ability—and perhaps, he wondered, the responsibility? —to understand it. More people might believe in their own ability if they grew used to seeing things, even small things, on their own. And that, in turn, might make them more receptive to education. The responsibility to understand, he supposed, was another matter, and a harder one. Even people who had the ability, and knew it, often seemed reluctant actually to use that ability. It was hard work, after all, and if you really understood what was going on, you were at constant loggerheads with those who did not. So the hell with it.

Yes, the hell with it, he told himself. But Officom makes and sells electronic equipment, and we have a helluva designer down the hall. He sighed as he crumpled the empty plastic cup. He was, after all, a marketer. And Sam Gaul's office *was* just down the hall.

A workbench stood where any other office had a desk. The wall above it was occupied by a pegboard. The tools and blister-packs of small parts that should have hung from the pegboard's pegs were strewn across the bench, as were disassembled phones, modems, and fax machines, spare circuit boards and chips, and scraps of wire. Sam Gaul sat at a smaller table from which the kipple had been banned. It held a computer workstation and nothing else.

Sam's round face, fringed by a reddish beard touched by grey, turned up as Ben leaned in the doorway. "Hey," he said. His voice bore more than a touch of the Scotland that had borne him. "Tell me that some customer hasn't changed his mind."

Ben shook his head. "Don't tell *me* you're overworked." He gestured at what Sam had been sketching on the computer screen; it seemed to be a hot-air balloon the size of a small city. He could just make out a helicopter sitting on a broad flange around its base.

"Ah, hobbies. It's an aerostat." He saved the image and blanked the screen. "But what have you got for me today?"

"Maybe nothing." Ben described the automated veedo his friend had suggested and was delighted when Sam keyed his computer for a fresh design file. "A flat screen," he said as he typed. "A hardwired program built into the frame. A loop on the back so you can hang it on the wall. It's easy!" His thick fingers banged the keyboard while Ben watched. A name for the device —AUTOVEEDO—appeared on the screen, a description, a sketch, and the command that sent a copy of the file to the office of the company's lawyers. "I will build it," he said. "They will patent it. *You* will sell the thing. The conjugation of invention."

"And now you can tell me," he added, "where the hell you got the

idea.'' When Ben explained, he said, ''It might even work. We'll have to see about feedback.''

Bleary faces were turned all in the same direction. Beery voices rattled down the length of the polished bar:

''Look't them tits!''

''The hell you say! That's an elephant's ass.''

''Not any more. That bit's turning into a mushroom cloud.''

''I wanta see the game.''

''Shaddap and lookit that.''

''Helluva fart!''

''I wanta see the game!''

A name, ''Bonnie Dilton,'' was readable on an envelope on a flat surface in the foreground. The young woman to whom the name seemed to belong sat in a straightbacked chair, staring alternately at the bookdisk in her hand and at her unseen watcher. The room behind her bore all the earmarks of a college dormitory cell.

She sighed, clearly bored by whatever textbook she was studying. But then her eyes opened wide and her posture stiffened. She read aloud: ''In the middle of the last century, America was renowned for the intensity of its creative energy in business, science, and art.''

She looked, her forehead wrinkling, her eyes narrowing. Then she murmured, ''So what happened? So . . .''

A man, considerably older than Bonnie Dilton, muttered at the can opener in his hand. ''Goddamn, cheapjack, shoddy, *busted* shit!'' He shook it. It rattled. ''Didn't last a month! Buy American, like hell!''

He looked up, staring directly at his invisible observer for a moment. He turned and left the room. When he returned, he had a screwdriver in his hand.

A voice came from another room: ''What are you doing, Jack?''

''I am going to take this sucker apart.'' Even as he answered, he knelt on the floor. He found the screws that held the device's case together and began to turn them.

''You've never done that before.''

''Then it's about time, isn't it?'' As he lifted the case off the can opener, a small screw rolled onto the floor before him. He picked it up, shook the broken appliance again, and was rewarded when a small, flat piece of metal with a hole in one end fell out as well. ''Aahh,'' he said. Within moments he had found where the loose parts belonged and reassembled the can opener. ''That wasn't even hard.''

Ben Hilbert watched as Sam Gaul punched for replay after replay. ''They love it in the bars. The Dilton kid has just had the first real insight in her life, and God knows where it'll take her. That fellow just discovered he can think. In just a small way, maybe, but that's all we hoped for, and it's a start.''

''How did—?''

The red-grey fringe around Sam's face quivered as he laughed. ''We put in a minicam, a mike, and a transponder-recorder. When we query it, it bleeps back whatever it's recorded.''

''What did the lawyers say?'' Ben had an uncomfortable feeling that the ''feedback'' Sam had provided could mean trouble.

''Didn't ask them. I figured the pro-

duction models won't be bugged, and we could get away with murder on these freebies we're giving away." He punched one more retrieval code. "Mostly it's empty rooms and vacant minds. But look at this one."

A teenager stared back at them. He was watching an Autoveedo, not Ben, but the illusion was perfect. To one side, an arm faded into unfocused fuzz. The picture jiggled as if the boy were trying to adjust the picture he saw. He muttered, "Goddamn. Why didn't they give it a freeze button? I wanta *keep* some of this stuff."

"That's Peter McLeod," said Ben. "His family lives not far from me, and I gave one to his father just yesterday. Do you think we should add a way to stop the picture?"

"It's doing just what you wanted as it is." Sam shook his head. "Watch . . ."

The boy turned his back and walked away from the camera. The watchers could see a desk across the room. A personal computer waited atop it. Peter McLeod sat down, turned the machine on, and began to type. "A graphics program," said Sam.

Images began to form on the screen, but without the random dance of the Officom product. The boy swore again, slammed the heel of a hand on the corner of his desk, and tried again. Sam chuckled. "He will get the idea eventually. As long as he keeps trying."

"It's a hit. They gave Sam and me raises. But it was really your idea, and . . ." Ben shrugged. He hefted the cardboard box in his arms. "I have a dozen of them here. It's all I could do. Sell them, or give them away."

Walter Meader laughed. "I'll hang them on the walls," he said. "Maybe they'll work here as well as in a bar. Certainly, they should impress the ignorant at least as well as those." He gestured at the prints and watercolors that covered the walls of his gallery.

When Walter took the box, Ben stepped closer to what seemed to be a landscape, although the hills bore a distinct resemblance to mounds of raw hamburger. "I see what you mean. . . . But, it's being carried by the chain department stores, and selling steadily. It might not—"

"It might not fit the image?" Walter set the box on a glass-topped display stand containing several abstract plaques. "If anyone sneers, I will simply look susperior and let them think that I too am a genius."

When Ben left the gallery, he did not return to the office. It was not yet quitting time, but if he left the city now, he could get home not long after his daughter. And there were two more Autoveedos in their cartons on the seat beside him. One he planned for the wall of his living room. The other he wanted to give to Janine. Perhaps, he thought—he hoped—it would work on her as it had on Bonnie Dilton and Jack and Peter McLeod. If it did not . . . At least, it was attractive. He was sure she would give it wallspace. And then—it *was* a piece of his work, and through it she might gain a hint of the example he craved to set.

Traffic was light, and he actually made it home before his daughter. He

had removed the Cezanne print from the wall over the disk rack in the living room and was hanging an Autoveedo from the hook when she came in.

Her initial reaction was everything he had wished: "Oh, Daddy! It's just what we needed. Everybody has one! Turn it on!"

He obeyed, but even as the screen glowed to life, Janine spotted the second carton on the coffee table. "Another one?"

"I brought it just for you."

"Thank you!" Her arms went around his neck, and her lips were warm on his cheek. His hopes rose, and he asked himself if she had already seen one, and found it stimulating.

Unfortunately, Janine showed little tendency over the next few days to spend less time before the veedo set or cavorting with her friends. Certainly, she showed no tendency at all to spend more time with books, either from school or from her father's library.

Yet she was watching the Autoveedo. It glimmered on the wall of her room when Ben walked by the half-open door, and he had seen it jutting from her purse on the way to school and play.

He did not understand until weeks later, when he saw Janine and three friends sitting in a circle on the lawn. He had met the friends before; he knew them as Tony, Mikal, and Mair. Tony was the blonde, his thin face spattered with freckles. Mikal was short and stocky. Mair was as dark as Janine, though taller and thinner. All four now sat with their legs crossed, in the style of tailors or Hindu mystics, and their heads bowed. In the center of their circle lay the Autoveedo.

He was going to speak to them, to ask them what was going on, when Walter Meader laid a hand upon his arm from behind. Ben jumped. "I didn't know you were there," he said.

Walter smiled sadly and gestured toward the circle. "I've seen this in the gallery, too. Our gadget does indeed stimulate some people. But others it bemuses. They say it helps them meditate."

"Have you taken them down?"

Walter shook his head. "Why? They do what we wanted, with some people. As for the rest? Maybe some just are not born to think."

"But . . ." Ben's mouth hung open. What about his daughter? Would even Elly have been helpless? Or was there some other way to reach her? "The principle is sound, isn't it? It's just *this* gadget. It distracts them. We need another . . ." His voice trailed off.

Walter touched him again. He shrugged. "We might publish bookdisks sprinkled with illegible words to encourage interpolation, but they do not read. Your company might make keyboards and number pads whose letters and numbers easily wear off, to encourage memory. But someone would market stickers."

Ben thought of Jack, whom the Autoveedo had stimulated to repair a can opener. "What about appliances and tools with repair kits? With instructions? Or no instructions, but drawings of the insides?"

Walter nodded. "That might help. It would urge people just a bit at a time toward thinking for themselves. The

effect would be subliminal and incremental. It would work like the Autoveedo, by making people itch in such a way that they must do their own scratching. But what do they do now, when something breaks?"

"They throw it out."

"And some of them—heck, most of them—always will. They'd rather have someone else do their thinking for them."

Ben Hilbert slumped, and he turned away from the circle on the ground. "Which is how we got into the problem in the first place."

Walter squeezed his shoulder. "Come on over to the house. I have some beer, and remember, the thing does work on some people. Give it time."

Janine and her friends had fallen silent when they heard her father approaching. Now, as the two men left the yard, Janine murmured, "Blue in quadrant three."

Tony added, "Pink in two."

"Intruding black."

"Yellow bar."

As they spoke, a few of the figures they mentioned passed across the Autoveedo screen. "What are you and Tony trying to do?" asked Mair.

Janine shrugged. She wasn't sure. "Prediction?"

"Practice helps," added Tony. "It comes slow, you know? But I know we can do it." He paused, holding one index finger over the Autoveedo screen, and said, "A green spot, right there!" He pointed, and in a second, indeed, a green spot appeared an inch away.

Mikal wondered aloud, "Can you call the shots with anything else?"

"I've been thinking of the track," admitted Tony.

"But not yet," said Mair. "You need more hits. And closer ones." Her expression was skeptical, as if she thought that the Autoveedo might be stimulating their thought processes in an entirely useless fashion. At the same time, she seemed to be wondering at her own skepticism. If Ben and Walter had been watching, they might have suggested that the Autoveedo was stimulating her thoughts as well, if less directly.

"We'll get them," said Tony.

"We'll be good enough soon," said Janine.

"And then!"

"Give it time," said Mair. She sighed. ■

●The boys with the typewriters and cameras serve a useful purpose, no doubt; but in the long run the decision is generally made by some rough character with a firearm. Or a club or a bow or a hydrogen bomb."

Donald Hamilton, *Line of Fire* (1955)

The Alternate View

THE RAINBOWS OF GRAVITY

John G. Cramer

I recall, many years ago, reading an SF story in which explorers traveling to a distant part of the universe thousands of light years from home came upon a planet that seemed identical to the Earth in all respects, right down to the shapes of the continents, etc. But on landing they found that the replication was an illusion. The planet was a bare and lifeless ball of rock upon which ghostlike images of white clouds and grassy plains and blue oceans were somehow being projected, to give the illusion of the Earth as it was many thousands of years ago. How could such an illusion exist?

The resolution of the mystery came when it was realized that there was a large warp in space exactly half way between Earth and this ghost planet. The light rays and even gravitational pull were radiating out from the real Earth, to be focused by the space warp to a 1:1 image at this distant point, thereby making a visual replica of the Earth as it was at the time many thousands of years ago when the light started on its journey. That, of course, was only science fiction. Nothing like that could actually happen . . . right? Or could it? This AV column is about real space warps (made by gravity) and about the astrophysical illusions which they may have produced.

Astrophysics is a spectator science. The practitioner cannot go to his laboratory and do astrophysics experiments. He can only sit as a groundling in a vast audience, watching the show that nature has staged in the heavens. Fortunately that show is sufficiently rich and varied that the scientific cycle of making hypotheses and testing them moves as rapidly in astrophysics as in sciences where laboratory experiments are possible. The universe is a large and wondrous laboratory bench on which billion year-old "experiments" are there for the observation, and new lessons are being learned every day. The most recent example of this is the recent discovery of "cosmic arcs."

In mid-1987 two groups of astronomers almost simultaneously announced separate observations, in rather different parts of the sky, of single narrow elongated arcs of light about 20 arc-seconds in length contouring around the central regions of a rich cluster of galaxies. This discovery caused great excitement in the astrophysics community. In the science press the arcs were heralded as the largest and most mysterious objects in the universe, millions of light years in length and of no known origin, a new phenomenon begging for explanation.

What could these arcs be? Were they an illusion? Could anything so large be a real physical object? A giant linear galaxy, perhaps? An extended star cluster stretching along a cosmic string? Tongue in cheek, Arthur C. Clarke speculated that they might be the scaffolding left behind by some derelict con-

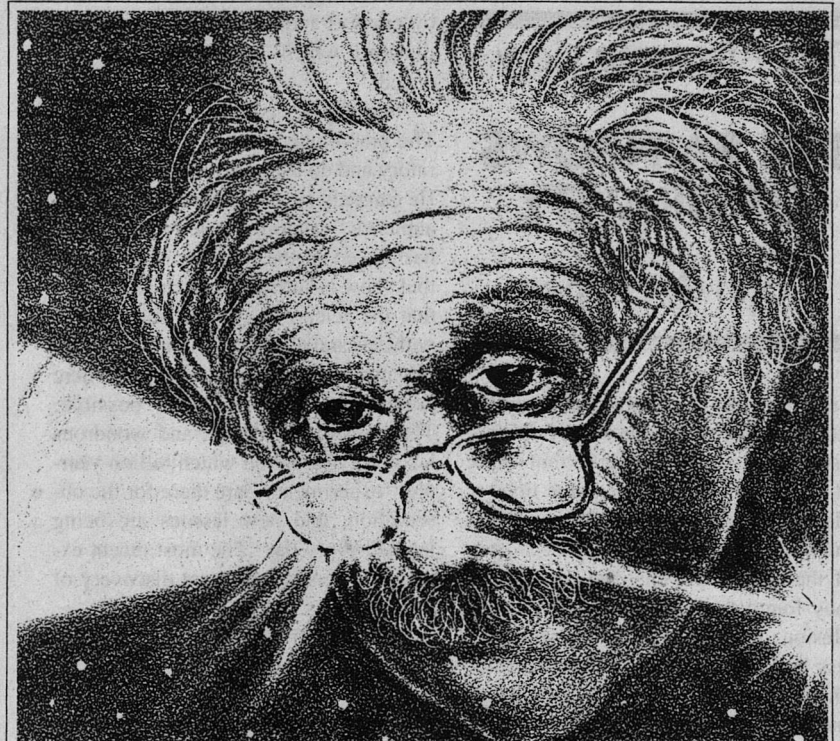


Illustration by William R. Warren, Jr., 1988

tractor who went bankrupt during the construction of the universe. More detailed observations always help in understanding new phenomena. The first order of business for the astronomers was to get more detailed data on the light from the arcs. It was soon learned that the color and wavelength spectrum of the light was consistent with light from a fairly ordinary Sb-type galaxy like Andromeda. There were also indications that at least one of the arcs showed a considerably larger red shift than that of the "nearby" galactic cluster at its center, an indication that the arc might actually be considerably more distant. Many astrophysicists began to suspect that the arcs were not real objects but optical illusions, artifacts of a phenomenon called a gravitational lens, a sort of rainbow produced by the bending of light by gravity.

The deflection of light by gravity is of special significance in the history of physics. Seven decades ago, in 1919, a pivotal confirmation of Albert Einstein's general theory of relativity came up with the observation of the bending of star light by the gravitational pull of the sun during a total solar eclipse. The

execution of this test had been delayed for several years by the more pressing matters of World War I. Finally, in April of 1919, a group of British astrophysicists led by Sir Arthur Eddington voyaged to the remote equatorial island of Principe in the Gulf of Guinea off the coast of west central Africa, to await a total eclipse of the sun scheduled to occur there on May 29, 1919.

It was raining on the morning of the 29th, and the party did not glimpse the sun until the eclipse was already in progress. But during the maximum of the eclipse they were able to photograph the pattern of stars near the edge of the sun, to be compared with the same pattern photographed in the same region of the sky in the previous January. The images of stars nearest the sun were seen to be displaced in the eclipse photographs because of the deflection of their light as it passed through the sun's gravity well. The amount of the displacement was just that predicted by Einstein. One of the crucial predictions of general relativity had been confirmed. To celebrate his accomplishment Eddington wrote a parody of the Rubaiyat that concluded with the lines:

Oh leave the Wise our measures to collate.
One thing at least is certain, LIGHT has WEIGHT.
One thing is certain, and the rest debate—
Light-rays, when near the Sun, DO NOT GO STRAIGHT.

The deflection of light by gravity has been well established since that time. But focusing is not the same as bending, and the idea that gravity could act as a lens did not come until 1936. Albert Einstein at that time demonstrated mathematically that with the proper geometrical arrangement, the pull of a massive object at an intermediate distance could collect and concentrate the diverging light from a distant luminous object. He showed that a distant light source, for example a bright galaxy, would be imaged as a ring of light if it was on the same line-of-sight with a closer massive object, perhaps a cluster of galaxies or a black hole. This ring-image has come to be known as an "Einstein ring." Precise alignment of the source and focusing mass is essential for the formation of a complete ring. If the light source is slightly displaced from the line through the focusing mass, the ring image is distorted into a pair of circular arcs.

This interesting prediction of general relativity remains unconfirmed. Many double quasar images attributed to gravitational lensing have been found by astronomers, but no example of a true Einstein ring has ever been seen, perhaps because the precise alignment requirement is not likely. The Einstein ring is not, strictly speaking, an image of the familiar kind made by a lens. Instead it is a "caustic," a limiting condition for the bending of many rays that causes rays incoming from slightly different directions to pile up in the same place and appear as a bright line.

A more familiar example of a caustic is the rainbow. The sun's rays passing through falling raindrops are bent and reflected to form an arching caustic, the very bright edge of the circle of allowed scattering. Because the angle of the rainbow's caustic is slightly different for

different wavelengths of visible light the familiar multicolored rainbow arch results. The sky is bright within the arch where much of the sunlight is scattered, and dark outside the arch because scattering cannot occur outside the caustic limit. The Einstein ring, also a caustic phenomenon, can be regarded as "Gravity's Rainbow," recalling the title of Thomas Pynchon's well-known novel.

Could the cosmic arcs be Einstein rings? Some observational evidence has been interpreted as indicating they are not. Einstein rings should be continuous or have *two* equal arcs on opposite sides of the focusing mass. Astronomers have examined each of the observed arcs for any sign of a matching arc on the other side of the galactic cluster assumed to be the focusing mass, but no such twins has been found. The absence of the second arc has been used to argue against the Einstein ring explanation of the phenomenon. A recently published paper, however, may have provided an explanation of why the arcs do not have matching twins. The calculations of Einstein assumed that the focusing mass producing the ring was perfectly symmetric, like a sphere. That assumption is reasonable for a black hole or a spherical galaxy, but it is not realistic for the irregular clusters of galaxies assumed to be the focusing masses of the observed arcs.

Scott A. Grossman and Ramesh Narayan of the University of Arizona have taken the old calculations of Einstein a step further by including the possibility that the gravity field of the focusing mass is irregular, and pulls harder on the light passing near it in one direction than in another. This would be expected if the arrangement of galaxies was slightly oblong. Under this more realistic assumption the double arc of the Einstein calculation becomes a single arc.

Grossman and Narayan also did computer simulations of the focusing effects of randomly generated galactic clusters. They found that rough, irregular mass clusters could produce smooth single arcs of about the same angular size as those observed. The conclusion of this work is that the cosmic arcs are not giant and mysterious structures. They are caustics, rainbows produced by the force of gravity bending and concentrating the light from very distant but fairly normal galaxies.

The new calculations indicate that if one looks carefully enough and with sufficient sensitivity, such arcs may be fairly common. Further, in the general case where one arc occurs, other fainter arcs should also be present. A detailed analysis of a group of such arcs would provide a new way of learning about mass distributions of galactic clusters. And so nature has given us a glimpse of an object that is so far away as to be invisible under ordinary circumstances, and a new tool for learning more about how distant galaxies are distributed.

Out in the great universe we are not likely to find gravitational and optical images of the Earth or our sun. The space warps made by gravity are too imperfect as lenses and the Earth is too dim a light source to do the kind of imaging the SF writer imagined. But true Einstein rings may be out there waiting to be found, produced by massive black holes that would signal their

presence with a matching pair of gravity's rainbows. ■

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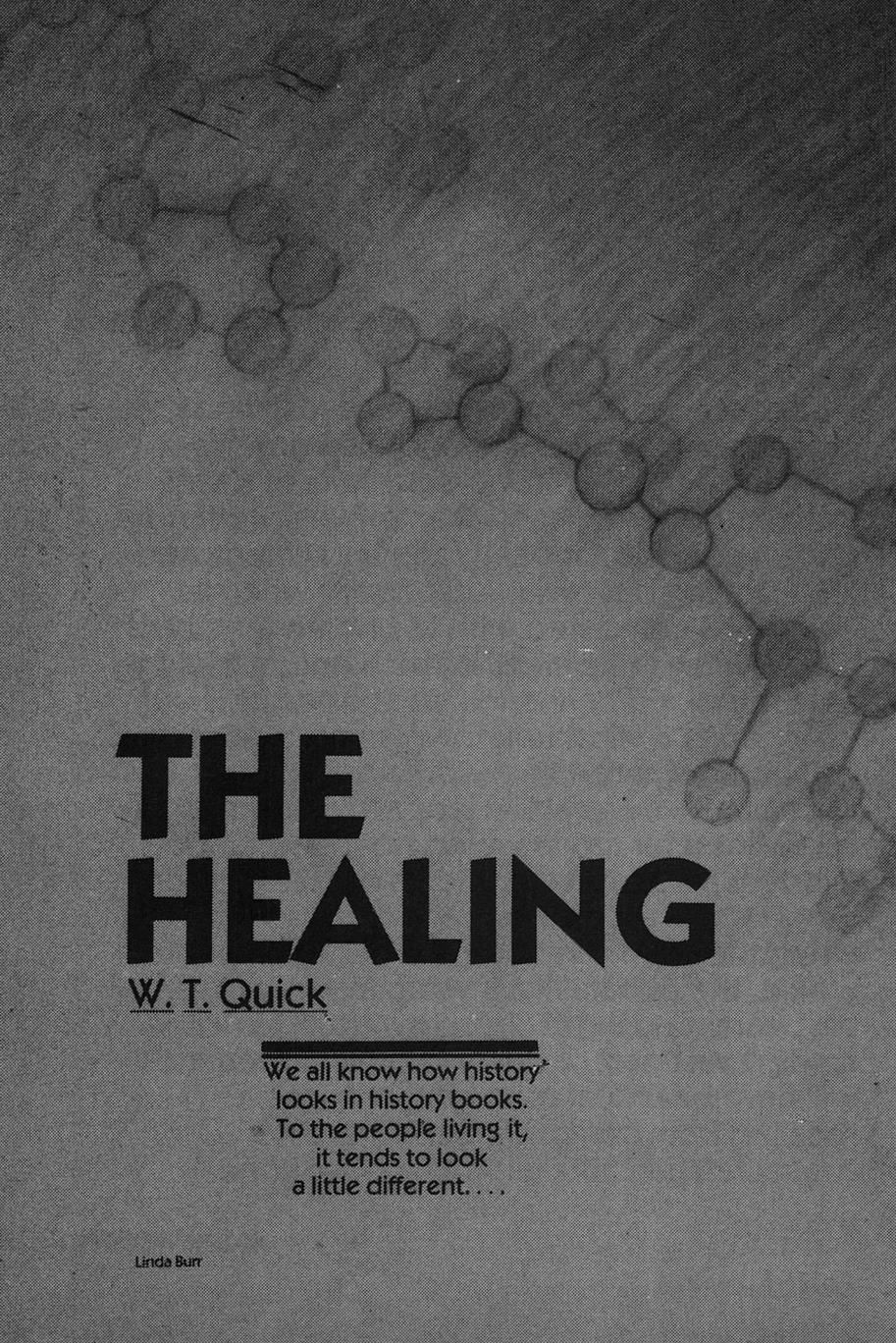
● It has been said that neither wilderness nor innocence can be regained once lost, and that little scraps of native wetlands can never be anything more than trivial souvenirs of a past journey. But a fragment of an original wetland is no less genuine for being only a fragment, and it is anything but trivial—especially when its diversity is compared with the homogeneity of surrounding tamelands. In the world of biology, as in the world of finance, such diversity is our only hedge against unknown and future risks.

