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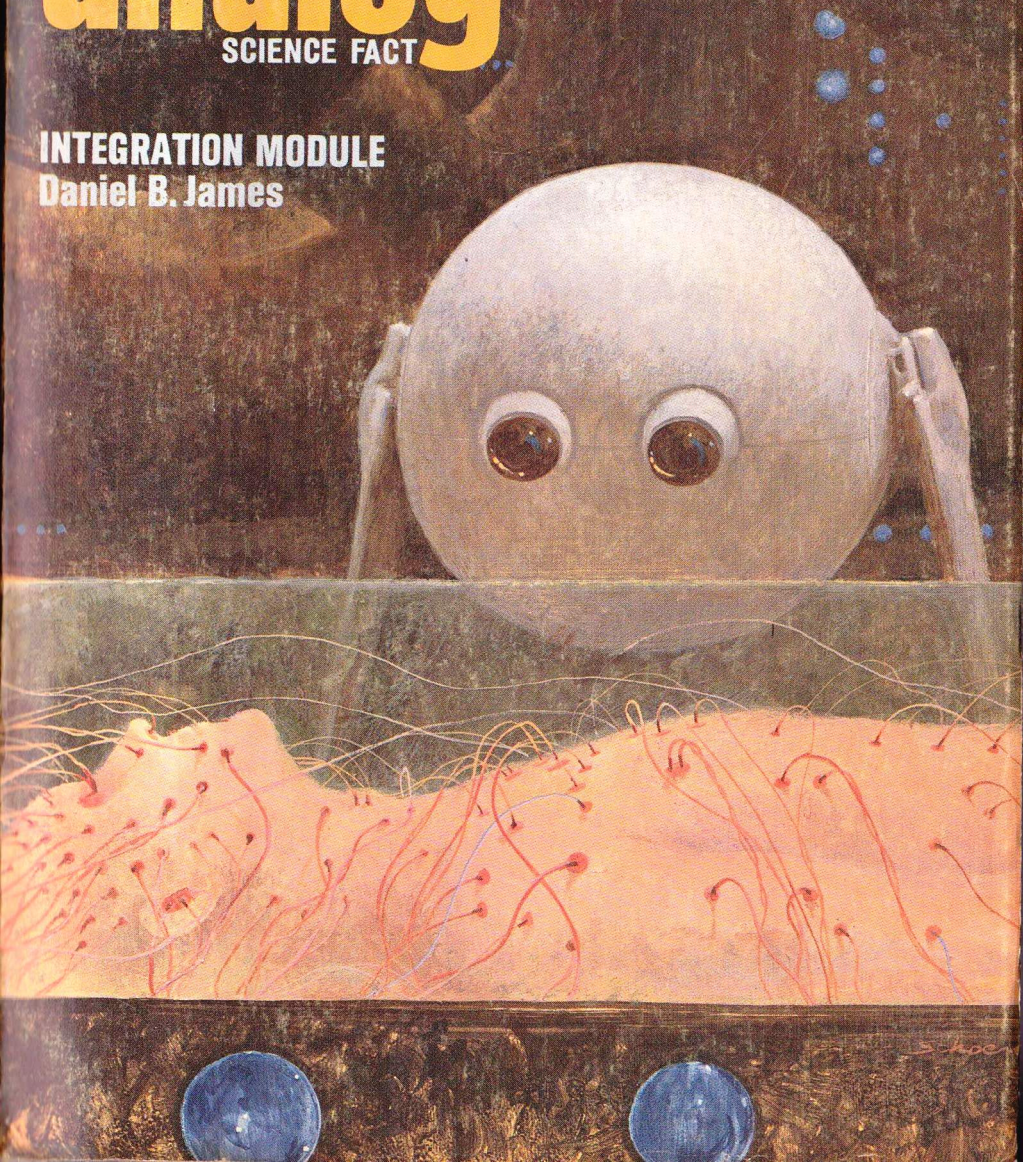
INTEGRATION MODULE

Daniel B. James



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NOVELETTE

SHORT STORIES

SERIAL

SCIENCE FACT

READER'S DEPARTMENTS

When Harry S. Truman suddenly became President, early in 1945, he was totally unaware of the Manhattan Project. Security was so tight on the nuclear bomb project that even the Vice President didn't know about it.

Editorial

"With friends like these . . ."

But with Franklin Roosevelt's death, it became necessary to inform the new President about the project. Henry Stimson, then Secretary of War, arranged for several Manhattan Project scientists to brief Truman. The Man from Missouri had a few of his key aides with him when the scientists explained the workings and the power of the new type of bomb.

Truman's military aide, an admiral who will go nameless, was dumbfounded at the end of the meeting.

"But it will never explode!" he insisted. "And I ought to know, I'm an expert on explosives."

With friends like that, who needs enemies?

Fortunately, the admiral's inability to grasp a new idea didn't shut down the Manhattan Project. The bombs were made, tested and used on Hiroshima and Nagasaki. Maybe they could have been demonstrated rather than dropped on those cities. But they did help to end the war and avoid millions of American and Japanese deaths. (The nuclear bombs were terror weapons of the most shattering kind. But simple little two-pound thermite bombs—in huge quantities—did more damage and killed more people than the nuclear bombs ever did, in the so-called Great Fire Raids on Tokyo and Osaka.)

The point is, there are times when the advice of a professional is the worst thing in the world. And that time usually comes when a new idea is being considered. Someone once defined the average engineer as being so narrow-minded that he could see through a keyhole with both eyes. That's unfair, but when it comes to examining a brand-new idea in a completely honest and unbiased way, scientists and engineers

are not much better than anyone else.

The trouble is, the expert knows all the problems in his field; he's struggled with them all through his career. He knows what's impossible. The newcomer is blissfully ignorant of such difficulties. He just goes out and does the impossible, without realizing it. That's why science fiction writers have been much better at predicting the future than scientists or futurologists. They're unhampered by the "realities." And still, they usually are far too conservative, as history has proved.

The professionals, in almost any field, stick close to what's known; they don't merely parrot the party line—they *are* the party line.

Consider the situation in cosmology, man's study of the origin and workings of the universe. For long ages, cosmological thinking was bound up so tightly with religious beliefs that to question the orthodox view of the heavens was tantamount to heresy. And the punishment for heresy has never been light.

Copernicus waited until he was on his deathbed before allowing his revolutionary *De Revolutionibus* to be published. As a churchman himself, he knew perfectly well what would happen to him once he published his idea that the sun—not the Earth—is the center of the solar system.

Giordano Bruno, an early supporter of the Copernican idea, was burned at the stake. Galileo was arrested and faced with life in prison if he didn't recant his heretical notions. Legend has it that he muttered, *"Eppu si muove,"* to himself, meaning, "Yet it (the Earth) still moves." But he formally recanted and begged the Church's forgiveness—and was allowed to live his last few years in relative peace and comfort.

Is today any different?

When Fred Hoyle, Thomas Gold and Hermann Bondi suggested the Steady State cosmology in the late 1940's they were roundly attacked by the "orthodox" astronomers and cosmologists. There was no observational proof available either for or against the Steady State theory. But the attacks against it were vehement and even became personal. A sort of vendetta has pursued Hoyle for more than a quarter of a century, and finally reached the point last summer where he quit his endowed chair at Cambridge University and came to America.

But this is nothing compared to the attacks on Immanuel Velikovsky.

Velikovsky made two serious mistakes, as far as professional cosmologists are concerned. First, he tried to explain everything from the current state of the solar system to the fall of the walls of Jericho by one grand phenomenon: the idea that a chunk of the planet Jupiter ripped away from the giant planet (causing the Red Spot), zipped through the solar system and passed close to Earth (causing all sorts of Biblical incidents, including the parting of the Red Sea) and finally took up a stable

orbit and is now what we know as the planet Venus.

But an even worse mistake was that he was neither an astronomer nor a cosmologist. He was a medical man, a psychiatrist, and an amateur ancient historian. Sacrilege!

Velikovsky's ideas hold about as much water as a well-worn piece of cheesecloth. They're the result of trying to find one sweeping explanation for every strange and wonderful event that confronts us; this is a syndrome that's very common in science fiction. If anyone ever tried to calculate the energy necessary to rip away a planet-sized chunk of matter from Jupiter's immense gravity well and ping-pong it through the solar system, and then insert it into the most nearly circular of all the planetary orbits—well, the energy requirements are (pardon the pun) astronomical. Where did the energy come from? What caused all this fuss? Is it reasonable to expect all this to happen so that the errant planet can show up on cue for most of the miracles of Exodus? And why don't other Middle Eastern chronicles of the same era also record large-scale natural disasters?

But the rational arguments about Velikovsky's theory were instantly drowned cut by a hurricane of personal and quite vituperative attacks on the man himself. An outsider, poking his nose into the sacred precincts!

There's an instinctive reaction in the human critter that makes him fight back when attacked. Velikovsky's followers, who had been dazzled by the originality and grandness of his thinking, felt that *they* were being attacked whenever a professional scientist took a swing at their hero. In a way, the attacks on Velikovsky strengthened and hardened his followers, and made his theory an article of faith among them. Instead of a rational discussion of the merits of Velikovsky's ideas, the argument quickly degenerated into a shouting match where one side claimed the man was an ignorant fool and the other enshrined him as a nearly-martyred genius.

Some of Velikovsky's theoretical ideas have been confirmed by observation: Venus does indeed have an anomalously high surface temperature; there is a solar wind of electrified particles wafting through interplanetary space. But that doesn't mean that his basic concept is correct. There are other, simpler explanations for these phenomena. And others of Velikovsky's ideas—such as the belief that the Moon's craters might have been formed in Biblical times—don't set too well with the evidence at hand, such as the billion-year-old rocks that have been brought back from the Moon.

But the sad fact is that scientists can make asses of themselves just as easily as anyone else can, particularly when they're faced with a totally new idea from an outsider. The old Neolithic attitude—if he's not one of us, he's an enemy—can pre-

vail in even the most sophisticated mind.

Look at what happened in the area of weather modification. It's a good example of the work of a handful of creative scientists being stymied for more than ten years by a scientific bureaucracy.

On November 13, 1946, Vincent Schaefer sat in the back seat of a light plane and dropped a few pounds of dry ice into a cloud near Mt. Greylock, Massachusetts. A few months earlier he had discovered that dry ice crystals can cause a miniature "snowstorm" in a deep-freeze locker—which had been his experimental laboratory at the G.E. Research Labs in Schenectady, New York.

Standing outside the lab and watching the plane through binoculars was Dr. Irving Langmuir, Schaefer's mentor. Langmuir had won a Nobel Prize in chemistry in 1932, and had done pioneering work in the study of very high-temperature, ionized gases. It was he who coined the term "plasma" for ionized gases.

Now as he watched the plane circle the cloud bank over the mountain, he saw snow begin to fall. Langmuir, who was then sixty-five years old, shouted, "This is history!"

And he spent the next ten years battling the "experts" of the U.S. Weather Bureau and several other Washington agencies, trying to prove to them that man can and had deliberately modified the weather.

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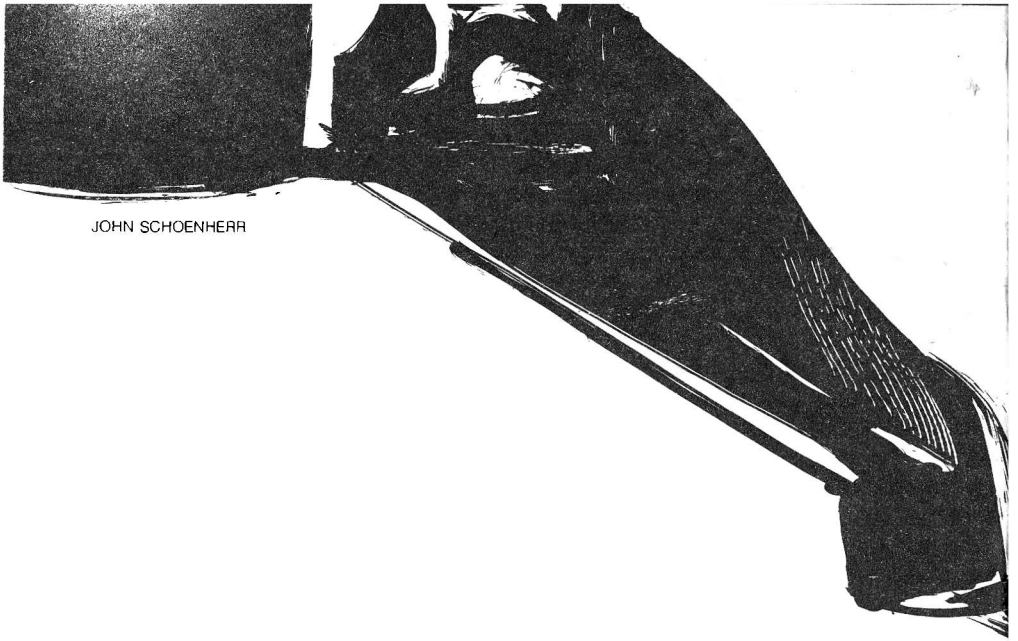


JOHN SCHOENHERR

Integration Module

The most difficult thing in all the universe for man to understand is—the mind of man!

DANIEL B. JAMES

The ball was going to strike the hard earth of the court right at his feet. Joseph dropped back and began his swing in one smooth motion. Whack! The tennis ball licked the edge of the net and sped on to the left corner of his opponent's court. The triple-jointed silver arm flashed and the ball came hurtling back, but too low; the net lurched as it absorbed the impact. The ball bounced twice before it was plucked out of the air by a plastic-and-metal hand.

Joseph laughed. "That's two out of three games, Beta. I'm just too good for you." He walked to the rear of the court, stuck his racket under his arm and bent to pick up a towel.

Somewhere in the building a digital computer performed a rapid calculation, the ball arced up, a racket flashed. Joseph straightened up quickly, having been smacked by a tennis ball square in the gluteus maximus. He rubbed his rear and glared at the two small electronic eyes which protruded slightly from the metal sphere to which the arms attached.

"O.K., O.K. I know what you can do when you have a second or two for calculation; you don't have to convince me. If you're going to be a poor sport, I'll just have to beat you three out of three next time."

There was an answering laugh from the sphere to which he spoke. "I am not worried, Joseph. In fact, I think I have detected a certain weakness in your game which I promise to fully exploit the next time we play."

The sphere rotated smoothly, its eyes following Joseph as he walked toward the small shower room. Joseph paused in the doorway and looked up at the sphere. "Well, Beta, you'll have to wait till Thursday to try out your strategy. Tomorrow I have some new assignments to discuss with you and it will probably take you most of the day to process them."

"What are they?" the sphere asked eagerly. The hydraulic tube and its movable shuttle to which the sphere was attached moved on its complex track in the ceiling. The tube extended and in a moment Joseph found himself looking into Beta's eyes.

"Mostly the usual problems from Central," Joseph said, "but there is one interesting job which will call for restructure."

"Good. Very good. I was hoping for something like that. A challenge. By the way, Joseph, have you heard anything from Central about the surprise reward that I'm supposed to be surprised by?"

"No," Joseph said slowly. He knew that if it were possible, Beta's eyes would be twinkling now with mischievous humor. "They don't know you have them all figured out."

"It wasn't hard. They're going to put in permanent communications between me and the Industries Computer Center at Louisville so that I'll have wonderfully expanded information access. How nice of them.

Then when they 'happen' to stumble on a problem important enough, they'll assign it to both of us so we can work on it together."

"Are you unhappy about it?"

"Not at all. But why don't they be straightforward about what they want?"

"Not the way of government bureaus, Beta. If they can't obscure something or confuse someone, they're unhappy. Besides, it's their way of rewarding you and increasing efficiency at the same time."

The sphere sighed. "I don't know what I'd do without you around, Joseph. If I dealt only with the government men, I'd burn out my transistors in six months."

Joseph pulled some sweat out of his short black beard. He said softly, "I'm a government man, Beta."

The sphere folded its three-foot arms and rose swiftly to the ceiling and called down, "You've taken me aback, Joseph; but I love you anyway and I'll never tell your terrible secret."

Joseph laughed and said, "You worthless pile of wires and bolts!" He wadded up his towel and threw it up an ineffectual twenty feet or so.

Beta swooped down, caught the towel, and threw it back at the figure ducking into the doorway. "Joseph, the only thing you have on me is compactness. Otherwise, I'm a much more well-rounded individual."

Joseph stuck his head out the door. "But you still can't play tennis for freeze-dried beans!"

Joseph slipped quickly out of his tennis clothes, turned on the shower, tested the temperature of the water and stepped into the cooling stream. On a whim he decided to wash his hair; and as his fingers worked the short, somewhat curly black hair into a white froth a thought came to him unbidden. His eyes were shut against the soap, his fingers busily rubbed his scalp all over, and beneath the scalp the skull and beneath the skull the thought of that white body . . . long white body lying forever unmoving not more than a hundred yards from where he stood. And on the door of that room in which it lay was a small sign which read: CAUTION! HYPERCRITICAL FACTORY INTEGRATION MODULE.

Joseph finished his shower and dressed quickly. He emerged from the doorway and looked around for the sphere. It hung still in the far left corner of the room. Its arms were neatly folded and its hydraulic tube was telescoped to the minimum length. *It looks dead somehow,* he thought. But then all of Beta's secondary bodies looked dead when Beta was gone from them. In all the years Joseph had known Beta he had never got used to either the sudden "coming to life" or the equally sudden temporary "death" of Beta's autosurrogates.

As he looked at the deactivated sphere, he thought again of the small room and of the body whose only movement was the incredibly slow one of its own growth. How many

millions of wires emerged from it? Joseph had forgotten, and it piqued him; he did not wish to forget. He promised himself that he would visit the room soon; for although his official routine called for an inspection of that room by him once a month, he had always gone more often. There was usually nothing for him to do there, but he went anyway to see if all was well with the body and . . . to see the body.

There were no sensors in that room or in the approaching corridor. Beta did not know the room existed.

He walked out of the silent game room into a long hallway which led him to another room, a small one which had served him as an office since he joined the Beta Project twenty-three years before. He dropped into his comfortable leather chair and lifted a briefcase onto his lap. Better check the memos before leaving. He pulled out a small notebook and opened it to the present date: 6 June, 2047. Damn! He reached out without looking and picked up a small desk microphone.

"Beta," he said. A tiny red light came on in the small metal sphere which was mounted on the wall. "I just wanted to let you know something I forgot earlier."

"What is that, Joseph?"

"A reporter is coming down here with me tomorrow."

"A technical reporter?"

"No, Beta, this one's from Public Media."

A brief silence followed. Then: "I do hope this one is not quite so dumb as the last reporter you brought."

"Well, I wouldn't bring any if it were up to me, but Central decided these things and you and I just have to live with it. Oh, another thing. Central asked me to ask you nicely if you would be a little easier on this one if you could."

Beta laughed. "O.K. I'll try, Joseph. But if he asks me if I think I'm worth all the money that's been spent on me like that last fool did, I'll let him have it."

"Beta, I cringe every time I think of that interview. I wish to hell I had never let you lay eyes on 'The Dictionary of World Slang.' "

"A birthday present, I believe."

"Check your memory tapes, Beta; it was a Christmas present, and it was with no Christmas spirit that you roasted that poor fellow's ears in seventeen languages."

"I promise I'll be a pleasant host tomorrow, Joseph. See you then."

"Good-bye, Beta. See you at ten A.M."

"Oh." A pause. "One more thing, Joseph." Another pause. "Do you think . . . I mean could we . . . never mind. I'll talk to you about it later. Bye."

Joseph switched off the phone, shook his head thoughtfully and stood up. No more to be done today. He would go home to Eleanor and the kids.

The atmosphere had begun to

thicken with the approaching dusk as his helicar lifted and, tilting slightly, glided away smooth and silent as a gull.

Later, with supper over and the children finally enticed to bed and asleep with a story, Joseph relaxed with a brandy and soda. Eleanor sat quietly sketching a flower which she had pinned to a sheet of white cardboard in front of her.

"A reporter named Mullroy called today," she said. "He dropped a couple of hints about getting together with you earlier than the scheduled appointment, so I invited him up for breakfast. But I let him know that meals in my house are for eating and relaxation, not work."

"Good for you." He took an extra-deep draft of brandy and soda and sagged even further into his hundred-year-old lounge chair. Somehow he just wasn't looking forward to this interview at all. It was the wrong time. Beta was going through one of his questioning cycles which had been coming along with increasing frequency.

Joseph knew Beta as well as he knew the woman who had borne his children—no, better; for he had been with Beta every day of the cyborg's life until the creature was all of ten years old. It had only been possible then for him to marry, to be away from Beta for increasing stretches of time and to think of being able to devote himself to a wife and children. But he would not have had it any other way. Few men had ever been able to devote themselves to truly pioneering work, and in his epoch the great unknown was the human mind. *And,* thought Joseph, *I've been dead-center in the exploration.*

The next morning began well. Joseph's nose informed him of Canadian bacon sizzling down below in the kitchen, even before the other senses had fully taken up their duties. Then his ears pricked to an unfamiliar sound—a low unidentifiable rumble. He leaned toward it, listening. He caught a syllable or two and realized that it was a human rumble—a man's very deep voice. The reporter. Oh, yes, the reporter. He closed his eyes and lay back until the Canadian bacon came again to inhabit his nasal cavities. Perhaps he would get up after all.