Our remaining native wetlands also have this in common: many are in jeopardy, doomed to be drained for crops we do not need, to be filled for resort developments or factories, or simply to be used as garbage dumps. And when the last prairie pothole has been put to wheat, the Achafalaya Swamp made safe for soybeans, and Butte Sink converted to rice fields, a vast part of our wild original wetlands will have been lost forever. It cannot be recalled from computer banks, and no spacecraft can take us where it has gone.

John Madson



THE HEALING

W. T. Quick

We all know how history looks in history books. To the people living it, it tends to look a little different. . . .

Linda Burr

Tommy was exactly two months past his eighth birthday when his mother, Janice, watched him do something odd. It was at the dinner table in the kitchen just a little after six, and he was sitting in his chair, his skinny legs dangling over the edge of the seat. In front of him was a plate with two slices of his favorite meatloaf, a stalk of broccoli, and some mashed potatoes without gravy.

Janice had just finished saying grace, a quickly mumbled affair, although she noted that Tommy had bowed his head and scrunched his eyes earnestly shut. Now he opened his eyes, picked up his fork and lifted a bite of meatloaf directly into his cheek. His right cheek, she thought, irritated.

"Tommy!"

He looked at her with a blue, puzzled glance, looked down at his plate, put his fork into the meatloaf and tried again.

The brown piece of meat tumbled from his cheek, missed his plate and landed on the tablecloth. He stared at it. Four tiny red spots grew on the soft flesh of his face where the fork had almost pierced the skin.

She inhaled. "Tommy, that's not funny at all."

He held the fork awkwardly, as if it were some strange utensil he hadn't quite learned how to use. He looked at her and she recognized the look. It was the not-quite-tears look that happened when he didn't understand why he was being punished.

This time she wasn't sure what to explain. He looked away. Then he cut another piece of meatloaf, popped it into his mouth and chewed.

Dinner went on. Her husband, Tommy's father, Frank, was still at work. She wished he could find more time for the two of them. They ate alone more often than she thought good.

But Frank said, and it was true: the good, safe life—a house, a car, a little something in the stock market—took a lot of money, and somebody had to earn it.

She wouldn't remember this particular dinner until later.

"Off," Frank said. Obediently the fifty inch screen hanging on the living room wall turned off the eleven o'clock news and rolled itself into its slot. In the ensuing silence Frank stretched and yawned. He was a thin, sandy-colored man with a receding hairline and washed-out blue eyes. She wondered how his color had translated into the electric gaze Tommy used with such good effect.

"Tired," Frank mumbled.

"You ought to try to relax more," she said. "You work too hard."

Frank heard the praise beneath the warning and grinned. "Everybody works too hard," he said. "You work too hard, Jan. But—"

She smiled. "Hard work never killed anybody. I know."

They sat in companionable silence. Over the ten years of their marriage, she had come to understand the unspoken philosophy which motivated her husband. The cup was always half-full. If money was short, you didn't cut expenses, you worked harder and made more money. It was a kind of hard-edged optimism, a peculiarly American thing in these late days of great empire, when the country was beset by Asian

economic imperialism and the uncertainty of bedrock values. Frank believed in results, in hope, in strenuous effort, and not very much in the God of his fathers.

She wasn't at all sure she shared these maxims. It seemed to her that things often became disconnected for no good reason, and she felt on a nerve-and-bone level that life was less logical, less amenable to manipulation than Frank assumed. Yet the mortgage got paid, the bank accounts were healthy, and their son would have a future brighter than they could imagine.

It was a life. If not content, Janice was at least resigned. She had learned to muffle the thin call of fear which underlay all her own hopes. And sometimes at night, to herself, she prayed. Best to cover all the bases.

"I got a note from Tommy's study counselor a few days ago," she said.

"Mm? About what?"

She paused, trying to arrange her thoughts. The note had been disquieting, but on a level hard to explain to her pragmatic accountant husband. "The counselor said Tommy had been disruptive in class."

Disruptive was the operative word here. It caught his attention. "What does that mean? Disruptive? What did he do?"

"He made faces," she said.

Frank stared at her. "He what?" His lips twitched.

She sighed. Of course it sounded like normal seven-year-old horseplay. So why did it bother her? And why was it so important that Frank share her concern?

"She said he makes faces," she repeated. "It disrupts class. The other kids laugh."

Frank's mental antenna, honed by marriage, picked up the undercurrents. "Kid stuff," he said. "But it bothers you, right?"

"Well," she said, unhappy with the way the conversation was going, "yes. I guess so."

"Have you talked with him?"

"I thought you could."

He blinked, "OK," he said.

Two days later, Tommy walked into the side of a SamTrans bus as it taxied out to the takeoff circle a block from their house.

The waiting room smelled like fried onions, she thought wildly. Why would it smell like that?

Frank sat on a leatherette and chrome sofa across the small room from her, holding but not reading an ancient, tattered *Time* magazine. In one corner a dusty ficus tree drooped beneath a smeared skylight. They were alone. The family that had been there earlier, two boys, a teary mother, and a fat aunt, had left. Bad news, and no more reason to wait in the waiting room.

She scraped her thumbnail against the pad of her index finger and wanted to scream, but although that would make her feel better, it might tip Frank over the edge. She could feel the aura of tension he exuded. She knew that what he hated most was the helplessness. No matter how hard he worked, it wouldn't help his son. And resources that might have helped another man, resorts to faith or prayer or even fatalism, were denied him. He was a modern man. Fate played no part in his world. Nor did gods.

"Mr. uh. Mrs. Johannesen?"

"Yes?" they both said together, then stopped, embarrassed. She had half risen from her chair, a reflex. Now she stood. I want to hear standing up, she thought.

"It's OK," the young resident said. He had light purple bags under his eyes. She wanted to tell him to take a nap. How stupid. He was a doctor. "He'll be fine. A broken arm and a mild concussion. He's sleeping now, but you can see him."

Frank was shaking the doctor's hand, pumping it up and down, grinning like a mad man. The doctor's head shook with the force of the motion, but he smiled, too. He was used to this, the explosive release of tension. He preferred it to the other kind, the slow leakage that deflated hope, when he carried bad tidings to this ugly green room.

"When can we—" Janice said, but the doctor raised his right hand in a wait-a-second gesture. "There is one other problem," he said.

The slowly widening tear in the fabric of their life was becoming more evident, Janice thought. Across the room, Frank stared at the blank spot on the wall where the TV screen would normally be. The newspaper rested unread in his lap. He'd started smoking again, which she hated, but unconscious of her disapproval, he lit up now and inhaled with quick, nervous puffs. Unconscious or, worse, uncaring. She was afraid it was the second.

"It stinks," she said.

"What? Oh, sorry." He didn't look sorry, but he stubbed out the cigarette. There was a hysteria to him now. It frightened her.

"No, I didn't mean that, the cigarette, although it does stink. I mean us, everything."

She didn't say, "our lives," and most of all, she didn't say "Tommy." Neither one used his name much when they were alone. They said "he," or "the boy," as if by avoiding his name, they could somehow avoid what had happened.

Frank looked away from her. He inhaled. He said, "How is he today?"

"If you'd come home earlier, you could have seen for yourself. Before I put him to bed."

He shook his head, a short, angry gesture. "I have to work, Jan. The bills, even the insurance—"

"Yes, I know." She felt unutterably tired. "I fed him about seven. No problems."

He stared at his newspaper but didn't pick it up. "If only—" he started, but didn't finish.

"Oh, Frank. It's not your fault."

"Of course it's not. I didn't make my genes. I inherited them. From my mother. And it's not her fault either. And it's not Tommy's fault that he's crippled and he'll get worse and eventually he'll die and there's not one goddamn thing any of us can do about it. Except feed him and change him and wait."

She sat back suddenly, pushed by the heat of his words, abraded by the raw hate behind them.

"Don't hate," she said softly. "Not Tommy. Hate me, if you have to, but not him."

Frank looked up, his face absolutely still, and she was shocked to see tears

rolling silently down his face. "I don't hate him," he said. "But I hate *it*."

The disease. The strange thing lurking in the cells, the odd bit of DNA, the flawed RNA transfer, the defect. Now Tommy couldn't even feed himself. And it would get worse. It would take all their money, which they would gladly spend, and eventually it would take their lives. First Tommy's, but then—and she could see it clearly—it would take their marriage as well.

Because logically she could understand, but some deeper, more primal part of her could not forget. It came from Frank, from his side of the family. And though she despised herself for even thinking it, she couldn't *not* think about it. Nor could he, and so he smoked and worked almost constantly, and cried without realizing it.

She got up and went over to him and touched his shoulder. "We're both tired. Let's go to bed."

He looked up at her, his cheeks still wet. He didn't notice. "I love him, Jan."

"Yes," she soothed. "Me too." But even that would turn, which terrified her most of all.

Tommy smiled. Or at least he tried to. His lips quivered so much it was hard to tell.

"How are you, honey?" Jan said. "Feeling better?"

"I mm mm f f fine . . . uh uh."

She kept a smile pasted on her face. It was so hard for him to talk, but he tried. He doesn't understand, she thought. He's trapped inside his flesh, but he doesn't understand. He doesn't *realize*. And she squeezed Frank's fingers so hard he sucked in air.

Her son was so small. The disease had eaten him away, so that his bones shone through his pale skin in translucent splendor. Now he lay on his back in a big hospital bed, the center of a small circle of shiny chrome machines. The machines moved him and monitored him and breathed for him. She despised the machines.

Frank reached forward and took his son's hand and gently placed it on his frail chest. It was an absent thing, movement for the sake of movement. Tommy's eyes followed him. Frank grinned and spoke too quickly, too heartily.

"I'll be back to watch the game with you, OK? Your mom has to go home for a while, but I'll stay. We'll have fun. The Super Bowl. I bet the Broncos take it all. You think?"

"Mm . . . mm . . . "

"Sure they will," Frank said. Janice turned away, because her face was crumbling and she didn't want him to see. Either of them.

Doctor Ingram was a big man, tall, wide, grizzled, who used his rough baritone like a trumpet. Janice liked him, even though there was something of the showman about him. His specialty was so arcane she could barely pronounce it, but it related to Tommy.

"It is very new," Dr. Ingram said. "I sent Tommy's records to them and they said they wanted to try. They would accept him."

Janice and Frank sat in front of Dr. Ingram's mahogany desk which was crowded with old photos in tarnished silver frames—two movie actors, sev-

eral distinguished looking people in white coats, even one president—and stared at him.

Finally she spoke. "Is it—will it be dangerous?"

"Could be," Ingram said. His voice boomed hollowly. "But."

And then Janice came to it, and when she did it was so terrible, so appalling that she wanted to vomit. In that one word reposed all her nightmares. But. Of course it's dangerous but. But Tommy will die anyway. But if he doesn't he will destroy you and your husband. But you love him. But what does it matter?

But.

"What are the chances, Doctor?" Frank said. He sounded calm and businesslike, as if by fitting this horror into some familiar framework—I'm an accountant, let's take a hard look at this—he could somehow mitigate the sad flat awfulness of it.

Ingram moved his shoulders and Janice thought of a bear. A kind bear. "Hard to tell. It's what they call cutting edge. Tommy would be one of the first, maybe even the first. They didn't say. I heard about it through a friend of mine, professional, that maybe it might be of some help. Of course there's a risk, but."

"I see," said Frank. He glanced at Janet.

But. What the hell choice do we have?

She suddenly remembered Tommy stabbing himself in the cheek with a forkful of meatloaf, remembered the four tiny red marks, like the strike of some imaginary, invisible animal.

And she had scolded him. Some guilts were too terrible to carry forever. Even for a mother.

"I say yes," she said.

Frank stopped by the local Seven-Eleven and bought a road use permit for the trip from San Francisco to Palo Alto. They took the Datsun 340 ZX. Tommy would go by air, a hospital lazer cab fitted out as an ambulance.

The crowded hills of the Peninsula flowed by, brown and green. Bits of the Bay peeped at them, sudden shards of blue.

The silence in the small car was accentuated by the rushing wind, a deep, hollow sound. The roar of the wind was depressing. As if, Janice thought, that word has meaning to me now.

"I feel like a traitor," she said.

Frank kept his eyes on the vision screen. They faced the back of the car. What appeared to be a window was a wraparound screen which showed a digital picture transmitted by cameras on the outer hull of the car. Occasionally he touched the steering wheel, but mostly left navigation to the onboard computers. Janice had grown up with older cars, and still found the reversed pressures eerie.

"Don't," Frank said. His voice was husky. "What are we betraying? Not him."

"Yes, him. Tommy. Our son. What if he dies?"

He shook his head. It was as if he'd already made some kind of decision, something he didn't wish to tell her, something she was sure she didn't want to know anyway. "Tommy," he said tiredly. "Have you looked at him? Can he be happy . . . the way he is?"

"He's alive," she said fiercely. "And if he's alive, then there's—"

But she couldn't say it, so he said it for her. "Hope. Is that it? But Janice, this is hope. If it comes, it won't be something simple, easy. It will be like this, risky, dangerous maybe. If it was simple, they would have already cured him."

She closed her eyes. The inside of the car smelled of leather and dust. The wind roared. "It's shitty shitty shitty!"

She never swore.

"I know," Frank said.

"My name is Robert Hafaday," the man said. He was of average height but huge, a great round man whose fat was solid. She couldn't imagine him jiggling. His thick hair was white and perfectly combed. There were absolutely no wrinkles on his wide face. It was as if his skin was stretched tight, like a perfectly made bed.

Nor was there any jolliness about him. He radiated seriousness, and she felt a bit of comfort. Jolly fat men played no role in her fantasies of hope.

"Can I buy you a cup of coffee in the cafeteria?"

"Sure," Frank said. He took Janice's arm just beneath the elbow. "Which way?"

The cafeteria was small. Half a dozen tables, the kind usually set up for banquets, were in two rows. Along one wall several vending machines for coffee, sandwiches, candy bars silently displayed their wares. A thin fog of Muzak filled the air. There was a sharp, medicinal odor Janice couldn't identify. Hafaday fed dollar bills into one machine and carried three plastic cups to their table. He moved slowly, carefully.

Janice tasted her coffee. It was as bad as she expected, and she immediately forgot about it. In the far corner two people, a young man and an older woman, talked quietly. The woman raised her voice. The younger man glanced at them and they both paused for a moment.

They know who we are, Janice thought, and was unexplainably terrified.

"Do you understand what we propose?" Mr. Hafaday said. "Has it been explained?"

"You can help Tommy!" Janice blurted.

Hafaday looked at Frank. "Possibly," he said. "We think we can."

"But no guarantees," Frank said.

Hafaday moved his eyebrows. He approved of Frank's realism. "No. No guarantees."

Frank exhaled. "Tell us," he said.

"Molecular technology," Hafaday said. "Some people call it nanotechnology. It means very small machines."

Frank nodded as if he knew what Hafaday was talking about, although Janice knew he had absolutely no idea. She wanted to nod, too. Yes, we understand, yes, we agree. Will that help?

But Hafaday was evidently used to this sort of blind acknowledgement. "What we do here is quite new. The concepts, at least. But we've been testing for years. Animal tests most recently. And now the FDA has approved human tests. In certain cases."

"What kind of cases?" Frank asked.

"Let me be blunt." Hafaday placed one meaty elbow on the table. "We took

Tommy because he has no other chance. His particular disease is a genetic failure. No therapies exist. He will continue to get worse, and then he will . . .''

Frank nodded. This time he did know what Hafaday was saying. The three of them were silent for a long moment. Janice rubbed the tabletop with her fingertips. It was slick and greasy.

''But you think you can cure the disease.''

''Not the disease,'' Hafaday replied. ''We think we can cure Tommy.''

''I don't understand,'' Janice said.

''When you eat, do you know what happens?''

Janice looked at Frank. What a strange question. What did it have to do with Tommy?

Hafaday didn't wait for an answer. ''You digest your food, break it down, create energy. Everybody knows that. But what really happens is nanotechnology. On the molecular level, certain molecules work on the food molecules. They break things apart, move them here, attach them there. Think of those molecules as machines, because that is what they are.''

He stopped, leaned back, watched them to see if they were following. He knew they weren't, not really, but he had to explain as well as he could. They would have to sign the papers, after all.

''We've built similar machines,'' Hafaday said at last.

''Wait a minute,'' Frank said. ''You've built machines as small as molecules?''

''Essentially, yes. A micron is one millionth of a meter. We've built computers that take up no more than a cubic micron, which is less than one thousandth of the volume of a typical cell, yet these computers contain more information than human DNA, the blueprint for our bodies. These computers operate equally small machines that can move and change other molecules.''

''That seems impossible,'' Frank said.

''Your body is living proof that it isn't,'' Hafaday said.

Frank reached over and stroked the back of Janice's hand lightly. ''These . . . machines can help Tommy?''

''We will program the computers with the correct information for Tommy's cells. Healthy cells. In effect, we will create artificial DNA for Tommy. DNA with the right instructions for healthy cells. Then the machines will repair the damage. That's what I meant when I said we wouldn't cure the disease. We will make Tommy well instead.''

Frank thought about it. ''The machines would repair the cells all the time?''

''Whenever a cell deviates from the patterns we give the computer, the computer will repair the cell. Yes. Do you understand?''

''No,'' Janice said. ''Machines in Tommy's body? No, I don't understand.''

Frank squeezed her fingers lightly. ''What are the chances?''

''We don't know. Tommy will be the first. But the animal results are very encouraging.''

''How encouraging?''

''Eighty percent.''

Frank looked at the ceiling. He puffed out his cheeks, blew air, chewed at his lower lip. ''Eight of ten,'' he said.

"The papers are in my office," Hafaday said.

They drove to the motel. Frank checked them in and carried their suitcases to the room. "I want a drink," he said. He snapped one suitcase open, rummaged blindly inside, folded down the top. Nervous energy. Terror.

"There's a place across the street, a little bar."

Janice drank once a year, a glass of champagne, precisely at midnight on New Year's Eve. "I'll come with you," she said.

The bar was small and smoky. Evidently they hadn't heard of the antismoking laws, or didn't care. Frank lit a cigarette. A very pretty cocktail waitress came to their table.

"Black Jack Daniels. On the rocks," Frank said. "And a coke for—"

"No. A glass of wine. White wine, whatever," Janice said.

Frank stared at her. She looked away. The cocktail waitress brought their drinks and took Frank's card. He sipped his bourbon and made a face. Janice lifted her wineglass and was surprised that the clear liquid had no taste at all.

"Did you understand?" she said finally.

"Not really. No. But that isn't the point. They understand, and they think it will work."

She moved the wine glass on its napkin. The glass felt cool. Somebody put money in the antique jukebox and it began to boom an old rock song. Something by Bob Dylan. His ragged voice sang, "Somethin's happenin' here but you don't know what it is . . . "

"Do you know what open heart surgery is?" Frank said. "I mean, if they tried to explain the stitches, the blood vessels, the cuts they would make?"

She shook her head. She felt terribly lonely, as if the world was slowly receding, moving away from her.

"But if I needed it, you wouldn't mind. Because they do it, and it works, and everybody knows it does. Well, maybe in a few years this will be that way."

"He's the first," she said, desolated.

"Yes," Frank said. "Would you rather we didn't do anything?"

"No."

He lifted his drink and tossed it back in a single motion. "They said it will be fast. No more than a week. At least we won't have to wait."

He took her hand and they listened to Dylan wail his lament into the neon dark. Later they went back to the motel and went to bed, but they didn't sleep.

"I want to laugh," she said, and knew it sounded stupid. Something round and black and greasy that nobody could see had just oozed up from her belly, stretched her throat, widened her mouth and floated away invisibly. Now she felt a hundred pounds lighter.

Frank's grin was so wide it had to hurt. Unconsciously he clapped his hands together, sharp, hard sounds. Where she simply wanted to sit down, he seemed electrically charged. She could imagine his hair standing on end. For once his eyes were as glittery as crystals.

Only Mr. Hafaday was unchanged, his serious bulk planted stolidly next to them.

"Congratulations," he said.

"It's a miracle," Frank stuttered.

"No, it's science. Technology." Hafaday took Frank's arm. "He'll have to stay with us a while. A few weeks. Then, if everything goes OK, you can take him home. A few more details."

"Details?"

"In the papers you signed. Tommy will have to come back on a regular basis, so we can monitor."

"Yes. I forgot. How long is that?"

"The rest of his life," Hafaday said.

"Did I sign that?" Frank said. Already the accountant was counting the cost.

"Frank!" Janice said. A week ago Tommy didn't have a life to have the rest of. Now he did. Small cost.

Janice waited in the small anteroom of the building while Frank finished with the last arrangements. She was startled at how bright the colors were. Outside, the green was so vivid it hurt her eyes.

The receptionist smiled at her. She smiled back. Her mind whirled.

Something had happened here. She remembered the way her spine had locked, unlocked, then snapped to an electric crackle when they entered Tommy's room.

He glowed. The twitch, the quiver, all of it was gone. He seemed like a young prince. She thought of her early Sunday school, of Lazarus stepping from the grave.

"Hi, Mom," he'd said, and she'd started to cry. Of course. But so had Frank, and Tommy had watched them, puzzled.

Now the weight she'd carried was gone. The rest of his life. But it would be a healthy life. They assured her of it. If everything went OK, Tommy would never again be sick. She didn't understand, not really, but somehow she sensed a sea change.

Science. Technology. Vast things. She'd learned about such things in high school. Fire. The wheel. The printing press. The atom.

Now this. The tides were moving again. Someday maybe Tommy would be in the history books. But that wasn't the point. She didn't regard herself as a particularly intelligent woman. Frank was bright, and he would learn all the details. He was that way.

But on a deeper level she sensed great movement, and she wondered if it was always like that. Did the printing press, the atom, at the very beginning reach down a finger from the storm of change and touch a family perhaps named Tommy, Frank, Janice?

Touch and then move on?

She suspected it was so. How else could any of it have meaning? Then Frank came and they stepped outside into the morning and the world, as always, was made new again. ■

●The endeavor to understand is the first and only basis of virtue.

Baruch Spinoza.

submitted by G. Harry Stine

the reference library

By Tom Easton

Neon Lotus, Marc Laidlaw, Bantam, $3.95, 272 pp.
A Truce with Time: A Love Story with Occasional Ghosts, Parke Godwin, Bantam, $16.95, 310 pp.
Crazy Time, Kate Wilhelm, St. Martin's, $16.95, 248 pp.
Spacer: Window of the Mind, John Maddox Roberts, Ace, $?, 182 pp.
The Vang: The Military Form, Christopher Rowley, Ballantine/Del Rey, $3.50, 369 pp.
Brightsuit MacBear, L. Neil Smith, Avon, $3.95, 212 pp.
Project Pendulum, Robert Silverberg, Walker, $15.95, 200 pp.
The Man-Kzin Wars, Larry Niven, Poul Anderson, and Dean Ing, Baen Books, $3.95, 320 pp.
A Very Large Array, Melinda M. Snodgrass, ed., University of New Mexico Press, $16.95, 264 pp.
Imagination: The Art & Technique of David A. Cherry, David A. Cherry, Donning, $12.95, 112 pp.

Marc Laidlaw's first novel was the off-the-wall *Dad's Nuke,* a fairly effective short-range extrapolation of present-day America. He is capable of more, and he proves it with **Neon Lotus.** It is just as off-the-wall, even more effective, and the extrapolations will short your pacemakers.