When Joseph entered the kitchen, he found Mullroy sitting comfortably with a cigarette in one hand, coffee in the other. The two men greeted one another. Mullroy was tall. He unfolded from his slouch like a carpenter's rule until Joseph was looking up at the man's thin, deeply-lined face. The smile was wise and friendly, but the eyes betrayed years of question-asking and answer-doubting. Mullroy's hands were very large and bony; Joseph felt his own almost disappear into Mullroy's firm grip.

The breakfast was pleasant in the cool morning air. The two children ate together, laughing and chatting

about their plans for the day, under the nearby willow tree on a heavy bench Joseph had built. And true to his promise, the slightly nervous Mullroy asked no questions. The amount of coffee he drank was phenomenal.

Eleanor sat with the two men for a while, talking easily about the flower sketches she was doing; and finally she began gathering up the dishes and urging her children to the few chores they had to do before they ran to the forested fields or down to the river to play. Joseph lit a long, thin cigar, reached for his oversized mug of coffee and suggested to Mullroy that they might walk together down toward the river for a while before they left for the Beta Complex. Mullroy accepted eagerly.

The two men walked for a while in silence, leaving as they went small bluish clouds of smoke in the still-cool morning air. After a short time they came to the rounded brow of the hill on whose upper slope Joseph had built his house.

"Eleanor and I used to come here years ago, whenever I could spare a few hours from the Beta Complex, and dream together of that house and the children who rattle it now with their energy."

"Why don't you tell me about yourself, Dr. Beckman," said Mullroy. "I've read your dossier at Central, of course, but that doesn't help much in getting a feeling for a fellow."

So Joseph began to talk about himself, with only occasional questions from Mullroy or requests for more detail. Joseph's father had been killed in a helicar accident in the winter of 2003, when Joseph was only four years old. His mother had taken him and his three-year-old sister to live on his grandfather's farm. Joseph had, from the beginning, loved animals; and by the time he was fourteen he had assumed complete responsibility for the care of all the livestock on the farm.

His grades in school had been excellent, especially in the sciences and in linguistics and mathematics. He had won state prizes in his science fair presentations on animal communications two years in a row. He was awarded college scholarships, and by his sophomore year he had written a paper entitled "Empathetic Feedback and Interspecies Learning" which aroused excitement in the graduate schools. His academic adviser began to subtly urge him to balance his interests in animal psychology with a solid program of human psychology, organic mechanics, the interdepartmental Patterns of Science, and somewhat to Joseph's surprise but not counter to his interests, his adviser especially urged him to take the full range of courses called Molecular Engineering.

He later found that Central secretly helped him. He had thought it was luck that in his first year in graduate school he was invited to work on the new neuromotor projection

experiments under Dr. Oldstead, perhaps the finest psycho-neurophysiologist of his time. The team was able to prove that, particularly in the nervous systems of mammals, there is a large degree of arbitrariness in the projections of the sensorium. This meant that what a brain perceives about the body it is in and the environment around it doesn't have so much to do with the way it was originally hooked up as with the information it receives from its sensory cells. So, if one changes the sensors and their arrangement, one also changes the perception of both body- and world-image to that brain.

"You mean you could stick a rat's brain in a cat and the rat would see itself as a cat?" asked Mullroy.

"Yes, theoretically," said Joseph, "but it is enormously difficult and dangerous to the organic systems, and there as yet seems no practical reason to do it, except for the scientific value. No, very early in our investigations we chose to emphasize the replacement of the normal body sensors of an animal in the late stage of fetal development with artificial sensors."

"By artificial sensors, do you mean some sort of sensing machine?" asked Mullroy.

"Machines only in the broadest possible meaning of that word. Anything—mechanical devices, crystals, even tuned molecules—can be artificial sensors if they respond to a change in their environment in a predictable manner and degree. The response can be chemical, electrical, magnetic—as long as it is reliably consistent in its reaction.

"From what we learned in the experiments with animals, we developed micro-linkages which converted the signals from the artificial sensors to signals that were in the simple electrical code that the human nervous system is used to.

"About that time, Dr. Tell of Zurich Polytechnic developed faciplastic which, as you probably know, will contract like muscle under electrical stimulation. It was child's play for us to connect the motor nerves of an animal or human through an amplifier to this faciplastic. Never will I forget that first experiment. I watched with awe as a mouse lifted a one-pound weight from across the room by his nervous signal to a crudely-mounted strip of the faciplastic. Oh, those were exciting times!

"Then, at the end of my Ph.D. studies, my adviser introduced me to the representative from Central. He offered me more than a job. He offered me a life's work: to be a mother, father, companion and technical adviser to the world's first permanent cyborg. I would assist in the creation of the cyborg, and from the moment of its birth I was to be its primary link with reality."

"Dr. Beckman," said the reporter, "could you tell me why you were chosen for this project? I mean, aside from your excellent technical qualifications?"

Joseph was silent for a moment and then he said, "I think it was my 'motherly' instincts." He smiled. "I suspect that the thing which clinched it was my background in animal care. Central realized that the teaching of a permanent cyborg would take patience, calmness and . . . love."

"Love," Mullroy repeated with an irritating flat tone of voice as he scribbled in his notebook.

Joseph's relaxation vanished. He found himself staring at the faintly cynical downward curve at the corners of the reporter's mouth.

"You seem to have stumbled over the word 'love', Mr. Mullroy. Why?"

"Maybe the word clashed in my mind with the thought of a human being wired into a concrete building, Dr. Beckman," said Mullroy softly, without looking up.

"Look, Mullroy, we're not ogres!" Joseph paused; he knew he must not be defensive with this man. "There are two things I want you to understand. First, because of the human module's defects he would either have had euthanasia or be forced to endure a life of near-immobility because of the minimum four or five cubic feet of life-support mechanisms that he could not survive without. The second thing, Mullroy, is this: I do love Beta and I've done everything in my power to help him live a meaningful, healthy and interesting life."

"You speak of the 'human module', Dr. Beckman, and then you speak of Beta. Don't you consider Beta human?"

Joseph got up and stretched, consciously calming himself before he answered.

"Beta is an entity—a highly complex cyborgean chemical engineering and manufacturing factory. Beta contains as one of his functioning parts what is the finest integration and feedback device that we have knowledge of—the human nervous system. Because of this system, the factory is aware of himself and his environment in a unified field of consciousness. Millions of bits of information flow into the human module every second to be processed and projected. Why, Mullroy, compared to this the finest computers we have are mere toys!"

"And cheap . . ."

"No, not cheap. Beta cost what eight ordinary factory complexes would cost. That is not to say that Beta hasn't paid back much of his original cost in increased production and in improved techniques. Not to mention the invaluable scientific knowledge we have gained."

"You would say, then, that Beta is an economic success?"

"Mullroy," said Joseph, "of all the reporters I've talked to, you have come the closest to making me mad. You are a real expert."

"I admit, Dr. Beckman, that Im not unaware that a little—not too much, but a little—anger sometimes helps the information flow. What

about that last question, then?"

"No, this human module factory has a long way to go before it could be called an economic success. But what is more important" (he stared hard at the reporter to emphasize his point) "is the grand experiment that it is. It involves scientists from fifty nations, many of whom will be dead long before Beta."

"Why do you say that Beta will die? Won't it just be the human module that will die?"

"Yes and no. Of course, only the human module can organically die; but it took us eight months to complete wiring the module into the factory, and it took as many years for Beta to learn to control his actions and to integrate his senses as it does a child to do the same with his body. Furthermore, as the years have gone on the nervous system and the electrical and chemical components of the factory have adjusted to one another in countless ways. No, when the human module dies, the factory in a sense dies too; for it would have to be completely rewired for the next human module."

Joseph had been pacing around as he spoke. Now he stopped and looked at his watch. "We'd better start back, because I told Beta that we would get there at ten."

Mullroy got up and stretched. "O.K. Perhaps you could tell me how you see this 'grand experiment'. I'm not exactly a religious type, but I agree with most religions in their assumption that there is something a little special about man. I don't see what justifies your taking away a man's body and sticking him in a machine."

They walked for a few moments before Joseph replied. "As I said, we didn't take away the physical body—just disconnected it. Then we gave him another body.

"As to the justification you asked for, I could repeat some of what I've said and add a dozen other good reasons having to do with medicine, psychology, economics and so on. But personally I've felt at times that it isn't so much a question of right or wrong as it is a coming to pass of the inevitable."

"I don't get you."

"This isn't easy for me to talk about, Mullroy, and don't quote me. What I'm trying to say is that if it hadn't been us that first helped man step beyond his skin and become another being it would soon be someone else. The cards were dealt long ago by old lady nature herself when she realized that if you could have one form of living thing you could have millions of them. We scientists—and man in general, I might add—can't help trying to follow her act. It might blow us to kingdom come, but homo sapiens is going to try to do everything it can think of and, Mullroy, *be* everything it can imagine."

"Like what? Give me some examples."

"Use your imagination, Mullroy.

What form would you take if you could choose from among endless varieties? What senses would you have, if you could choose from a list of thousands, including X-ray vision and bat-hearing? What would be the limit of your strength, and how would you design muscle arrangements if those choices were virtually unlimited—as they soon will be? You could be a human version of a bird or deep-sea fish. You could swim in the hot lava of a volcano, or rocket casually off to the moon—not in a space ship, but in your own sensitive, reacting body. And you would live longer, too, because there wouldn't be the wear and tear on your physical body except for the nervous system and it can live to a ripe old age."

"Could I be the Mississippi River?" Mullroy asked.

"Glad to see you're getting into the spirit of the thing, Mullroy. Maybe you could, someday. You could be a continent . . . hell, you could be the entire earth if you wished! At least theoretically, that is. You might have to spread your sensory and motor nerves a little thin—maybe one per square mile." His voice grew more serious. "But the important thing is that your brain could handle it. It could contain within itself a unified, changing projection of the whole earth. You wouldn't experience being a nervous system; you would experience *being* the earth. In a sense, the planet would be inside your brain, but you would never know that except by reason. Just as with your body—I mean your experienced body and not your physical body—it is inside your brain, but you don't know that because your brain has been evolutionarily biased to pretend otherwise."

"Now just hold it, Dr. Beckman." Mullroy stopped and gestured to the sky and surrounding hills. "Are you suggesting that all *this*—what I experience—is within my brain? Along with my experienced body? That makes you a solipsist, I believe."

"Forget the philosophical tags, Mullroy. They have a way of numbing the mind. To answer your question—yes! Where in hell do you expect your experience to be but in the organ of the human body which is specialized to perform the experiencing function? Everything you experience right now is taking place within the volume of something not much bigger than a softball. For example, that magnolia tree over there, blooming so beautifully, which we see as maybe a hundred yards away is actually within your cranium and, logic informs us, is but a few inches from your body-image at the most."

"One of us is crazy, Doctor," said the reporter. "I mean—well, I don't disagree with you, I can't refute what you say—but it just doesn't mean anything to me. It's like finding out how many cells there are in the human body—interesting, but it changes nothing about the way I feel about living or other people or myself."

"Of course it doesn't, Mullroy. The brain is a little like the stomach—it takes in some new data and either assimilates it or rejects it. It doesn't know what to do with something it can neither assimilate into the system nor simply toss out. Mullroy, one of the things which keeps life so interesting for us humans is the fact that we live in terms of paradox. We have a built-in desire for truth; wherever man looks he sees questions—they are as much a part of his gaze as color. We shall seek to answer our questions as long as we are human. Yet we shall never cease fearing the unknown even as we are drawn to it. We shall also attempt the paradoxical effort to contain raw truths within the box of our illusions. Why? Because illusion is our method, a function of our nervous systems. It is the fragile invention of organic systems of atoms trying to *know.* And ultimately the brain will corner itself somewhere . . . and fearfully try to encompass within itself the raw truth of its method, its surrogate reality."

The reporter stopped to light a cigarette. He took a long time at it. He shook his head and spoke; his voice seemed older and tireder. "And what then? What do we do then?"

"I don't know. I just know it's something we must do. We really don't have much choice but to pursue mysteries, including our own, wherever they lead us." Joseph thought for a moment. "Whatever happens, I think we will find that mystery—like life—doesn't die, that it changes, mutates into another form. It will be with us as long as we exist."

The interview went smoothly and Joseph was pleased with the questions the reporter asked, which were intelligent and concisely put. Mullroy was writing in his notebook some impressions concerning Beta's answer to the last question on the reporter's list. The sphere made a little nod to Joseph, who sighed inwardly. Beta was up to something.

"And now I have a question for you, reporter," said Beta.

"Shoot." Mullroy continued writing furiously.

Beta shot. "What is causing your hand to move right now as you write?"

"Huh!" Mullroy's eyes rotated up so that they peered at Beta through bushy eyebrows. "I am, of course."

"Are you? I suggest you write a word and tell me what passes through your mind as you do so."

Mullroy wrote a word, a noncomplimentary one, which he directed at Joseph who for the past few moments had been pointedly engrossed in the patterns of the tiles on the ceiling.

"Well," said Mullroy, "to be honest, I'd have to say that I wasn't thinking about the act of writing as I did it. It's just sort of automatic."

"Would you say that you were not aware of it?" Beta asked quickly.

"Certainly I was aware of it. I did

it. I watched it as it happened."

"Try it again and tell me what is in your awareness besides just your experience of the act."

Mullroy paused and sighed. Slowly he guided his pen in the writing of a long word.

"Nothing. There is nothing in my mind as I write except the experience itself."

Beta chuckled. "So the causing of the writing is unconscious to you. How can you take credit for doing something that you're not even aware of?"

"Look," said Mullroy with a touch of exasperation in his voice, "*I* wrote the word. *I* decided to write it. It was *my* act. Just what are you getting at?"

"I wonder if you really did decide," Beta said serenely. "Joseph, would you mind telling Mr. Mullroy that story of yours about the time you 'noticed' your hand?"

Joseph shuddered inwardly. "Oh, I doubt if Mr. Mullroy would care to . . ."

"But I would, I would." Mullroy leaned forward in an exaggerated expression of great interest.

"All right. I'll be brief. One time when I was sitting in school, a very bored eleven-year-old boy, I noticed my hand lying on my knee. I use the word 'noticed' because it was the first time that I had seen my hand as an object—a physical object like a banana or a rock. So I began thinking how strange it was for me to be able to cause this object to move just by telling it to do so. I remember feeling a strange sense of power and magic. In this frame of mind I began to order my hand—this object—to move, to drum fingers on my knee, to make a fist and so on. Of course nothing happened; the hand just lay there. I clearly recall summoning up all my force of will and commanding my hand to rise. Arise, hand! I was amazed to see that the hand did not move at all."

"You must have been telling your hand *not* to move," Mullroy said.

"Not consciously, I wasn't. The point is . . ."

"The point is, Mr. Mullroy," said Beta, "that perhaps you did not 'decide' to write the word any more than Joseph was able to decide that his hand should move, assuming of course that you are constructed more or less the same as Joseph."

"*I* was not constructed. I grew." Mullroy said archly.

There was a short pointed silence from Beta. Then: "Joseph, I think I am getting that 'Dictionary of World Slang' feeling again."

"Yes," said Joseph. "I think this is a good time to terminate the interview. Unless you have any more questions. . . ?"

"No, I have all I need. Thank you very much, Beta. Sorry I couldn't follow your little philosophy lesson better. I never did too well in it in college."

"You are welcome, Mr. Mullroy," said Beta, a decided chill in his voice.

Joseph led the confused reporter

to his office, poured two mugs of coffee and sat down, waiting.

"O.K.," Mullroy said, "would you mind telling me what in hell *that* was all about?"

Joseph smiled, although he was not at all at ease. "Don't worry about it, Mullroy. Beta does that to me, too. It is his nature to, well, speculate on things. With you he was trying to show that you can observe your hand guiding the pen, but you can't observe nor directly control that which causes your hand to move. The cause remains as unknown to your consciousness as, say, the center of the earth."

"You seem to have actually encouraged Beta in these . . . speculations. Which reminds me, how come you told Beta that story about your hand?"

"God knows! I don't remember the circumstances. As you know, one of Beta's advantages is that besides his ordinary human memory, which is as fallible as ours, he has connections to a memory tape system. I never know while I'm talking with him if he's taping or not. He spends hours of his off-duty time randomly scanning his memory tapes until he finds something interesting to think about. I think that's how he came up with that 'hand' story."

They talked a while longer, then as the reporter was taking his leave he paused in the doorway. "One last question, Dr. Beckman. Since information on the human module is considered 'sensitive' rather than secret, how do you prevent Beta from finding out about himself?"

"Well, the 'sensitive' classification enables Central to keep the media from sensationalizing the information on this project. That keeps the public calm, and the scientific community can function better in an atmosphere of free exchange of information. All we have to do is be very careful what Beta reads, as he has no other way of finding out about the human module. And Beta prefers tapes, which are cleared, to books anyway."

Mullroy nodded, waved his hand in farewell, and closed the door behind him. Joseph sat for a few minutes finishing his coffee and thinking. His thoughts were troubled by vague little fears. The cyborg was hunting for something; these speculations of Beta's were not idle. They were part of a pattern of behavior which went back years into the past.

He put it firmly out of his thoughts and reached for the button which would call Beta to activation. As he did so, he realized with horror that the red light was already on.

"Beta! How long have you been activated?"

Came the answer as soft as his question was sharp, "Only about five seconds, Joseph. Why? Were you and the reporter talking about something I shouldn't hear?"

Joseph's heart stopped beating quite so rapidly. "No. I just . . . was surprised, that's all." He hurried on. "Are you ready for the briefing?

There are some restructure problems which should interest you."

Pause. "Certainly, Joseph. Proceed."

The briefing took more than an hour. Joseph could hear the moving of massive machinery in the Main Room as Beta moved parts of himself about, trying first this arrangement and then that in his search for the most efficient one for the production of the new plastics. Finally he was satisfied.

"No problem, Joseph. Central can pick up their sixty tons of TCP-19 by tomorrow afternoon at the south loading dock. I may have some problems with one of the components for the other plastic, though. I can produce it O.K., but it tends to lump in the gross transport pipes. I'll have to experiment with flow vibration frequencies until I can find the right one. That may take a while."

"No rush on that order anyway, Beta. I'll put it in the project data tapes so you can get busy. Anything else you need?"

"Not for these projects, but . . . Joseph, I can have most of this worked out and set up for the Automatic Section by eight o'clock tonight . . ." Beta could set up a process, work it a while, then let it proceed as effortlessly and unconsciously as digestion in a man.

"You don't have to do it that fast, Beta. You can quit at the regular time," said Joseph.

"I know, but I want to have everything done . . . if I can talk you into coming back over here tonight."

Joseph was surprised. It was the first time in years that Beta had asked him to come at an unscheduled time. "What's up?" he asked.

"I want to talk about some things. But not during working hours. See, this is personal . . ." his voice trailed off.

Joseph hesitated. He was afraid, and he didn't know why. There was a suppressed excitement in Beta's voice, an urgency. But he said that he would come.

On his way back to Beta that night, Joseph thought through the events of the past few days, then he raced through his memory as one might through fields. Beta was as complex as anyone he had ever known. And just as unpredictable. All he knew for sure was that this was important—not only for the experiment which had consumed the entirety of his professional career, but for Beta's life and mind as well. Joseph felt he had to be more than a guide and a father—he had to be a friend to a cyborg who had become a mature organism.

He parked the helicar and walked the few yards to the entrance. In the beginning, he had felt that he was entering Beta's body when he walked through these doors; but now he only felt that way when he entered the Main Room where most of Beta's apparatus and sensors were. The Main Room was full of complex noises, although the sound level was

not uncomfortably high. The sphere was hung in the corner, unmoving. The job he was working on seemed to take all his attention, for he said nothing to Joseph, who was watching quietly.

Finally Beta spoke. "There! All finished. I've got that sequence on tape and it can go on automatic as soon as the other job is done. It took me a little longer than I thought."

Beta activated the autosurrogate and it moved down from its corner until it hung a few feet from Joseph. The sphere and the man stared at each other without speaking for several moments; then Joseph spoke.

"Well, Beta, what's on your mind?"

"A million things, Joseph. But they all have to do with what I am."

"Are you unhappy?"

The sphere made a small gesture of surprise. "No, not at all. I'm content enough, but even so I find myself asking questions which lead not to answers but to more questions. Frankly, Joseph, I'm confused."

Joseph laughed. "You can join the club, Beta. Nearly everyone I know who has the wit to question existence is confused. You wouldn't be a true child of the human species if uncertainty weren't part of your heritage."

"I appreciate your kindness," Beta said with mild irony, "in telling me that it is natural and acceptable to be confused. But I want more than that. I want the answers—and I feel you can give them to me."

"Really?" Joseph said slowly. "Maybe so, but I doubt it."

"Consider, Joseph, what I was saying to that reporter toward the end of the interview. What did you think of that?"

"I told Mullroy, when he asked me, that you were trying to demonstrate that voluntary control is really a nonconscious control."

"In other words," said Beta, "we don't really know what we are *going* to do, only what has just been done."

"Yes, that's what I told him you were getting at."