The story's time is some centuries hence. Tibet is still under the Chinese thumb, and the old-time buddhists are in exile, scattered around the world. In India, a Tibetan scientist has just devised a machine that should permit guidance of a released soul past the risk of reincarnation to nirvana. But before the machine's final test, a three-eyed villain assassinates the man. His assistant tries to see him through to nirvana but fails. The scientist's soul takes root in the fetus just begun in the womb of Kate Riordan, who has just met her true love on an Interfaith Fellowship tour.

Kate's child, Marianne Strauss, grows

up and is drawn Eastward. In India, the Tibetan state oracle prophesies that she will be the Great Mother, the liberator of the homeland, and soon she is in Tibet itself. There she meets an ancient computer in the form of an even more ancient god, Chenrezi the Thousand-Armed. Chenrezi, Laidlaw promptly reveals, has been separated from five items that hold essential memories and powers. Think of them as memory banks, though one is a liquid whose true existence is no more than an ineffable molecular structure. The others are a glowing lotus, a wand of power, a wheel, a stone.

Marianne must now roam Tibet, seeking the five sacred relics and seeing the gengineered adaptations of the natives to refill ecological niches emptied by human depredations, the technical adaptations of nomads who must hide their powers until the prospects for rebellion against the Chinese seem auspicious, the deep and intimate melding of technology and mysticism. No one else has so successfully realized Clarke's dictum that a sufficiently advanced technology must seem like magic. Laidlaw has done the trick by seeing that humans are all too likely to use new technologies to put new shine on old beliefs. With Tibetan buddhism, this must mean bringing three-eyed demons and awe-inspiring gods to life and making sacred objects real. At the same time, it must wind up revealing that the ancient Tibetans understood something about the true fundamentals of reality.

Of course, Marianne succeeds in her mission. But to say much more about the story itself would run the risk of spoiling something special. Laidlaw brings the stark land of Tibet and its gloriously imagistic religion to life in a way for which I will long be grateful.

He also leaves me trembling with anticipation: he has made a tremendous leap from *Nuke* to *Lotus,* and he is now at a level that should ensure him a long and gratifying career. But I hope he doesn't stop here. He has shown such a capacity for growth that I can hardly wait to see his next.

I have not reviewed much of Parke Godwin's work. It has come my way, but I have let it languish, unread, while I turned to other books. The reason, quite simply, was that he seemed to be writing a kind of fantasy that failed to thrill me. I was not about to waste my time, even though, I knew, he was gaining quite a rep.

But it bothered me that I was being so cavalier. Therefore, when **A Truce with Time: A Love Story with Occasional Ghosts** landed in my mailbox, I vowed to read it. In due time, I did.

And I am here to tell you, brethren and sistern, that I am very happy that I did so. *A Truce with Time* is a marvelous book, warm and witty and soul-illuminating and more than worth your time, even though it is not at all science fiction and perhaps only by courtesy fantasy. (Although the protagonist is a writer of Arthurian fantasy and at one point in the tale attends a local con; science fiction readers will gain some extra enjoyment from trying to penetrate the disguises Godwin imposes upon several well-known SF writers.)

Godwin's hero is Pat Landry, a one-time actor now a novelist fearful, in his fifties, that he has drained dry the Pierian spring. A veteran of too many marriages and more one-night stands, he is a gratuitously insulting, prickly schmuck. But then a friend arranges for him to meet Lauren Hodge, hard-driving video artist, veteran of marriages, affairs, children, as prickly in her way as he.

And they get on famously, if not without the occasional contretemps.

The fantasy comes in as Godwin reveals the roots of Landry's problems. His family—vaudevillean parents, airman and delinquent brothers, suburban sister—loaded him with inferiority, hate, love, conflict, guilt, and all the other emotional baggage an adult can carry. And they are not done: their ghosts sit on Landry's bed and at his table, hover near at parties, and generally strive to drive him nuts as they act out old memories. Or are they ghosts? Landry has a vivid imagination, and Godwin lulls us into believing that they are merely ghosts of memory. We may be pardoned for believing him until near the end he slips past us one small clue that they are something more.

Are they true, supernatural ghosts? Are they ghosts of memory? It does not matter. Landry's life task, like that of a psychiatrist's patient, is to come to terms with the past, to recognize and embrace the love that lies beneath the hate and guilt, and thus to make love possible for himself at last. He succeeds, and it is a tribute to Godwin's immense skills that we applaud when Landry at last rings down the curtain on the final act of his childhood.

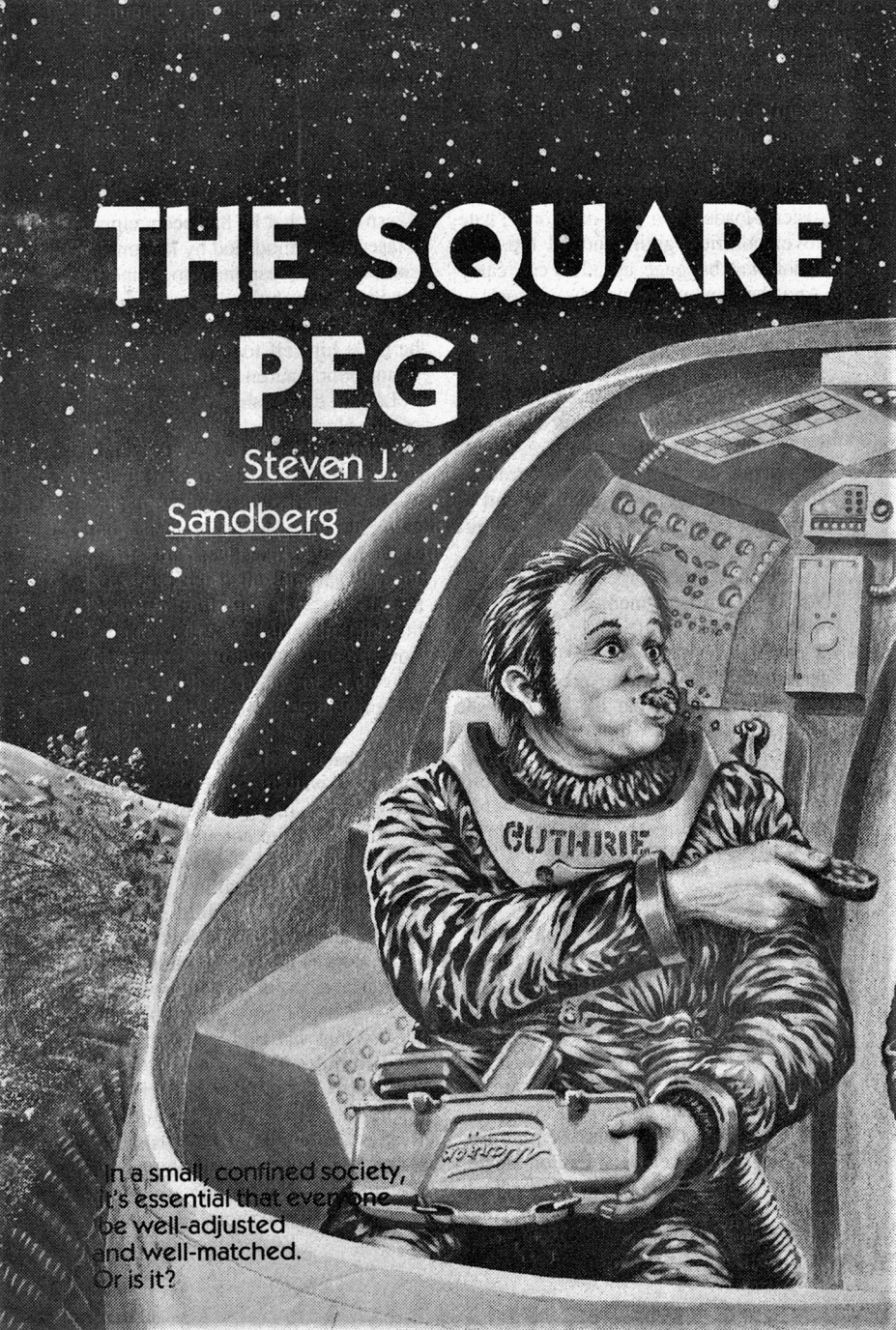
Just as good in a rather different way, is Kate Wilhelm's **Crazy Time.** Godwin knows how to make you laugh, but he emphasized the more touching aspects of his love story. Wilhelm gives us a touching love story that lasts much longer than anyone in his or her right mind would think possible, but her emphasis is on sheer hilarity.

The laughter begins with the premise: one evening, psychologist Lauren Steele, an outsized redhead, is followed back to the office by Corky, a short, red-haired, round-eyed, semi-employed, would-be cartoonist. He is sketching her as the epitome of the career woman, just the character he needs for his intended strip. In the hallway off her office, as she turns to stare at him, he glows blue and vanishes. We know, though Lauren doesn't yet, that he has been zapped by a laser oddly modified by its controlling computer in response to imperatives given it by a chubby teen-aged hacker. He is not dead, only dispersed, and soon he pulls himself together and begins to haunt poor Lauren.

Lauren thinks she is going out of her mind. Her coworkers don't help, for they really *are* bats—when Lauren walks out, saying her clients will get just as much good from sitting in her empty office, her boss hails her as a genius for inventing "primary exclusion therapy." (Just as satiric in intent, when on duty the shrinks—even Lauren—all talk like the ELIZA shrink-simulator.) At the same time, Colonel Trigger Happy Musselman thinks Lauren and Corky are conspiring spies and surrounds her with agents. He gets really hot when he realizes that Corky can appear and disappear at will, and the reader splits a gut when an invisible Corky starts interfering with the colonel's plans.

The love affair develops as Lauren and Corky become allies, and it leads to a very satisfying ending. But I won't tell you any more about that. The point of the story is the combination of humor and a serious point. Wilhelm says, when we ask where Corky goes when he disperses, that his body is dust, but his mind intrudes upon a realm where all the minds of the dead collect to form a sort of library on which dreamers, mystics, inventors, and artists all can draw. This library began empty, which explains why human life was once so nasty, brutish, and short. Now it is fairly

(Continued on page 153)


THE SQUARE PEG
Steven J. Sandberg
GUTHRIE
In a small, confined society, it's essential that everyone be well-adjusted and well-matched. Or is it?


ALDER
RESCUE
William R. Warren, Jr.

As I surveyed the empty cafeteria, I recalled an old Chinese proverb suggesting that when going to an eating house, one should go to one filled with customers. I had to give some credence to this thought because, given virtually any alternative, the base cafeteria would be the last place most people would care to eat. We just didn't have any alternative. The fact that the cafeteria was deserted was not entirely unexpected; in fact, it suited my plans perfectly. The last shift had eaten three hours before and no one would likely be by till breakfast in the "morning," or what constitutes morning around here where an actual sunrise occurs only once every two weeks.

I had just made an unauthorized EVA to retrieve an item of culinary contraband from the shadows of a rock 150 meters from the maintenance dome airlock. By careful allocation of my supply, I could afford this luxury about once every four months for the duration of my five year tour of duty or until I was caught, whichever came first. I took the package from under my daysuit where it was beginning to give me quite a chill and tore open the protective layers of wrapping to reveal a sausage, mushroom, and pepperoni pizza from Little Vinnie's Pizzeria back home on Earth. It was still very frozen.

Such contraband was officially frowned upon by base administration not only because of the tremendous expense involved in lifting such incidentals up from Earth but also because they considered the dietary well-being of employees to be under their supervision. To this end we were supplied with all of the latest delicacies known to nutritional science that could be manufactured from the hydroponic algae farms that recycled our daily waste. All of this was under the watchful eye of Hildegaard Krupp, Chief Dietician and Royal Pain-in-the-Keester.

"More roughage, Mr. Alder, more roughage," she would extol, the Rs rolling off her tongue like ball bearings. "A moving bowel is a happy bowel."

"Fat, Mr. Alder, fat!" She would screw her face into a good likeness of a prune. "Rusts out your arteries, yes, rusts out your arteries."

"Meat, Mr. Alder, meat! Gives you a heart attack, yes, gives you a heart attack!"

Well, she would have a heart attack herself if she saw what I was about to do, but fortunately she wouldn't. She was safely ensconced in her sleep cubicle dreaming dreams of algal bread and algal milk. To be perfectly fair, some of these concoctions were palatable enough, but sometimes I wondered why we didn't just bypass the algae farms and eat shit directly.

I keyed the cipher combination into the kitchen door and slipped inside. The combination was supposed to be held secret by Hildegaard and her kitchen staff but I had eased it out of Pamela DeMontes during an evening of passion shortly after my arrival. Pamela's a pretty good kid even if she does work for Hildegaard. There are a lot of things I would like to hold against Pamela but working for Hildegaard wasn't one of them.

The pizza thawed quickly and I popped it in the oven. Before long it was bubbling and steaming like the surface of Io and the smell started to fill the

kitchen. The power of the sense of smell to elicit memory is unparalleled and I was quickly transported back to Thursday evenings at Little Vinnie's and eating pizza with Laura Jean Walker and washing it down with Orange Crush. I hear she's married now and has three kids. She and I could have been married now if I had been able to make a commitment and hadn't signed a five year contract with Global Fusion Power and Light to work at their Lunar Helium Extraction Project. She never could understand my desire to live and work underground on a barren, lifeless world 400,000 kilometers from Earth. Sometimes, now, I can't remember why it seemed like such a good idea. I told her the money was good and that when I got back I would have quite a nest egg and we could get married. We had one last pizza at Little Vinnie's, she said she would wait for me, and I lit off for the moon with fifteen frozen pizzas hidden in the bottom of a carton of light bulbs. Seven months later she married Larry, an accountant for Fritsch, Smith and Wallet. That was three years ago and I guess they are very happy.

The ring of the oven timer broke my reverie so I quickly completed my preparations. With the pizza sliced into eight perfectly divided pieces, I sat down to devour my prize. This was going to be great; to not only eat the fruit of the forbidden pizza tree but to do so at the table where Hildegaard planned and created her culinary holocaust—this always sent chills up my spine.

I was just raising the first slice to my waiting lips when a shrill siren went off behind me. "Pizza, Mr. Alder, pizza. Rusts out your arteries, yes, gives you a heart attack." I jumped in horror but quickly realized that it wasn't Hildegaard's laser cutting voice but that of my best friend, Logan Thomas.

"Jesus," I exclaimed, "you scared the living crap out of me. Get in here and close the door behind you."

"You're getting complacent, Johni," he said. "I spotted the kitchen door ajar and thought it might be you in here. It seemed like it was about time for one of your periodic personal pizza parties."

"Yeah, well maybe you can eat that slop Hildegaard dishes up year in and year out without a respite but I can't. It isn't even real food."

"Well, I've got to admit," Logan said, "that I found it somewhat disgusting when I first arrived here but, you know, algae kind of grows on you."

He plopped his butt down in the chair opposite me, cupped his chin in his hands and drilled his elbows into the table. "Hildegaard's going to skin you alive for this, Johni. She'll detect the odor of real food first thing in the morning when she comes in."

"I know. It'll drive her nuts," I said. The thought of her scurrying around looking for evidence of a suspected crime gave me a perverse sense of delight.

"It's not going to take her long to figure out who the culprit is," Logan said. "She'll smell it on your breath." That was true. Old Hilde had the nose of a bloodhound; she could sniff out a chocolate bar three domes away.

"Well, she hasn't caught me in three years and she's not going to catch me tomorrow. I'll be out on the rail all day

and after that it'll be too late." I smiled smugly and turned back to my pizza. "Want some?"

"No thanks," Logan replied. "It's too late in the evening for me and I don't want to face The Valkerie in the morning with pepperoni on my breath."

I looked across the table at Logan and he was still sitting there with his chin in his hands only now he had a twisted smile pasted on his face. This was an expression I'd seen out of him before, kind of like a sparrow that's just found a horseplop. He knew something that I didn't know and was going to let me sit there and stew awhile. I knew that he knew something I didn't know and he knew that I knew that he knew. This was a little game Logan liked to play and I wasn't going to let him get my goat this time. I once again picked up my first slice of pizza and raised it to my lips just as Logan said, "Rail schedule's out."

"Oh," I said, trying to be indifferent. The smile on his face widened slightly and his eyes twinkled. Slowly the import of what he said began to sink in. It was two days late but the rail schedule was out. If he was going to get my goat with this little tidbit of information, there could be only one reason. Mikelson must have done it to me again, and for the third straight week in a row.

"Tell me it isn't true," I said, my indifference quickly vaporizing. But his smile just widened so that I thought his ugly face was going to break in half. I bolted from the table, flung the kitchen door open and raced down the tunnel toward the administration dome with a best friend trailing in my wake who had just gotten my goat, and who was plenty pleased with himself as a result.

I squealed to a stop in front of Mikelson's office where the rail schedule had been posted and my fears were confirmed. The first shift assignments for the next week on Mass Driver Number 2 were Alder and Guthrie. Rodger K. Guthrie, that is. Good Ol' Rodg.

How can Rodg be described as anything but an enigma walking around in size thirteen shoes? On the one hand he had a good heart and seemed to hold malice toward no man, but on the other, he exhibited certain affectations that were capable of challenging a person's sanity. Paradoxically, he was competent, if not often brilliant, in the performance of his job and then seemingly incapable of tying his own shoelaces.

Logan wandered up beside me, his hands buried deep in his pockets. "Who'd you get paired up with, Johni?"

"You know perfectly well who I got paired up with," I snapped. "And you wouldn't be so smug if you had to work with him yourself." Logan could afford to be smug. He worked over in the refractory extracting isotopic helium out of the interstice of ore mined from the nearby mare areas. That's not to imply that he was totally immune from being "Rodgerized;" no one was. It's just that those of us that worked directly with him had greater access, and it seemed like I was being "granted" more access than anyone else.

"You know, Johni," Logan said, "to a certain extent the predicament you find yourself in is self-inflicted. All of the other techs have complained to Mikelson about having to work with Rodg and you haven't. In fact, Nelson has

refused to work with him at all. The old saw about the squeaky wheel getting the grease seems to be in force.''

There was undoubtedly some truth in that statement. I could go into Mikelson's office and piss and moan about having to work with Rodg, but what would be a plausible reason? That he looks like he uses 40-weight gear oil on his hair? That he talks in non sequiturs? That he whistles Christmas carols in July or that he likes to fart while cycling through the airlocks? I wonder what Nelson had said? And if Rodg was really that bad, why didn't they boost his tail back to Earth? This was all part of the Rodg enigma.

''Well, you know,'' I told Logan, ''call it a character defect if you like, but I usually try to give a person the benefit of the doubt. After all, I seem to get along all right with you. In Rodg's case, though, every time I seem to be making progress in liking him, he does something to piss me off. How do you suppose he got through the psychological screening we all had to go through, anyway; I mean, it was pretty extensive. Everyone else around here seems to be pretty much Mr. or Ms. Normal with the exception of Rodg and a certain Chief Dietician.''

''Nice of you to include yourself in the 'normal' category,'' Logan countered. ''I'm not sure having a private stash of pepperoni pizzas in lunar vacuum storage qualifies as normal behavior.''

''Speaking of pizza,'' I said, ''mine is getting cold. Let's head back.'' We turned up the corridor back towards the commons dome. ''Besides, I like to think that my pizza cache is in keeping in the spirit of the early astronauts like, say, Alan Shepard.''

''Alan Shepard?'' Logan challenged. ''That's kind of a reach isn't it?''

''No, really,'' I replied. ''Remember at the completion of the Fra Mauro EVA on Apollo 14? Alan Shepard unfolded a collapsible club and drove a golf ball what he said was 'miles and miles and miles.' Actually, he apparently duffed it and it went only about 75 meters. Anyway, that activity wasn't exactly on NASA's itinerary but the ball has been recovered and now resides in a glass case in the National Air and Space Museum in Washington, D. C. I've seen it myself.''

''And maybe someday one of your pizzas will reside along side it, right?''

''No, you're missing the point, Loges,'' I said. ''In all of these space endeavors there has had to be enough tolerance in the system to allow pegs of a certain ellipticity to fit into the round holes. I mean, no one's perfect but, unfortunately, in Rodg's case somehow a square peg managed to get through the round hole and I'm stuck with him for at least another week.''

We passed through the cafeteria toward the kitchen door and I heard some motion inside. ''Oh, Christ,'' I thought. ''It's Hildegaard and I'm green algae soup.'' I cautiously peered in and what I saw made my jaw drop. Logan pushed the door open and there was Good Ol' Rodg licking up the last vestiges of my pizza.

He looked up from the plate, with eyes wide with excitement and said, ''Oh, hi, Logan. Hi, Johni. Boy, did you guys just miss out. I was walking by and the door was open and the light

was on and I found a pizza. Can you believe it? A real rootin' tootin' pizza! And it was hot too. Too bad you didn't get here sooner or I'd have given you some."

His hands and lips were still covered with grease. That was my grease. I couldn't stand to look so I turned away. "See you in the morning, Rodg," I said. It was going to be a long week.

The next morning I went over to Logan's cubicle and rousted him out of bed for an early game of handball in the recreation dome, and then proceeded to beat the pants off him in retribution for getting my goat with Rodg the previous day. In the process my sense of frustration was eased to where I felt I could again face Rodg with a sense of optimism. It was, after all, a new day. At least that's what the clock said.

Rodg and I usually met in the commons room but I first headed over to administration to pick up the targeting assignments for the day. It would be a short diversion because of the way the base complex was arranged. Eight subterranean domes were placed on the perimeter of a circle with the commons dome at the center. Like spokes of a wheel, a tunnel connected each perimeter dome to the commons dome. Each perimeter dome was then connected by a tunnel to its two adjacent neighbors. Walking around the perimeter one would go through administration, recreation, crew quarters, air quality, aquaculture, power generation, maintenance, surface transportation and then back to administration. Therefore, there were never more than two tunnels separating any two domes.

I was just about to enter Mikelson's office in administration when I came face-to-face with Hildegaard coming out. To put it politely, Hildegaard was rather broad-of-beam and her presence in the corridor could not be ignored. When she spotted me, I gave her a good morning smile and she responded with a scowl and a curled brow. "Good morning, Mr. Alder. Joining us for breakfast are you?"

"I don't believe so, Ms. Krupp," I said. "Rodg and I have to get out to the rail."

Her nose quivered like a rabbit's as she tasted the air. "Most important meal of the day, breakfast is, the most important meal," she declared. She wasn't going to detect any trace of pepperoni on my breath; Rodg had seen to that. It would serve him right, though, if Hildegaard smelled it on him. Logan had told me that Carla Beisinger had spotted Rodg coming out of Hildegaard's sleep cubicle late one night. There hadn't yet been a public indication of a relationship between the two but, if true, it was a match seemingly made in heaven and a joy to contemplate. I guess it's true what they say about there being someone for everyone, even on the moon.

She again sniffed the air. "I figured you would probably skip breakfast, Mr. Alder, so I included some of my special protein cakes in your lunch kit to eat on your ride out. And you make sure Rodger eats his, make sure!"

"Absolutely, Ms. Krupp, absolutely," I answered. "But he probably won't be hungry." I slipped around her and ducked into Mikelson's office before she could reply.

Warren 'Mike' Mikelson was chief of launch operations and coordinated the manufacturing output of the plant with the delivery schedules sent up from the home office. Even though I was torqued off at him for assigning me with Rodg for another week, I figured it probably never hurt to suck up to the boss a little. So I put my irritation on hold and said in a cheerful voice, "Morning, Mike. What you got for us today?"

"It looks like a pretty full schedule," he said. "Here." He handed me the lading report which included the types of materials being launched, their masses and their destinations. There were the usual eight or ten dewars of liquid helium destined for fusion plants on Earth, a couple for Mars, and one for L-5. The last item on the list, though, caught my eye. It was a load of coiled titanium alloy for the new station being built in the L-4 Lagrange Region.

"Isn't this kind of a heavy load for L-4?" I asked. "I don't think we've ever launched anything with this much mass."

"Yeah, it's a heavy one all right," Mikelson said. "I got a call from Tanner at L-4 a couple of days ago saying he had three ships down on unscheduled maintenance. He says he needs the materials to meet an inspection schedule and doesn't have the resources to chase down shipments all over the cosmos. Anyway, I told him we'd try to package it all nice and neat in one bundle and lay it on his doorstep. That's why I've assigned it to you and Guthrie. You two have the best targeting record of all my crew combinations."