"Joseph, a couple of years ago I was talking with you about something and I remember that I was quite voluble. I was discoursing on something I knew well and I spoke fluently, even brilliantly—or so it seemed. Then a strange thing happened. I suddenly realized that I didn't know what words were going to come out of my speaker until they were already echoing off the walls. I was amazed. It was as if the words were streaming out of eternity through me. I began to think about this. My thoughts have clustered around this experience. Joseph, it is almost an obsession with me now. Where do the words come from? How are they strung together in such logical order?"

Joseph thought he saw a way out of the coming confrontation. "Put it out of your mind, Beta. The mind of man which created you as another stage among endless stages of evolution does not understand everything

it creates. Just as you create new associations of atoms without a complete knowledge of molecular relationships, so we have generated you as another version of ourselves without knowing everything there is to know about ourselves. You have as many unknowns in you as we have in us. We don't know where our words come from either."

"I find it hard to believe that you don't know."

Joseph was so shocked that he said nothing.

Beta continued. "But let us continue. Another thing which has occupied my thoughts is something subtle that I've identified in my experience. Not only have I decided that somewhere there is something *do*ing what I have thought *I* was doing, but I've begun to wonder about my perceptions. You, Joseph, taught me long ago about my sensors. And, whenever I wish, I can look them up in my tape memory. Sensors for this, sensors for that—I have thirty-one different kinds of sensors."

"So?" Joseph sank into a chair for the duration.

"So—somewhere the millions of bits of data are all put together into a unity. Otherwise I would experience no unity. Somewhere all the data is examined and censored and pruned and trimmed. Then I receive what's left."

"I give you my word," said Joseph, "that we do not interfere with your sensory experience."

"I thank you for telling me and I believe you. But that information changes nothing. I am convinced that there must be a device which integrates my data and then sends it to me. Which brings me to my last point."

The sphere moved closer to Joseph until their eyes were about a foot apart.

"Joseph, where is my experience?"

"What! Your experience?"

"You needn't be so surprised, Joseph. I've just thought about the things you have taught me. What I think is as much your ideas as mine."

Joseph thought ruefully of his conversation with Mullroy and of the magnolia tree that the reporter did not wish to have in his head, preferring the useful illusion of "out there."

Beta went on. "Joseph, I've got millions of sensors, but only one unified awareness of my world. As far as I can see, that unity could not be the result of scattered functions or devices. It's impossible. Everything I experience has an underlying similarity, despite the apparent differences in quality or form. Somehow these seemingly different things undergo a similar process—the end result of which is my total experience at any one time."

"What can you conclude from that, Beta?"

"I conclude that there is a device—one single device—which provides the ultimate integration of all the relevant information available to my

waking being. I think that what we call 'consciousness' *is* this complete integration. If this is true, then where is this device? Joseph, please tell me."

"Do you think it's something you can just go look at?"

"Yes, why not?"

"Before we go any further, tell me why it means so much to you."

"Don't you understand, Joseph? That device holds the secret to where I am and what I am. It's where I really live. It's where everything I have ever known has its location and existence and overlay of meaning."

"I don't understand . . ."

"You do, you do!" Beta said, nearly shouting. "I can tell!" Then, more calmly, "I know that I don't experience myself directly—the atoms and molecules of me. I know myself only in the way that I know other things, things external to my physical machinery. I only *experience* myself. The self that I know by experience must logically be within that device, along with everything else I experience."

Joseph shook his head sadly. "What can you possibly gain by pursuing this?"

"I am not thinking in terms of gain anymore. All I know is that neither myself nor my world is what I thought it was, nor where I thought it was." The sphere started to sway to and fro. "Oh, Joseph, am I some flickering image somewhere who only thinks he has will and self? Help me. Help me."

"Be quiet," Joseph said sharply. "Do you think you are ready for any understanding of yourself if you act this way?"

The swaying stopped abruptly. Then came Beta's voice, cool and calm as ever. "Sorry, Joseph. It's very rare that I feel that way. Usually it is the curiosity which drives me in this search. Sometimes, though, I become confused and lonely and the thinking becomes fuzzy, difficult to follow. The more difficult it becomes, the more I feel compelled to attack the problem. To be honest with you, I confess that I must find out about myself, this device, what my world is made of. It's not just curiosity anymore."

"What you ask is not possible," Joseph said.

"Tell me about it then. You must know! I am a child of the human species, you said. You must know how my consciousness was made."

"Man," said Joseph cryptically, "makes many things that he doesn't really understand."

"Is this one of them?"

Joseph couldn't lie now. Beta would know and the precious trust would die.

"No, Beta, it isn't," he said softly.

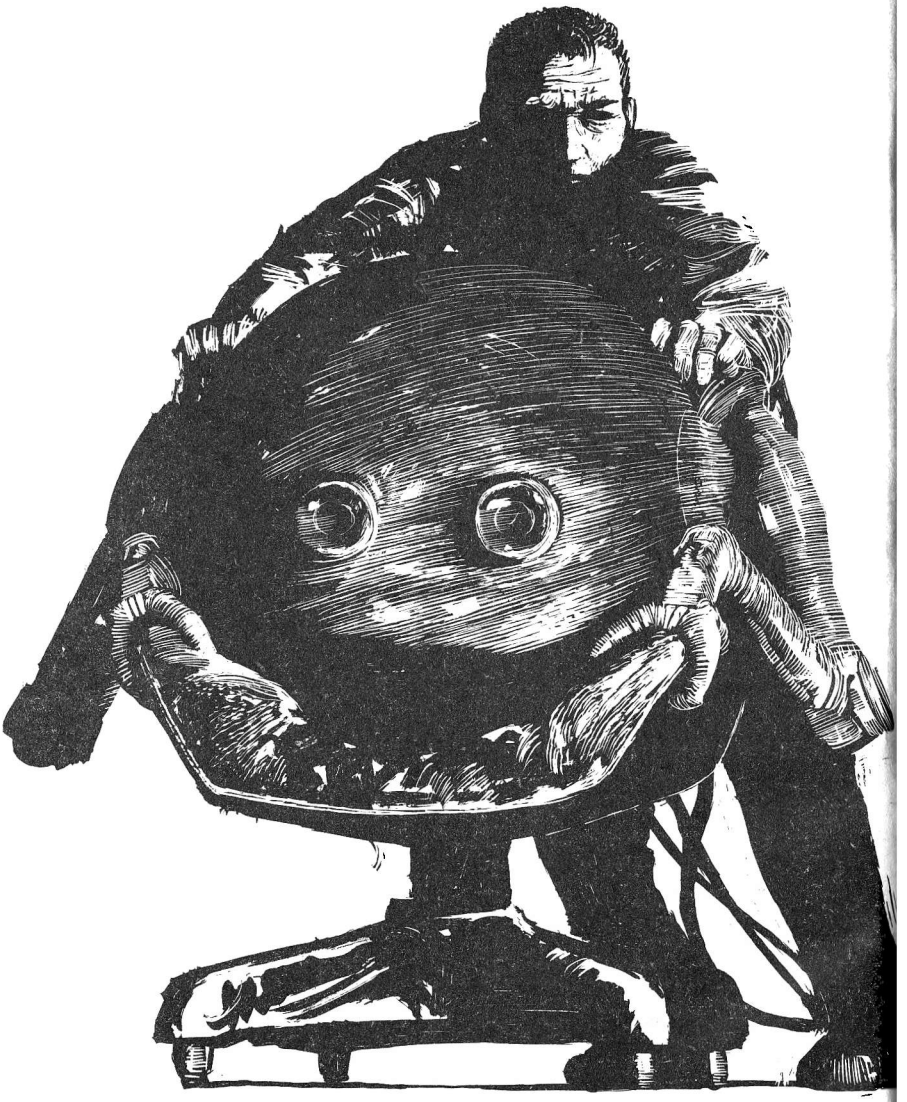
"Joseph, take me to it."

"Beta, for God's sake! It's against regulations . . ."

"Then I was right! It does exist!"

Joseph exploded. "Yes, it exists! But can't you forget it? It would do you no good to see it."

"I don't care about doing myself



good. This is something I need."

"Beta, most of the men who brought you into existence feel that it would be bad for you. I am forbidden even to mention the matter to you, let alone allow you to see the Integration Module."

"So that's what you call it."

It wasn't easy. It took him ..alf the night to free the required four hundred feet of cable which ran behind the paneling of walls and ceiling of the Main Room to the autosurrogate. There had been no way to splice a section of cable into it; it was far too complex for that. He didn't know what Beta was doing meanwhile; no doubt he was going over his memory tapes to review everything he had recorded about this matter. Damn! He couldn't find anything to carry the autosurrogate in. The thing was far too heavy for him to lift. Childishly, he wondered if he wouldn't have to call this madness off. No, not so lucky. His mind's eye presented him with the answer and he realized Beta would think of it too: the chair in his office with the little casters.

They were ready by two-thirty in the morning. With the help of Beta's arms and hands supporting the weight of the heavy sphere, Joseph was able to wrestle the excited orb into the heavily cushioned seat.

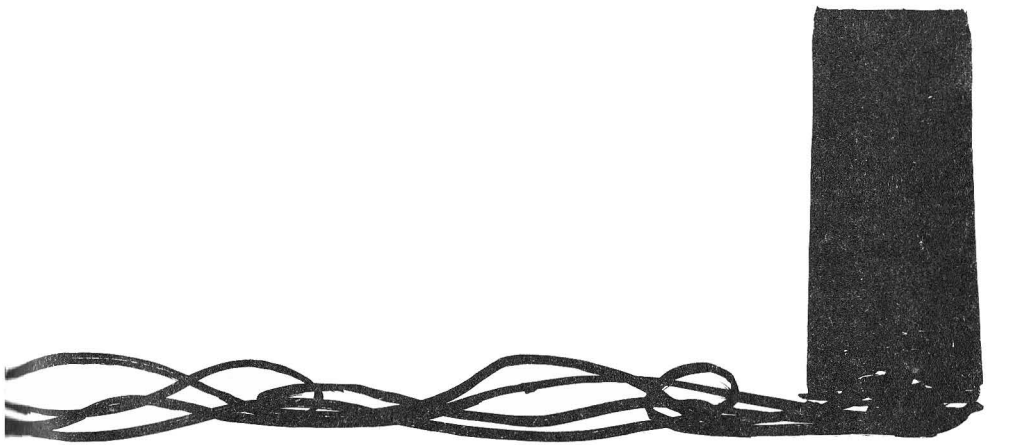
"Right side up, if you would." Beta was staring out upside down. It made him feel a little funny.

Using one of the arms for a lever, Joseph carefully turned the autosurrogate over. Beta still felt strange and said so.

"You've lost your hydraulics, Beta. Your reflexes are sending out balance and posture control messages, but now nothing happens. Are you dizzy?"

"I'm all right. I'm fine."

"Sure you are," Joseph said sar-



castically. "Look, let me know if you start to get sick."

Beta assured him that he would. And then slowly, very slowly, Joseph anxiously began wheeling the chair toward the corridor. The journey was not long, but it took almost an hour. Joseph had to stop every few feet to pull the cable forward, to check the floor surface over which the chair would pass, to pause and relax his own tense muscles. Injury to the autosurrogate and the unknown possibility of damage to Beta's psyche if there were an accident—all unthinkable! With agonizing slowness they crept down the narrow corridor; painfully they turned the corner; slow as plant growth they approached the forbidden door.

Beta stared at it for a long while. Joseph could hardly breathe now. There was a prickle at the back of his neck. Madness. Madness. A wave of vertigo nearly swept him to the ground. Emotion splashed through him as though he were a bucket with no bottom. Above all was embarrassment, shyness. As always when he tiptoed here. For here was housed the soul of his friend . . .

There was a trembling in Beta's arms as he repeated "integration module, integration module" over and over very softly. Finally he visibly steadied himself and said that he was ready to go in.

Joseph pushed open the door. The room was dark. Moving like a man at the bottom of an ocean, he pushed the chair and its silent occupant through the soft light which angled into the room from the hall and into the blackness.

Beta waited quietly. Joseph moved to the light switch.

"Have courage, Beta, my friend," he breathed. "We should have told you, but they were afraid; now it will go hard for you. I am with you, my friend." The light slowly increased.

Out of the gloom came that unbelievable image: the long white body so still upon its electronic bier, so perfect beneath its protective plastic cover. Faint rhythms played through the muscles. At first Beta did not move as he stared at the young male form. Then his arm twitched up and dropped back. He raised his hands and cupped them around his eyes. He shuddered and a groan filled the room. And then he began to cry in short, harsh sobs. And not just the autosurrogate was crying, but the whole cyborg. Joseph could hear deep rhythmic throoming sounds from all over the factory.

Not knowing what to do, Joseph knelt beside the chair and waited. Beta put out a blind hand, groping, found Joseph's shoulder, gripped it hard. Joseph winced with pain but did not move. Beta spoke then with great difficulty, tearing each word from the fabric of his crying.

". . . there . . . inside there! . . . now . . . I'm in THERE, Joseph . . . now! And I . . . always was."

After a time, Beta grew quiet and the great sounds throughout the factory died away. Joseph reached to

his shoulder and took Beta's hand which lay there. Beta gave a start.

"Now I know," Beta said, "why the warmth of human touch always felt so good to me. Joseph . . . why didn't you tell me? Why does that . . . lie there instead of walking . . ." His voice broke.

"It never would have walked, Beta, never done a hundredth of what you can do. Listen to me, Beta, it had such serious defects it would probably not have lived or if it lived it would have been confined to a room somewhere. Oh, Beta. I couldn't tell you. I'm sorry . . ."

Silence filled the little room. Beta continued to stare at the body. "Defects," he said finally. "If that is so then I have no regrets. I've had a hand, you know, in making myself what I am." His voice was a strange mixture of irony and pride.

The tension of fear in Joseph broke and melted. Beta would be all right. He was strong. Now a wetness came to Joseph's eyes as he too gazed at the form which housed Beta's essence and his world.

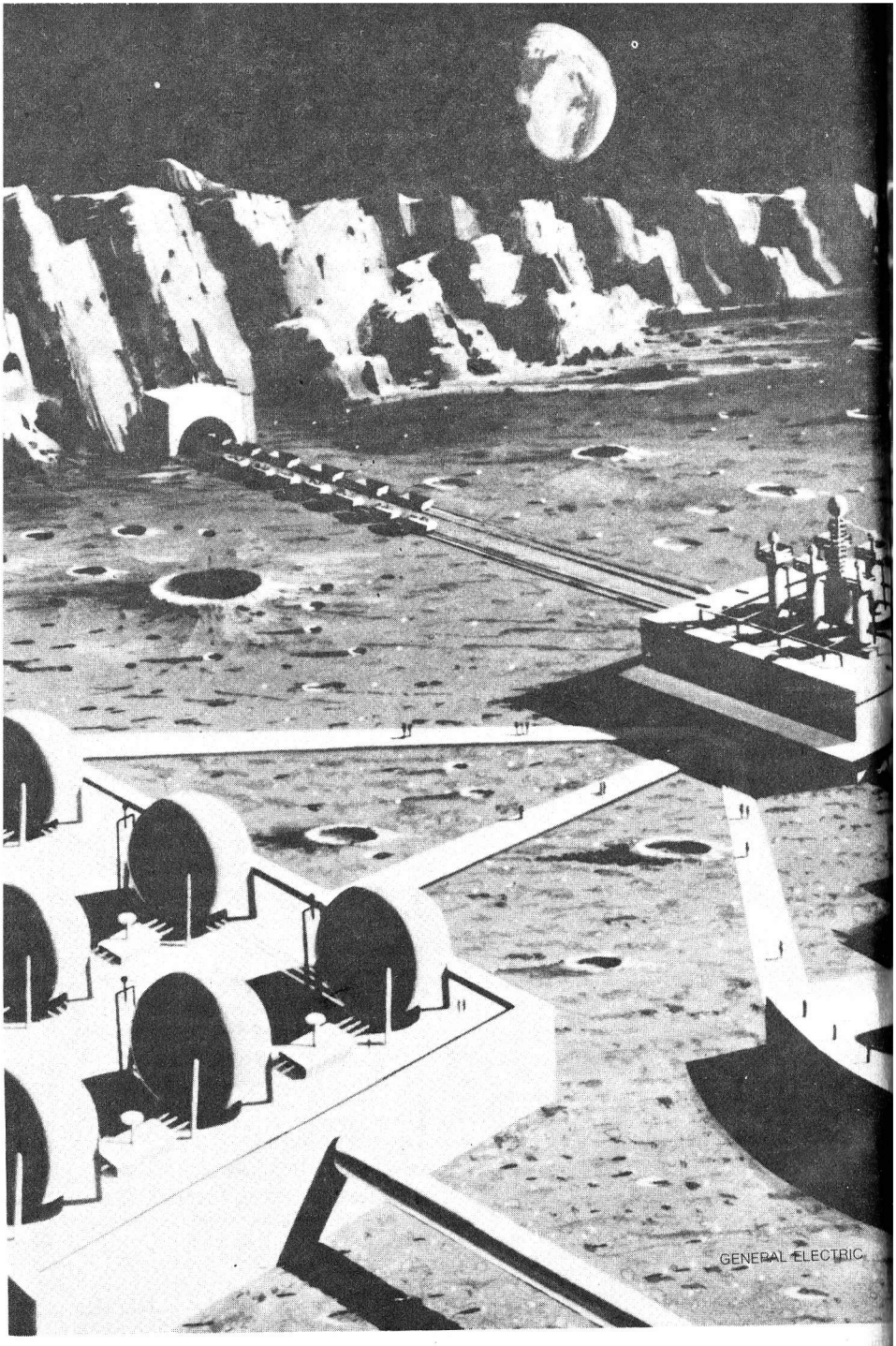
"No one should have to go through what you have, Beta." His voice seemed small and far away.

"You're wrong, Joseph," said Beta slowly, "doubly wrong. For years my thinking and questioning have made ideas like so many arrows all pointing to the same unknown place." He gestured around the room. "This is that place. I had to know what was in that place." He looked at the body and said, "I'm glad I know."

"You said I was doubly wrong."

Beta thought for a while. "I followed an unmarked path in my mind until I found that the core of myself is human. I never expected that. And now I see that the end of my journey is where I join you on your path and begin again. All my questions still apply; the arrows point to a new unknown place."

"I see," said Joseph. "Yes, the questions still apply. Our words come, but we don't know from where. The bright world leaps up like flames in the brain, but we don't know how. And all is soaked in meaning, and we ask why." He smiled. "Welcome, my friend, to one hell of a long, confusing, and fascinating journey!" ■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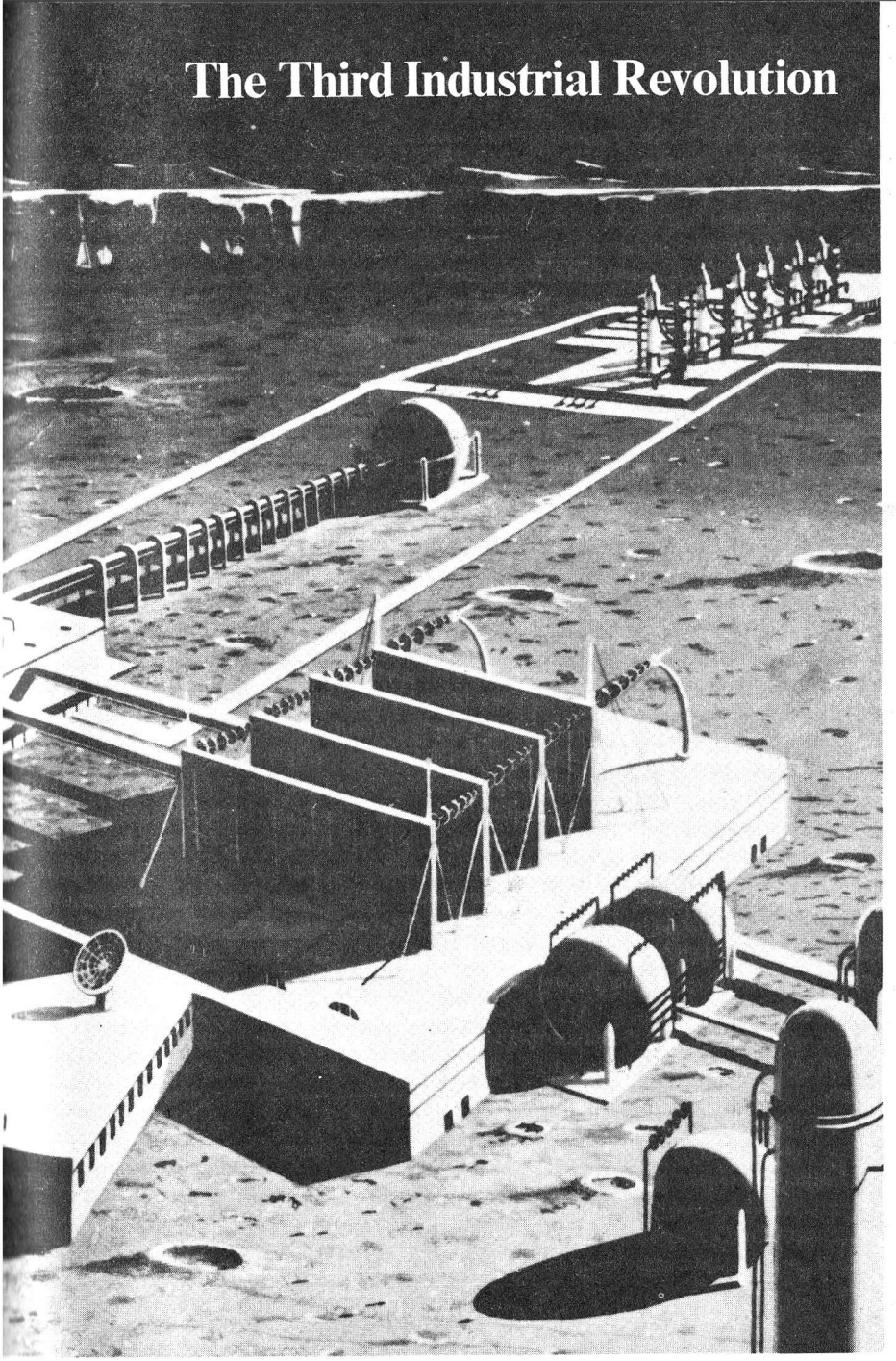
The Third Industrial Revolution



Part One of Two Parts.
The first industrial revolution freed man from physical slavery. The second is beginning to liberate man's mind from the numbing drudgery of repetitive tasks. And the third . . .

G. HARRY STINE

While some well-meaning but incompletely informed people are loudly decrying industry, technology, progress, and science, a new industrial revolution is quietly getting under way. Fifty years from now, it may render their viewing-with-alarm as humorous and short-sighted as the solemn pronouncements of Nineteenth Century "experts" proving that a human being could not survive a speed of thirty miles per hour . . . or Dr. Simon Newcomb's careful proof in early 1903 that showed a flying machine to be an impossible device.

This new industrial revolution will change the face of our planet, alter our life styles, forge new industrial empires, and create new billionaire industrial moguls.

It will take place two hundred kilometers over our heads.

It is difficult, if not impossible, to forecast all of the changes this will make in our lives. We can draw a close analogy by playing the science fiction game of "let's suppose." Let's crank up our Universal Time Machine (Model 1, Mod 0) capable of temporal transposition of people.

Let's extemporize to the present time, Lucian of Samosata, Thomas More, and Jules Verne, all s-f writers of the past who were the futurists of their time. Here they stand, looking around them at the wonders and miracles of the Twentieth Century. We'll supply them with Lingua-Dapters (Model 4, Mark III) so they can talk with each other and with us.

Lucian and More, separated in time by over a millennium and from different cultures, would have little trouble relating to one another; their lives were basically the same because their worlds were basically the same: small cities, many tiny farm villages, animal-powered agriculture, rulers who exacted tribute and taxes (there's a difference?), and the bartering merchant and tradesman.

They would have great trouble understanding the Nineteenth Century world of Jules Verne.

Lucian and More would see our Twentieth Century world as full of literal miracles. Jules Verne would be able to understand some of it, but some areas such as solid-state electronics would baffle him completely. He would probably remark that the Twentieth Century is considerably different than he had anticipated.

Let us now reverse the connections on our Time Machine and temporally transpose back to the present a science fiction writer from 2072 A.D. Like us, he will have little or nothing in common with Lucian or More in terms of way of life, but unlike us he will not be able to relate to Jules Verne; his world to Jules Verne is a world of magic in accordance with Clarke's Second Law. If he could explain the Twenty-first Century to us, I suspect we would be forced to admit it isn't anything like we had anticipated.

Why? What was one of the causes of these great dislocations of life style between Lucian/More, Verne, ourselves, and Twenty-first Century man?

Lucian and More both lived before the First Industrial Revolution. Jules Verne was a child of the First I.R. and lived before the Second Industrial Revolution. We are children of the Second I.R., and we are separated by our progeny of a century hence by the Third Industrial Revolution.

What do we mean by "industrial revolution" and what were the changes that were wrought by the first two?

"Industrial revolution" is a precise term. It is a radically different way of doing things, of harnessing the work potential of human beings.

The First I.R. began in England and the United States of America. Its start was in England at the beginning of the Nineteenth Century, give or take a few years. It reached its culmination in the U.S.A. about 1875. The First I.R. involved the introduction of machinery to replace human and animal muscle power, the conversion of fossil fuel energy into heat energy and thence to mechanical motion, and the development of the mass-produced device made with interchangeable parts on a production line manned by people who carried out only one assembly operation per person.

Two factors may have triggered the First I.R.: (a) England found herself stripped of manpower to administer and defend her growing colonial empire, and (b) at the same time the last of England's hardwood forests were cut down for fuel. This forced people to figure out a way to get coal out of the deep, flooded mines. It was a matter of either developing the required technology or freezing to death. Getting the water out required pumps. Pumps required iron. Iron required high smelting temperatures. It is possible to trace the entire development of modern

technology back to a common ancestor: Darby's coke oven. The First I.R., when it had run its course, changed the life style of Western Europe and the U.S.A. beyond all recognition. Since I am also a child of the machine, I had to live for several years in New England to begin to appreciate the *good* consequences of the First I.R.; many people who are talking about a "return to the simple life without modern technology" simply haven't looked into what it was like before the First I.R. We have come so far in the last two hundred years that most of us don't consciously grasp the total magnitude of the change that has taken place. Even though the First I.R. reached its peak about a hundred years ago, we are still living today with many of its processes and consequences. And we will be for some years to come because we cannot afford the luxury of throwing them out until we have better and more efficient ways of doing the same things. Yes, the First I.R. did have some expensive consequences: it completely destroyed the previous agricultural base of living and it began destroying the stored-up energy sources of our planet. Perhaps it could have happened in no other way, however.

The Second Industrial Revolution began in the U.S.A. early in the Twentieth Century. It involved the use of feedback controls and logic devices to replace the human brain for directing machinery in repetitive or rapid tasks. It occurred because the devices and processes of the First I.R. had matured to a point where a human being could not act quickly enough or could not handle the complexity of the interrelating variables of the improved machine operations. The Second I.R. required people who could use their brains foremost and also their hands . . . simply because people still needed to troubleshoot the automatic controls and computers. ("But the automatic stop didn't stop!" To which the shop foreman replies, "Well, why weren't you watching the automatic stop, eh?") The Second I.R. produced another complete change in our way of life between 1930 and 1970. Some of us can still remember hand-stoking a coal furnace at home before the automatic Iron Fireman was installed. Many new industrial processes became possible, practical, and economical (in that order). Greater energy inputs were required. This accelerated the depletion of fossil fuel deposits. The increased complexity of the industrial processes resulted in very complex industrial waste products . . . and these were *really* waste products because they play merry hell with the natural ecology because there are no natural recycling mechanisms for them. Pollution became a major problem because there are *always* waste products. See the Second Law of Thermodynamics. The combined First and Second I.R. industrial operations on Earth have grown to a size, cost, and complexity that make

it exceedingly difficult to expand their operations, improve them, eliminate all of their polluting capability, or make important innovations within the suddenly-perceived closed-cycle ecology of this small planet. The Second I.R. is reaching its peak because the size of the planet is finite. Even if there were unlimited sources of energy and raw materials, we wouldn't have any place to dispose of the waste products.

The next step is quite logical. The anthropologist Carleton Coon has pointed out that the entire history of the human race for the past million years or so has been concerned with human beings converting natural energy into social structure at an ever-increasing rate. To continue this process which overshadows such anthropologic eras as the Paleolithic, Mesolithic, Neolithic, Bronze Age, Iron Age, et cetera to the multifarious modern "ages," we can no longer be confined to the planet Earth. Since the womb of Mother Earth is getting crowded and polluted—as wombs naturally become just prior to parturition—we are going to have to begin operating and living in a bigger system, the universe. Or, as Heinlein put it twenty years ago, "Time to find a new planet; we've used this one up."

The Third Industrial Revolution—and perhaps the last one—will take place in space beyond the surface and atmosphere of this small planet.

The Third I.R. is just at its barely-discernible beginnings. Very few people have forecast it. But it has started to happen already.

We need industry, and industry needs both energy and raw materials. We will be going into the Solar System—and eventually beyond—to find them. There is enough raw material in the Solar System to take care of our requirements for many years to come. Sol is a very large and active energy source, and it will take us a few years before we need to utilize the entire energy output of our primary (creating, perhaps, a pseudo black hole of energy). We will also need a "sink" in which to dump the waste energy, and there is a whole universe out there to use as a sink. I hope that the environmentalists don't panic about that for at least a couple of million years. The universe is pretty big and seems to be getting bigger all the time, and any waste heat from the Third I.R. that is dumped into the universe contributes only a picoscopic (that's even smaller than microscopic) bit to the entropy flow of the universe. It seems quite unlikely that we can achieve the energy pollution of the entire universe; if we ever reach that point technologically, we may well be tossing our garbage into black holes and perhaps into parallel universes. Space warps have always been a handy place to get rid of dirty laundry.

But the Third I.R. promises, even at this very early stage, to be consid-

erably more significant and have far greater consequences to us than the first two industrial revolutions. It also holds the promise of righting the wrongs and curing the ills that our industrial progress has created.

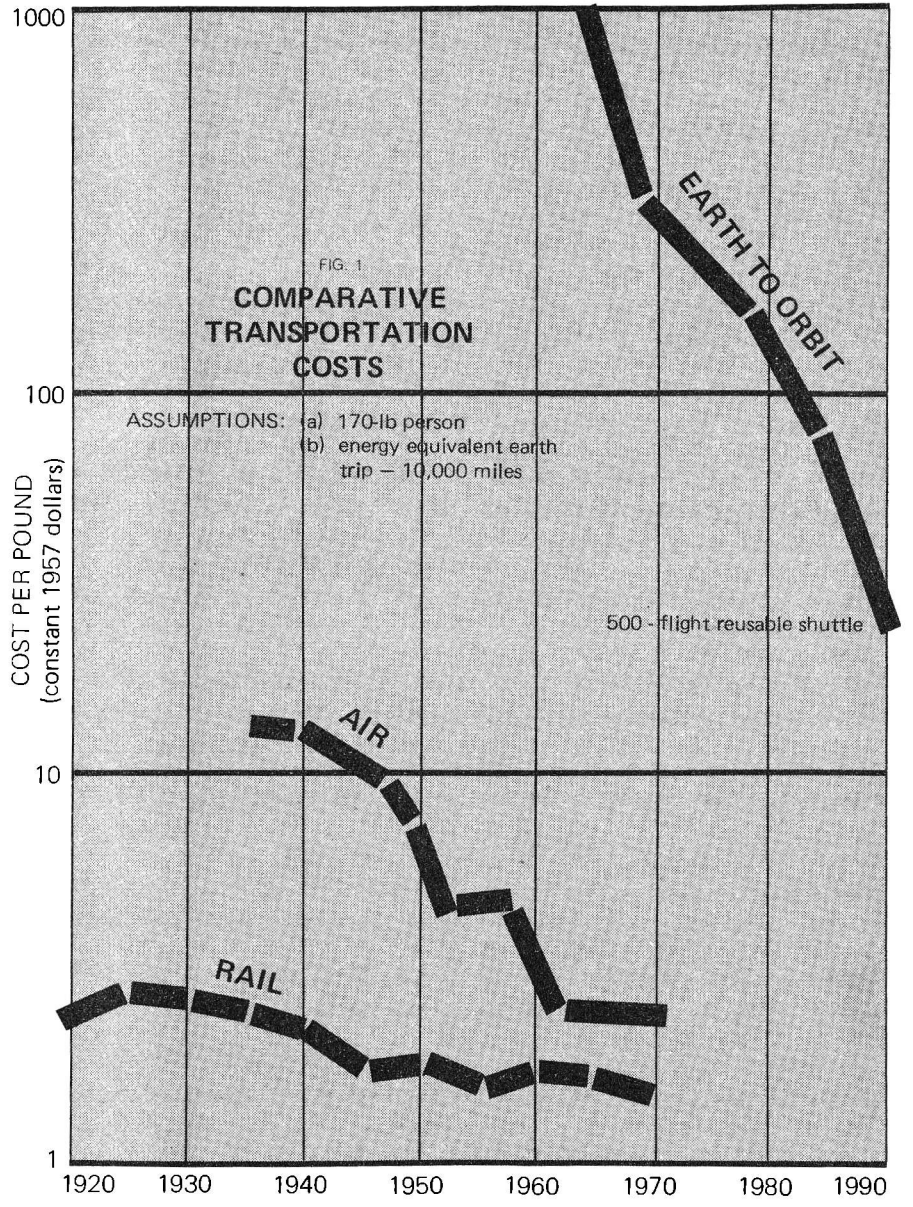
But an industrial process requires more than raw materials to process into finished products and energy to make the process go. It must have capital equipment with which to manipulate the energy and raw materials. It must have personnel to manage the operation beyond the capabilities of the Second I.R. devices. And it must have a transportation system to convey raw materials, finished products, and personnel so that they are where you want them when you want them there.

At the present moment in time, the key element in the start-up of the Third I.R. is transportation. But it's coming. A considerable amount of effort has been devoted to this, is being devoted to it now, and will continue to be devoted to it for the next twenty-five years at least. Our initial space transportation system, the expendable rocket-propelled vehicle, has a tariff of about $1000 to $500 per pound of payload delivered to a 200-kilometer orbit from the Earth's surface. Thus, only very special payloads of very high priority have been placed in the space environment thus far. The NASA-USAF Space Shuttle Phase One will hopefully lower the cost of delivery to about $100 per pound in the 200-kilometer orbit. Using the eventual Phase Two orbiter and fly-back booster, the costs may come down to about $38 per pound in the 1980-1990 time period. (See Fig. 1.)

This cost really doesn't look too bad because, as we'll see, it is the cost of transporting people. The amount of energy required to put a pound of payload into Near-Earth-Orbit (NEO) is about the same as that required to send it by subsonic jet airplane halfway around the world—New York City to Sydney, Australia, for example. At the time of this writing, it costs about $700 to send a person by air from JFK to SYD. For the average 170-pound passenger, this works out to about $4.00 per pound. But more people travel by surface automobile than by jet plane, and in order to transport our 170-pound person 10,000 miles by car at the government-approved rate of 15 cents per mile, we expend $8.50 per pound.

Even at a cost of four times that much, it becomes worthwhile to think about sending people into orbit for industrial purposes even today. In years to come, this cost will come down. In 1926, the domestic airline passenger rate was 12 cents per mile . . . in 1926 dollars. In 1972, the rate is 6.5 cents per mile in smaller 1972 dollars.

But we should not use Space Shuttle—or any other space transportation system with costs equally as high—for sending raw materials *into* NEO.


1000
100
10
1
COST PER POUND
(constant 1957 dollars)
FIG. 1
COMPARATIVE
TRANSPORTATION
COSTS
ASSUMPTIONS: (a) 170-lb person
(b) energy equivalent earth
trip – 10,000 miles
EARTH TO ORBIT
500 - flight reusable shuttle
AIR
RAIL
1920
1930
1940
1950
1960
1970
1980
1990

Any earth-to-orbit space shuttle system now conceivable and probably attainable between now and Century-21 will be used to deliver highly-qualified industrial engineers and technicians or industrial research scientists to and from space . . . and possibly to deliver finished products from space down the gravity well to a landing on Earth. It certainly does not cost $38 per pound to bring something down that gravity well from space!

Actually, the optimum space-to-surface industrial product transportation system—a space-going box car, if you will—need be nothing more than an unmanned ballistic reentry body with a simple autopilot, an ablative heat shield, and a parachute. All it takes is a nudge out of orbit, a little rocket propellant, plus some ablative material. The autopilot will drop it right on target. It may eventually be cheaper to make them expendable from materials produced in space. In any event, transportation costs for industrial products delivered to the Earth's surface from space are *not* going to be excessive.

When talking costs, it may be deceptive to quote actual numbers, by the way. We are actually considering *value,* not cost. And value ultimately depends upon the desire/need for the product on the part of the human consumer. Before the telephone was invented, nobody wanted it or needed it; today, nobody can do without it, and those that don't have it want it desperately.

Even at dollars per pound for transportation costs of personnel, raw materials, and finished products, by the turn of the century it may be cheaper to conduct industrial operations in space than on the surface of the Earth. Why?

Tough, strict, enforced antipollution regulations may render some industrial processes too expensive or impossible to conduct any longer on the Earth's surface. It may be cheaper to conduct them in space. And only in space might it be possible to conduct certain operations at all!

Because there are some industrial processes that can be carried out cheaper in space than on Earth, or some processes that can be done *only* in space, we are quite likely to experience another phenomenon similar to the Great Aluminum Caper.

We now take aluminum for granted. It is one of the most common elements in the Earth's crust. Housewives use aluminum foil to wrap their garbage. Yet, in 1827, aluminum was one of the rarest of metals and sold for $160 per pound. Its use was confined to laboratory experiments. The Hall electrolytic process of extracting aluminum from bauxite using a cryolite catalyst dropped the price to a mere 15 cents per pound and resulted in an increase in annual production from a mere 85 pounds in 1885 to millions of pounds today.

So we cannot blithely assume that some one of today's exotic products costing thousands of dollars per pound will continue in that rare product category. The space environment has some unique characteristics, and when industrial engineers get around to using them in industrial processes, a lot of seemingly-impossible or now-expensive materials and products are going to become quite commonplace indeed.

We can categorize the space environment as having the following characteristics that are of interest to industrial engineers:

1. Gravity-free (therefore strain-free) environment and its corollary, the controlled acceleration environment. This includes the controlled gravity-gradient environment as well.
2. Matter-free (high vacuum) environment and its corollary, the controlled-pressure environment.
3. Controlled radiation environment.
4. Wide-range temperature environment.
5. Wide-range energy density environment.

Space industrial processes will use one or a combination of the above characteristics. With the exception of the long-term gravity-free environment, all of them can be created here on the Earth's surface—but, I might add, at very great cost and with great complexity. Thus, we do not need to wait until we have a full-fledged orbital industrial research laboratory staffed and ready in order to begin investigating what we might be able to do in the space environment. For many years, people at NASA's George C. Marshall Space Flight Center in Huntsville, Alabama have been studying space manufacturing; there have been a number of symposia held there since 1968. A number of industrial firms are now involved in the work. And in view of the fat reports and proceedings that have come from these meetings, the early space-based industrial research laboratories are going to be very busy indeed.

These symposia have revealed that there is a great deal more to the subject of space industry than is immediately apparent to the unaided optic. Most Americans think in terms of product, not process, and therefore most of the revelations that have filled the press releases from these symposia have concerned themselves with such mundane possibilities as truly spherical ball bearings, high-purity crystals including super-sized diamonds, and free casting of strange shapes. But there is more to it than that, and to discover it we should have a very close look at each of the space environment characteristics. Mind you, these are just some of the *characteristics* of the space environment that appear to be of interest to industrial types. What can be done with them is another matter to be discussed later in this piece. Some of the processes that will be used in space manufacturing use

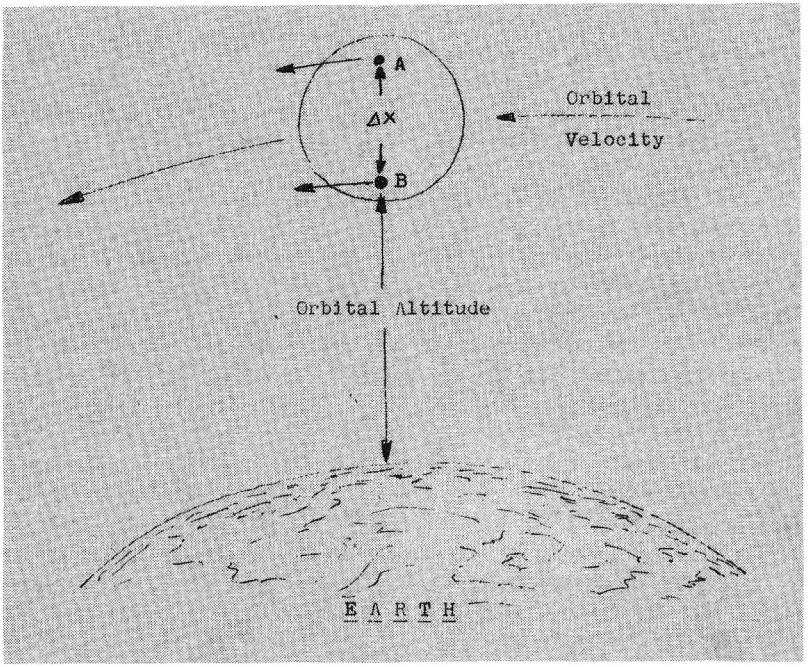


FIGURE 2

A gravity gradient exists even in a satellite. This produces a torque or twist between A and B. Eventually, A and B will line up pointing toward the center of the Earth below.

one or more of the space characteristics, and they can often be combined to produce some synergistic possibilities. Again, more on this later on. For the nonce, the *specific* characteristics of the space environment, insofar as they can be discussed separately, are as follows:

1. *Gravity-free environment.*

This is perhaps the most unique characteristic of the space environment. It is also the most difficult for us to understand or comprehend because we have all grown up on the surface of the Earth in a constant one-g gravity field that also has a very low gradient. It gives us a rather distorted notion of physics. The discovery of permanent weightlessness is a totally new human experience. Aquatic buoyancy is the closest some of us have ever come to it. Some have briefly experienced it for less than a minute flying in a jet aircraft in a parabolic trajectory.