The targeting statistics were reported quarterly and they proved what I essentially felt was true—that when push came to shove, Rodg and I managed to work together pretty well as long as he could be kept focused on the job at hand. To his credit, though, it was Rodg who was responsible for the accuracy of our deliveries. The other crews let the computer perform all the calculations necessary to operate the mass driver. Rodg, though, seemed to have a sixth sense about the targeting algorithm. Oh, he used the output of the computer all right but he often adjusted the computed parameters out in the third or fourth decimal places to suit his intuition. Only rarely did such an adjustment result in a launch outside the error bounds expected from a computer computation. Most of the time he was much closer than the computer could do it. I spotted him doing this when we first started working together and that's why I left him to do most of the targeting. Abraham Lincoln said that "If there is anything that a man can do and do well, I say let him do it." That's what I did, and as a team we tended to look very good. Of course any of the other techs could have looked good working with Rodg but I guess they didn't try as hard as I did to make it work. It was just another reason why I would probably spend most of the rest of my tour of duty working with him. Like Logan said, my predicament was essentially self-inflicted.

I studied the essentials of the L-4 shipment again, and did some quick computations in my head. "You know, Mike," I said, "I'm not sure we can put enough snoose in the capacitor banks to launch this much mass on that trajectory."

Mikelson pointed to a stack of tech manuals on his desk. "I just looked up the system specs and if you couple the outputs of generators one through five with the main solar bank there should be plenty to spare. Just let me know when you need the solars and we'll switch them over to you."

I squirmed a little. "I guess I'm a little uncomfortable on this one. Where's the economy if we end up launching this package out to the Oort Cloud?"

"Well, I tell you what," he replied. "See how the system operates today. If you and Rodg feel she's up to it, go ahead and launch. If not, we'll break it down into two or three bundles tonight and Tanner can work the problem of gathering them up. Oh, and ask Rodg not to digitize Mickey Mouse figures on the launch reports, will you? Those files go on the data link down to the head office."

I laughed but Mikelson didn't look amused. "OK, Mike," I said, "that's fair. I'll talk to you later." I turned to leave but he caught me with one more question.

"By the way, Johni," he said. "You don't know anything about unauthorized activities in the kitchen last night do you?"

"Kitchen, Mike?" I replied innocently. "I haven't eaten since lunch yesterday." I quickly gathered up my papers and headed off to collect Rodg.

I emerged from the administration tunnel into the commons area and immediately spotted him among the seven or eight people who were there. He was kicked back in a lounge chair that he had pushed up in front of one of the video viewers. He looked typically Rodg, kind of like an unmade bed. I flipped his tangled mop of brown hair with my hand and then immediately wished I hadn't. "Come on, Rodge," I said, looking around for a place to wipe my hand. "Let's go to work. We've got some important deliveries to make today."

He looked up from a video he was watching. "Just a minute, Johni, I've got to see how this turns out."

I peered over his shoulder to see what could be holding him in such rapt attention. I had thought that I had lost my capacity to be surprised by "Rodgerisms" but this was a new one. He was watching an old 2-D black-and-white video of a 1950s game show. "My God, Rodg," I said. "What, literally, on Earth are you watching?"

"This is a great show," he exclaimed. "These old ladies come on and tell stories of how pathetic their lives are, and how everything would be rosy if they only had a washing machine. And the one with the most pathetic story wins. It's called 'Queen For A Day' and it's terrific." He turned his attention back to the screen.

Over in the corner I saw Christine McKenzie watching this scene with mild amusement, her eyes rolling back in her head. I gave her a knowing smile as I ejected the thimble from the viewer and threw it at Rodg. The viewer went mercifully blank. "Spoilsport," he exclaimed. "I'll tell you all about it on our way out to the rail." This was not welcome news because it was Rodg's tendency to stand too close and speak too loud, not unlike one hard of hearing. Curiously, though, if you were trying to have a private conversation with

someone, he seemed to have parabolic antennas for ears.

Up in the transportation dome Rodg and I went about the business of suiting up in light duty pressure suits. Regulations required we wear them when operating a tug, even though the cabins were pressurized. We didn't have to wear our helmets while in the tug, just have them handy in case of an emergency. Rodg kept up a running commentary of his game show interspersed with a barrage of non sequiturs covering an amazing range of subjects. He was a veritable walking encyclopedia capable of discussing almost any topic but, unfortunately, it was often on a random access basis.

I checked out the battery charge on Tug One and it had apparently just been brought back in. Tug Two, however, was fully charged so I undogged its access hatch and climbed in. Rodg handed me our gear, helmets, and the lunch kit Hildegaard provided to the rail crews. He then followed me in, dogging the dome and tug hatches behind him, and we cycled through the airlock. I brought the tug operating systems to life, got all green lights and undocked from the dome. Pulling gently back on the wheel, we rolled slowly out of the slip and into the harsh sunlight of lunar day.

It was the second day of the two week lunar day so the sun was still quite near the horizon. A gibbous Earth hung overhead as I jockeyed the tug around and we trundled off down the road at a leisurely five to ten klicks towards the refractory complex about a kilometer to the southeast.

When Mikelson had asked me if I knew anything about unauthorized activities in the kitchen I had evaded his question by telling him I hadn't eaten since lunch yesterday. That had actually been a true statement and my stomach was reminding me of that fact. Even Hildegard's infamous protein hockpucks were starting to sound pretty good.

"Hey, Rodg," I said. "Hildegaard said she put a bonus in our lunch kit for us. Check it out and see if she did." He grabbed the kit and opened it like a kid on Christmas morning. "Hey, great," he exclaimed. "Protein cakes." He jammed two of them immediately into his mouth. With his cheeks all puffed out, he looked like a goddamn chipmunk.

"Hey, Rodg," I said. "You wouldn't want to give me one of those would you?"

"Oh, sorry, Johni," he mumbled, ejecting a spray of crumbs. "Here you go." Oh well, his mouth was mercifully occupied, at least for the time being.

At the loading dock of the refractory, our consignment for the day was already loaded onto a trailer and waiting. I backed the tug up to the docking hitch and it locked home. We pulled away from the dock towing a trailer loaded with fourteen barrels and headed for Mass Driver Two about three kilometers away.

About a half hour later we pulled up alongside the automatic loader adjacent to the mass driver. I uncoupled the trailer from the tug and pulled over to the control building and into the docking slip. Moments later we were inside and settling down to do a day's work. We removed our pressure suits and Rodg went about bringing up and checking

out the computer while I checked out the power and mechanical systems.

Rodg had programmed his computer terminal to play the first eight bars of the old "Twilight Zone" theme upon the completion of its self check, so when I heard the repetitious four notes coming from his console I knew he was ready. I initiated the loading sequence and the first barrel containing a dewar of liquid helium was lowered into the magnetic bucket. I watched through the observation port as the bucket was rotated ninety degrees and then driven into the breach of the mass driver. The mass driver, or "rail" as we liked to call it, is an intrinsically simple device consisting of a two-kilometer-long cylinder surrounded by coils of wire.

The computer had calculated the system parameters and Rodg was looking them over and making any corrections he deemed necessary. He said he was ready so I charged the capacitor banks to the levels he specified and he enabled the computer to initiate the countdown. At the count of zero the power relays closed allowing a measured pulse of current to flow through the drive coils, and in less than two seconds the resultant magnetic field had accelerated the magnetic bucket by about 150 gees and it had traversed the two kilometer length of the cylinder. At the end of the cylinder, the bucket was rapidly decelerated by a counter magnetic field, and the contents of the bucket shot out into space at greater than two and one-half kilometers per second on a lunar escape trajectory that would send it to waiting capture ships in Earth orbit. With most of its velocity dissipated by the counter magnetic field, the bucket entered a gently curving track that would lead it 180 degrees back to the breach end of the mass driver to be used again.

Rodg usually watched the launch through the forward observation port in the hope of getting a glimpse of a departing barrel as it exited the end of the cylinder. This was occasionally possible if the sun was just right and gave a specular reflection. The barrels of liquid helium, being highly reflective, enhanced this possibility but, still, it was kind of like trying to see a bullet exiting the muzzle of a gun.

I usually watched the tracking computer to see whether the launch had been successful. Occasionally a coil would fail during a launch and a barrel wouldn't achieve escape velocity. In that case, the barrel would be coming back and we would need to know immediately if it had achieved a stable orbit or if it would impact. Such impacts had only happened twice in thousands of launches and they had been in areas of little concern. The moon was, by anyone's standards, still sparsely populated.

The tracking data was coming in on our first launch and it looked to be right on the money. Rodg wandered over with a look of disappointment painted all over his face. "I didn't spot it," he said. "The solar elevation angle was too high." He stood looking out the observation port while seemingly in deep thought. I knew what was coming; I could feel it. The gears were grinding away and Rodg was about to spew forth another of his famous non sequiturs. Finally the suspense was broken as he looked down and said, "did you know that cows belching up methane gas are a major source of air pollution on

Earth?'' This one struck me as particularly funny for some reason and I just had to laugh. ''Don't ever change, Rodg,'' I said. ''I like you just the way you are.'' And so it went through the rest of the shift and thirteen successful launches.

After the tracking data came in on the thirteenth launch I kicked back in my chair and put my feet up on the console. ''Well, Rodg,'' I said, ''what do you think about that load of titanium for L-4? We've launched thirteen straight barrels and they've all been well within predicted error bounds. Should we go for it?''

''Let me compute the parameters,'' he said. He keyed in the required data and studied the output for a while. ''Well, I can't see any reason not to go ahead and give it a try,'' he said. ''How will we know we can't do it if we don't try?''

''Well, I can't see any reason either,'' I said, ''other than no one's done it before. The system is performing flawlessly and we're not doing too badly ourselves.''

I picked up the phone to Mikelson and told him we'd launch as planned and that we'd take the output of the solar arrays in thirty-five minutes. That would give us plenty of time to get set up. Mikelson was glad we'd decided to launch and said he was going to call Tanner at L-4 and tell him to be ready because we were going to drive a load of titanium through his front door.

The loader strained slightly as it lifted the last barrel out if its cradle on the trailer and slipped it into the magnetic bucket. As the bucket rotated down to a horizontal position, I thought I detected a minor twisting motion in its decent. It was a heavy barrel; maybe the hydraulic motors were straining under the load. As a check, I raised and lowered the bucket again. This time I detected no motion. Curious.

''Hey, Rodg,'' I said. ''I'm going out to take a look at the bucket before we launch.''

''What's up?'' he asked.

''Probably nothing,'' I replied. ''I just want to make sure everything's where it should be.''

I suited up, grabbed a lamp and cycled myself through the airlock to the outside. I climbed up on the breach platform and inspected the exterior of the bucket, looking for cracks or distortions. At 150 gees these buckets didn't last forever. I then inspected what I could see inside the bucket between the barrel and the interior surface. All appeared normal. I went back in and popped off my helmet.

''Any problems?'' Rodg asked.

''Yeah,'' I replied. ''Looks like the jitters . . . mine!''

I went ahead and drove the bucket into the breach of the mass driver and started charging up the capacitor banks. The relay board indicated the solar arrays had been transferred over to our bus so I threw them in as well. Even with the extra power from the solars it took almost three times as long to achieve the charge Rodg had computed we needed. Finally, I got a green light indicating the specified charge had been achieved. I double checked the tracking board to make sure tracking systems were in operation and the launch corridor was clear of traffic. The launch alert signal was broadcast.

"OK, Rodg," I said. "I've got all green lights. Go ahead and initiate countdown at your discretion." He keyed in his launch enable sequence and initiated the usual countdown. "OK, we've got twenty seconds," he said, and then went over to the observation window to try once again to see the launch. Hope springs eternal. I just watched my console.

The computer counted down methodically, "Three, Two, One, Launch," the power relays closed and once again the bucket accelerated down the center of the drive cylinder, only this time something went terribly wrong. An investigation later would conjecture that the motion I had seen in the bucket was caused by the rupturing of one or more of the bands holding the coils of titanium alloy in tension inside the barrel. As the bucket accelerated at 150 gees, the barrel itself must have ruptured and the uncoiling titanium spools jammed the whole works inside the bucket. As the bucket entered the deceleration region of the coils, there wasn't nearly enough counter magnetic flux to stop the bucket and its contents so they both emerged from the end of the mass driver with about half of their originally imparted momentum.

Well, Rodg certainly had a front row seat for what was about to happen. Mark Twain once said that "in certain trying circumstances, urgent circumstances, desperate circumstances, profanity furnishes a relief denied even to prayer." Well, I knew something was desperately wrong when I heard Rodg utter in an urgent voice, "Oh, shit!" It was even more ominous because I don't believe that in all the time I'd spent around Rodg that I'd ever heard him swear. I instantly looked up from my console to the observation port and what I saw left me speechless.

The emerging bucket, full of twisted and jammed titanium, had entered the curving return track at such a velocity that the bucket quickly broke free and went skipping and hopping across the lunar surface raising enormous clouds of dust at every contact until it quickly disappeared from sight below the horizon. It was later found twenty kilometers away. In breaking free, the bucket imparted an immense transverse force to the rail and, not unlike one would flip a garden hose, introduced a traveling wave that successively sheared the light duty bolts anchoring down the rails. To our horror, that wave was propagating along the path of the rail which would take it right in front of the control building.

In what seemed like slow motion but probably took less than five or six seconds, the turmoil of dust and debris snaked its way back toward the breach of the mass driver. As it whipped by the front of the control building, the walls were pelted with thrown up rock and debris but no real damage was done. When the wave reached the breach end of the rail, the terminus held and the wave reflected back along its original path. This time past the control building, however, the rail, which had held during the first pass, sheared and swung wildly around, slamming into the side wall of the control building.

All hell then broke loose as a twenty-five centimeter hole in the wall opened up and we suddenly had a full-fledged loss of pressurization accident. The hur-

ricane of air rushing out of the hole threw me from my chair to the floor. As I was going down, I saw Rodg, who had instinctively backed away from the viewing port, literally throw his body at the hole. He was rotated in midair by the force of the wind and landed across the rift with his back and shoulders where the residual air pressure kept him firmly affixed.

"Rodg," I screamed. "are you all right?" He had a dazed, shocked look about him but he was conscious.

"The air pressure, Johni, cut the air pressure," he groaned.

I immediately comprehended what he was saying. The automatic pressurization system, sensing that pressure had stabilized, was trying to reestablish full atmospheric pressure and that pressure was literally pushing Rodg out through the hole. I hit the manual override and reestablished the pressure to a level equivalent to about 15,000 or 16,000 feet on Earth. There was still plenty of pressure, though, to keep Rodg firmly pasted to the wall.

Now I had to do something and do it fast. I was going to be all right; I still had on my pressure suit and all I needed was my helmet and gloves. I found my helmet on the floor behind the tracking console but my gloves were gone, apparently caught up in the initial vortex of air that escaped through the hole. Maybe I wasn't going to be all right after all. I scouted around and finally found Rodg's gloves which, for once, were in his locker where he'd hung up his pressure suit. There was no hope of getting him suited up so I grabbed up his gloves and went over to explain what I was going to try to do. He was not looking good; his face was very pale and he seemed to be in great pain.

"Johni," he said, "before you try this there's something you've got to know."

"Later, Rodg," I said. "There'll be plenty of time later."

"No, Johni, now!" he insisted. "I may not make it and you've got to know. It's all been an act, Johni, all an act. And somehow you managed to take it all and come back for more." He seemed to be gasping for breath. "Under other circumstances I would have been proud if you could have called me your friend but I couldn't allow that to happen."

"What the hell are you talking about, Rodg," I said. "I don't understand."

"Look, Johni," he said urgently as he grasped my hand. "Check out Administrative Procedure 1431 sometime. You're a bright boy; you'll figure it out." His grasp weakened. "And Johni," he whispered as a tear rolled down his cheek, "sorry about your pizza." His eyes slowly faded closed.

I brushed away the tear. "Don't worry about it, Rodg. It probably would have rusted out my arteries anyway."

Leaving Rodg, I went over to the airlock where the tug was docked. I entered the command sequence that forced the tug to dump pressure to that of the control building and was then able to open both airlock doors. I pulled up one of seat cushions from the tug and tossed it over by Rodg. I then put on my helmet and gloves, established suit pressure and started dumping pressure in the control room. As the pressure dropped, the force holding Rodg to the hole diminished and finally I was able to pull him

free. As the remaining air screamed out the hole, I slammed the seat cushion over it and it formed an adequate seal. In doing so I discovered why Rodg was in such critical condition. When the rail had punctured the wall it had created a blade-like shard pointing toward the inside. When Rodg threw himself on the hole, he also impaled himself on the shard. A stalagmite of frozen blood outside of the hole attested to the amount of blood he'd lost.

I quickly pulled him into the tug and dogged the airlock doors shut and reestablished normal atmospheric pressure. Pulling off my helmet and gloves, I opened the first aid kit on the wall and I took out the largest compression bandage I could find and placed it over the wound in Rodg's back. I then rolled him over on to it to hold it firmly in place.

Undocking the tug, I made for the transportation dome at the main complex at all the speed the tug would give. I radioed in and told the dispatcher the nature of the problem and to have help ready. On the way back I passed two tugs on the road who were scrambling out to help if possible. I radioed them that the emergency out there was over.

I rammed the tug into the slip, docked and popped open the airlock doors. Doc Bronowski, Nurse Mitchell, Mikelson and others helped me get Rodg out and onto a gurney. They wheeled him away to the infirmary in the commons dome. The rush of adrenalin finally took its toll on me and I just sat down and shook.

Logan found me a couple of hours later wandering the tunnels and trying to sort out what had happened. "He didn't make it, did he," I stated matter of factly.

"Nope," he replied. "Sorry, Johni. Doc Bronowski did all she could."

"You know that lugnut saved my life?" I said. "I only wish I could have returned the favor."

"Doc says he was as good as dead when he hit the wall," Logan said. "The shard apparently punctured a pulmonary artery. Give yourself a break, Johni. There wasn't anything else you could have done." I suppose he was right.

Later, we went through Rodg's belongings and found a will. A lot of us write one when we sign on here. He didn't have much family so in accordance with his wishes we put his remains in a barrel and launched him on a solar intercept—ashes to ashes, I guess.

I was troubled by Rodg's final words saying that it had all been an act. What had been an act? I went to the computer terminal in my cubicle and requested the administrative procedures file for Global Fusion. When I asked for AP1431 it replied *"Access Limited—Enter Password."* Hypercrap. The direct approach was not going to work; I didn't have a clue as to what the password was. I could go ask Mikelson about AP1431 but somehow I didn't think my chances of getting anything out of him were very good. I would have to try an end run if I was going to get anything. I requested AP1430 and 1432 and was granted access. They were not applicable, both dealing with matters of finance and accounting. On a whim, I scanned the entire format of the AP file and found a list of references in the back that were keyed to page numbers in the procedures. With the last page number of AP1430 and the first page number

of 1432, I found a reference that dealt with AP1431. It was from the *Journal of the Society of Modern Psychology*. Now this sounded like I was making progress.

I interrogated the base library for the reference but it wasn't on file. It would cost me a bundle, but I accessed a down link to a terrestrial data base and requested information on the the referenced item. The terminal responded "*Abstract Available,*" I instructed it to transmit and the information scrolled out across the screen.

On the Dynamics of Carefully Screened and Matched Populations Abstract.

Long term studies have shown that carefully screened and matched populations, while initially efficient and competent, can degenerate, often over trivial matters and minor personal idiosyncrasies. The introduction into the population of "foil" personalities can stabilize group personal interactions and serve as a reference for normal behavioral patterns.

I sat and thought about this psychological BS for quite a while in the light of what Rodg had said about everything having been an act. I finally had to conclude that Good Ol' Rodg was like a tarnished coin placed among us so that we wouldn't loose sight of how brightly we shined. If true, this was quite remarkable. I smiled to think how well he had accomplished his task and was at the same time saddened by the alienation it must have cost him.

Some sort of response was in order. Although it was way ahead of my schedule, later that night I made another excursion out to the surface and retrieved one of my pizzas. Once again, I cooked it in Hildegaard's kitchen and as I held the first slice to my lips I said, "here's to you, Rodg, a round peg dressed up in square peg clothing."

After I'd finished half of it, I sandwiched the rest between two plates and left the kitchen for the crew quarters. I stopped in front of Hildegaard's cubicle and knocked quietly. She opened the door and stood there looking quite surprised to see me.

"Mr. Alder?' she said. "What—"

I leaned over to her and planted a big greasy kiss right across her forehead and handed her the remains of the pizza.

"Here, Ms. Krupp . . . Hildegaard," I said. "Go ahead and live dangerously for once. I won't tell if you won't." I turned and went back to my quarters. She stood there as I walked away and was uncharacteristically speechless. A short time later I heard a rustle outside my door and a folded piece of paper slipped underneath. There was but one word written on it, "Deal."

Three or four weeks later I was walking over to the recreation dome with Logan for a game of handball when I spotted a new face coming out of the men's restroom. He was tall and lanky and his blonde hair looked as if it had been combed with a Van de Graaff Generator. I could hardly contain myself when I saw that he was trailing about three feet of toilet paper from the back of his trousers. "Hey, Logan," I asked, "who the hell's that?"

"A new guy," he said. "His name's Charles Scannel and he just came in on Tuesday's shuttle. The guys are calling

him Chuck and I've been assigned to train him over in the refractory."

I could no longer resist and broke down in waves of laughter. It was going to throw a wrench into the schemings of the eggheads in "psych," but I was pretty sure that I was going to like this new "Rodg." ■

IN TIMES TO COME

● Our December cover is for "Sanctuary," by James White. There have been plenty of speculations about what form first contact between humans and extraterrestrials might take. A fact often overlooked is that there exists one very old and well-established category of people who already have unique qualifications for the job—and might take a dim view of turning it over to some of the other groups who think *they* should handle it. I won't say more except to tell you the story was inspired by a real setting near Jim's home on the Northern Irish coast. . . .

Margaret L. Silbar has the fact article, concerning some of the interactive relationships between living organisms and light. We all know about vision and photosynthesis, but the possibilities are much more varied than that—and some of them are only beginning to be understood.

And, of course, we'll have quite a variety of additional fiction, including a novelette by Michael F. Flynn and shorter pieces by Pauline Ashwell, Jerry Oltion, and W. T. Quick.

THE REFERENCE LIBRARY

(Continued from page 135)

well stocked, and human intelligence and creativity are at a peak. Presumably, the library is improving its stock faster than ever now (more people mean more deaths), which explains the rapid pace of modern progress. By the same token, in the future human intelligence and creativity will rise beyond all our conceptions. It's a new wrinkle for the notion that we build upon the achievements of past generations, and I like it.

Stinker of the month is **Spacer: Window of the Mind,** by John Maddox Roberts. It begins as Kiril, a spaceport waif familiar to us all from the work of Andre Norton, flees the slum gang out to kill her. But she slams full-tilt into a heroic spaceman who disperses the foe and signs her, as "ship's girl," onto the roster of the independent trader *Space Angel*. No sooner is she beginning to believe her good fortune than an urgent message recalls the *Space Angel* to Earth, where—because it was the first ship to contact aliens (one of whom, an indestructible poet, decorates the *Angel*'s deck but doesn't do much)—it will join an expedition to open talks with a newly discovered group of aliens.

Unfortunately, the civilian side of the expedition is dominated by Ramon Izquierda, an implacable foe of the *Angel*'s captain. Izquierda, it soon emerges, has plans, he does (a twirl of the mustachios, please, maestro). Roberts's story is of how those plans are foiled by the plucky heroine, admittedly with the aid of others, including the gengineered human superwarriors, or Vivers (named as ultimate survivalists), K'Stin and B'Shant.

The story moves right along, and it's fairly short. Sadly, it is as tritely derivative as it sounds. Its brevity is a mercy.

* * *

You may be pardoned for thinking that Christopher Rowley is competing with Roberts for the gold-plated skunk. His **The Vang: The Military Form** starts off with the advantage of twice the length. Start reading, and you soon recognize a plentiful supply of cliches —from effete immortals to the jungle drug Tropic Acid 45 (I wonder why he named it that?), the drugrunners, and the corrupt officialdom that profits from the drug trade and does all it can to stave off the galactic authorities. A little later (as you were expecting from the cover blurb), dauntless asteroid-belt prospectors find a space capsule of unknown origin, pry into it, and awaken the Vang, and now you are into a B movie so ultimate that you wonder whether Rowley is putting you on.