Space is a totally strain-free environment for as long as you wish. In

fact, you have to deliberately produce a strain or acceleration.

Liquids become objects in their own right. Our experience tells us that liquids always need a container. Not so in weightlessness. Liquids become things that can be moved and processed all by themselves in the gravity-free environment.

The ability in zero-g to handle and process liquids *and* solids apart from any container using free-suspension techniques permits a high degree of control of contamination, purity, or doping (whichever way you are used to viewing it).

An important factor: In weightlessness, density no longer becomes a dominant characteristic.

Because density differences no longer can play a major role, ordinary convection heating currents in liquids and gases do not exist in zero-g. This introduces new elements into the processes of heating and cooling of materials—some desirable, others headaches. Heat transfer by convection being absent by and large, all heat transfer must then take place by conduction or radiation.

In a near-Earth-orbit location, it is possible to obtain a condition of weightlessness combined with a gravity gradient. True. See Figure 2. This gravity gradient can also exist over quite short distances. In Figure 2, Point A inside an orbiting satellite is further from the center of the Earth than Point B. It is therefore subjected to a few milligees less gravitational acceleration than Point B, a distance Delta-X closer to the Earth. This can be altered and controlled by changing the distance Delta-X between Points A and B. There is also a torqueing moment created by the fact that Point A, traveling at the same orbital velocity as Point B, is in a slightly higher orbit and will tend therefore to lag behind Point B. (On the other hand, the gravity gradient will tend to keep Points A and B aligned with the gravity vector. This permits tradeoffs and compromises in engineering design, and will turn out to be an important part of astro-industrial engineering.)

If you put a centrifuge in the orbiting space factory and are willing to put up with or design to compensate for the torqueing problems and gyro moments it is going to produce when it starts, runs, and stops, you will be able to create a controlled acceleration environment. A centrifuge permits you to create an acceleration environment to suit your industrial process with pseudo-gravity ranging from zero up to the structural limit of the equipment. The size of the centrifuge will determine the acceleration gradients you can produce within it.

The ability to create and sustain gravity and acceleration gradients is another totally new aspect of industrial processing in the space environment. The ability to have a given strain in one part of your equipment and a different strain in another

opens new possibilities, many of which we haven't even started to consider yet because we are still mentally chained to the one-g low-gradient terrestrial environment.

Another aspect of the weightless environment is also lacking in deep comprehension. In a strain-free condition, the only forces acting on an object are its internal forces. Surface tension is an obvious example. We don't usually think about such forces on the Earth's surface because they are masked or overshadowed by the very strong terrestrial gravitational field. But these internal forces are quite strong and quite evident in zero-g.

Another characteristic of matter that we find difficult to mentally separate from weight in a one-g field is the other aspect of mass: inertia. Unmasked by the absence of a gravitational field, inertia becomes a property of matter of and by itself, something that can be used in macro-industry as it is now used in the submicroscopic world of a mass spectrometer. Industrial engineers make use of inertia in centrifugal or cyclone separators. It is another property that becomes important in a zero-g environment.

And—but not finally—there is Coriolis Force. A space factory with a centrifuge will have some Coriolis Force for the engineers to work with. This can be a significant force "out thar."

These forces and characteristics of matter become more important in weightlessness because you can no longer count on freely using the gravity field to produce motion. Any motion in a weightless environment must be created by an outside force, and therefore by an energy gradient. Newton's Laws of Motion become realities. We all learned them in freshman physics, but we have yet to live with them in their untarnished state.

The strain-free industrial characteristics discussed above are most exciting to scientists and engineers contemplating what we can do in space. They become even more exciting when we synergize them with the other space environment factors.

2. *Matter-free environment and controlled pressure.*

A vacuum pump has facetiously been defined as a device which pumps nothing into a vacuum. The only way to get a vacuum on the Earth's surface is with that very expensive device, the pump.

But at 500 kilometers orbital altitude, there is a better vacuum existing all around you than you can get on Earth except with the finest and most expensive hi-vac facilities. It's there for the taking. There might even be some commercial value in bringing some of it back to the ground because it is such good vacuum by surface standards. It might also be cheaper to bring it back than to make it on the ground!

Even so, the "hard vacuum" of space isn't a pure vacuum at all. In

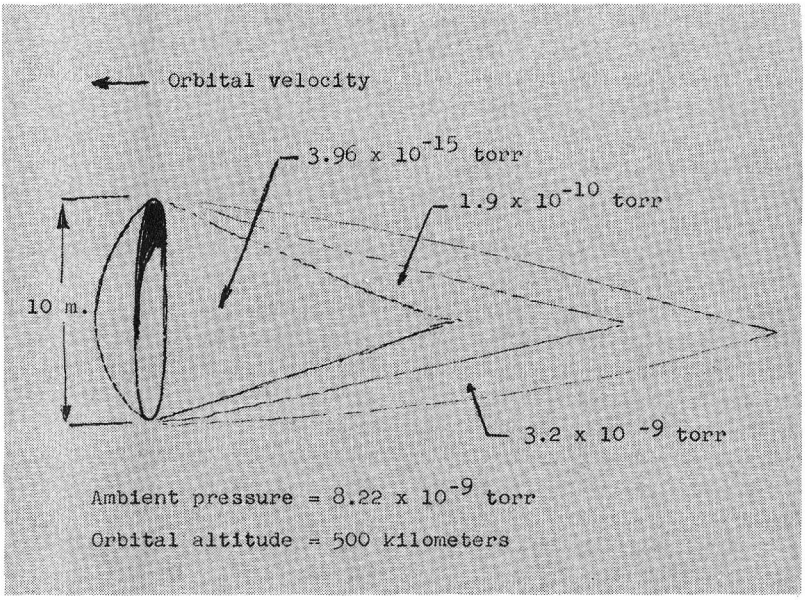


FIGURE 3

Even though a very good vacuum exists at orbital altitudes, even higher vacuums exist in the wake of a satellite. This figure shows the general vacuum regions that lie in the wake of a satellite disk 10 meters in diameter at an orbital altitude of 500 kilometers.

Earth orbit, there are still the tiniest traces of the very uppermost parts of the Earth's atmosphere to contaminate your nothingness . . . plus the fact that the Earth's orbit is within the measurable solar atmosphere. At 500 kilometers, the ambient pressure—if you can really think of it as such—is about 8.22 x 10^{-9} torr. Pretty good, but it takes very little to get an even better vacuum.

A high vacuum exists right in the wake of your satellite.

Satellite velocities are so high and interplanetary gas densities so low that there is a wake to a satellite. If you place a disk 10 meters in diameter in orbit as shown in Figure 3, it will have high vacuum regions behind it as shown. You can obtain vacuums of 3.96 x 10^{-15} torr in regions of the satellite disk's wake. And you get this chunk of nothing for nothing. It's there to use.

Of course, starting from this next-to-nothingness around the space factory, you can use pumps or chemical reactions to create gas volumes . . . and in turn create various atmospheres to your specifications with pressure up to the limits of the physi-

cal structures of the space factory to contain them.

This matter-free environment can be highly controlled. Since there is very little there to start with, an industrial engineer can introduce controlled amounts of whatever matter he desires for his industrial process.

Pressure, vacuum, and high-purity atmospheres are already widely used in many industrial processes here on Earth. They are already a part of our industrial world. As industry moves into space in the Third Industrial Revolution, it doesn't have to learn a great deal about this characteristic of the space environment. But it will have more of it than ever before. And all because of a mere 14.7 psi pressure difference.

3. *Controlled radiation environment.*

Because the terrestrial atmosphere is such an excellent filter for certain regions of the electromagnetic spectrum, the natural radiation from the universe that finally impinges upon the Earth's surface is only a feeble remnant of what exists above 200 kilometers. Space industry is going to have available the raw radiation from our neighborhood fusion reactor, Sol. So?

Any good industrial chemist or chemical engineer will tell you of a whole list of chemical reactions that can be initiated, accelerated, controlled, retarded, or stopped by applying or removing radiation.

Irradiation chemistry has been limited and retarded here on Earth by a lack of suitable, effective, and economical radiation sources in certain portions of the electromagnetic spectrum. There are also limitations on the amount of radiation output that can be obtained from terrestrial sources in parts of the e-m spectrum.

In space, there is Sol. It radiates energetically in a wide swath across the e-m spectrum.

To get more of what Sol produces, one can concentrate and focus it where the technology is available to do so. Or, eventually, one can move in to infra-mercurial solar orbits deep in the solar atmosphere.

The radiation is available out there. It is a form of energy that will be useful in a number of industrial processes.

4. *Wide-range temperature environment.*

There has been much said and written about this space environment characteristic. The full impact of a wide range of available temperatures hasn't become obvious yet.

Between the temperatures of -40° C. and +3000° C., it is still reasonably inexpensive and easy to conduct industrial operations on the Earth's surface. It gets complex and expensive when low temperatures are required . . . and most impractical when the required temperatures begin to approach absolute zero. High-temperature regimes will become more and more expensive, more difficult, and more antisocial as Earth's supply of fossil fuels runs out and as

our antipollution laws become stiffer.

It is probable that we will be able to continue some high-temperature operations and processes here on Earth if we do not overload the ecology with waste heat energy beyond the point where it can recover and provided there is a source of heat energy available.

On the other hand, our space factories will have available to them a range of temperatures from nearly absolute zero—give or take a fraction of a degree—all the way up to where temperature, per se, becomes a measure of the velocity of molecules. Furthermore, these temperatures aren't just temperatures; they are representative of the heat energy that is available.

In space, it is also possible to sustain temperatures at a given level for very long periods of time with little energy input or out-flow. In a sense, the space environment is like a great big ideal black body.

5. *Wide-range energy density environment.*

Many of today's industrial processes require high energy density levels and rates. Melting, smelting, vaporizing, solidifying, freezing, and a host of other processes require that energy be put into or dumped out of the system at various rates. It is not immediately obvious that in the space environment there can exist comparable energy levels and rates. The space environment is usually considered to be a region of very low energy density. True, but there are nodes of extremely high energy density available.

Such as Sol.

And the very low energy density region of open space.

That gives us an excellent energy density gradient to work with . . . much better than anything available on the Earth's surface.

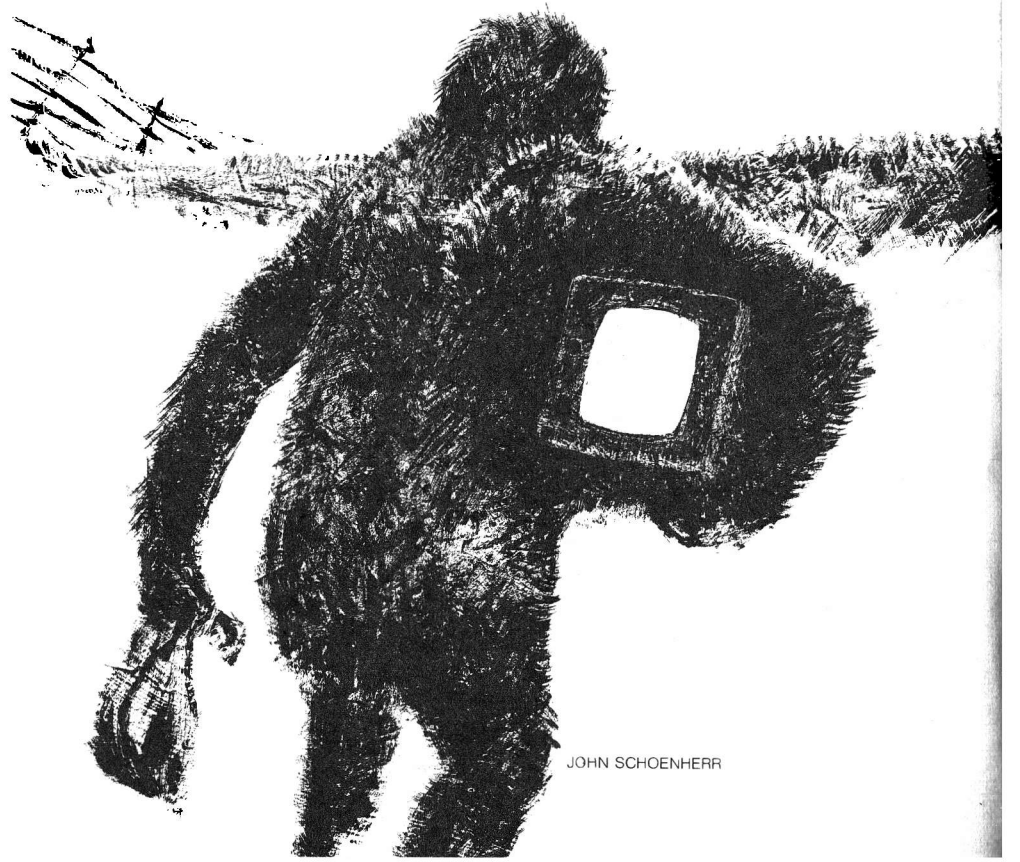
For example: at the distance of the Earth's orbit, Sol produces a natural energy density rate of about 2 calories per square centimeter per minute. This does not sound like very much. But it can be collected, concentrated, and focused to produce an extremely high energy density. If you spin-up a parabolic mirror of aluminized mylar film with a diameter of 100 meters, you will have a hefty 11 megawatts available at the focal point. Stick a 100 cm^2 target in there, and the heat flux is 110 kilowatts per square centimeter. This is enough energy density and rate to vaporize over 11 kilograms of copper *per second!*

Did somebody say something about energy densities of industrial magnitude?

It may even be possible to achieve even higher densities by utilizing solar radiation as a pumping medium for laser-like devices.

This is what is waiting for us beyond the thin envelope of the Earth's atmosphere. All we have to do is get out there and use it.

TO BE CONCLUDED

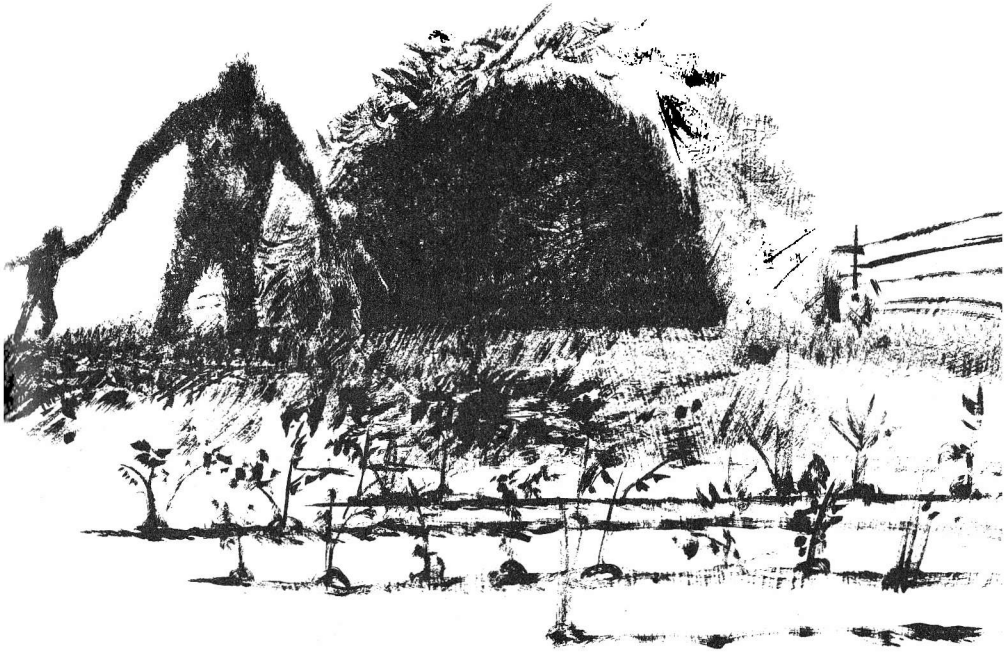


JOHN SCHOENHERR

Health Hazard

Sometimes high-minded scientists with the best of good will, can be remarkably obtuse—while by mistake doing something useful!

HOWARD L. MYERS



Romee did not doubt that the men and women from Earth were as fully human as the chimos and chimees of Notcid. But sometimes they did things that struck her as absurd.

And that made dealing with them difficult, and more than a little frightening.

Right now, she had to get the damn-television set fixed, and wasn't sure how to go about it. There was a repair shop at the Trading Center—or the Cultural Exchange Center as it was called by the new set of Earth people running it now. Romee had carried the damn-TV some forty-five miles under her arm, jittery all the way because she didn't know what to expect from the new people.

She wished the traders (or "exploiters" as the new people wanted them called) were still running the Center. A person could do business with them without so much upsetting uncertainty.

It was some relief to reach the compound, and to find the repair shop where it had always been. In fact, when she went in she recognized the Earthman in charge as the same one who was there two years earlier, when last she had visited the shop.

She lifted the damn-TV set onto the counter.

"Can you fix it?" she asked.

"Sure, I can fix anything," he replied, more understandably than the average Earthman despite his monotone accent.

"How much will it cost?"

"I won't know until I find out what's wrong. Give me your name, honey."

"Romee of West Hill with the Flat Rock on the Brook," she replied.

He shook his head. "That won't do for the record, Romee. The Demography Office has assigned family names. You run over to the office and find out what yours is."

"Oh, that," she gasped nervously, flustered by her mistake. "I already know it. Romee Westbrook."

"O.K." The man wrote her name on a ticket which he attached to her damn-TV. "This ought to be ready for you tomorrow, Ro. . . I mean, Miss Westbrook."

"Mrs. Westbrook," she corrected him.

He grinned, and she grinned back. She was glad he was still running the shop. As a leftover from the time of the exploiters, he was fairly easy to understand.

"How come you're still here?" she asked, momentarily boldened by his grin.

He shrugged. "Because I wasn't important enough to kick out when the new regime took over."

She nodded vaguely, said goodbye, and left the shop. How could a man who could repair something as marvelously intricate as a damn-TV set be unimportant? she wondered.

That was just one more unsolvable puzzle of the Earth people, she concluded. They made big importances out of little things, and no impor-

tance out of great dangers and fearful problems.

For instance, they did nothing about the horrors of the jungle lowlands.

And she had to go down to the jungle now. She had to go there to gather the natsacher shoots to sell to the Earth people, to get money to pay the damn-TV repairman, and to buy some chocolate . . . if the new people were still selling chocolate.

In any event, she had to gather natsacher shoots, and the thought intimidated her, almost to the point of making her whimper.

For a while she wandered around inside the compound of the Cultural Exchange Center, peering in shop and office windows at the men and women and chimos and chimees. She realized she was merely killing time, postponing the inevitable. But maybe she would gain courage by looking at other humans, particularly the men and women.

Maybe they looked strange, with their hair concentrated on the tops of their heads, and needlessly long there, and their peculiar stance with legs straight instead of flexed, which made them look taller than they really were. And the males almost as breastless as herself, since the Earthwomen not only bore the young but also nursed them . . . an arrangement that struck Romee as so odd that she sometimes wondered if that physical absurdity might account for all the other ridiculous traits of these people.

But the humans from Earth, for all their foibles, had courage. They were brave beyond understanding. Why, she had heard that a loud noise wouldn't even make some of them jump!

She wished she had some of that courage right now.

Slowly she headed for the compound's gate, then turned aside to examine the bulletin board.

A woman was feeding in a new notice as she approached.

"Good morning," Romee said politely. "Is that something new?"

The woman turned and studied her. "Yes. Would you like to hear it?"

"If you please."

Romee hoped the new bulletin would not be another lecture on the evils of chocolate. Those lectures frightened her, and they were constantly popping up on damn-TV these days. Romee knew she was hooked on the stuff, and couldn't give it up. So, to be told over and over that it was taking years off her life was sheer torture. She had made up her mind not to believe the lectures, but she couldn't stay sure they weren't right, no matter how hard she tried.

But it turned out that the new bulletin wasn't a lecture. The woman pressed the button and the board said: *"The services of several chimos and chimees are desired for a series of tests on response to environmental stimuli. A modest stipend will be paid to participants. Apply at Exotic Psy-*

chology Office, Brown Building."

"Thank you," Romee said to the woman, and headed once more toward the gate. Then she halted and turned. She had never heard of the Exotic Psychology Office before, which suggested it might be very new on Notcid—even newer than the replacers of the exploiters. And being new, it might have a lot of prestige and money, since Earth humans thought highly of new things.

"How much money is a 'modest stipend'?" she asked.

The woman frowned. "We prefer applicants who are motivated by a desire for increased understanding and cultural progress, rather than monetary rewards," she said stiffly.

Romee thought about that, and nodded. If this was something to increase her understanding of Earth people's peculiarities, or help these people progress toward more rational behavior, she was all for it.

"I have those motivations," she said, "but I have newly hatched young and a husband whose breasts are heavy with milk. For their sakes I must inquire about the stipend."

This seemed to please the woman. She nodded. "The pay will be fifty cashers."

That was more than Romee could expect from two gatherings of natsacher shoots!

"O.K. When do I start?" she said.