Maybe he is. *The Vang, the Military Form,* is designed to conquer other species, awaken its Overlord, the Higher Form, who will engender its court, and then recreate the ancient Vang Empire. That Empire was destroyed ages ago by foes who destroyed planets and even suns to get the Vang. And those foes were on the side of Right. The Vang are omniparasites, monsters that turn humans into more monsters by shoving seeds (conversion modules) up their bums. It's a guaranteed gross-out. And you can't stop turning the pages. Rowley is good at what he does.

The Vang gain strength, first in the asteroid belt, then on the world of Saskatch, where the human response is hampered by human greed. A few noble cops are fighting their corrupt superiors, and the latter are far more intent on preserving their positions and wealth than on paying attention to those strange noises coming from . . . Too late. Too bad. The Vang are victorious. A small crew of heroes elude capture and conversion, but their defeat seems inevi-

table. To save them, Rowley deliberately cheats. He has the Vang competence falter, and then he introduces the Bulmunk, a man-sized lobster whose natural defense mechanism, projected nausea, makes the Vang turn inside out. Oddly, the Bulmunk and the Vang seem to share certain features.

Rowley's point, if he has one other than flipping your stomach as he revs your adrenals into high gear, is that conflicts of interest can have disastrous results. More subtly, he may be saying that planning pays, for the Bulmunk, native to Saskatch, has long eluded humans. Now, apparently driven by some sort of prescience, it has come to help, and thus to save its own life, as well as its posterity.

But Rowley isn't about to tip his hand. He doesn't even tell us much about the Bulmunk. I am therefore betting that there will be a sequel. And in that sequel, we will learn that the name of the planet, Saskatch, is significant. Think: Sasquatch means a sort of elusive primitive or pre-human. Surely we will learn that Saskatch is the ancient home world of the Vang, and the Bulmunk represents its ancestral Philosopher or Artist or Peacenik Form, now shaking its head sadly over how badly its last round of descendants have gone astray.

L. Neil Smith's Gallatin Divergence series is based on the idea that back aways in history, events took a different turn and the emphasis in Western civilization shifted from individual rights to individual responsibilities. The series is devoted to showing how this libertarian schtick works in an age of vast starships such as *Tom Paine Maru,* friendly aliens such as the trisymmetric lamviin and taflak, and mysterious villains such as the Hooded Seven, and it has produced some pretty good yarns. Unfortunately, **Brightsuit MacBear** is not one of them.

The trouble is that the book is little more than a travelog of a fairly antique sort. You've seen them: teenaged boy in strange environment—look! see!—pursues or flees villain into even stranger environment—look! see!—and triumphs, returning home a wealthy hero. Add details, and we have: boy living with grandpa on the *Tom Paine Maru* (lookit all the details!) learns that the old man was responsible for his parents' deaths and has kept from him his heritage. Now grandpa has swiped a precious artifact from a local museum and vanished. The boy must follow to a world with a bizarre ecology (would you believe kudzu, miles deep? OK, so it's not kudzu, but . . .), discover grandpa's treason and the threat of the Hooded Seven, recover the artifact, and return home a wealthy hero.

The book's purpose seems to be to introduce the Hooded Seven and MacBear and equip the latter with a special spacesuit, the brightsuit, that makes him a fairly good stand-in for a superhero. I hope the next books in the series will justify Smith's effort. This one doesn't do it.

The indefatigable Byron Preiss operation has been packaging the Millennium series for Walker. The first three of these books for young people were Katherine Kurtz's *The Legacy of Lehr,* Roger Zelazny's *A Dark Traveling,* and David Gerrold's *Chess with a Dragon.* Now add Robert Silverberg's **Project Pendulum.** Sadly, it's the weakest of the lot, and it is not helped by Moebius's often feeble line drawings. It may be quite an effective introduction to the idea of time travel, but it suffers from lack of real plot or resolution. It is a set piece, a static display for an idea.

The idea is that time is just a little like a spring. Take two identical masses—here, identical twins Sean and Eric. Activate the apparatus, powered by a tightly coupled miniature black hole/white hole pair, and the two masses will start oscillating back and forth in time, first past, then future, a little further on each swing, until they reach the age of dinosaurs and an equivalent future and the spring just won't stretch any more.

Silverberg works out the technical details very neatly, but nothing happens. The twins get glimpse after glimpse of time past and future, remember the lives that led them to their oscillations, and then—just how flat the end falls is well indicated by the book's last paragraph: "They were going to have plenty to tell each other, Sean knew. Enough to last them for the rest of their lives."

Perhaps Silverberg was hoping to hook a few youngsters into a life-long addiction to SF. After all, if we don't do a little pushing in the schoolyards, the business must eventually peter out. Sadly, few youngsters—or adults—are attracted by idea alone, no matter how ingeniously worked out. They need action and excitement. Give them that as well as idea, and SF may indeed live.

The cover tells you that **The Man-Kzin Wars** was "created by Larry Niven with Poul Anderson and Dean Ing." It therefore looks like just another entry in the shared-world sweepstakes. And it is. Shared worlds are as hot as condos, and every writer with a concept he or she doesn't want to develop himself or herself is recruiting tenants.

Here, Niven has done a good deal of the development work, beginning with the book's lead story, "The Warriors," a human-supremacist yarn in the old *Astounding-Analog* vein. This is the story that first told us humans have given up war because they are so very good at it, as the felinoid Kzinti discovered to their dismay when human and Kzinti civilizations met and clashed. Later, Niven knitted the Kzinti into his Known Space series, but he skipped over the period of war between human and Kzinti. Now, he's letting writers with a more military bent fill in the gap.

Any suggestion that his motivation springs solely from the great current marketability of vicarious adrenaline should be vigorously pooh-poohed. That motive may be there, but it can't be all. Poul Anderson has produced a nice novella in "Iron," which follows a human exploratory expedition to a dim red star whose metal-poor planets have been cooling in the void for two-thirds of the universe's age. Anderson astounds us with cosmological marvels, including a deadly one, even as he has the humans run into a secret Kzinti base, preparing for a new round of war. The premise being what it is, the humans find a way out. Unfortunately, I found their solution both predictable (have I simply read too much science fiction in the last 30 years?) and too dependent on Kzinti incompetence.

Ing's novelette, "Cathouse," struck me as even better. In it, a human scholar, Carroll Locklear, is captured by Kzinti on their way to attack human worlds. They stash him for the duration on a planet that just happens to be available and that, strangely, is studded by walled-off environments. One of these zoo cages seems to match ancient Earth. Another matches Kzin, and this is where the Kzinti drop Locklear. There he finds a cave filled with Kzinti who last lived millennia before. They are in stasis, and when he awakens a female he finds that she is not the mindless breeder of modern times. She has a mind of her own.

She is, in fact, a feminist. Her type vanished from among the Kzinti because military-minded dunderheads took charge and selectively bred female intelligence out of the species. At the same time, they bred the male for ferocity, and as Ing reveals all this, we get a clue to why humans can defeat the felinoids: Kzinti behavior is strongly influenced by reflexes or instincts; human behavior is far more flexible and therefore more adaptive.

It is such a truism of anthropology that the development of intelligence and the loss of instinct go together that I doubt that the Kzinti, as reflexive as they are, could ever have developed a civilization. Ing may agree. At least, when the Kzinti spaceship returns, he shows us that an intelligent female is a much more potent turn-on than one selectively bred for docility. The result is the victory of intelligence.

Wouldn't it be nice if we humans were as smart as we keep telling ourselves we are?

New Mexico is home to a surprising number of science fiction writers. They are there for a variety of reasons: Jack Williamson and a few others were born there; John J. Miller has simply never felt any reason to live anywhere else; Martha Soukup moved there because she liked her neighbor writers; George R.R. Martin finds it an intoxicating place to live; Fred Saberhagen was fleeing Chicago and got stuck in Albuquerque; Roger Zelazny sought and found a congenial place to live.

I'm sure this concentration of what-if minded talent has to give the local cocktail parties a strange and excellent flavor. More to the point is the wealth of fiction, short and long, generated in that state, and thus the possibility of publishing books with the New Mexico label prominent upon them. Books, that is such as **A Very Large Array,** edited by Melinda M. Snodgrass.

If you suspect me of being a touch snide, let me reassure you. It's a very good anthology. Snodgrass has drawn together an excellent set of stories, with hardly a dog in the batch. She gives us: Zelazny's "For a Breath I Tarry"; Williamson's "Jamboree"; Walter Jon Williams's "Video Star"; Saberhagen's "Smasher" Berserker yarn; Suzy McKee Charnas's "A Musical Interlude," an excerpt from her excellent *Vampire Tapestry*; Terry Boren's "Sliding Rock"; Martin's "In the Lost Lands"; Stephen R. Donaldson's "Unworthy of the Angel"; Victor Milan's "Feast of John the Baptist"; Soukup's "Frenchmen and Plumbers"; Miller's "Ouroboros"; and Snodgrass' own "Requiem." Each has a page or so of notes on the story's significance to its author and/or why the author lives in New Mexico.

Buy and enjoy.

Imagination: The Art & Technique of David A. Cherry. The title says it all, though you might like to know that Cherry is the brother of C.J. Cherryh, despite the extra letter in her name, and that he trained as a lawyer before chucking it all in favor of a life of creativity.

You say you've never heard of David A. Cherry? You have certainly seen his work gracing the covers of SF paperbacks, including several by his sister. You have been pleased by his work, as muscular as that of Vallejo or Frazetta, but subtler, leaner, cleaner, expressive of a wider range of feeling than, "Uggh! Me Tarzan, you Jane!"

If you wish to see more, here's your chance. If you are curious about how he does it, as layperson or budding artist, here's your chance again, for there is a lengthy discussion of how he exe-

cuted the cover piece, "The Offering." Unfortunately for you artists, all he reveals is technique. The secrets of his perception and creativity remain his.

ANADEMS

Remember Spider Robinson's Callahan? Of course you do, bless your soul, and you will be delighted to hear that Phantasia Press (5536 Crispin Way, West Bloomfield, MI 48033) is bringing out **Callahan and Company** as the complete chronicles of that miraculously congenial saloon.

What more can I say? The price is $20, unless you want to see whether any of the special edition of 300 signed, numbered, and boxed copies are left at $50 a pop.

Let me call your attention to the Avon paperback edition of **Trillion Year Spree; The History of Science Fiction** by Brian W. Aldiss, with David Wingrove ($9.95, 511 pp.). Its coverage is ample, its voice authoritative, and its authors impeccably distinguished. If you are a fan, an SF scholar, an essayist or reviewer, or even a student who needs something from which to crib a term paper, you need it. So get it. ■

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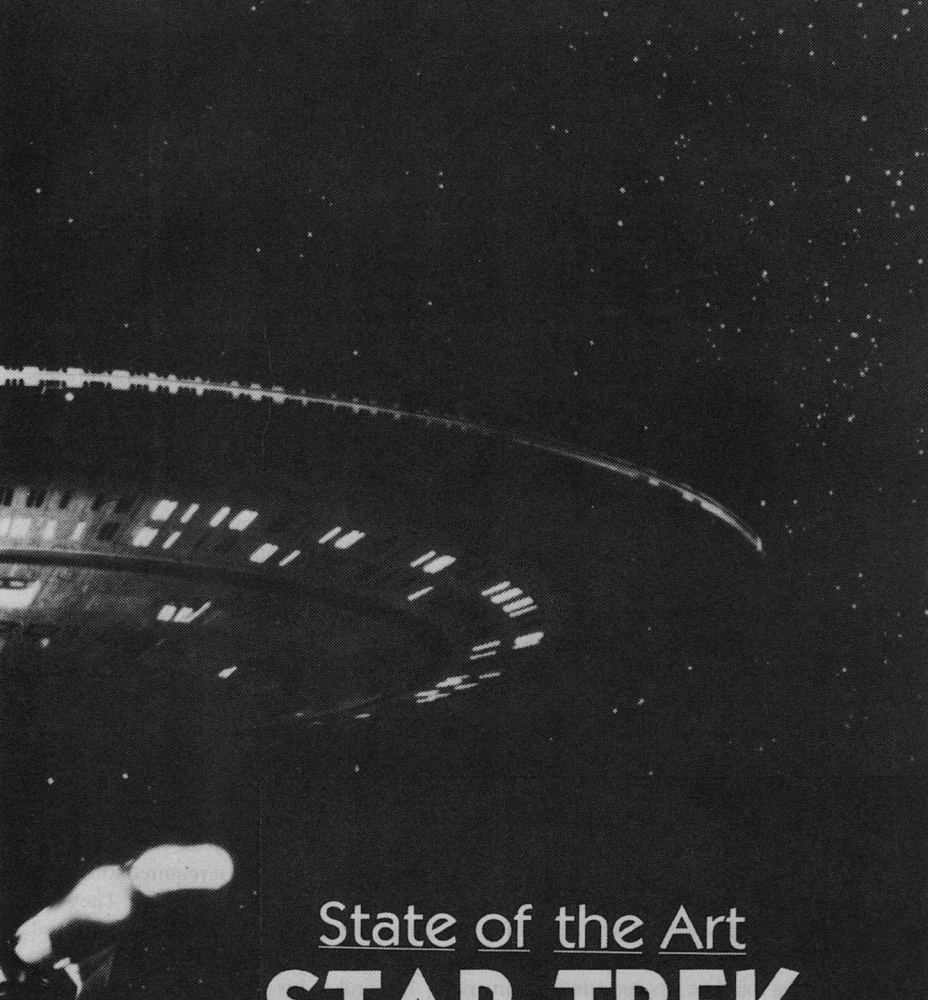

State of the Art

STAR TREK REVISITED

G. Harry Stine

How our culture views its future makes an illuminating reflection of its present.

On September 8, 1966, a phenomenon burst out of the television screens in the United States and Canada: A new adventure series about science, technology, star flight, humanity, extraterrestrial life, and a hopeful future that took place aboard a huge star ship on a five-year mission to explore strange new worlds, to seek out new life and new civilizations, to boldly go where no man had gone before. . . .

It was *Star Trek*, and it did all of those things.

It's five-year mission was originally interrupted at three years but then went on to become a twenty-year-plus mission as of this writing . . . and its mission isn't over yet.

It explored strange new worlds, not only externally in our own corner of the galaxy but within ourselves as well.

It sought out new life and new civilizations and helped create a new civilization here on Earth.

And it certainly went where no person had gone before, especially in the world of television, motion pictures, and the entertainment industry.

The series had an internal integrity to it like no other. It was very different from other "science fiction" series popular at the time. Its speculative universe held together as well as any in science fiction literature. Its people were very real, so real that the actors who portrayed the *Star Trek* characters had a great deal of difficulty convincing the growing legion of fans that they were *not* those characters.

The February 1968 issue of this magazine carried a science-fact article, "How To Make A Star Trek," by this author. It was the *first* of thousands of magazine articles that were eventually published—and are still being published—about *Star Trek*. It covered in some detail many of the aspects of the *Star Trek* universe drawn from the original mimeographed *Star Trek Guide* dated April 17, 1967, and intended for prospective writers and directors.

Star Trek was a thought-provoking action-adventure series and probably the best science fiction series ever to appear on the tube. In 1966, it was a sensation in the TV world. It's worth repeating the comment of a television network executive who remarked after seeing the *second* pilot (unusual because the network sprung for not just one pilot, but two): "This is the most fantastic thing we've ever seen . . . It's too good for TV!" (It was!) The NBC Vice President in Charge of Television Programming said that he really *believed* those people were out there in deep space in a star ship. But the network high brass still thought the series was "too cerebral," that it would go over the heads of most of the viewers, that it required too much thought in order to understand. They felt that the producer, former commercial pilot and policeman Gene Roddenberry, had broken his original promise to create a "Wagon Train To The Stars" series. And they had trouble keeping this new show apart in their minds from another "science fiction" series, *Lost In Space*. They were afraid of the mixed crew, worried that a Negro crew member would lose them viewers in the South, concerned that a Japanese crew member would lose sales for the series in Indonesia, for example. They thought an

all-male WASP crew would be safest, and they became so entangled in their controversy that they ended up letting Roddenberry do it his way because they couldn't make up their minds.

But a miracle happened. In the middle of February 1966, word came that *Star Trek* would premier as a network TV series the following September.

The details of this process have been thoroughly documented in the classic book, *The Making of Star Trek*, by Stephen W. Whitfield and Gene Roddenberry (Ballantine Del Rey, New York, 22nd Printing, 1986, ISBN 0-345-34019-1, $4.95). This was before Desilu Productions was acquired by Paramount Pictures who was in turn acquired by Gulf + Western who in turn acquired Scribner's who acquired Pocket Books who thereafter had a lock on *all* books relating to *Star Trek*.

The series didn't draw a big audience—a fact, along with network scheduling in strange time slots, which caused its eventual demise after only a three-year mission. The Great God Neilsen struck it down. But it drew a loyal and *quality* audience every week . . . and for weeks and months and years after it left the network.

However, the aborted five-year mission of the United Star Ship *Enterprise* actually lasted far longer than its creator imagined and had a lasting impact upon the lives of most people on this small planet who possessed television sets on which they could view the series.

Twenty years, a fifth of a century, have passed. Looking back, we can now see that *Star Trek* indeed changed the world.

That's a pretty broad statement to make, and it may well be that only *parts* of our world were changed by a television series. But let the record speak for itself:

In the three seasons 1966 through 1969, 78 episodes of *Star Trek* were aired. These episodes, all of them, are still in rerun syndication. This was followed in 1973-1974 by 22 animated episodes.

In 1979, the first of four *Star Trek* motion pictures hit the theaters. We haven't seen the last *Star Trek* motion picture, and the original stars have become writers and directors for their own movies.

The series literally made or dismayed the careers of several actors and changed the lives not only of its audience but the people involved in its creation.

Hundreds of *Star Trek* books —including "The Abode of Life" written by my alter ego, Lee Correy—have been published. And they've sold very well, thank you.

And the enormous impact of *Star Trek* can be gauged by the fact that it has added to our language:

"Beam me up, Scotty!" (Actually used only in *Star Trek IV: The Journey Home*.)

"He's dead, Jim!" (Used many times . . .)

"I grok Spock!" (Which didn't come from the show but which expressed so well the empathy fans felt for the character.)

"I'm a doctor, not a . . ."

"Fascinating, Captain!"

Warp factor, star date, impulse drive, transporter, phaser, sensors, dilithium,

tricorder. Few people, even those who never watched the original show, do not have some idea of what those words mean. No single science fiction novel or story has had such an impact.

The most popular plastic assembly kit in the hobby industry was and still is the battleship U.S.S. *Arizona*, but the second most popular one is the AMT plastic kit of the United Star Ship *Enterprise*. An unassembled kit shot from the original molds and still in its original packaging is now worth a small fortune.

No other science fiction novel, story, motion picture, or television series managed to name a space ship. Organized and prodded by the indefatigable Bjo and John Trimble who succeeded in getting more than 500,000 letters into the White House, President Gerald Ford overruled NASA Administrator James Fletcher (who is NASA Administrator again) and changed the name of the first space shuttle Orbiter. When it was rolled out of its hangar at Palmdale, California, on September 17, 1976, it bore the name *Enterprise* in bold black letters on its nose. The Air Force band mangled the *Star Trek* theme song as it came around the corner of the huge hangar, but those of us who were there, including Gene Roddenberry and the cast, were cheering so loudly we couldn't hear the band anyway.

Many fans were dismayed to learn that the Orbiter *Enterprise* can never go into space; it wasn't designed to. But they should take heart in the knowledge that it's destined to be preserved forever in the National Air and Space Museum of the Smithsonian Institution, never to be scrapped, perhaps some day to be on hand when the actual Star Ship *Enterprise* is built.

In fact, one of the original models of the U.S.S. *Enterprise* is in the National Air & Space Museum collection (and was on display for nearly a decade) as well as the film of the original pilot, "The Cage" (later to be melded into the two-part series show, "The Menagerie").

People who watched *Star Trek* banded together to form fan clubs and hold conventions. Many fans do the same thing now for other television series. But the "Trekkies" (the sobriquet hung on them by non-fans and a name *Star Trek* fans both love and hate) were the only group who did these things because of a single three-season television series. (Sorry, Whovians, but the Trekkies beat you to it and probably have you outnumbered as well! But that's a moot point.) The ranks swelled again when the animated series came along. And the Trek population grew again as the four movies were released. The details of the growth and activity of the unique segment of science fiction fandom are told by Bjo Trimble in her book, *On The Good Ship Enterprise* (The Donning Company, Virginia Beach VA, 1982, ISBN 0-89865-253-7, $5.95).

Not bad for a television series that was made before men landed on the Moon and before Kubrick's "2001: A Space Odyssey" made modern SF films popular in 1968. In fact, in spite of low-budget, low-tech special effects, *Star Trek's* original shows hold up well in reruns more than two decades later!

Gene Roddenberry and I became good friends over the years. We have

a lot in common; we're both pilots and science fiction fans. Jerry Pournelle introduced me to computer word processing, and I in turn introduced Gene to the wonders of the new technology. Gene tried to get me involved in television because of its enormous public impact, but I told him that I understand writing and publishing better and didn't want to work his side of the street. But I shall never forget the luncheon we had together in Studio City, California, in February 1978 between the television series and the first motion picture; Gene was worried about leaving a legacy behind him! I reminded him of Admiral Peary of the Explorers Club (we're both members of that, too) who wrote in his diary long before he reached the North Pole, "Here I am twenty-six years old, and I haven't done anything yet!"

Gene is now listed in "Who's Who In America" and got his "star" on Hollywood Boulevard on September 4, 1985. That was one of the strangest days of my life because, as a friend and a *Star Trek* author, I was invited and went. Not many science fiction authors meet their characters in real life; they stay in our minds even after we've put them on paper and seen them illustrated. But after "hearing" and "seeing" the *Star Trek* characters in my head for several months while writing *The Abode of Life*, I suddenly found myself surrounded by them on the Hollywood Boulevard sidewalk! John W. Campbell, Jr., editor when *Analog* published my first *Star Trek* article twenty years ago, often admonished me never to allow the science fiction universes I built in my imagination to become confused with the real universe around me; that day, it was damned difficult!

But with a *Star Trek* legend already built, Roddenberry was still a persistent individual.

Therefore, I was only mildly surprised, but greatly delighted when on January 14, 1987, the postman delivered to me a plain brown envelope postmarked from Los Angeles. It contained a document marked CONFIDENTIAL. It was Gene Roddenberry's outline and guide for *Star Trek: The Next Generation*.

I don't have to keep it a secret any longer. If you watched a local independent televsion station on the evening of September 30, 1987, you know what was in that outline and guide. (A few small changes were made, which will make that first guide a collector's item in the years to come. No, sorry, I won't sell it!)

The new series is *different*.

During the three years of ST:TO (*Star Trek*, The Original), Gene chafed under the network censors who, for example, raised hell when Kirk embraced Uhura in "Plato's Stepchildren" which aired on November 22, 1968. The mere idea of a white male kissing a black female on network TV was totally and completely *verboten* twenty years ago. The censors and network executives balked when Gene wanted to do any episode that was even slightly controversial although the plot would have examined some particular human condition or foible. That's why Gene convinced Paramount Pictures to syndicate ST:TNG (*Star Trek: The Next Generation*) with independent television stations. An in-

dependent in one part of the country might find one particular ST:TNG show not to their liking, but other independents would broadcast it. In short, the restrictions of network TV are not present in the independent TV world. And *that* is why ST:TNG airs on independent stations.

Other changes are obvious. ST:TNG takes place 78 years after ST:TO. New ship, the U.S.S. *Enterprise* NCC-1701-D, fifth Federation star ship to bear the name. You occasionally see scale models of the various *Enterprise* vessels in the Captain's Lounge on the screen.

A new crew also runs the bigger *Enterprise*.

New villains complicate the situations.

Well, you've seen the new show—and if you haven't, you as an *Analog* reader should.

Along with the obvious technological progress that has taken place in 78 years, social progress is also evident.

The best example of this is a bridge officer of a race portrayed as the arch-enemy of the Federation 78 years before. He is Lieutenant Worf, a Klingon. *A Klingon on the bridge of a Federation star ship?* No mention is made of Worf in the Writer/Director's Guide except a comment, "We are determined not to copy ourselves and believe there must be other interesting aliens in a galaxy filled with billions of stars and planets." In case the presence of Lieutenant Worf interferes with the suspension of your disbelief, look at it another way: forty-five years before this article was written, the U.S.A. was involved in total war with both Germany and Japan. Today, the skies over America are full of airplanes crewed by Japanese and Germans peacefully flying for JAL and Lufthansa. In fact, Lufthansa pilots are trained not twenty miles from where this is being written and I share airspace with them every time I fly. (I have also flown a Russian and a Czech in my plane.)