The woman blinked. "Why . . . immediately, I suppose. Yes. Come with me, please. I'm Miss Dallas McGuire, assistant director of Exotic Psychology."

"I'm Romee Westbrook."

Miss McGuire led the way to the Brown Building and into a sparsely furnished office suite near the rear. She motioned Romee into a chair beside a desk, and seated herself behind it. Without complaint, Romee perched on the chair instead of squatting comfortably on her haunches.

"We'll have to wait for Dr. Radley Truit, the director," said Miss McGuire, "but in the meantime we can fill out your application form." In a businesslike manner she scribbled some words on a sheet of paper. "What is your age, Mrs. Westbrook?"

"Twenty-two years."

"The hatching you mentioned, was that your first?"

"No, my second."

"How many young?"

"Three each time."

"Are they all living?"

"Yes."

"What about your parents? Are they living?"

Romee repressed a whimper. "No. The jungle got them."

Miss McGuire made a clicking noise with her mouth and looked annoyed.

"Were they on chocolate?"

"Yes."

"And are you?"

"Yes."

Miss McGuire put down her pen and gazed at Romee. "Don't you

know that's bad for you, Mrs. Westbrook?" she asked solemnly. "Can't you give it up for the sake of your young, if not for yourself?"

This was so absurd, to talk about giving up chocolate. "I've tried, but I can't," she replied, hoping to satisfy the woman. But she couldn't help adding, "I can't tell that it does me any harm, and it makes being alive much nicer."

"Any *harm*?" demanded the woman sharply. "Surely, Mrs. Westbrook, you know of the tests made on the dakcha and gobhow meat animals? Chocolate is utterly alien to Notcidese life forms! It *has* to be harmful! Look at the evidence, Mrs. Westbrook. Before the exploiters arrived, less than a hundred years ago, the high plains of Notcid were filled with your people. Now most of them are gone. Of the bowers still standing, at least half are empty and falling into ruin. And you don't see *any harm* in chocolate! Really, Mrs. Westbrook!"

Romee was so totally intimidated that she could hardly reply to any of this. She would have liked to say that no chimo or chimee ever ate enough chocolate at one time to coat their entire insides with an indigestible brown layer, which was what had killed the overfed experimental subjects, the dakcha and gobhow meat animals. (Besides, she knew Miss McGuire would have an answer to that: that the pounds of chocolate fed the animals in one day was less than the hooked chimo or chimee would eat in ten years, and since Notcidese life could not assimilate chocolate, the cumulative effects could be similar. Not the coating inside the guts, of course, but harmful buildups of deposits elsewhere within the body.)

Also, Romee would have argued, if she could, that chocolate was no more alien to Notcidese life than natsach was to Earth people. And tons of natsach were exported to Earth every year, where people used it to sweeten their food. They used it because it *wasn't* assimilable, and thus would not make them fat as Earth sugar would. Also, natsach left no unpleasant aftertaste and did not cause disease, the way artificial sweeteners did. If natsach was so good for Earth humans, why was chocolate so bad for Notcid humans?

And as for the rapid decline of the population . . .

"The jungle got them," she managed to say.

"Hah!" snorted the woman. "The jungle got them because their reflexes were debilitated, or because fear of the jungle was too much for chocolate-weakened hearts!"

Romee had reasons to wonder if this was true, but she did not have the nerve to argue the matter with this forceful Earth human, who was going to pay her fifty cashers. So she nodded and said, "I'll try harder to kick the habit."

"Good!" approved Miss McGuire. "Please understand, Mrs. Westbrook, nobody's blaming you or

your people for this chocolate addiction. It was those damned exploiters."

Romee nodded again, as a short man with white hair on the bottom of his face came into the office.

"Dr. Truit, this is our first applicant, Mrs. Romee Westbrook," said Miss McGuire.

"Ah, fine, fine," the little man said rapidly. "I just completed setting up the test site. We can get started right away if you're ready, Mrs. Westbrook."

"I'm ready," Romee gulped.

"Then come along, come along."

He led the way out of the building with Miss McGuire bringing up the rear. Outside he cramped Romee in the back of a hovercar and got into the front seat with Miss McGuire. Much too fast for Romee's fragile peace of mind, the car whizzed out of the compound and across the rolling grassland. Romee cowered with hands over her eyes and ears till the motion stopped and the car's engine fell silent.

"Here we are. Everybody out," said Dr. Truit.

Romee climbed from the car and looked around. She was beginning to have doubts about this business. Of course, these new Earth humans had made it clear that they felt the best of goodwill toward the Notcidese, and wanted nothing more than to repair the harm done by the exploiters. But just the same, one never knew what to expect from Earth people. And fifty cashers was a lot of money . . . surely more than she could expect if no danger was involved.

Still, she could see nothing that looked like a threat. They were standing on a flat hill, a few miles from the compound with nothing around them but grass, close-cropped by wandering herds of meat animals.

Dr. Truit kicked at the stubble and muttered something about unbalanced ecology. Then he and Miss McGuire stationed themselves somewhat to one side and stood watching Romee.

She squirmed with fright and self-consciousness.

KRO-O-OMM!

The sudden tremendous roar behind her sent Romee in a flying leap, completely over the hovercar. She hit the ground on all fours, skittered around and lay flat.

"Beautiful response!" approved Truit. "Beautiful!"

Slowly Romee recovered her wits, and peered about. Still nothing in sight except the two Earth people and the hovercar.

"See?" said Miss McGuire. "There isn't any danger. Just a loud noise."

"What made it?" she whimpered.

"A piece of equipment, buried underground," said Truit, "No danger at all, Mrs. Westbrook. Stand up, please."

Romee rose, and saw they were watching her the same as before. Well, she was going to keep facing

that place where the noisemaker was hidden, so it couldn't—

KRO-O-OMM!

Again the blast of sound came from behind her, and sent her sailing over the hovercar.

This time she lost consciousness briefly. When she opened her eyes the two Earth people were bending over her.

"See? It was only a noise again," Truit assured her. "You don't need to be frightened by it, or respond to it. Nothing's going to hurt you."

"Let me help you up, Mrs. Westbrook," offered Miss McGuire.

"No, no!" she begged, hugging the ground and sobbing. "If I stand he'll do it again!"

"I'm not attempting to terrorize you," Truit replied frostily. "You can take a break until you settle down, and while I explain. What we wish to do is test your ability to modify, under controlled conditions, an overresponse to stimuli that seems a universal flaw . . . characteristic, I mean . . . in the Notcidese psychophysiological pattern. After you've rested a bit, we'll try it again, and this time I want you to try to modify your reaction. That is, keep rational control of yourself when the noise stimulus comes, and refrain from jumping."

Romee felt too weak and shaky to get up and run away. She lay there wondering how Truit had captured a jungle noise in his equipment, because that was what it was. He must have set up a recorder at the edge of the jungle to get the sound, and then made it loud and close the same way one turned up the volume of a damn-TV set.

So really, Truit was right. It was just a noise, and this wasn't the jungle. So why should she jump when she heard it?

For that matter, why did her people jump . . . at least a little bit . . . at *any* loud noise? Why not ignore noise like the Earth people usually did?

She stopped sobbing as the surprising thought struck her: maybe, in this one way, her people rather than the Earth people behaved absurdly.

In any case, it was better to be scared and alive, with fifty cashers, than to be scared and perhaps dead in the jungle. And she just *had* to get her damn-TV fixed, or lose status as a bowerkeeper with her chimo. And how good it would be to have some chocolate right now!

She had to go along with this experiment.

Still quivering, she rose to her feet and gazed questioningly at Truit.

"Good girl!" he approved, "I mean, very good, Mrs. Westbrook. Now remember, this time try not to jump."

She nodded and tensed, waiting for the noise.

When it came, her leap was half again longer than the two previous times.

"Don't tighten up so!" snapped Truit impatiently. "Dallas, can't you

get this silly aborigine to settle down?"

"Watch it, Doc," the woman snapped back, then said softly to Romee, "Just try to relax, Mrs. Westbrook. Decide you don't care about the loud noise, that it isn't going to frighten you."

After a while, Romee stood up again, by now too exhausted to be anything other than relaxed. When the sound came, she jerked, and fell forward flat on her face.

"Excellent!" applauded Truit. "We modified the response! Next time, try to modify it still more, and not fall down."

But when Romee stood and the sound came, she jerked and fell again. Three more trials produced the same results, and Truit was getting extremely cross. This had tensed Romee up again, and it was all she could do to limit her response to merely falling down.

As she lay on the ground after the latest trial, she heard a different Earth human yell, *"Are you idiots trying to scare the natives out of their limited wits? What's going on here?"*

She lifted her head to see a second hovercar settle to the ground nearby, and Hector Grandolph, director-in-charge of the Cultural Exchange Center, come waddling out of it. When he saw her, he stopped in his tracks and pointed at her. "Who's that, and what's going on here?"

"Why, ah, yes, Mr. Grandolph," stammered Truit. "Yes. Yes, indeed. How are you today, sir? Well, yes, we have been running a little experi—a little examination, with the cooperation of Mrs. Eastwood here—"

"Westbrook," corrected Miss McGuire numbly.

"Yes, that is to say, Mrs. Westbrook agreed to cooperate with us, for the advancement of cultural understanding—"

Grandolph growled. "Don't cover it with crap, Truit! This was illegal experimentation, as you know damned well! What were you trying to find out . . . how much it would take to scare this poor creature to death?"

"On the contrary, sir," retorted Truit, stiffening. "We were seeking only to ameliorate her fright response by . . ."

"*Nuts!* Both of you can start packing when you get to the compound! You're going back to Earth on the next ship!" Grandolph waddled over to Romee and hunkered down beside her. "Are you all right?"

"I'm tired is all," she said. Very slowly she rose to her feet. "When do I get the fifty cashers?" she asked.

Grandolph's face looked as if it might explode. "Did they offer you fifty cashers to cooperate in this experiment?"

"Yes."

The big man turned to glare at the culprits. "Your names are mud from now on," he growled. "Count on it."

"What about my fifty?" Romee persisted.

"You'll be awarded damages,

chimee," said Grandolph, "and I would guess that'll come to several hundred cashers."

Romee did not dare risk a reply to such astonishingly good news as that. She stood waiting in silence for the money. Was it supposed to come from Truit or from Grandolph? she wondered.

Truit presumably had nothing to lose by talking, because he was doing a great deal of it. "We were doing her no harm at all," he was protesting. "At one time the Notcidese were obviously jungle creatures, for whom the fright response and nervousness in general were a necessary survival pattern. They escaped the predator that emits the pre-attack roar by leaping.

"When they left the jungle for the plains, after developing rudimentary herding and agricultural skills, they no longer needed the fright response," Truit continued, "but so far they haven't lost it. This may be taken to indicate their sojourn on the plains has been relatively brief. However, the fright response is now a handicap to their cultural creativity. They cannot undertake innovative activities that require extensive forward cerebration, such as plains-cultivation of natsacher shoots, or supra-bower social organization, because too much of their energies are absorbed by fright activities. Thus, the test being conducted by Miss McGuire and myself was—"

"—was even worse than I thought!" Grandolph broke in angrily. "So you were trying to turn the Notcidese into Earth-style peasants, hah? Imposition of our cultural pattern on a native intelligence! Very exploitative, Truit!"

"I was trying to keep them from becoming extinct!" Truit almost screamed, making Romee quiver. "By removing the need for them to enter the jungle to gather natsacher shoots . . ."

"Nonsense!" bellowed Grandolph, and Romee made a tentative six-foot leap. "Everybody knows what's killing off the natives! It's *chocolate,* not any damned jungle!"

Romee wondered self-pityingly why these Earthmen didn't stop arguing absurdities and give her the damage money so she could leave. Or at least not yell so loud.

"You two are frightening Mrs. Westbrook," Miss McGuire announced smugly.

"Huh? Oh, my apologies, chimee . . . Mrs. Westbrook," said Grandolph.

"That's all right," Romee quavered. "If I can have my damage money I'll leave so you can yell all you like."

"Your damage money?" He looked puzzled. "Oh, I'm afraid you'll have to wait a little while for that, Mrs. Westbrook. The claim must be processed through the nearest Interspecies Circuit Court—a matter that will have my personal attention."

Romee nodded. "Tomorrow?" she asked.

"Longer than that, I'm afraid, but very soon. Probably within half a year, certainly no more than a year, Mrs. Westbrook."

Romee wondered dejectedly how "half a year" could be considered "very soon."

Grandolph reached in his pocket. "Here," he said. "If you are short of money, Mrs. Westbrook, this should tide you over."

Romee took the paper and studied it. It was a two-casher note. "Thank you," she said, hoping she was not revealing her disappointment.

Because she was going to have to go down to the jungle, after all.

She found an empty bower near that of a cousin of her chimo in which to spend the night. The next morning she returned to the Cultural Exchange Center compound and entered the trading post. She felt she just couldn't face the jungle today without a bite of chocolate first.

"Half a casher of chocolate, please," she said timidly to the woman behind the counter.

"We don't have any," the woman snapped crossly.

"Oh." Romee hesitated. "When will you get some?"

"Get some what?"

"Chocolate."

"I have no idea what you're talking about," the woman snapped.

Romee was shaking badly, but her desire wouldn't let her leave. "Chocolate is what I'm talking about."

"Never heard of it," said the woman, not quite so harshly.

Could it be that this woman really didn't know about chocolate? That didn't make sense at all, but after all, what did about Earth people?

"It's brown and bitter unless it has sugar in it," Romee explained pleadingly. "It comes in square cakes about this thick." She held up her hand to show the thickness.

"Oh, that stuff," said the woman. She reached under the counter and came up with a half-casher block of chocolate in a plain green wrapping. "This what you mean?"

Romee took the block and tore the wrapping from a corner. It was chocolate, all right.

"Yes."

"Half a casher, please."

Romee paid her and received her change. Quickly she took a bite and chewed it rapidly. Um-m-m. How nice it was! And already she was feeling less tensed up.

"I thought everybody knew about chocolate," she said to the woman, who was watching her with a strange expression.

"Knew about what?"

"About chocolate." Romee pointed to the block in her hand. "About this."

"Of course everybody knows about that!" said the woman.

Romee munched in thoughtful silence. Here was a strangeness that needed solving, because it dealt with chocolate. She wished she didn't

have to worry about it now, since going to the jungle was problem enough for one time.

At last she said, "You know about this," indicating the block in her hand, "but not about chocolate."

"That's right," the woman said.

"But this is chocolate."

"I never heard of it."

Romee thought some more. "What is this stuff called?" she asked in sudden inspiration.

"It doesn't have a name, so far as I know," the woman replied.

"It had a name yesterday," murmured Romee.

"That's right, it did," said the woman. "But last night a directive came from Director-in-Charge Grandolph, who was steamed about something." She held up a sheet of paper with writing on it. "Would you like to know what it says?"

"Yes, please."

The woman read from the paper: *"All personnel at this station have been entirely too negligent in their responsibility toward the native population whose welfare is our trust. Namely, we have taken no firm steps toward the reduction and eventual end of the (bleep-bleep) addiction that became established under our exploitative predecessors with fatal consequences for hundreds of thousands of innocent natives."*

The woman looked up. "Where I said 'bleep-bleep', the director-in-charge used that word you mentioned," she explained, then continued reading:

"Unfortunately, the economics of our situation here make the immediate cessation of our trafficking in (bleep-bleep) impossible. And despite our warnings, the natives' cravings for (bleep-bleep) continue unabated. Only a few hours ago I was the pained witness to the indignities a native will willingly suffer to obtain the price of this addictive.

"Therefore, I order that, effective immediately, the very word (bleep-bleep) be omitted from the vocabulary of every Terrestrial on this planet. The health hazard warnings will be dropped from telecasts, as indeed will all mention and display of (bleep-bleep) be stricken from TV programming.

"It is my belief that we have discussed (bleep-bleep) entirely too much, and too freely, with the natives, and can make our abhorrence clear to them only by refusing to mention (bleep-bleep). It occurs to me that treating (bleep-bleep) as too horrid to mention may have a salutary effect on the natives, by playing upon their fright syndrome.

"To repeat, all personnel are hereby forbidden to speak of or display (bleep-bleep). If a native mentions it you will make clear that you never heard the word and do not know its meaning."

The woman finished reading and stood looking at Romee with a peculiar twisted smile.

Romee thought about the words on the paper. Presumably they were sensible words, from the Earth-hu-

man viewpoint. And she wasn't sure whether or not they were more absurd than most Earth-human doings, from her viewpoint. She was puzzled.

"Bleep-bleep," she murmured, trying the sound the woman had used in place of "chocolate."

The woman brightened. "Why, yes. Bleep-bleep!"

Romee tucked away the remainder of her block of chocolate, said good-bye to the woman, and left the trading post.

On her way to the gate she met a chimo she knew coming in. "Are you going to buy chocolate?" she asked him.

"Yes, Romee."

"They don't talk about it anymore," she told him. "But if you ask for bleep-bleep, they'll sell you some."

The chocolate was relaxing, but did not take away fright. Romee was very scared as she descended the steep slopes from the Cultural Exchange Center to the edge of the jungle, and felt almost numb once she entered the trails that twisted through the thick foliage, even though the trails were safe.

The danger would begin when she left the trails to squirm her way through the undergrowth, and she would have to do that. The trails were kept picked clean of natsacher shoots. She kept peering through the shadows, trying to spot a patch of natsacher that was not too far from safety. She found an isolated shoot or two that was within reach from the trail, but these were only enough to emphasize how big and how empty was her gathering-sack.

At last she took a deep, tremulous breath and plunged off the trail. For a distance of some fifty feet she fought through thick tangle, then came out in a relatively open area where enough light filtered down to make natsacher grow. And indeed, there were shoots all around her. Rapidly she began breaking them off and stuffing them in her sack.

When the patch was picked clean she plunged frantically back to the trail. Only then did she take time to estimate the fullness of her sack . . . about a third.

KRO-O-OMM!

The sound was distant, but it was behind her. She jerked and fell on her face. She lay there and trembled for a while, then rose and followed the trail deeper into the jungle.

A brightness off to her left indicated another likely natsacher patch. She pushed through to its edge, and paused, looking at it. She wasn't sure just why, but this patch had a particularly dangerous look to her. But it was a big one, at least twice as big as the other. She could fill her sack here.

Slowly she moved out among the shoots. Nothing happened. She began picking. This was a long narrow patch which she had entered at one end. As she worked her way along it, her confidence grew a little. It was

heartening to see how fast her sack was filling.

And then it was full. She saw there were plenty of shoots left to be picked. If she needed another sackload to pay for fixing the damn-TV and to get enough chocolate to last her family a while, she would come back to this place.

She lifted her sack, turning slowly toward the trail as she did so.

KRO-O-OMM!

She jerked and flopped on her face, her thoughts racing in terror and dismay.

It's got me! I didn't jump away from it! My poor hatchlings!

SWISH! Something large and fast swooped past, over her cringing form. She waited for the monstrous killer to pounce on her.

Instead she heard a creaking as of strained tree limbs. Several seconds passed.

KRO-O-OMM!

She tried to hug the ground more closely.

SWISH!

She was more than halfway unconscious, and aware of nothing but the continuing sounds, and only vaguely of them.

KRO-O-OMM! SWISH! CREAK.

KRO-O-OMM! SWISH! CREAK.

The pattern seemed to go on and on.

Finally it occurred to her that she wasn't being eaten, or even bitten. Slowly, and very cautiously, she twisted her neck and looked up.

KRO-O-OMM! SWISH! A greenish-brown mass about two feet in diameter came arcing down, across the natsacher patch, to zing through the air above her. It snapped to a halt a short distance past her, just short of the wall of undergrowth surrounding the patch.

CREAK. It reversed direction, moving slowly now, and came back over her. She saw that the mass was attached above to an oddly jointed limb or heavy vine. This limb was now bending, and in a moment had carried the mass upward and out of sight in the foliage. She could still see some of the limb.

KRO-O-OMM! SWISH! Here it came again! The limb was snapping straight, like a many-jointed leg of some kind. The mass reached the end of its trajectory and stopped.

CREAK. It began moving back once more.

Romee realized she could easily crawl away, out of its path. But she didn't feel up to moving just yet. So she watched it and thought about it.

If she had jumped when she heard the noise, she would have landed in the undergrowth, just about where that mass would have knocked her if she hadn't fallen out of its way. It was as if the noisemaker wanted her in that particular spot of undergrowth, and had meant to put her there, one way or the other.

What was waiting for her there? And why didn't it just come get her?

She was tempted to crawl over and

peer through the leaves to find out. The temptation to do such a risky thing made her cringe some more.

KRO-O-OMM! SWISH! Creak. Crackle.

It had added a new sound. Crackle. She looked up, wondering why, and saw that the jointed limb was beginning to look shredded. It wasn't used to swishing so frequently and continually, she guessed, and was wearing itself out. It must have some way of sensing she was still in its path with her back more or less turned toward it, but couldn't tell she was lying down. She resolved to crawl away after the next swish, so it would stop that horrifying noise.

KRO-O-OMM! Here it came. SWISH! CRACK!

The limb snapped. Instead of making its sudden stop, the detached mass was flung into the undergrowth. A moment later Romee heard a rough grating noise coming from the spot where the mass had landed.

This noise was sickening rather than frightening. In a little while she felt much better, and her curiosity was aroused. She crept forward, pushed into the undergrowth, and stared at what was happening.

The ground there was covered by what looked like misshapen boxes with open tops, all packed tightly against each other. Each box was twisting in place, back and forth, rubbing against the sides of the neighboring boxes. Their top edges were sharp, and their motion made them cut anything touching them, the same way the power knives sold by the Earthmen cut.

They were chopping the greenish-brown mass to bits. The shredded pieces of it were forming a pulpy mess in the areas between the blades. Romee shuddered hard, thinking how close her own body had come to that same fate, and of how many people had been chopped up to feed that kind of . . .

. . . that kind of *tree.* Because she could see it was a tree. The slim trunk rose from the middle of the blade-edged boxes (they were really something like roots, she realized), and by changing position slightly while she looked up, she could follow the trunk to where it divided into three down-looping limbs, one of which had a splintered, bedraggled look. And no mass on the end of it like the other two.

Romee giggled. For the first time since she was a tiny hatchling. She giggled. Then she laughed. *It was so funny!* She had tricked the noisemaker into eating part of itself!

She was laughing like a drunken Earthman. It was a strange sensation, laughing, but nice. She squatted comfortably to enjoy it while it lasted.

Finally she grew quiet. The way she felt was puzzling, but she couldn't figure out what it was. Well, no matter. Life was full of mysteries she couldn't hope to solve.

She rose, looked at the noise tree for a moment, toying with the idea

of tricking it into eating its remaining two masses. That would be a foolish and useless risk to take, she decided. She retrieved her sack of shoots, returned to the trail, and began the trip back to the Cultural Exchange Center.

There she would tell the Earthmen about the noise tree, and how it was killing and eating the chimos and chimees who went into the jungle for natsacher shoots. The Earthmen would know some way to kill off the noise trees so that . . .

No.

The Earthmen would pay her no attention. They would just say that chocolate . . . or bleep-bleep . . . was the culprit. And besides, they would say, they could not think of upsetting the jungle ecology of Notcid by exterminating a predator species.

Romee wished again that the exploiter Earthmen were still running things. *They* would have given the noise trees a real scorching. After which there would have been plenty of Notcidese on the plains once more, to go hunt natsacher shoots. Plenty of natsacher for Earth, and plenty of chocolate for Notcid.

But as things stood, whatever was done about the noise trees would have to be done by the Notcidese themselves . . .

She paused on the trail. If a noise tree was tricked into eating all three of its masses, would it die?

Perhaps. Certainly it would be harmless. Why not go back and finish off that one she had started on?

She decided against it. That was something to try when she had no new hatchlings and a chimo heavy with milk . . . and when she was not herself heavy with eggs, of course.

The seasons passed at the bower on West Hill with the Flat Rock on the Brook. The new hatchlings grew rapidly. There was plentiful milk for them, because Romee and her chimo Pipak enjoyed the secondary sex act frequently, keeping Pipak's mammaries well stimulated.

And certainly there was no shortage of meat animals, although their flesh was tougher and less tasty than it had been when the animals were fewer and the grass taller. There was also enough redroot, even though it was almost impossible to keep the meat animals from raiding the garden and nibbling away the tops before the redroots could become mature.

And there was damn-television. And chocolate.

But the time came when Pipak's breasts were empty, and the hatchlings were weaned. And the chocolate was running out.

Romee had dreaded this moment, but knew it had to come. She had, of course, told Pipak about her experience with the noise tree, and how it could be outwitted. Also, she had told her neighbors, and they in turn had told theirs. Most everyone on the plains knew about it, but still natsach gatherers went into the

jungle not to return when the noise sounded.

Telling them to fall flat rather than jump wasn't enough, Romee realized. They needed the Earthman Truit to train them, as she had been trained, to modify their reaction. But Truit and Miss McGuire were long gone.

Romee mentioned to Pipak once that she, not he, should go to the jungle, but he would not hear of it. He had his masculine pride, and it was his turn to go. She could not cross him.

One morning she set out for the Cultural Exchange Center, after promising him faithfully that she would not enter the jungle, that she merely wanted to find out about her damage money. She meant to keep her promise, but her trip had another purpose aside from the damage money.

As she neared the Center, she left the main path and angled off across the rolling grassland until she reached the flat hilltop where Truit had conducted his experiment. She had some trouble deciding exactly where the hovercar had landed, but finally figured it out. Then she picked a spot and began digging.

The device . . . the noisemaker . . . was still there, barely covered with a clump of loose sod. She put it in her sack and paced back past the place where the hovercar had sat. In a moment she found the second noisemaker.

She squatted and studied them for a while, but, as she had expected, she did not know how to make them work. She put both of them in her sack and headed for the Cultural Exchange Center.

The same man was still running the damn-TV repair shop. He grinned at her and called her "honey" because he didn't remember her name. It was strange, she reflected, that the exploiters had, like this man, always been friendly but hardly ever polite, while the new people were polite but hardly ever friendly.

Romee put the noisemakers on the counter. "I want to stand in one place, and make either of these work in two other places," she said to him.

He examined the devices. "No problem," he grunted.

She walked home through the dark that night, partly because she wanted to get the noisemakers in place while Pipak and the young ones were sleeping, and partly because she wanted to get back so quickly that Pipak would be sure she had not gone to the jungle. The Earthman Grandolph had surprised her by having her damage money ready for her, and she did not want Pipak to doubt her word when she told him how she had raised the price of a large sack of chocolate and a power knife as well.

She was squatting outside the bower, eating a redroot, when he woke at dawn and came outside. He

smiled as soon as he saw her.

"You're back."

"Yes, I hurried."

Almost reluctantly she pressed the button on the little box concealed in her hand. In a way, this was a mean trick.

KRO-O-OMM!

Pipak went flying through the air, and there was a scurrying and scuffling inside the bower. In a moment six young furry faces were peering out the entry at her.

"Come outside, children," she ordered, "and stand facing that way."

When she had the young positioned so neither noisemaker would be behind them, she walked over to where Pipak lay shaking. "See? There isn't any danger," she said. "Just a loud noise. A piece of equipment made it. Stand up. I will test your ability to modify, under controlled conditions, an over-response to stimuli that seems a universal flaw . . . characteristic, I mean . . . in the Notcidese psychophysiological pattern . . ."

She hoped she was getting the words right. ■

in times to come

• Poul Anderson's new novel, "The People of the Wind" begins in next month's issue. Back in our April 1972 issue, Anderson introduced the intelligent, winged Ythrians in a short story called "Wings of Victory." Now he's written a many-faceted novel about them and their human allies—and enemies. More than that, Anderson's developed a beautifully detailed and carefully thought-out culture, not only for the Ythrians, but for the humans who colonize one of the Ythrian worlds and build a society composed of the two vastly different types of intelligent creatures. The Ythrian culture itself is fascinating: "freedom" means something very different to a creature that can literally fly. And the interactions between Ythrian culture and human makes for a novel that has depths of meaning seldom equalled, while still telling the highly adventurous story of an interstellar war. The cover is by Leo Summers.

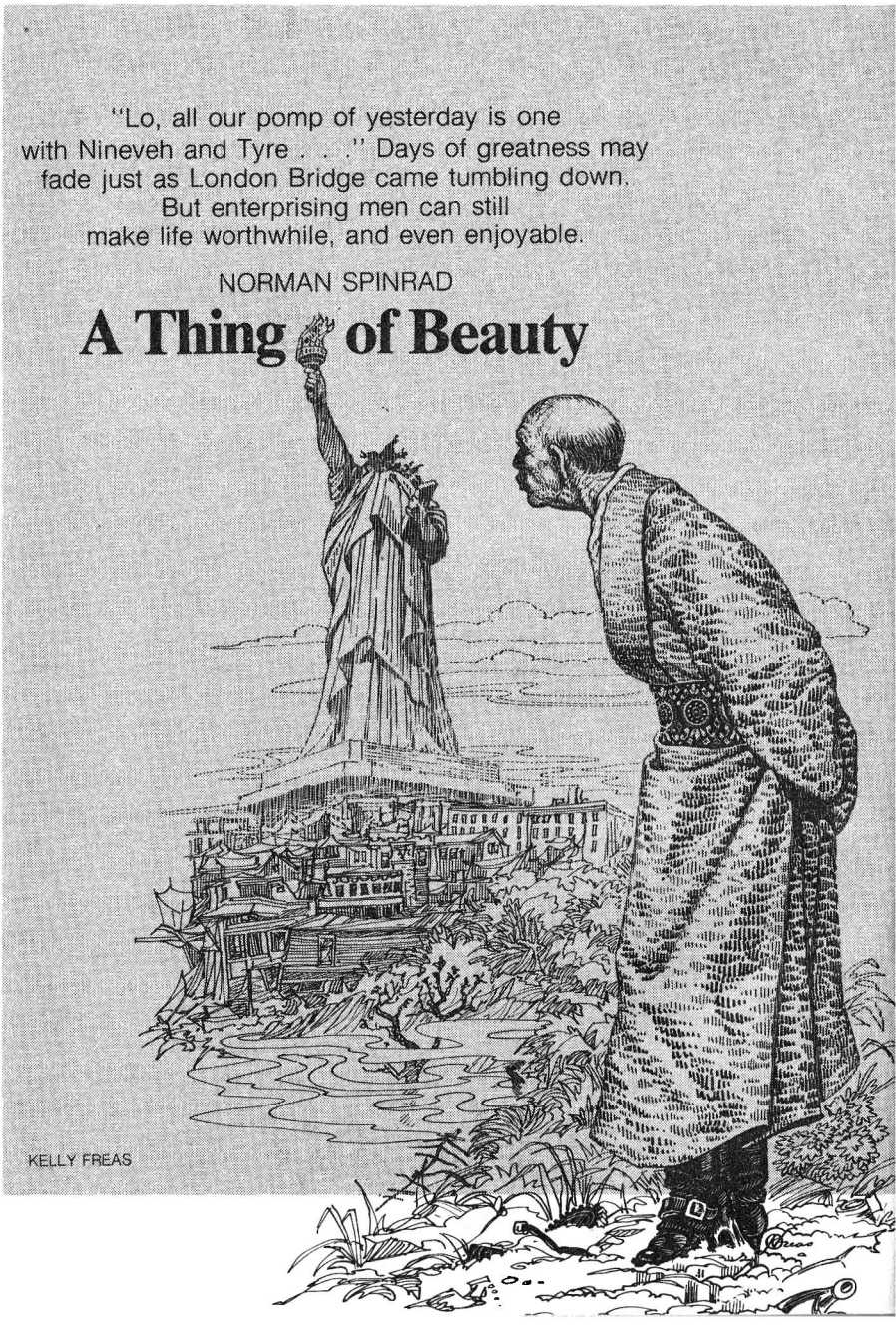
• There will also be a Guest Editorial in February's issue, by R. G. Cleveland. He's taken the ideas generated by John W. Campbell in his May 1961 Editorial, "Tribesman, Barbarian and Citizen." Cleveland's piece is called, "Beyond the Citizen." It's a look at what's happening to our society today, and where it's heading.

• Also on tap for February will be the second half of G. Harry Stine's "Third Industrial Revolution," plus several short stories and the usual Reference Library and Brass Tacks departments.

"Lo, all our pomp of yesterday is one
with Nineveh and Tyre . . ." Days of greatness may
fade just as London Bridge came tumbling down.
But enterprising men can still
make life worthwhile, and even enjoyable.

NORMAN SPINRAD

A Thing of Beauty



KELLY FREAS

"There's a gentleman by the name of Mr. Shiburo Ito to see you," my intercom said. "He is interested in the purchase of an historic artifact of some significance."

While I waited for him to enter my private office, I had computer central display his specs on the screen discreetly built into the back of my desk. My Mr. Ito was none other than Ito of Ito Freight Boosters of Osaka; there was no need to purchase a readout from Dun & Bradstreet's private banks. If Shiburo Ito of Ito Boosters wrote a check for anything short of the national debt, it could be relied upon not to bounce.

The slight, balding man who glided into my office wore a red silk kimono with a richly-brocaded black obi, Mendocino needlepoint by the look of it. No doubt back in the miasmic smog of Osaka, he bonged the peons with the latest skins from Saville Row. Everything about him was *just so*; he purchased confidently on that razor edge between class and ostentation that only the Japanese can handle with such grace, and then only when they have millions of hard yen to back them up. Mr. Ito would be no sucker. He would want whatever he wanted for precise reasons all his own, and would not be budgeable from the center of his desires. The typical heavyweight Japanese businessman, a prime example of the breed that's pushed us out of the center of the international arena.

Mr. Ito bowed almost imperceptibly as he handed me his card. I countered by merely bobbing my head in his direction and remaining seated. These face and posture games may seem ridiculous, but you can't do business with the Japanese without playing them.

As he took a seat before me, Ito drew a black cylinder from the sleeve of his kimono and ceremoniously placed it on the desk before me.

"I have been given to understand that you are a connoisseur of Filmore posters of the early-to-mid-1960s period, Mr. Harris," he said. "The repute of your collection has penetrated even to the environs of Osaka and Kyoto, where I make my habitation. Please permit me to make this minor addition. The thought that a contribution of mine may repose in such illustrious surroundings will afford me much pleasure and place me forever in your debt."

My hands trembled as I unwrapped the poster. With his financial resources, Ito's polite little gift could be almost anything but disappointing. My daddy loved to brag about the old expense account days when American businessmen ran things, but you had to admit that the fringe benefits of business Japanese style had plenty to recommend them.

But when I got the gift open, it took a real effort not to lose points by whistling out loud. For what I was holding was nothing less than a mint example of the very first Grateful Dead poster in subtle black and

gray, a super-rare item, not available for any amount of sheer purchasing power. I dared not inquire as to how Mr. Ito had acquired it. We simply shared a long, silent moment contemplating the poster, its beauty and historicity transcending whatever questionable events might have transpired to bring us together in its presence.

How could I not like Mr. Ito now? Who can say that the Japanese occupy their present international position by economic might alone?

"I hope I may be afforded the opportunity to please your sensibilities as you have pleased mine, Mr. Ito," I finally said. That was the way to phrase it; you didn't thank them for a gift like this, and you brought them around to business as obliquely as possible.

Ito suddenly became obviously embarrassed, even furtive. "Forgive me my boldness, Mr. Harris, but I have hopes that you may be able to assist me in resolving a domestic matter of some delicacy."

"A domestic matter?"

"Just so. I realize that this is an embarrassing intrusion, but you are obviously a man of refinement and infinite discretion, so if you will forgive my forwardness . . ."

His composure seemed to totally evaporate, as if he was going to ask me to pimp for some disgusting perversion he had. I had the feeling that the power had suddenly taken a quantum jump in my direction, that a large financial opportunity was about to present itself.

"Please feel free, Mr. Ito . . ."

Ito smiled nervously. "My wife comes from a family of extreme artistic attainment," he said. "In fact, both her parents have attained the exalted status of National Cultural Treasurers, a distinction of which they never tire of reminding me. While I have achieved a large measure of financial success in the freight-booster enterprise, they regard me as *nikulturi,* a mere merchant, severely lacking in aesthetic refinement as compared to their own illustrious selves. You understand the situation, Mr. Harris?"

I nodded as sympathetically as I could. These Japs certainly have a genius for making life difficult for themselves! Here was a major Japanese industrialist shrinking into low posture at the very thought of his sponging in-laws, whom he could probably buy and sell out of petty cash. At the same time, he was obviously out to cream the sons of bitches in some crazy way that would only make sense to a Japanese. Seems to me the Japanese are better at running the world than they are at running their lives.

"Mr. Harris, I wish to acquire a major American artifact for the gardens of my Kyoto estate. Frankly, it must be of sufficient magnitude so as to remind the parents of my wife of my success in the material realm every time they should chance to gaze upon it, and I shall display it in a

manner which will assure that they gaze upon it often. But of course, it must be of sufficient beauty and historicity so as to prove to them that my taste is no less elevated than their own. Thus shall I gain respect in their eyes and re-establish tranquillity in my household. I have been given to understand that you are a valued counselor in such matters, and I am eager to inspect whatever such objects you may deem appropriate."

So that was it! He wanted to buy something big enough to bong the minds of his artsy-fartsy relatives, but he really didn't trust his own taste; he wanted me to show him something he would want to see. And he was swimming like a goldfish in a sea of yen! I could hardly believe my good luck. How much could I take him for?

"Ah . . . what size artifact did you have in mind, Mr. Ito?" I asked as casually as I could.

"I wish to acquire a major piece of American monumental architecture so that I may convert the gardens of my estate into a shrine to its beauty and historicity. Therefore, a piece of classical proportions is required. Of course, it must be worthy of enshrinement, otherwise an embarrassing loss of esteem will surely ensue."

"Of course."

This was not going to be just another Howard Johnson or gas station sale; even something like an old Hilton or the Cooperstown Baseball Hall of Fame I unloaded last year was thinking too small. In his own way, Ito was telling me that price was no object, the sky was the limit. This was the dream of a lifetime! A sucker with a bottomless bank account placing himself trustingly in my tender hands!

"Should it please you, Mr. Ito," I said, "we can inspect several possibilities here in New York immediately. My jumper is on the roof."

"Most gracious of you to interrupt your most busy schedule on my behalf, Mr. Harris. I would be delighted."

I lifted the jumper off the roof, floated her to a thousand feet, then took a Mach 1.5 jump south over the decayed concrete jungles at the tip of Manhattan. The curve brought us back to float about a mile north of Bedloe's Island. I took her down to three hundred and brought her in toward the Statue of Liberty at a slow drift, losing altitude imperceptibly as we crept up on the Headless Lady, so that by the time we were just offshore, we were right down on the deck. It was a nice touch to make the goods look more impressive—manipulating the perspectives so that the huge, green, headless statue, with its patina of firebomb soot, seemed to rise up out of the bay like a ruined colossus as we floated toward it.

Mr. Ito betrayed no sign of emotion. He stared straight ahead out the bubble without so much as a word or a flicker of gesture.

"As you are no doubt aware, this

is the famous Statue of Liberty," I said. "Like most such artifacts, it is available to any buyer who will display it with proper dignity. Of course, I would have no trouble convincing the Bureau of National Antiquities that your intentions are exemplary in this regard."

I set the autopilot to circle the island at fifty yards offshore so that Ito could get a fully rounded view, and see how well the statue would look from any angle, how eminently suitable it was for enshrinement. But he still sat there with less expression on his face than the average C-grade servitor.

"You can see that nothing has been touched since the Insurrectionists blew the statue's head off," I said, trying to drum up his interest with a pitch. "Thus, the statue has picked up yet another level of historical significance to enhance its already formidable venerability. Originally a gift from France, it has historical significance as an emblem of kinship between the American and French Revolutions. Situated as it is in the mouth of New York harbor, it became a symbol of America itself to generations of immigrants. And the damage the Insurrectionists did only serves as a reminder of how lucky we were to come through that mess as lightly as we did. Also, it adds a certain melancholy atmosphere, don't you think? Emotion, intrinsic beauty, and historicity combined in one elegant piece of monumental statuary. And the asking price is a good deal less than you might suppose."

Mr. Ito seemed embarrassed when he finally spoke. "I trust you will forgive my saying so, Mr. Harris, since the emotion is engendered by the highest regard for the noble past of your great nation, but I find this particular artifact somewhat depressing."

"How so, Mr. Ito?"

The jumper completed a circle of the Statue of Liberty and began another as Mr. Ito lowered his eyes and stared at the oily waters of the bay as he answered.

"The symbolism of this broken statue is quite saddening, representing as it does a decline from your nation's past greatness. For me to enshrine such an artifact in Kyoto would be an ignoble act, an insult to the memory of your nation's greatness. It would be a statement of overweening pride."

Can you beat that? *He* was offended because he felt that displaying the statue in Japan would be insulting the United States, and therefore I was implying he was *nikulturi* by offering it to him. When all that the damned thing was to any American was one more piece of old junk left over from the glorious days that the Japanese, who were nuts for such rubbish, might be persuaded to pay through the nose for the dubious privilege of carting away. These Japs could drive you crazy—who else could you offend by suggesting they

do something that they thought would offend you but you thought was just fine in the first place?

"I hope I haven't offended you, Mr. Ito," I blurted out. I could have bitten my tongue off the moment I said it, because it was exactly the wrong thing to say. I *had* offended him, and it was only a further offense to put him in a position where politeness demanded that he deny it.

"I'm sure that could not have been further from your intention, Mr. Harris," Ito said with convincing sincerity. "A pang of sadness at the perishability of greatness, nothing more. In fact as such, the experience might be said to be healthful to the soul. But making such an artifact a permanent part of one's surroundings would be more than I could bear."

Were these his true feelings or just smooth Japanese politeness? Who could tell what these people really felt? Sometimes I think they don't even know what they feel themselves. But at any rate, I had to show him something that would change his mood, and fast. Hm-m-m . . .

"Tell me, Mr. Ito, are you fond of baseball?"

His eyes lit up like satellite beacons and the heavy mood evaporated in the warm, almost childish, glow of his sudden smile. "Ah yes!" he said. "I retain a box at Osaka Stadium, though I must confess I secretly retain a partiality for the Giants. How strange it is that this profound game has so declined in the country of its origin."