The new *Enterprise* is twice the size of the ship in ST:TO and has a crew of 1,012 in contrast to the original 410. The ship isn't as sterile and "battleship"-looking as the one in ST:TO; it's far more livable with plants here and there. The holographic decks (holodecks) can duplicate a given locale on any planet so the members of the crew can go "home" occasionally. However, in a literal sense, the ship is *home* to its inhabitants because it's an exploration ship intended to stay in space for a long time; therefore, families live aboard her.

This has caused some problems for Captain Jean-Luc Picard, who is obviously uncomfortable with the situation, having come from command of the deep-space charting vessel, U.S.S. *Stargazer*. Other than a single teenager, Wesley Crusher, 17-year-old son of medical officer Dr. Beverly Crusher, we haven't yet seen other families or children aboard except in passing. I hope we do; one of my favorite stories which I was never able to sell was about a child who is rescued by Captain Kirk and then raises hell aboard the original *Enterprise*.

All of this is also causing some problems for the old ST:TO fans, by the way. I'm on the BIX (Byte Information Exchange) computer network where Bjo

Trimble conducts a *Star Trek* conference which is one of the most active in the network. Here are some of the most common comments:

Some fans don't like Captain Picard who is greatly different from Captain Kirk. So? Kirk was unusual and often unlikeable in his own way. So is Picard. In today's U.S. Navy or Coast Guard, no two ship commanders are the same. Some of the dissent is obviously caused by old fans wanting clones of the old characters. Well, they can watch the ST:TO reruns for that. I intend to enjoy seeing Captain Jean-Luc Picard and the other members of the new crew evolve and take on their own life just as did the characters of ST:TO Remember: It took many episodes before Kirk, Spock, McCoy, Scott, Uhura, Sulu, and Chekov became real enough that we could understand and therefore like them. The same will happen with Picard, Riker, Data, Troi, Yar, La Forge, Worf, Crusher, and especially Wesley Crusher.

Many fans detest Wesley Crusher, the boy genius. This is an interesting phenomenon because I suspect many of the computer literati on the BIX network were once teen-agers of above-average mentality themselves and are damned glad to have gotten through that difficult period of their lives when they may have hated themselves just as passionately as they seem to hate Wesley Crusher. Wes is portrayed by an excellent young actor who is perhaps doing his very best with what I would consider to be marginal dialogue because I'm not certain that the writers understand Wes yet themselves. I've known a lot of young genius types. Few of them were likeable. Few of them were understood by others. I'm willing to give Wes a chance to mature in the role . . . although I'm enough of an old curmudgeon myself that I wouldn't let him get away with some of the things he already has without talking to him like a Dutch uncle afterwards. (However, guess which character has drawn the most fan mail thus far?)

Another interesting phenomenon has surfaced as a result of the comments on the computer network: When ST:TO originally aired, *there were no personal computers and no computer networks!* Today, many personal computers nearly equal the ship's computer in ST:TO! Twenty years ago, we didn't have the luxury of being able to be instant intercontinental critics. The feedback process took longer then. And perhaps it was therefore leavened a little bit because of the time delay.

Which brings me around to what I really wanted to talk about.

Star Trek has changed.

But so have we!

ST:TNG probably accurately reflects many of the social changes that have taken place over twenty turbulent years of one of the most profound social revolutions of this or any other century. In many ways, ST:TNG reflects the growing openness of our society that was exemplified by an alien philosophy held up as an ideal in ST:TO: The Vulcan IDIC—Infinite Diversity in Infinite Combinations. The characters of ST:TO revelled in something totally new to us in 1966: the appreciation of others because of their differences. While this concept is not yet totally a part of the Euro-American civilization, we've come

a long way toward that goal. Our social institutions are now far more mixed-race and mixed-gender than they were a generation ago. We're far more tolerant of individual differences now than we were then.

In fact, I think this was probably one of Gene Roddenberry's ulterior motives for ST:TNG. Those of us who love ST:TO could have sat around another twenty years enjoying the reruns and perhaps getting an increasingly reluctant generation of our grandchildren to watch that "old show." But now we have *Star Trek: The Next Generation* which is not only a series of stories that are true sequels of the original series but are also intended to bring along *the next generation* of human beings by means of a television series that is openly in favor of progress, that is based on the premise that we will manage to solve the critical problems of the twentieth century, and that the future can be a better place if we work to make it that way. We can go to the stars and we will, if we work for that. We can make a better world, if we work for that. And when we tangle with the future problems of the for-real Klingons and Romulans, we won't immediately react to wipe them out but will work to become friends and keep moving onward and outward.

As of this writing, *Star Trek: The Next Generation* has been picked up for an unprecedented second season well before the first season is completed.

Which is another factor that makes Gene Roddenberry's creation unique.

And, face it, *Star Trek* in all its forms is a phenomenon unique in television and unique in science fiction.

No other television series has had its own successful sequel.

No other television series has continually involved so many science fiction personalities, many of whom got their start here in the pages of this magazine. For example: Hugo-award-winning space and SF artist Rick Sternbach who got his start with the October 1973 *Analog* cover is listed in the credits of ST:TNG. When ST:TO first aired, Rick was a teen-ager in my Connecticut model rocket club; today, he's part of the next generation of *Star Trek* creators, and you can see his distinctive space art in the background of many scenes.

No doubt about it: Gene Roddenberry is leaving more than the legacy of a single television series. He's helping bring along the next generation . . .

Gene, ten years ago you said something to me about a legacy?

Let me conclude this observation of the state of the art by quoting what I wrote twenty years ago in these pages and which still holds true today:

"There are adventures galore to keep the crew of the *Enterprise* warping across our screens for years to come, interweaving their adventures with pungent comments upon humanity, philosophy, and the whichness of what, and wrapped up in an optimistic projection of the future of mankind and the technological tools he is even now forging to control rather than to be shaped by his environment." ■

a calendar of analog upcoming events

21-23 October
CON*STELLATION VII: CENTAURUS (North Alabama SF conference) at the Huntsville Hilton, Huntsville, Ala. Guest of Honor—John Varley, Artist Guest of Honor—Todd Hamilton, MC—Algis Budrys, Fan Guest of Honor—Ricia Mainhardt. Registration—$15 until 6 September, $20 thereafter. Info: Con*Stellation VII: Centaurus, Box 4857, Huntsville AL 35815-4857. Include S.A.S.E.

4-6 November
PHILCON LII (Philadelphia area SF conference—The oldest running SF conference) at Adam's Mark Hotel, Philadelphia, Penna. Principal Speaker—Orson Scott Card, Guest Artist—Robin Wood, Special Guest—George R.R. Martin. Registration—$15 until 1 November. $20 thereafter. Info: Philadelphia Science Fiction Society, Box 8303, Philadelphia PA 19101.

11-13 November
ORYCON 10 (Oregon SF conference) at Columbia River Red Lion, Portland, Ore. Guests of Honor—Lucius Shepard, John Varley, Connie Willis; Special Guest—Mona Clee. Registration—$15 until 31 May, $20 until 30 October, $25 at the door. Info: OryCon 10, Box 5703, Portland OR 97228. (503) 283-0802.

11-13 November
WINDYCON XV (Chicago area SF conference) at Hyatt Regency Woodfield, Schaumburg, Ill. Author Guest of Honor—Orson Scott Card, Editor Guest of Honor—Lou Aronica, Artist Guest of Honor—Erin McKee, Fan Guests of Honor—Lynn & Mark Aronson, TM—Wilson Q. Tucker. Registration—$20 (adults), $20 (child care service, must be pre-registered) until 6 October, $25 at the door (adults only); babes in arms or kids in tow (up to 10 years) free. Info: Windycon XV, Box 432, Chicago IL 60690.

11-13 November
SCI CON 10 (Chesapeake area SF conference) at Holiday Inn Executive Center, Virginia Beach, Va. Guest of Honor—David Brin, Artist Guest of Honor—David Mattingly, Fan Guest of Honor—Bud Webster, TM—David Cherry. Registration—$15 until 30 September, $20 at the door. Info: SciCon 10, Box 9434, Hampton VA 23670.

18-20 November
READERCON 2 (Boston area reader-oriented SF conference) at Lowell Hilton, Lowell, Mass. Guest of Honor—Samuel R. Delany. Registration—$15 until 14 October, $20 thereafter. Info: Readercon, Box 6138, Boston MA 02209. (617) 576-0415 (evenings and weekends).

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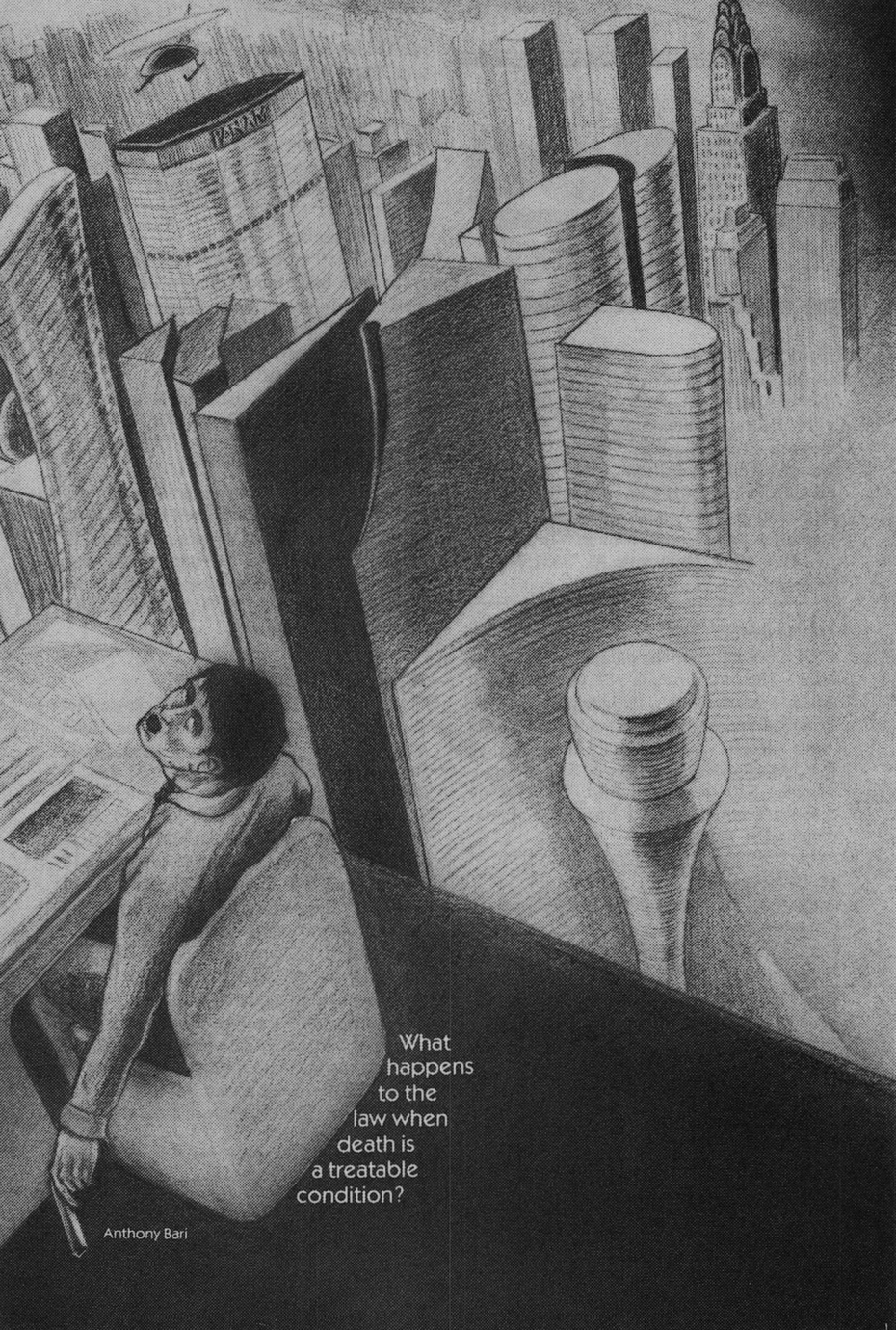
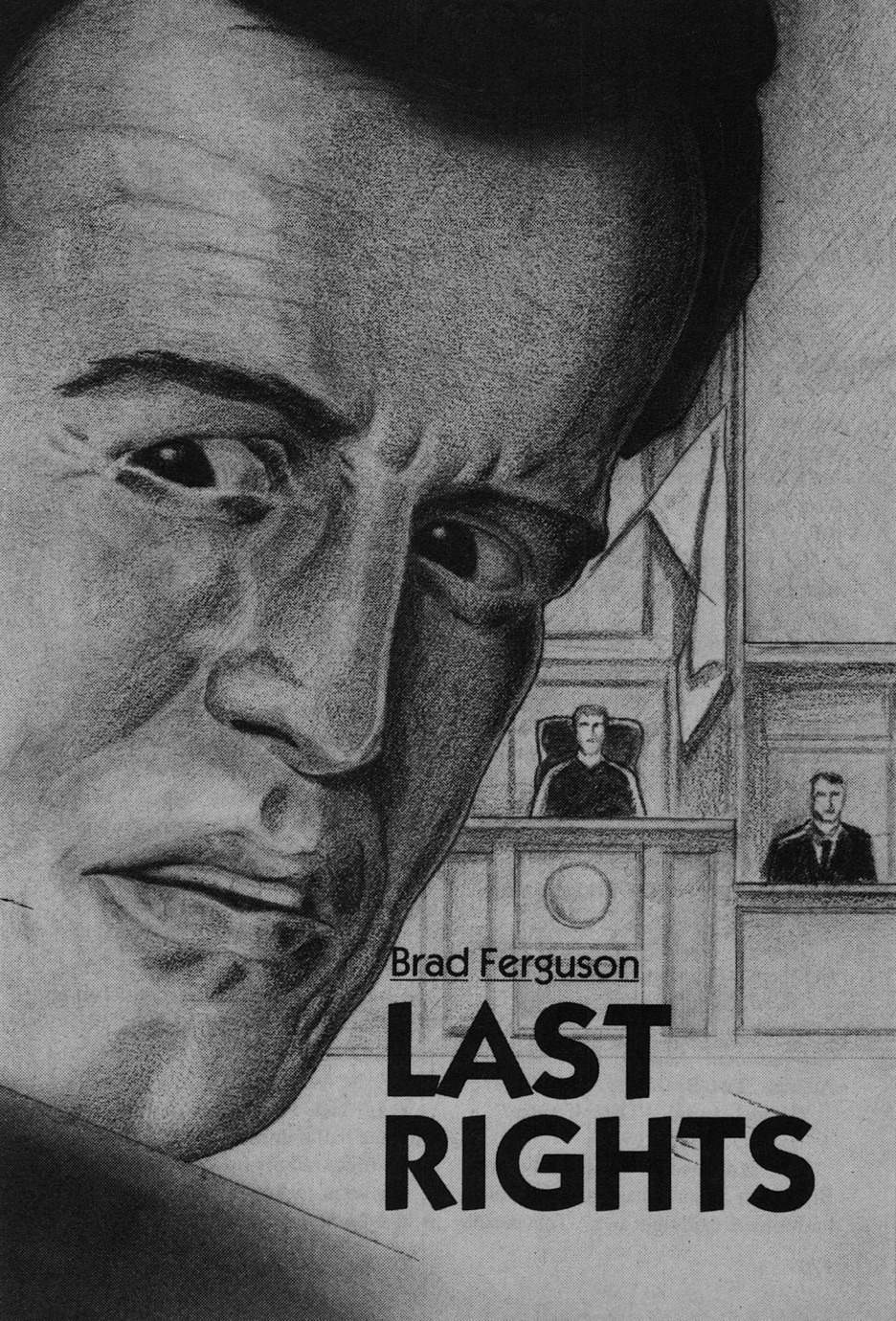
31 August-4 September 1989
NOREASCON III (47th World Science Fiction Convention) at Sheraton-Boston Hotel & Hynes Convention Center, Boston, Mass. Guests of Honor—Andre Norton, Ian & Betty Ballantine; Fan Guest of Honor—The Stranger Club (Boston's first SF club). Registration—$60 (adult), $40 (child) to 15 September 1988; $70 (adult), $45 (child) to 15 March 1989; $80 (adult), $50 (child) to 15 July 1989. Supporting—$20 at all times. No advance memberships after 15 July 1989. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate and vote for the Hugo awards and the John W. Campbell Award for Best New Writer. Info: Noreascon III, Box 46, MIT Branch, Cambridge MA 02139.

—Anthony Lewis


PAN AM
What happens to the law when death is a treatable condition?
Anthony Bari


Brad Ferguson
LAST RIGHTS

It was one of those gray-on-gray March mornings that go so well with decaying downtown Manhattan. I had nothing much to do but look out the window to where the demolition crews were nibbling away at the World Trade Center, inch by ugly inch. Then my phone buzzed.

The ansatape whirred, lying to whoever it was that I was busy. I pressed the bug button and listened to the incoming message.

"Dave?" came a voice I didn't recognize. "This is Frank Bridges. Might have a job for you, if you're not too busy. Call me before noon. You should have the number. Bye." Bridges clicked off.

But who *was* Bridges? I couldn't remember him to save my life. "Computer."

"I'm listening." Insolent bitch. I wished again for one of those sweet, new IBApples with the sexy voice and the white slave manner . . . but at six thousand newbucks, one of those is too rich for my blood. (I was *still* paying off my law school loan and my initiation charge for the Metropolitan Law Library. Oh, never mind.)

"Search phone file: Bridges, Frank. Add: Bridges, Francis."

"Okay." There was a short pause, and then: "Found. One entry."

"Read it."

"Bridges, Francis Xavier. Assistant vice president, Aetnadential Insurance. Address, Two Broadway. Shall I dial?"

"Hold," I said. "Date of entry?"

"Last December 16."

That explained it. I must have met Bridges at a Christmas party and filed his business card right away. That meant I probably didn't owe him any money or favors.

I looked at my watch; it was just nine thirty-two. I had plenty of time to call Bridges back without appearing overanxious. "Flag reference: Bridges, Francis. That's all."

"You're welcome," the computer said.

I leaned back in my creaky chair and put my feet up on the desk. If Bridges had work for me, I wanted to talk to him; the office rent was due. And I noticed I could use a new pair of shoes; my uppers were cracking.

I killed the rest of the morning doing the *Times* puzzle and did not call Bridges back until just before eleven-thirty. "Computer."

"I'm listening."

"Retrieve reference: Bridges, Francis. Dial."

It did, and Bridges came on the phone. "Frank, this is Dave Aaron, returning your call. How are you?"

"I'm just fine, Dave. Busy morning?" Bridges seemed in a good humor. I wished I remembered what he looked like; I had a vision circuit when I worked for the city, but not any more.

"As usual," I replied. "And you?"

"Busy enough. Actually, not to rush you, but that's what I called about. Tom Meaghan over at Smith and Stern says you've done some revival work for him."

Yes, I had. I knew Tom pretty well; I'd done half a dozen cases for him, all paper-filing, all preprogrammed losers. It was good to know Tom didn't hold it against me. "That's right," I said,

and gilded the lily: "Revival work is a specialty of mine."

"Fine. Want to handle one for me?"

My eyebrows went up. "We could talk about it," I said casually. A revival case for Aetnadential, the biggest life insurance outfit in North America? You bet your ass I'd talk about it.

"Good. Look, I don't want to waltz around the block with you on this. The fact is, I need someone *fast* to handle a revival hearing."

A hearing? I hesitated a bit; I hadn't pleaded a revival in person before, but I couldn't afford to let Bridges know that if he didn't know it already. "Uh, Frank, if I might be so bold—why are you farming this one out?"

Bridges didn't hesitate. "Fair question. Our guy got sick, and his backup's on vacation. Tom can't oblige me either; too busy. It happens."

"It does indeed." I thought a moment. You win about one of every hundred revival cases, ungood for a lawyer newly in private practice. Revival cases are dogs. "Frank, I need to know more."

Bridges hesitated. "If you take the job, I can zap you the particulars over this line."

So I was supposed to buy a pig in a poke, after all. But it didn't matter. First assumption: The case was a truly sick dog, even for a revival case. Second assumption: I would lose. Third assumption: Bridges didn't expect me to do better than lose. Fourth assumption: If I *won*, I'd be in tight with Aetnadential. "Fair enough. I accept."

"Thanks," Bridges said. "Thanks very much. If you're ready to receive, I'll shoot you the packet. The hearing's at two."

"Two? This afternoon?"

"Yep. *Told* you it was a rush job." I think he was grinning, the scumbag.

"All rise," called the bailiff. We did. "This honorable court is now in session. The honorable Houghton J. Barnes, presiding." The honorable Barnes sat down in his plush chair behind the bench. "Be seated," said the bailiff.

"First case?" asked the judge.

"The petition of Barbara W. Criswell, Your Honor. Docket number NYRC-8965-44."

The judge scanned a sheet in front of him and nodded. "Will the parties in the matter now before this court please rise and identify themselves?"

Maggie went first, of course. "Margaret Whitling for the City of New York, Your Honor." The judge bestowed upon her a fatherly smile, which Maggie returned with just the right amount of Virgin Mary behind it. It's all a game, every bit of it, and Maggie plays it pretty well. (I'm not much of a game player, myself; about all I do is make sure my hair's combed, my nose is blown and my fly's zipped.) Maggie looks the part, too: tall, pretty, and slim, her head topped with bunches of tight blonde curls. She looks real good in a navy blue business suit, which doesn't hurt a lawyer, especially a female one. I used to work with Maggie. I miss that.

It was my turn with the judge. "David Aaron, Your Honor, representing the petitioner." I got a respectful nod, something I don't rate yet from a man with as many years on the bench as Howie Barnes has—except that Judge

Barnes is generally respectful of everyone who's respectful of him; that's why we call him "Your Honor" even without a jury present. I'd only been before him twice, on city business. "To my left are Mrs. Barbara Criswell, the petitioner, and her son, Michael Anthony Criswell. Mrs. Criswell is Mr. Alton Criswell's widow, and Michael is their son. He is an only child."

Judge Barnes smiled at the boy, who returned it sweetly, thank God. "How old are you, son?"

"Four and a third, sir," piped the boy. *Ten points for using "sir,"* I told myself. *Ten more points for the cute answer, not that it'll make much of a difference.* Mother and son were good casting, too. Barbara Criswell was a slight brunette who looked like she'd been crying all night and all day; the boy was brown-haired, blue-eyed, and polite.

"Good boy," Judge Barnes said. "Mrs. Criswell, I think I speak for us all when I say we're terribly sorry for your grief."

"Thank you, Your Honor," Barbara Criswell said quietly. "Everyone's been very kind."

"I should hope so. Now, has everything been explained to you about what we're going to be doing here?"

"Yes, Your Honor." I'd done a rush job of it myself. I'd met Mrs. Criswell and Mike for the first time just ten minutues before court met. Legal Aid clients get more time with their counsels than *that,* for Christ's sake.

"Fine, then," Judge Barnes said. "All right, Mr. Aaron, please proceed. Everyone else, be seated."

"Thank you, Your Honor." I took half a second to gather my thoughts, and began. "Your Honor, the petitioner's spouse at the time of his death was a Caucasian male, 32 years old, with a wife and a young son." I caught the judge stealing a glimpse of Barbara and Michael. Good. "They were all, at the time of Mr. Criswell's death, legal residents of the city and had been residents here for the required five years. Mr. Criswell was president and co-owner of CrisLock ThinkWare, a small software design business also located in the city. Mrs. Criswell is a part-time management consultant for another firm.

"Two days ago, on March 19, Mr. Criswell died in his office." I picked up several papers from the raft of them before me. "At this time, if it please the Court, I would like to enter the police report of the March 19 incident into the record, and I ask that the police report be marked as Petitioner's Exhibit 1."

"Any objection, Miss Whitling?"

"None, Your Honor."

"So ordered."

The bailiff took the police report from me and handed it to the judge; Maggie already had a copy. I continued, "The medivac unit put Mr. Criswell's body into stasis as soon as the team leader determined that Mr. Criswell was deceased. It remains in the stasis unit of the coroner's office, pending Your Honor's decision."

"Just a moment, Counselor," the judge said. "Let me take a look at this." He scanned the police report. "I see here that the coroner determined the moment of death at, um, three-twenty in the afternoon."

"That's correct, Your Honor."

"We're getting fairly close to the seventy-two hour cutoff, then." I could almost feel Barbara's apprehension about that; I hope Judge Barnes did, too. "The time frame here is a little tighter than I'd like. Let's make it move, Mr. Aaron," the judge said, scowling a bit.

"Yes, Your Honor. Simply put, petitioner asks that her petition for the revival of her husband be granted forthwith. We will show that Mr. Criswell's credentials for revival are both substantial and compelling, and that they demand the utmost consideration. Thank you, Your Honor." I sat down.

"Miss Whitling? Proceed."

"Thank you, Your Honor." Maggie rose, pencil in hand; she always worked with a pencil, sometimes jabbing it in the air or rapping it on a table or jury bar, driving her words with a lawyer's jungle rhythm; now she was simply holding it, but that at least gave her hands something to do. "The people will not dispute the facts in this case. The circumstances of Mr. Criswell's tragic death are as counsel described. However, Your Honor, we intend to show that no compelling reason exists within the law to revive Mr. Criswell." If the presence of my client and her son inhibited Maggie in any way, it didn't show. That was bad. I'd hoped to take some of Maggie's edge off by their presence, especially the kid's. I should have known there wasn't a chance it would work. Maggie can be tough.

"The city grieves with Mrs. Criswell and her son over the death of Mr. Criswell," Maggie continued, "but restoring a husband and father to his family simply for the sake of making the family whole again does not fall within the guidelines for revival set in the law." Maggie began pacing. "The candidate for revival must be shown to have been of substantial value to the community while alive, and the candidate's physical *and mental* condition at the time of death must support the decision to revive him. The city feels that neither point is satisfied by the history of this particular candidate. Thank you, Your Honor." Maggie sat down.

"Very well," Judge Barnes said. "Do we have the coroner's report here?"

"State's Exhibit A, if it please the Court," Maggie said.

"Any objection?"

"No, Your Honor," I said. That report—the coroner's eyeball inspection of Criswell's body, with his best guess as to Criswell's cause of death—was not going to help my case. Maybe I could create some doubt as to the facts, though; there would be no autopsy until, and only if, I lost. There's no sense in tearing apart a corpse that's up for revival until the case has been settled.

"Let's get the report into the record," the judge said. The bailiff took it from Maggie, and the judge studied it. I already had a copy, of course. "Does the petitioner stipulate the cause of death as given in State's Exhibit A?"

"No, Your Honor," I said, and the judge nodded; my refusal was standard stuff. It's almost impossible to win a revival case for a suicide. Such revivals are not precluded by law as are, say, the revivals of people older than sixty, individuals of any age with bad health histories or overwhelming disabilities, and so forth . . . but just try to get a judge to agree to revive a guy who's already killed himself once.

The *only* thing I could do to win this case would be to create some doubt as to Criswell's state of mind at the time he killed himself. I just might be able to get Barnes to agree that Criswell was a good guy whose suicide was the result of an insane impulse and not part of a psychotic pattern. Then all I'd have to do is convince the judge that Criswell was worth bringing back.

I always do my questioning from my seat at the petitioner's table, although I stand; not everyone does. Lawyers who wander around the courtroom as if they were in a 3V drama exhaust themselves and annoy judges.

My first witness was in the box and had been sworn: William Locker. "Mr. Locker, what is your profession?"

"I'm chief executive officer of CrisLock ThinkWare," Locker replied.

"That is the same company in which Alton Criswell served as president?"

"That's correct."

I nodded as sagely as I could. "Please tell the court how you met Mr. Criswell."

"We were roommates in college. Columbia."

"So you'd known each other for a long time."

"Yes, we did. More than ten years. We were very good friends." Locker's voice ran down; he suddenly looked sad.

"You liked each other well enough to found a business together, didn't you?"

"Yes, we did." Locker came up with a slight smile. "Right after graduation, we signed a lease on an office and opened the company."

"And how *was* business?"

"We did well. After a year, we paid off the three-year note at our bank and were hiring staff."

"I understand those hirings included Mrs. Barbara Criswell?"

"Yes, but Al and Barbara weren't married then. Barbara was our first secretary, but she soon became our office manager."

"How did you two meet Mrs. Criswell?"

Locker stirred uncomfortably. "Well, Barbara and I had a relationship at the time. It ended, though, and I bore no grudge. Nor did she. We worked well and successfully together."

"So, is it fair to say that CrisLock ThinkWare was a successful company?"

"Objection," Maggie tried. "Calls for a conclusion."

I looked unconcerned. "The witness is qualified, Your Honor."

"Overruled," the judge said. "Go ahead and answer, Mr. Locker."

"Yes, it was successful."

"Would you say its success was an important contribution to the community?"

"Objection," Maggie said. "Same grounds."

"Sustained."

"Thank you, Mr. Locker. No more questions." I turned to Maggie. "Your witness." I sat down as Maggie rose, her trusty pencil in hand.

"Mr. Locker, how much money did CrisLock ThinkWare make last year?" she asked.

Locker blinked. "Well, I'm not sure, not without having all that information in front of me." *Oh, Christ,* I thought to myself. *Clear evasion on the first damned question!*

"A guess will do, Mr. Locker."

"Objection," I called, and now it was my turn to sway slowly in the legal wind. "The witness is not required to guess at facts that can be demonstrated otherwise."

"The witness *is* qualified, Your Honor," Maggie said, too sweetly.

"Overruled," rumbled the judge. "Mr. Locker, an approximation will do. Counsel, will you please rephrase to fit?"

"Certainly, Your Honor. Mr. Locker, about how much did your company make last year?"

Locker's lips pinched together. "Nothing."

"It lost money, did it not?"

"Yes."

"About how much?"

There was no use in my objecting again. I let Locker answer. "About three hundred thousand dollars."

Maggie looked surprised; she's a pretty good actress, as I said. "As much as that? How?"

Locker frowned. "There's several reasons why losses occur in business." He was beginning to look surly; I began to worry. Damn, I thought Locker would make a *good* witness!

Maggie smiled. "Please go ahead and tell us what they are, Mr. Locker."

My man's frown deepened. "We'd signed a contract with the United States Department of Defense. The amount of the contract did not cover the cost of the work we were doing. Covering those costs deprived us of resources in other areas important to our business."

"And what kind of work was involved in the Department of Defense contract?"

"Objection, Your Honor," I said, rising; here, I was on solid ground. "The matter is classified."

The judge nodded. "I don't see the relevance in any case. Next question, Counselor."

"Very well, Your Honor. Mr. Locker, did CrisLock ThinkWare make any money the year before last?"

Locker looked stubborn now. "I can't recall."

"Or the year before that?"

"I don't know." Locker folded his arms. *Oh-oh,* I thought.

Maggie looked puzzled. "Excuse me, Mr. Locker—didn't you say you were chief executive officer of the company?"

"Yes, I did. I *am.*"

"And you can't remember whether your company made or lost money a year or two ago? Doesn't that strike you as strange?"

"Objection!"

"Sustained. Watch it, Miss Whitling."

"Sorry, Your Honor. Withdrawn. At this point, if it please the Court, I would like to introduce into evidence State's Exhibit B. Exhibit B consists of tax returns filed by CrisLock ThinkWare with the New York State Department of Taxation and Finance for the past seven years."

"Objection, Mr. Aaron?" Judge Barnes asked.

"Point of procedure, Your Honor. This one takes us by surprise. We haven't been copied on this."

"I apologize for that, Your Honor," Maggie said, "but the necessary documents did not arrive at my office until just this afternoon. There was no time to copy counsel."

"These cases do move quickly," the judge said. "I'll allow the introduction. The returns are a matter of public record, in any case." The bailiff took the returns from Maggie and handed them to the judge; Maggie came over to hand me my copy. She looked very serious.

"Sorry, Dave," she whispered.

I shrugged. "I know. Forget it."

"I didn't mean about the tax forms."

"I know that, too."

"Yeah." Maggie walked back to her table. "Now, Mr. Locker, please look at State's Exhibit B, if you would. Please tell the Court what those returns say about the amount of money made or lost in the past seven years by CrisLock ThinkWare."

Locker ruffled through the papers, stalling.

"Come, now, Mr. Locker," Maggie said, a bit impatiently. "After all, you signed those returns, did you not?"

"Yes," Locker said, grudgingly.

"So please answer the question."

Locker sighed. "The first four show profits of from ten thousand to two hundred thousand dollars per year. The next three show losses of from one hundred thousand to four hundred thousand per year."

"And in what tax year did the firm begin losing money?"

"In 2040."

"The year after the contract you already testified to was signed with the Defense Department?" Maggie asked.

"Yes."

"And those losses are successively greater in each year from 2040 through 2043?"

"Yes." Locker sighed.

"You've testified that 'we' signed that contract. Who were 'we'?"

Locker paused, uncomfortably.

"An answer, please, Mr. Locker," Maggie insisted. "Was it you?"

"No," he said. "The contract was signed by the president of the company."

"Mr. Alton Criswell?"

"Yes."

"With your consent?"

Locker remained silent.

"I ask again," Maggie said, "if the contract was signed with your consent."

"No, it wasn't," Locker finally answered.

"It was signed without your consent?"

"Yes."

"Against your advice?"

"Yes."

"What, in your opinion, was the matter with that contract?"

Locker thought for a moment, and then spoke. "I did not consider that the contract compensated us enough for the work we would be called upon to do. Al—Mr. Criswell—insisted we bid low in order to secure the business; he was worried about the recession growing, and he wanted a fat government contract in our file. He thought it might lead to our getting other government business."

"Has it?"

"No."

"So the contract was signed anyway, and CrisLock ThinkWare began losing money?"

"Yes."

"Didn't you attempt to renegotiate the contract with the government?"

"The government refused."

"I see. How far is CrisLock ThinkWare from bankruptcy, Mr. Locker?"

"Not far."

"Would you say that bankruptcy is imminent?"

"Yes."

"Primarily because of the Defense Department contract that Mr. Criswell insisted be signed and *did* sign?"

"Yes."

"Would you, based on your experience in business and your experience as CEO of CrisLock ThinkWare, call Mr. Criswell's decision about the contract a good one?"

"No."

"In fact, that decision was a disaster that destroyed a promising new company, wasn't it?" She jabbed toward Locker with the pencil, emphasizing that all-too-deadly point.

"Objection!" I thundered, as Maggie knew I would.

"That's all, Mr. Locker," she said, not even waiting for the judge. I heard Barbara Criswell sniffle; I didn't look at her.

"—and eighteen months after I began working there, I married Alton," testified Mrs. Criswell.

"Have you been happy?" I asked her. I was trying to show that the Criswells had had a good, stable marriage—not much against Maggie's having painted him as a clod in business, but something, anyway. That community welfare issue again—lots of good husbands die every day, but a good businessman is hard to find.

"Very," Barbara said. "Alton was good to me and Mikey. I loved—love —him very much." A tear rolled down her cheek, daintily, as good as if we'd rehearsed it.

"Was your husband seeing a psychiatrist or psychotherapist, or receiving medical aid of any kind before his death?"

"No, he was not."

"Did he seem depressed to you?"

Barbara actually considered that for a moment. She was an honest woman. "No," she finally answered. "I wouldn't say so. He seemed worried about how the business was doing, but he wasn't obsessed by it."

"That's all. Thank you, Mrs. Criswell." I sat; Maggie got up. Something in her eye told me this was going to be a bad one.

"Mrs. Criswell, if I may, I'd like to ask you this: have you ever heard the name 'Stella Mae Childress'?"

Barbara's eyes snapped open in surprise.

"Again," Maggie insisted, "I'd like to know if you've ever heard the name 'Stella Mae Childress.' "

Barbara looked down. Finally, not looking up, she said, "Yes" in a small voice, and I knew exactly where Maggie was going. I turned a bit and saw Locker, sitting in the front row of the nearly empty spectator section, turning red. He looked coldly angry. I didn't know who Stella Mae was, but I could make a goddamn good guess.

"And who is Stella Mae Childress?" Maggie asked.

"A friend of my husband's."

"A good friend?"

"She was."

"A *very* good friend?"

Barbara began crying.

I shot to my feet. "Objection, Your Honor! The witness obviously cannot continue!"

Before Judge Barnes could respond, Barbara gathered herself and said, "Yes, she was. They had an affair about four years ago. It ended." She looked Maggie straight in the eye. "Alton and I worked it out. *And it's none of your business!*"

Maggie turned to the bench. "Will Your Honor please instruct the witness on this point?" she asked.

"Mrs. Criswell," Judge Barnes said, "while I know this must be painful for you, the questions Miss Whitling is asking are entirely proper and must be answered if I am to come to a decision. You must answer her questions."

Barbara's mouth tightened. "I understand, Judge."

"Very well. Proceed, counselor—but keep within the bounds."

"Certainly, Your Honor. Mrs. Criswell, how did your husband and Miss Childress meet?"

Barbara paused. Just before Maggie could prod her again, she said, "She was a secretary at the firm. She worked for one of the programming teams."

"How long had Miss Childress been working there before the affair between her and your husband began?"

"Several months."

"You were still working there at the time, were you not?"

"Yes, as office manager."

"But you left. Why?"

Barbara seemed to slump in her chair. "The affair had been going on for, I don't know, a few weeks. The word was all over the office. I *couldn't* stay there."

"You were embarrassed, of course."

"Yes."

"Humiliated?"

Barbara nodded. "Yes," she said quietly.

"So you quit the firm and went to work as a consultant."

"That's correct."

"But that wasn't all, was it? Didn't you move out of your apartment as well, and take your son with you?"

"Yes."

"How long were you and your husband separated?"

"About three months. Then Alton begged me to come back."

"And you returned?"

"Yes. I forgave him."

"But you didn't return to CrisLock ThinkWare, did you?" Maggie's pencil jabbed again.

"No."

"You couldn't, could you?"

"No."

"It would have been too humiliating."

"Yes," Barbara said.

I looked to my left, and little Michael Anthony Criswell was drinking it all in with wide eyes. This crap was worse than Family Court.

"How much money did Mr. Criswell pay you during your separation, Mrs. Criswell? How well did he support you and your son?"

Barbara looked very sad all of a sudden. "Nothing," she said.

Maggie's voice was very kind. "He didn't pay you anything? He didn't contribute to your support?"

"No. No, he didn't."

"That was why you had to go to work

right away, even though you had an infant to care for, isn't it?''

''Yes,'' said Barbara, sniffling.

''Thank you, Mrs. Criswell. No further questions.''

Well, that was probably the ball game. I looked at my watch and decided to try for a break. ''Your Honor,'' I said, rising, ''I respectfully point out that the hour is late, and ask that we recess until tomorrow morning.''

Judge Barnes nodded. ''Do both parties expect to finish this case by the lunch break?''

I nodded. ''We have to, Your Honor.'' I shrugged. ''The seventy-two hour rule.''

''Miss Whitling?''

''We will, Your Honor.''

''Then we're adjourned until ten tomorrow morning.'' Barnes wasn't a gavel-rapper; we all stood as he left the bench. I watched Mikey Criswell as the boy hurried to hug his mother. As Barbara reached down to him, I tapped her on the shoulder.

''We have to talk,'' I said. ''Right now.''

Barbara looked up at me, still red-eyed. ''No, not now, Mr. Aaron. I want to take care of my son. Please excuse me.''

What could I say? Could anything change the way this case was going? I left Barbara alone with her son, and wondered just how much of this he'd understood. I hoped his mother could do whatever healing of the boy's soul was called for; the way it looked now, it would be those two, alone, against the world from now on.

I turned and saw Maggie packing all those papers back into her briefcase. She glanced up and saw me; I held up two fingers, our old symbol for drinks. She smiled a little and nodded a quick yes.

A couple of hours later, Maggie and I were still in The Bar Bar, pretty near the courthouse. We were working on thirds. I never go past the second drink unless something's eating at me, and the case of Alton Criswell was chewing away at my innards with great good gusto.

I was beginning to mumble. ''Dunno. Be better off getting a 3V job, pleading cases before the Joe Wapner disneykins on *The People's Supreme Court*. Real life's too complicated. Gotta get me an agent.'' I squinted at Maggie. ''You know any?''

My beautiful drinking buddy looked concerned. For me? ''The case isn't over, Dave.''

''C'mon, Magg, you're a pro. There *isn't* any case. It got blown away because the freaking client told me absolutely jackshit *nothing*, not that she had much time to tell me anything in the ten whole minutes we had together before the hearing started. I go into Barnes's court with the usual rap about how the dead guy was a really good son of a bitch and how we all miss him, and you shot me down in about eleven seconds. It should have *taken* longer, Maggie. The guy's got a little kid, for Chrissakes.''

Maggie didn't say anything; I sighed heavily. ''Criswell's wife couldn't even afford her own lawyer, the bastard left her so broke. He suicides, so his personal life insurance is no damn good, and everything else he had got plowed

back into that rotting hulk of a company. His top-man policy at Cris-whatzit pays even in case of suicide, and it's the only reason I'm here. The good-hearted people at Aetnadential figure it's cheaper for them to pay me to get ol' Al resurrected than to pay that geek Locker a million bucks. If I get Al back on his feet, Aetnadential doesn't have to pay off on the top-man policy. Need I mention that I'm fairly new at this and I come real cheap, so it's a bargain for Aetnadential all around?''

Maggie frowned. ''All right, all *right,* so private practice isn't all what you'd thought it would be. So you're going to lose one. You go on to the next, that's all.''

''That's not all, kid, and you know it.'' I sipped at my bourbon. ''I feel like I'm killing this guy all by myself, like I pushed the stud on that freaking zap-gun. You see Barbara Criswell? Man, that's a woman who doesn't even know it's time to grieve. Her husband's dead, but he's not *really* dead until I lose tomorrow. Then she'll fall apart.'' I felt haunted. ''And I'll have to watch her do it.''

Maggie frowned even more deeply. ''You're taking this all too personally.''

''Listen, listen,'' I said. ''In the good old days, Al Criswell would have done himself in, and there'd be an end to it. Barbara would cry, they'd bury Al somewhere, and life would go on. Now, it's more complicated. We can *fix* people who've burned a hole in their chests, or even their brains. We can fix just about anything fatal that happens to anybody. *But we hardly ever want to,* and that's the hell of it.''

I shook my head and raised a finger. ''Eleven billion people in the world, Magg; nearly half a billion in the U.S. of A., and Al Criswell is just one too goddamn many, especially since he threw away his ticket. We don't have room for Al, not on *this* planet—and there ain't any others because we threw away *that* chance last century. Tell the class, now, how many suicides win revival cases?''

''Nearly none,'' Maggie said.

''Right the first time. That congressman two years ago is the only one I can think of. Congress cases are open-and-shut, anyway, regardless of cause of death; God bless federal exceptions to state revival laws. Those guys don't see the inside of a box until they're in their nineties, at least. They took *care* of themselves, all right.'' I raised my glass. ''Too bad my pal Al wasn't connected.''

Maggie was still frowning. ''Maybe somebody was,'' she said.

''Whaddya mean?''

Maggie shrugged. ''This was the easiest case I ever had to put together. Everything was in the city investigator's package—the affair with the Childress woman, the tax returns, everything. Usually the package comes through with hardly anything useful in it. You know how public investigators are. Everything takes them a month, and we only have a couple of days.''

''Sure, I know that. Invies are useless eaters. So?''

''So what I got was a polished report. I didn't think much of it at the time; I figured I'd win the case based on the suicide, so who needed all that evidence? Criswell's not well-known, not well-connected, not much of

anything—*and* he's a suicide. Who could lose?''

''Me,'' I said. ''Here's to poor Al.''

''Never mind that,'' Maggie said. ''All that information in the packet—it's overkill.''

''You should pardon the expression.''

''Not funny. There's just *too* much in there, Dave. Somebody fed the investigator everything he could possibly want.''

It was my turn to shrug. ''So what difference does it make? Somebody had a grudge against Alton Criswell. Doesn't make a difference. The stuff checks out. He ruined a thriving business single-handedly, which defeats the state's community-welfare provision. He cheated on his wife *and* left her without support, which defeats the good-character rule and, incidentally, makes him look like a louse to the judge. That's okay, because I guess he *was* a louse. To top it off, he committed suicide, which utterly defeats the mental-competence provision. Have I missed anything?''

''No, I'm afraid not.''

''So let's have another,'' I said. ''Then I'll be ready to go home and collapse. When I'm drunk, I don't dream. By the way, Magg, I miss you a lot.''

''Same here.'' We finished our thirds and had fourths and stopped there.

We were all in court again the next morning. I'd insisted that Barbara bring Mikey in, too, despite her strong desire to leave him home with his grandmother. I didn't have a case any more; I needed that little boy's face in the courtroom to sway the judge, if Barnes could possibly be swayed. I doubted it, though.

''I call Myron Kolowitz,'' Maggie said, and that was the opening gun. The bailiff echoed her, and a small, thin man took the witness stand.

''State your name for the record, please,'' Maggie asked.

''Myron Kolowitz. That's K-O-L-O-W-I-T-Z.''

''And your occupation, Mr. Kolowitz?''

''I work in the office of the chief medical examiner, City of New York. I'm an assistant coroner.''

''And what is your connection with this case?''

''I performed the inspection of Mr. Criswell's body just after he died, in order to determine the *prima facie* cause of death. I also expect to perform the official autopsy.''

''Objection,'' I said. ''Prejudicial.''

''Sustained,'' Judge Barnes said. ''Stricken. Mr. Kolowitz, whether you perform that autopsy or not depends on the outcome of this hearing.''

''Of course, Judge. I apologize.''

''Proceed, Miss Whitling.''

''Thank you, Your Honor. Mr. Kolowitz, please tell the court what you found when you arrived at the offices of CrisLock ThinkWare on the afternoon of March 19, 2044.''

Kolowitz cleared his throat. ''If I may refer to my notes?''

''Permission granted,'' said the judge.

Kolowitz took a small datapad from his jacket pocket and thumbed a couple of studs. ''I arrived at five-fifteen P.M. after my office received a call from the

police dispatcher at Midtown South. I found Mr. Criswell's body seated at his desk. It bore a chest wound typical of a zapgun burst fired at extremely close range. The weapon was still in Mr. Criswell's hand."

I'd seen the police pictures in the coroner's report already—zapblasts aren't as gory as gunshot wounds, but they're close, and the expression on the dead guy's face is always the same. Ugh.

"And your assessment of the manner of Mr. Criswell's death?" asked Maggie.

"An inspection of the body and the surrounding scene convinced me that the wound was self-inflicted and that death was instantaneous."

"Thank you, Mr. Kolowitz. Your witness."

I stood. "Mr. Kolowitz, if we may, let's step outside the formula for a moment." Kolowitz looked a bit puzzled by that, and maybe a bit scared; Kolowitz was the type who was most comfortable when dealing with supplying programmed answers to standard questions. I hoped to shake him up, create that doubt about Criswell's state of mind that I needed if I was to have any hope of bringing him back.

"How long have you worked in the coroner's office in your present position, Mr. Kolowitz?"

"Six years."

"And how many deaths have you investigated?"

"I don't know, precisely. More than five thousand, certainly."

"And, of those deaths, how many did you determine to be from suicide?"

Kolowitz thought for a moment. "Something on the order of three hundred, I think."

"Three hundred. Thank you." Good. That made Kolowitz an expert on death *and* suicide, for my purposes; I needed his expertise on the record.

"Now, as to the case of Mr. Alton Criswell, sir, what kind of inspection did you make?" I continued.

Kolowitz gave a small, short shrug. "I did my usual job, Mr. Aaron. First I looked around the office, noted the placement of the body in it, and tried to see if I could spot any gross clues that the police might have missed or not gotten to yet."

"Did you find anything?"

"Nothing unusual."

"Did you find a note?"

"No. As my report says, no note was found."

I tried to look surprised. "Isn't that unusual, Mr. Kolowitz? No note at all?"

Kolowitz looked smug. "On the contrary, sir. In my experience, suicide victims leave notes less than half the time."

"Really? Well, then, please tell the Court, in your expert opinion, what might prompt a suicide to write a note—or, in this case, *not* to write a note."

Kolowitz settled into his chair. "Well, Mr. Aaron, the most frequent reason in this city is that the suicide victim is illiterate." He gave me a know-it-all smile. I hate that.

"But that was hardly true of Mr. Criswell, was it?" I returned, as if to a little child. Kolowitz frowned; he didn't like that at *all*. "Now, sir, why would Mr. Criswell, the college-edu-

cated president of a small business, fail to leave a note? It couldn't have been because he was illiterate, now, could it?''

''Objection,'' Maggie called out. ''Calls for conjecture.''

This time Judge Barnes backed me up without my having to say a word, bless him. ''I don't think the expert qualifications of this witness as to the motives of suicides can be questioned, Counselor. I'll allow it.''

''Thank you, Your Honor,'' I said. ''Mr. Kolowitz?''

Kolowitz gave another shrug. ''It's hard to say.''

''Please try.''

''Well . . . it seems to me that the failure of Mr. Criswell to leave a note indicates that his suicide may have sprung from a sudden impulse, rather than an ongoing desire to kill himself.''

''Meaning that Mr. Criswell *impulsively* killed himself.''

''It could mean that.''

''And that impulse is indicated by his failure to leave a note?''

''Well, it doesn't *necessarily* mean—''

''Answer the question, please.''

Grudgingly, Kolowitz said, ''It's possible.''

''Thank you, Mr. Kolowitz.'' I'd scored my point, and since I had damned few points to make in this case, I was happy . . . or at least I was until I saw Maggie rise for a redirect. She was in pencil-jabbing mode, too. Some days, you just can't win.

''Mr. Kolowitz, *does* Mr. Criswell's failure to leave a note *prove* that his suicide was motivated by a sudden impulse, and was not the result of an ongoing psychological problem?''

Kolowitz looked relieved; I guess he'd hated having his words twisted. ''No, it does not. Not at all.''

''Indeed, Mr. Kolowitz, the fact that Mr. Criswell had a zapgun in his office might well indicate premeditation, couldn't it?''

''Yes, it could.''

''In fact, Mr. Criswell could have been thinking about killing himself for quite a long time, couldn't he?''

''Certainly.''

''Thank you, Mr. Kolowitz,'' Maggie said. ''That's all.''

Next we heard from Criswell's secretary, a fiftyish woman with the unlikely name of Binnie Bonner. She didn't have much to contribute. I had to drag it out of her that the reason she'd not been at her desk at the time of Criswell's death was that she'd been in the can. Apparently Binnie Bonner had trouble admitting in public that she had biological functions. In any case, she didn't know anything, so I had Binnie song-and-dance her way through a useless recitation of how nice a guy Criswell was. Maggie didn't even bother to cross-examine.

My last witness was Stephen Lane, the NYPD detective who'd been given the case. He looked anxious to be done and out of there; he probably had a hundred such cases pending, and there was damn little he could contribute to mine. I'd have called Lane earlier if he'd been available, but he'd been running around town putting toe tags on stiffs for most of the past two days.

After he was sworn and settled, I began. ''Officer, please tell the court what you found when you arrived at CrisLock

ThinkWare on the afternoon of September 27."

Lane looked at the judge, waving his datapad. "If I might, Your Honor?" Barnes gestured him to go ahead.

Lane began in a bored voice. "I arrived to find four police officers from the Midtown South precinct already on the scene. The victim was in his chair. There was a zapgun in his left hand and a wound in his chest typical of the kind a zapgun makes when fired at close range."

"Did you stay long?"

"No, Counselor. The uniformed officers had things well in hand. I talked to several people in the office; no one admitted seeing anything. The secretary—uh, Miss Bonner, Binnie Bonner—said she hadn't been at her desk at the time of the incident and had nothing to contribute."

I turned to gather my thoughts for another question, when I saw Barbara Criswell sitting stock-still in her chair, staring right at me, her eyes wide. It disconcerted me.

"Your Honor," I asked, "might I have a moment to talk with Mrs. Criswell?"

"Certainly, Mr. Aaron."

I walked over to the table. "What's wrong, Barbara?" I whispered.

Barbara shook her head slowly. "Left hand," she mumbled. "That can't be right, the left hand. No, no. Alton was right-handed. He *was!*"

"Shhh. Calm down, it's okay. Look, I haven't shown you the pictures from the scene, but it's clear the zapgun was in your husband's left hand."

"But he was *right-handed,* Mr. Aaron."

I turned. "A moment more, please, Your Honor?"

"Certainly," the judge rumbled.

I bent to talk with Barbara again. "Look, Barbara, no one's questioned the hand the gun was in. Your husband wore his watch on his right wrist. The most pathetic amateur armchair detective in the world knows that most left-handed people wear their watches on their right wrists. I assumed Al was left-handed. The cops assumed it. The detective, for Chrissakes, assumed it. Even the coroner assumed it."

"But he *was* right-handed, Mr. Aaron."

"Then why did he wear his watch on his right wrist, for crying out loud? It doesn't make sense."

But Barbara told me why, in a few brief words, and it *did* make sense . . . and, all of a sudden, I had a case again.

"Mr. Aaron?" the judge called.

"Ready, Your Honor. Detective Lane, I have no further questions."

"Miss Whitling?"

"Nothing, Your Honor."

The judge nodded. "Mr. Aaron, is there anything else?"

"Yes, Your Honor." I finally had something to smile about. "At this time, petitioner asks for summary judgment in favor of the petition."

Maggie jumped to her feet. "Your Honor!"

Barnes looked as if I'd just committed an offensive biological act right in the middle of his Persian rug. "You *do* have grounds for this motion, don't you, Mr. Aaron?"

"Yes, Your Honor. This wasn't a suicide. This was murder."

And *that* line was dramatic enough to suit anyone. Erle Stanley Gardner, eat your liver out.

Barnes didn't look pleased by it, though. "In my chambers," he said, rising. Maggie and I followed him as the bailiff announced a recess.

Barnes's chambers were down a short hallway behind the courtroom. I shut the door behind us.

"Drinks?" Barnes asked. He headed for a bookshelf.

"Scotch rocks," said Maggie.

"Bourbon, please," I called. "Neat."

Barnes swung the bookcase out, revealing a small but well-stocked and ornate bar; it even had one of those spigot things that could dispense all sorts of mixers from one nozzle. I'd been in Barnes's chambers before, but I didn't know he had a corner tavern hidden away in his wall.

Barnes saw me watching, and grinned. "I inherited it from old Judge Bennett. He had it put in sometime in the nineties, in between city scandals. Don't ask me how Bennett paid for it all; I was clerking here at the time, and there were all sorts of rumors."

Barnes made the drinks quickly and handed them out. He saluted us with his Chivas Regal and said, "Here's to crime. David, this better be a good one."

I raised my glass. "It is, Judge." I drank deeply. I hoped what I had was good enough.

Barnes nodded. "I know. You don't strike me as the kind given to theatrics." He sipped. "Well, let's get settled and you can lay it on us."

The judge took the seat behind his desk; Maggie and I sat in comfortable chairs facing him. "All right," Barnes said. "What did Mrs. Criswell tell you?"

"Alton Criswell was right-handed, Your Honor."

"So?" Maggie said, trying to interrupt, but Barnes gestured me to go on.

"Simply put, Your Honor, the case against Criswell's revival rises or falls on the fact of his suicide."

Barnes grimaced. "Not exactly true, David. I have to tell you that there's not much of a case here at all for revival."

I nodded. "Between you, me, and the wall, I agree. Criswell screwed up his business, he can't be shown to have contributed anything of value to the community, I can't show that he could be expected to do so if revived, and the conduct of his personal life doesn't help his case, either."

"That's an accurate representation, all right." Barnes sipped again. "So your man was right-handed. So what?"

"The so-called suicide weapon was found in his left hand. The coroner found the death to be a suicide based simply on what he saw, and only the most rudimentary tactile examination of the body."

"But, look here," Maggie interrupted. "What does all this have to do with the case? So Criswell was right-handed. So he shot himself with a zap-gun in his left hand. So what?"

"He didn't shoot himself, Maggie," I said. "He was shot. Attacked. The scene was faked, to look like a suicide." I turned back to face Barnes. "Judge, what Barbara Criswell told me was that Alton Criswell wore his watch on his right wrist because he was nearly blind

in his left eye. Criswell never had it fixed; I don't know why. But, as it was, it was simply more *convenient* for him to wear his watch on his right wrist, so he could glance at it quickly, without having to move his head awkwardly or drag his left arm across his body every time he wanted to know what time it was. Try it yourself and see; close your left eye and look at your watch."

"It's not too bad," the judge said. "A bit awkward, though."

"Now try looking at your right wrist."

Barnes did so, with the merest glance. "I see. So Criswell wore his watch on the 'wrong' wrist for convenience's sake. All right, I get that much." I could see that Maggie did, too. "But, again, what's the big deal?"

"I maintain, Your Honor, that the simple, almost trivial fact of where Mr. Criswell wore his watch has tainted the evidence as to the cause of his death. The police walk in, examine the scene, and one of the first things they see is the gun in Criswell's left hand. Oh-ho, they say. They look a little further, though, and they see that Criswell's watch is on his right wrist. Shoot, no problem, the cops say; he was left-handed. The coroner gets there and goes through the same thing. Criswell is dismissed as a left-handed suicide."

"But why didn't someone catch this before?" Maggie asked.

"So who sees those pictures except *us?* They're cop pictures, Maggie; the only people who saw them were strangers. I mean, no one's going to show them to Barbara Criswell, are they?"

Barnes nodded. "All right," Maggie said. "I see how it could happen that way. The cops and the coroner deal with twenty or thirty dead bodies every day; each one's a rush job. But, again, *so what?* What makes you think this was a murder?"

"Because," I said, "the guy who walked into Criswell's office while his secretary was gone figured it the same way. Criswell was bent over his paperwork. Maybe he heard the door; if he did, he probably thought it was his secretary. He never looked up until just before whoever did it jammed the zap-gun against his chest and fired it. The hit man's a real smoothie, a clever guy. He saw the watch, too, and put the gun in Criswell's *left* hand."

"Hit man?" Maggie asked.

"Sure," I said. "The murderer had to be a stranger. It's unlikely that anyone in the office would have made that same mistake. They all knew Criswell; they *had* to know he was right-handed. But would a hit man be briefed down to that small detail? I doubt it."

"So do I," Barnes agreed. "David, you haven't convinced me this was a murder, but you've managed to make me doubt the initial evidence. Under the circumstances, I can't grant the state's motion to deny revival."

A happy little man inside me jumped up and down with glee.

"But, Your Honor—" Maggie started, but Barnes waved her down. "No, Margaret. We're up against the deadline as it is. Criswell gets another chance. *If* this was a murder, we'll need him to supply evidence against the perpetrator—that'll supply the 'overriding social importance' David needs to win his case. We can't let a felon walk free. If David's reasoning is wrong and Cris-

well *did* kill himself, well, Criswell gets a free ride. It wouldn't be the first time that's happened."

Maggie shrugged. "I can't really object, Judge. I saw that little boy out there. I must admit I'm a bit relieved."

Judge Barnes nodded. "So let's finish our drinks and do it."

I drained mine. Tasted fine. God bless America.

"—the state has an overriding interest in apprehending the suspect or suspects involved in the commission of a capital crime," Judge Barnes was saying. "This Court finds that petitioner has shown sufficient evidence to cast into doubt the coroner's tentative finding that Mr. Criswell's death was due to suicide. The Court orders that an investigation be carried out. Mr. Criswell will be needed to assist this investigation, and the Court further finds that said assistance is in the public interest. Therefore—"

A voice came from the spectator seats. "Your Honor? Excuse me."

I turned around. *Locker?*

Barnes frowned deeply. "Don't interrupt me, Mister, uh, Locker."

"I feel I must, Your Honor." Locker stood.

I wondered what the hell was happening, and then I caught on. "Your Honor," I said quickly, "this is most irregular. I must ask that Mr. Locker be removed—"

"That won't be necessary, Mr. Aaron," Locker said calmly. "I confess that I arranged the death of Mr. Criswell. I hired someone to kill him. I'll be happy to identify that individual. Now I'll submit to arrest."

"Your Honor!" I almost shouted. "That's not a valid confession!"

Barnes looked sad. "Probably not, but I'm afraid it's valid enough for our purposes here." He sighed tiredly and changed tracks. "This Court finds that there is insufficient reason to grant petitioner's request for the revival of one Alton Criswell of this city. The petition is therefore denied. Court is adjourned. Bailiff, take Mr. Locker into custody."

I looked at Barbara Criswell. She looked at me as if she were waiting for the judge to say something else—but we were already rising as the judge left the courtroom.

Harry, the bailiff, was leading Locker away. "Hold it, Harry," I said, and hurried over. "I need to talk to him for a second."

"Make it fast, Mr. Aaron."

"Right." I stared at Locker. "What the hell was this all about?"

Locker almost smiled. "I hated that son of a bitch. He stole my woman and then cheated on her. He took all the money I had put into the business and lost it. He was about to lose a lot more. So I had him killed. I also made sure the city investigator got all the info he needed, in order to cripple Al's case for revival. Simple."

"So what happens now?"

Locker shrugged. "I'll do my bit. Al Criswell's death will be recorded as a murder, Barbara will get all his personal insurance, and the company will be bailed out by the top-man policy."

"And you'll probably walk," I pointed out.

"Because I confessed without benefit of counsel. Yes." Now Locker did

smile. "Rather neat and tidy, don't you think?"

"You're a cool bastard, Locker."

"Sorry I screwed up your case."

"Go fuck yourself." I turned my back on him. "That's all, Harry. Thanks."

Sure enough, the case against Locker fell apart. There was never any real ID on the hit man he'd hired—those guys are a little too careful to give valid names and phone numbers to amateurs—and the state couldn't prove a murder rap independently. Locker walked. Tawdry.

Aetnadential accepted the coroner's finding of murder, and Barbara got all of Alton Criswell's personal insurance money—double jeopardy, in fact; she made out well. CrisLock ThinkWare got the top-man benefit, too, which bailed out the firm. A couple of years later, Barbara married Locker, and I still haven't figured out why.

I got a N$2,000 fee and a see-you-later from Aetnadential Insurance. I paid the rent and bought some shoes. Haven't heard from Frank Bridges since. ■

●Outer space is like juvenile delinquency—the more we investigate it the more of it there seems to be.

Bill Vaughan

●The conquest of space is one of the greatest challenges since the beginning of human curiosity.

Dr. Harlow Shapley

brass tacks

Dear Dr. Schmidt,

I just finished reading Ben Bova's "Water Rite" in your March issue, and was wondering, enjoyable as the story was, how it qualified as science fiction.

The adventure elements were well handled—the love story was compelling and the evident fact that the story could expand into a series did not damage its unity. Yet the whole piece was focused on the aquifer business, and it seemed to me that the aquifer element of the plot had no more science fictional interest than the uranium dust hidden in wine bottles in Alfred Hitchcock's *Notorious*.

I mention Hitchcock because he is famous for saying that the thing heroes and villains are striving to do, acquire or prevent in an adventure story—he called it the "MacGuffin"—can be anything and need not even be fully understood by the audience, as long as it sets up interesting conflicts between the good guys and the bad guys.

The MacGuffin, in *Notorious*, made no sense scientifically, but *Notorious*, was not a science fiction movie. "Water Rite" 's aquifer project may have made scientific sense, but it had, if I may put it this way, no scientific presence. I couldn't tell from the story whether it is now (1988) possible to tap an aquifer or not; it was stated that there might be bad ecological consequences, but these consequences were not detailed; the aquifer was to be tapped by computer, but no details of the computer tapping were given. Instead, we were given many details of how hard it was to get to the room where the computer was—and this bit was reminiscent of a James Bond movie, where once again the "scientific" instruments glitter but in reality the adventure is all.

The heroine thwarted the computer program. Again, no details were given.

At last, the good guys escaped by APV. I don't insist on a spaceship in every *Analog* story, but by now I was thirsty for some science-oriented plot twists, and the APV, though a little heavy for the role, was the last straw. I wrote this letter.

Ben Bova wrote an excellent adventure story and he is, of course, an excellent science and science fiction writer. What happened?

JIM RAWLEY

Redlands, CA

Admittedly this story is pretty close to one of the boundaries of science fiction, and since those boundaries are not defined with absolute sharpness, it's inevitable that we're not all going to agree about which side of the line it's on.

Dear Mr. Schmidt:

I wasn't going to write about this issue, but that was before I read "Water Rite." Bova's writing has really come of age! Its inference seems to be relevance. The story was courageous, and takes the timely issues into account. He couldn't have made me happier than by bringing Libya into his story. Bova must have decided to make our lurid events count, the way I was hoping someone would. That'll be on my voting choice next year. And I hope you have a whole lot more like it.

All that I could ask now is some real hand-in-glove zeroing-in on NASA. The kind of live action, close-to-the-facts stories that pilots would read. You've gotten close, but not close enough.

There were other good items in the issue, too. Just keep putting the old familiar care into the issue and hang onto those artists, and *Analog* will continue as a wonder and a joy to read.

JOHN THIEL

Lafayette, IN

Dear Dr. Schmidt,

I just finished reading the March '88 issue. Very good! But I saw something disturbing in the fine editorial by Gregory Benford. In Table One, on perceived risk, we find that college students rate Nuclear Power first and Handguns second in risk. This should not be a very great surprise, considering the fanatical zeal that most media expend on their anti-nuclear and anti-gun crusades. I suspect that even the experts may have some bias (look at the reverse order of handguns, surgery, and motorcycles —motorcycles safer than surgery? I'd have to see the raw data on that one!).

What I find disturbing is not that some people are influenced by the constant repetition of memes like gun-evil. What is disturbing is that in Benford's editorial the group most affected appears to be college students. These are supposed to be the leaders of tomorrow? The young people who have demonstrated above average intelligence, shown some creative ability, and hopefully are capable of independent thought succumb to a propaganda blitz that would shame a post war Bolshevik? I realize that the greater respect shown Walter Cronkite over then President Jimmy Carter was an indication of a significant power shift. But that doesn't mean that people have to accept it. Votes should be a result of rational thought, not broadcast jingles or slanted journalism. It would seem that this is not the case for the college students in Bedford's Table One. That is what disturbs me.

Other than that, it was a super editorial. Mr. Benford obviously has more that a superficial knowledge of his subject matter. The rest of the magazine was excellent too.

PAUL F. BRUCE

South Haven, MI

Dear Stan:

As a social scientist working for an agency dealing with the "hard" sciences, I know the frustrations of being professionally accepted. I really appreciated "An Introduction to Psychohistory" by Michael F. Flynn. Getting psychohistory "professionally accepted" is going to be tough.

My only comment on Mr. Flynn's article is that he has not discussed "emerging laws." This would tend to make any predictive statement based merely on *past* statistics and trends unreliable. I would define emerging social laws as manifestations of changes to society in response to population growth and technological changes. Two examples come to mind.

First, until the turn of the century, it was always possible for those disaffected with civilization to leave. Now society has caught up with them and escape is impossible. Implications of this emerging problem would be increased (supposed) mental health problems because these individuals would not integrate well with "normal" people. Not to mention their reluctance to participate in mainstream society.

Second, growing population and fixed resources spell trouble. Our quality of life is based on personal liberty, cheap energy and abundant per capita resources. As resources (clean air for example) dwindle we will experience increased social control (smog checks) and management (air quality standards) of the resources by government.

When integrated into the existing static laws (based simply on past data), emerging laws should enhance psychohistory's predictive capability. For example, Mr. Flynn used past data to project that race riots may peak in 2010 A.D. The situation (not timing) is potentially worse as socially disaffected persons who do not enjoy an adequate quality of life can be expected to increase the magnitude of the disruption.

STEPHEN RYNAS

Monrovia, CA

Dear Dr. Schmidt:

Although I've only been able to read the first half of Michael Flynn's "An Introduction to Psychohistory," there are two observations which I would like to make about the content of the piece. First, as a matter of historical accuracy the field which Mr. Flynn is describing should not be called psychohistory. Appealing as that name is likely to be for any science fiction reader, myself included, the body of inquiry Mr. Flynn describes has already existed for approximately two hundred years under the name Political Economy. The three pioneer social scientists Mr. Flynn cites (Adam Smith, T.R. Malthus, and Karl Marx) would have, if you had inquired about their profession, introduced themselves as Political Economists.

This seemingly slight quibble relates directly to the other response Mr. Flynn's article prompts—Political Economy as a field of inquiry, has a thriving descendent in the field currently called Economics. Despite the rather sneering comment Mr. Flynn inserted in a footnote, no other social science has so systematically adopted the tools of modern mathematical technique to the analysis of social behavior. In spite of the well publicized differences between economists over public policy issues which were alluded to in the article, no other field has a more impressive roster of generally accepted and empirically validated predictions about social behavior.

The success of economics as a predictive field in fact has been so great,

that over the past several decades economics has been accused of "imperialism," i.e. applying the successful tools from economics, particularly the mathematical ones, to other social science fields. This is not to say that economics as a field is without flaw. In particular, the assumptions commonly made about human motivations are undoubtedly too simplistic to capture the full range of human behavior. Nonetheless the record is impressive and deserving of somewhat more respect than Mr. Flynn has accorded it so far in his fascinating piece.

JOHN H. BROWN

East Lansing, MI

Dear Dr. Schmidt,

I have been reading science fiction for over fifty years now, beginning with "Doc Savage" and going on to *Astounding/Analog*. In that time I doubt whether I've missed many issues, and I have been variously moved by the stories, articles and editorials in the magazine. Often I have been so stirred —whether to anger or admiration—that I began the process of composing a letter to the editor, in my mind. But I never reached the point of actually putting the words down on paper until I read the first part of Michael Flynn's "Introduction to Psychohistory" in the April 1988 *Analog*.

I believe that what Mr. Flynn is saying is truly portentous. I had no idea that an approach to the laws of history was as close as the research he cites implies it is. Certainly the research already done should lead us to examine the assumptions underlying our present beliefs, and when we have done so we may possibly be on the way to a more rational society.

I was particularly struck by this article because I had just finished a book which caused me, as an attorney, to think about the philosophical and ideological questions which underlie the assumptions on which criminal justice is based. As the author (Philip Jenkins, *Crime and Justice, Issues and Ideas*, Brooks/Cole Publishing Co., 1984) says, " . . . what are the ideas on which . . . rights are based? How can we talk of 'criminal responsibility' if we do not understand the assumptions this term makes about the individual's freedom to choose? . . . "

Both Flynn and Jenkins, in different ways, point out the necessity for a continuous examination of the assumptions we make about the world, and for basing our decisions on information gathered in a more rigorous, scientific manner.

JEROME GORDON

Hanford, CA ■

● A failure is not always a mistake; it may simply be the best one can do under the circumstances. The real mistake is to stop trying.

B.F. Skinner

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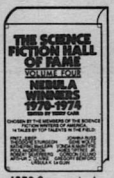

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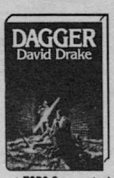

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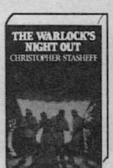

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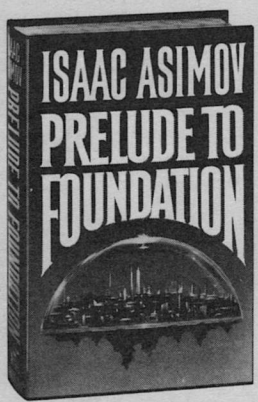

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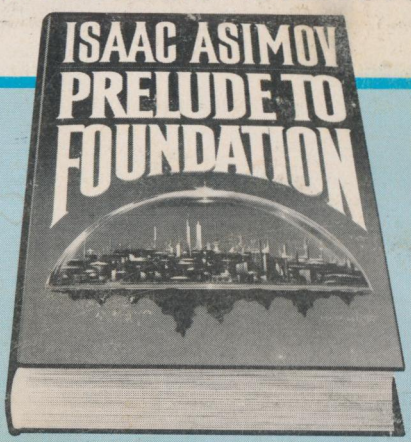

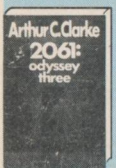

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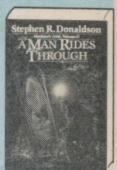

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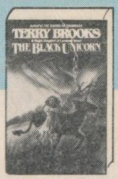

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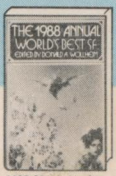

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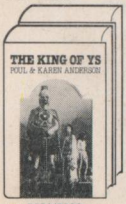

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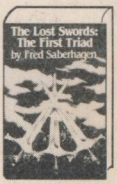

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