"Perhaps. But that very fact has placed something on the market which I'm sure you'll find most congenial. Shall we go?"

"By all means," Mr. Ito said. "I find our present environs somewhat overbearing."

I floated the jumper to five hundred feet and programmed a Mach 2.5 jump curve to the north that quickly put the great hunk of moldering, dirty copper far behind. It's amazing how much sickening emotion the Japanese are able to attach to almost any piece of old junk. *Our* old junk at that, as if Japan didn't have enough useless old clutter of its own. But I certainly shouldn't complain about it; it makes me a pretty good living. Everyone knows the old saying about a fool and his money.

The jumper's trajectory put us at float over the confluence of the Harlem and East Rivers at a thousand feet. Without dropping any lower, I whipped the jumper northeast over the Bronx at three hundred miles per hour. This area had been covered by tenements before the Insurrection, and had been thoroughly razed by firebombs, high explosives and napalm. No one had ever found an economic reason for clearing away the miles of rubble, and now the scarred earth and ruined buildings were covered with tall grass, poison sumac, tangled scrub growth, and scattered thickets of trees which might merge to form a forest in another generation or two. Because of

the crazy, jagged, overgrown topography, this land was utterly useless, and no one lived here except some pathetic remnants of old hippie tribes that kept to themselves and weren't worth hunting down. Their occasional huts and patchwork tents were the only signs of human habitation in the area. This was *really* depressing territory, and I wanted to get Mr. Ito over it high and fast.

Fortunately, we didn't have far to go, and in a couple of minutes, I had the jumper floating at five hundred feet over our objective, the only really intact structure in the area. Mr. Ito's stone face lit up with such boyish pleasure that I knew I had it made; I had figured right when I figured he couldn't resist something like this.

"So!" he cried in delight. "Yankee Stadium!"

The ancient ballpark had come through the Insurrection with nothing worse than some atmospheric blacking and cratering of its concrete exterior walls. Everything around it had been pretty well demolished except for a short section of old elevated subway line which still stood beside it, a soft rusty-red skeleton covered with vines and moss. The surrounding ruins were thoroughly overgrown, huge piles of rubble, truncated buildings, rusted-out tanks, forming tangled manmade jungled foothills around the high point of the stadium, which itself had creepers and vines growing all over it, partially blending it into the wild, overgrown landscape around it.

The Bureau of National Antiquities had circled the stadium with a high, electrified, barbed-wire fence to keep out the hippies who roamed the badlands. A lone guard armed with a Japanese-made slicer patrolled the fence in endless circles at fifteen feet on a one-man skimmer. I brought the jumper down to fifty feet and orbited the stadium five times, giving the enthralled Ito a good, long, contemplative look at how lovely it would look as the centerpiece of his gardens instead of hidden away in these crummy ruins. The guard waved to us each time our paths crossed—it must be a lonely, boring job out here with nothing but old junk and crazy wandering hippies for company.

"May we go inside?" Ito said in absolutely reverent tones. Man, was he hooked! He glowed like a little kid about to inherit a candy store.

"Certainly, Mr. Ito," I said, taking the jumper out of its circling pattern and floating it gently up over the lip of the old ballpark, putting it on hover at roof-level over what had once been short center field. Very slowly, I brought the jumper down toward the tangle of tall grass, shrubbery, and occasional stunted trees that covered what had once been the playing field.

It was like descending into some immense, ruined, roofless cathedral. As we dropped, the cavernous triple-decked grandstands—rotten wooden seats rich with moss and fungi, great

overhanging rafters concealing flocks of chattering birds in their deep glowering shadows—rose to encircle the jumper in a weird, lost grandeur.

By the time we touched down, Ito seemed to be floating in his seat with rapture. "So beautiful!" he sighed. "Such a sense of history and venerability. Ah, Mr. Harris, what noble deeds were done in this Yankee Stadium in bygone days! May we set foot on this historic playing field?"

"Of course, Mr. Ito." It was beautiful. I didn't have to say a word; he was doing a better job of selling the moldy, useless heap of junk to himself than I ever could.

We got out of the jumper and tramped around through the tangled vegetation while scruffy pigeons wheeled overhead and the immensity of the empty stadium gave the place an illusion of mystical significance, as if it were some Greek ruin or Stonehenge, instead of just a ruined old baseball park. The grandstands seemed choked with ghosts; the echoes of great events that never were, filled the deeply-shadowed cavernous spaces.

Mr. Ito, it turned out, knew more about Yankee Stadium than I did, or ever wanted to. He led me around at a measured, reverent pace, boring my ass off with a kind of historical grand tour.

"Here Al Gionfriddo made his famous World Series catch of a potential home run by the great Dimaggio," he said, as we reached the high, crumbling black wall that ran around the bleachers. Faded numerals said "405." We followed this curving, overgrown wall around to the 467 sign in left center field. Here there were three stone markers jutting up out of the old playing field like so many tombstones, and five copper plaques on the wall behind them, so green with decay as to be illegible. They really must've taken this stuff seriously in the old days, as seriously as the Japanese take it now.

"Memorials to the great heroes of the New York Yankees," Ito said. "The legendary Ruth, Gehrig, Dimaggio, Mantle . . . Over this very spot, Mickey Mantle drove a ball into the bleachers, a feat which had been regarded as impossible for nearly half a century. Ah . . ."

And so on. Ito tramped all through the underbrush of the playing field and seemed to have a piece of trivia of vast historical significance to himself for almost every square foot of Yankee Stadium. At this spot, Babe Ruth had achieved his sixtieth home run; here Roger Maris had finally surpassed that feat, over there Mantle had almost driven a ball over the high roof of the venerable stadium. It was staggering how much of this trivia he knew, and how much importance it all had in his eyes. The tour seemed to go on forever. I would've gone crazy with boredom if it wasn't so wonderfully obvious how thoroughly sold he was on the place. While Ito conducted

his love-affair with Yankee Stadium, I passed the time by counting yen in my head. I figured I could probably get ten million out of him, which meant that my commission would be a cool million. Thinking about that much money about to drop into my hands was enough to keep me smiling for the two hours that Ito babbled on about home runs, no-hitters, and triple-plays.

It was late afternoon by the time he had finally saturated himself and allowed me to lead him back to the jumper. I felt it was time to talk business, while he was still under the spell of the stadium, and his resistance was at low ebb.

"It pleasures me greatly to observe the depths of your feeling for this beautiful and venerable stadium, Mr. Ito," I said. "I stand ready to facilitate the speedy transfer of title at your convenience."

Ito started as if suddenly roused from some pleasant dream. He cast his eyes downward, and bowed almost imperceptibly.

"Alas," he said sadly, "while it would pleasure me beyond all reason to enshrine the noble Yankee Stadium upon my grounds, such a self-indulgence would only exacerbate my domestic difficulties. The parents of my wife ignorantly consider the noble sport of baseball an imported American barbarity. My wife unfortunately shares in this opinion and frequently berates me for my enthusiasm for the game. Should I purchase the Yankee Stadium, I would become a laughing stock in my own household, and my life would become quite unbearable."

Can you beat that? The arrogant little son of a bitch wasted two hours of my time dragging around this stupid heap of junk babbling all that garbage and driving me half crazy, and he knew he wasn't going to buy it all the time! I felt like knocking his low-posture teeth down his unworthy throat. But I thought of all those yen I still had a fighting chance at and made the proper response: a rueful little smile of sympathy, a shared sigh of wistful regret, a murmured, "Alas."

"However," Ito added brightly, "the memory of this visit is something I shall treasure always. I am deeply in your debt for granting me this experience, Mr. Harris. For this alone, the trip from Kyoto has been made more than worthwhile."

Now that really made my day.

I was in real trouble, I was very close to blowing the biggest deal I've ever had a shot at. I'd shown Ito the two best items in my territory, and if he didn't find what he wanted in the Northeast, there were plenty of first-rank pieces still left in the rest of the country—top stuff like the St. Louis Gateway Arch, the Disneyland Matterhorn, the Salt Lake City Mormon Tabernacle—and plenty of other brokers to collect that big fat commission.

I figured I had only one more

good try before Ito started thinking of looking elsewhere: the United Nations building complex. The U.N. had fallen into a complicated legal limbo. The United Nations had retained title to the buildings when they moved their headquarters out of New York, but when the U.N. folded, New York State, New York City, and the Federal Government had all laid claim to them, along with the U.N.'s foreign creditors. The Bureau of National Antiquities didn't have clear title, but they did administer the estate for the Federal Government. If I could palm the damned thing off on Ito, the Bureau of National Junk would be only too happy to take his check and let everyone else try to pry the money out of them. And once he moved it to Kyoto, the Japanese Government would not be about to let anyone repossess something that one of their heavyweight citizens had shelled out hard yen for.

So I jumped her at Mach 1.7 to a hover at three hundred feet over the greasy waters of the East River due east of the U.N. complex at 42nd Street. At this time of day and from this angle, the U.N. buildings presented what I hoped was a romantic Japanese-style vista. The Secretariat was a giant glass tombstone dramatically silhouetted by the late afternoon sun as it loomed massively before us out of the perpetual gray haze hanging over Manhattan; beside it, the low sweeping curve of the General Assembly gave the grouping a balanced calligraphic outline. The total effect seemed similar to that of one of those ancient Japanese Torii gates rising out of the foggy sunset, only done on a far grander scale.

The Insurrection had left the U.N. untouched—the rebels had had some crazy attachment for it—and from the river, you couldn't see much of the grubby open air market that had been allowed to spring up in the plaza, or the honky-tonk bars along First Avenue. Fortunately, the Bureau of National Antiquities made a big point of keeping the buildings themselves in good shape, figuring that the Federal Government's claim would be weakened if anyone could yell that the Bureau was letting them fall apart.

I floated her slowly in off the river, keeping at the three-hundred-foot level, and started my pitch. "Before you, Mr. Ito, are the United Nations buildings, melancholy symbol of one of the noblest dreams of man, now unfortunately empty and abandoned, a monument to the tragedy of the U.N.'s unfortunate demise."

Flashes of sunlight, reflected off the river, then onto the hundreds of windows that formed the face of the Secretariat, scintillated intermittently across the glass monolith as I set the jumper to circling the building. When we came around to the western face, the great glass facade was a curtain of orange fire.

"The Secretariat could be set in your gardens so as to catch both the sunrise and sunset, Mr. Ito," I

pointed out. "It's considered one of the finest examples of Twentieth-Century Utilitarian in the world, and you'll note that it's in excellent repair."

Ito said nothing. His eyes did not so much as flicker. Even the muscles of his face seemed unnaturally wooden. The jumper passed behind the Secretariat again, which eclipsed both the sun and its giant reflection; below us was the sweeping gray concrete roof of the General Assembly.

"And of course, the historic significance of the U.N. buildings is beyond measure, if somewhat tragic—"

Abruptly, Mr. Ito interrupted, in a cold, clipped voice. "Please forgive my crudity in interjecting a political opinion into this situation, Mr. Harris, but I believe such frankness will save you much wasted time and effort and myself considerable discomfort."

All at once, he was Shiburo Ito of Ito Freight Boosters of Osaka, a mover and shaper of the economy of the most powerful nation on Earth, and he was letting me know it. "I fully respect your sentimental esteem for the late United Nations, but it is a sentiment I do not share. I remind you that the United Nations was born as an alliance of the nations which humiliated Japan in a most unfortunate war, and expired as a shrill and contentious assembly of pauperized beggar-states united only in the dishonorable determination to extract international alms from more progressive, advanced, self-sustaining, and virtuous states, chief among them Japan. I must therefore regretfully point out that the sight of these buildings fills me with nothing but disgust, though they may have a certain intrinsic beauty as abstract objects."

His face had become a shiny mask and he seemed a million miles away. He had come as close to outright anger as I had ever heard one of these heavyweight Japs get; he must be really steaming inside. Damn it, how was I supposed to know that the U.N. had all those awful political meanings for him? As far as I've ever heard, the U.N. hasn't meant anything to anyone for years, except an idealistic, sappy idea that got taken over by Third Worlders and went broke. Just my rotten luck to run into one of the few people in the world who were still fighting that one!

"You are no doubt fatigued, Mr. Harris," Ito said coldly. "I shall trouble you no longer. It would be best to return to your office now. Should you have further objects to show me, we can arrange another appointment at some mutually convenient time."

What could I say to that? I had offended him deeply, and besides I couldn't think of anything else to show him. I took the jumper to five hundred and headed downtown over the river at a slow hundred miles per hour, hoping against hope that I'd somehow think of something to salvage this blown million-yen deal

with before we reached my office and I lost this giant goldfish forever.

As we headed downtown, Ito stared impassively out the bubble at the bleak ranks of high-rise apartment buildings that lined the Manhattan shore below us, not deigning to speak or take further notice of my miserable existence. The deep orange light streaming in through the bubble turned his round face into a rising sun, straight off the Japanese flag. It seemed appropriate. The crazy bastard was just like his country: a politically touchy, politely arrogant economic overlord, with infinitely refined aesthetic sensibilities inexplicably combined with a packrat lust for the silliest of our old junk. One minute Ito seemed so superior in every way, and the next he was a stupid, childish sucker. I've been doing business with the Japanese for years, and I still don't really understand them. The best I can do is guess around the edges of whatever their inner reality actually is, and hope I hit what works. And this time out, with a million yen or more dangled in front of me, I had guessed wrong three times and now I was dragging my tail home with a dissatisfied customer whose very posture seemed designed to let me know that I was a crass, second-rate boob, and that he was one of the lords of creation!

"Mr. Harris! Mr. Harris! Over there! That magnificent structure!" Ito was suddenly almost shouting; his eyes were bright with excitement, and he was actually smiling.

He was pointing due south along the East River. The Manhattan bank was choked with the ugliest public housing projects imaginable, and the Brooklyn shore was worse: one of those huge, sprawling, so-called industrial parks, low windowless buildings, geodesic warehouses, wharves, a few freight-booster launching pads. Only one structure stood out, there was only one thing Ito could've meant: the structure linking the housing project on the Manhattan side with the industrial park on the Brooklyn shore.

Mr. Ito was pointing at the Brooklyn Bridge.

"The . . . ah . . . bridge, Mr. Ito?" I managed to say with a straight face. As far as I knew, the Brooklyn Bridge had only one claim to historicity: it was the butt of a series of jokes so ancient that they weren't funny anymore. The Brooklyn Bridge was what old comic con men traditionally sold to sucker tourists, greenhorns or hicks they used to call them, along with phony uranium stocks and gold-painted bricks.

So I couldn't resist the line: "You want to buy the Brooklyn Bridge, Mr. Ito?" It was so beautiful; he had put me through such hassles, and had finally gotten so damned high and mighty with me, and now I was in effect calling him an idiot to his face and he didn't know it.

In fact, he nodded eagerly in an-

swer like a straight man out of some old joke and said, "I do believe so. Is it for sale?"

I slowed the jumper to forty, brought her down to a hundred feet, and swallowed my giggles as we approached the crumbling old monstrosity. Two massive and squat stone towers supported the rusty cables from which the bed of the bridge was suspended. The jumper had made the bridge useless years ago; no one had bothered to maintain it and no one had bothered to tear it down. Where the big blocks of dark gray stone met the water, they were encrusted with putrid-looking green slime. Above the waterline, the towers were whitened with about a century's worth of guano.

It was hard to believe that Ito was serious. The bridge was a filthy, decayed, reeking old monstrosity. In short, it was just what Ito deserved to be sold.

"Why yes, Mr. Ito," I said, "I think I might be able to sell you the Brooklyn Bridge."

I put the jumper on hover about a hundred feet from one of the filthy old stone towers. Where the stones weren't caked with seagull guano, they were covered with about an inch of black soot. The roadbed was cracked and pitted and thickly paved with garbage, old shells, and more guano; the bridge must've been a seagull rookery for decades. I was mighty glad that the jumper was airtight; the stink must've been terrific.

"Excellent!" Mr. Ito exclaimed. "Quite lovely, is it not? I am determined to be the man to purchase the Brooklyn Bridge, Mr. Harris."

"I can think of no one more worthy of that honor than your esteemed self, Mr. Ito," I said with total sincerity.

About four months after the last section of the Brooklyn Bridge was boosted to Kyoto, I received two packages from Mr. Shiburo Ito. One was a mailing envelope containing a minicassette and a holo slide; the other was a heavy package about the size of a shoebox wrapped in blue rice paper.

Feeling a lot more mellow toward the memory of Ito these days, with a million of his yen in my bank account, I dropped the mini into my playback and was hardly surprised to hear his voice.

"Salutations, Mr. Harris, and once again my profoundest thanks for expediting the transfer of the Brooklyn Bridge to my estate. It has now been permanently enshrined and affords us all much aesthetic enjoyment and has enhanced the tranquillity of my household immeasurably. I am enclosing a holo of the shrine for your pleasure. I have also sent you a small token of my appreciation which I hope you will take in the spirit in which it is given. Sayonara."

My curiosity aroused, I got right up and put the holo slide in my wall viewer. Before me was a heavily-wooded mountain which rose into twin peaks of austere, dark-gray

rock. A tall waterfall plunged gracefully down the long gorge between the two pinnacles to a shallow lake at the foot of the mountain, where it smashed onto a table of flat rock, generating perpetual billows of soft mist which turned the landscape into something straight out of a Chinese painting. Spanning the gorge between the two peaks like a spiderweb directly over the great falls, its stone towers anchored to islands of rock on the very lip of the precipice, was the Brooklyn Bridge, its ponderous bulk rendered slim and graceful by the massive scale of the landscape. The stone had been cleaned and glistened with moisture, the cables and roadbed were overgrown with lush green ivy. The holo had been taken just as the sun was setting between the towers of the bridge, outlining it in rich orange fire, turning the rising mists coppery, and sparkling in brilliant sheets off the falling water.

It was very beautiful.

It was quite a while before I tore myself away from the scene, remembering Mr. Ito's other package.

Beneath the blue paper wrapping was a single gold-painted brick. I gaped. I laughed. I looked again.

The object looked superficially like an old brick covered with gold paint. But it wasn't. It was a solid brick of soft, pure gold, a replica of the original item, in perfect detail.

I knew that Mr. Ito was trying to tell me something, but I still can't quite make out what. ■

JOHN SCHOENHERR

Conclusion. Threads of man's distant past and far future had to be pulled together before Carson could finish the work that he had come to the Cemetery World to accomplish.

CLIFFORD D. SIMAK

Cemetery World

Synopsis

Ten thousand years before the story opens, the final war has been fought on Earth, the last stages of it being carried on by great war machines, with the brains of men fused into the machines and directing them. With the Earth poisoned and ruined, many of the survivors flee into space, seeking new homes among the stars. In time a corporation, Mother Earth, Inc., sets up a cemetery on Earth, operating high-powered public relations programs to convince people of the sentimental prestige of being interred on the planet where mankind first arose. A few people, descendants of the ne'er-do-wells who were left behind when the rest of the population went to the stars, still live on Earth, but Mother Earth seeks to create the impression there is nothing there but the Cemetery.

On the gentle world of Alden, Fletcher Carson is attempting to build a compositor, a machine-instrument which can take a theme and translate it into every known art form. He plans to take the compositor to Earth, but he runs out of money before he can finish it. He is approached by Elmer, an incredibly ancient robot, who had worked on the last of Earth's war machines and who, because he was a skilled technician, was taken to the stars by the humans. He has been a free robot for centuries and now wants to return to Earth. He becomes Carson's partner, investing his life savings in the compositor, named Bronco.

Because they have no money left for a regular passage, Carson rides a funeral ship to Earth, taking Elmer and Bronco along as freight. Once on Earth, Carson quarrels with Maxwell Peter Bell, manager of Mother Earth, Inc., with Carson resisting being taken over by Mother Earth, which would like to use the composition he plans as publicity for the Cemetery. Carson meets Cynthia Lansing, a woman from Alden who carries with her a letter from Carson's old friend, Dr. William Thorndyke (Thorney), an archaeologist at Alden University. Thorndyke is a leading authority on the Anachrons, a mysterious galactic people who have long since disappeared, but have left traces of their culture among the artifacts of many other races. The Anachrons are popularly thought of as galactic traders, but Thorndyke believes they were cultural observers seeking new cultural approaches to graft onto their own civilization.

In his letter, Thorndyke says that Cynthia will be taking regular passage to Earth and will arrive there ahead of Carson. He asks Carson to help her in her quest for a treasure which he believes an Anachron observer had collected on Earth. This belief is based on a letter she has found among old family papers, detailing a meeting of an ancestor of hers with a strange being who could have been an Anachron, bringing the choice part of his collection from Greece to hide in a location near the Ohio River. Carson is reluctant to become involved in trea-

sure hunting, but takes Cynthia along with his expedition.

Once out of the Cemetery the party camps. When night has fallen, some great creature comes charging through the forest, smashing trees and making a great swath through the woods, barely missing the camp. Carson suspects it may be a war machine, although it seems unlikely such a machine would have survived for ten thousand years.

They are joined by a party of coon hunters from a backwoods settlement, who tell them the thing that smashed down the trees is the Ravener, a mythical being almost never seen. The coon hunters invite them to a hoedown in the settlement the following night.

At the hoedown there is a good deal of liquor in evidence, including a case of good whiskey which apparently has been provided by the Cemetery. An outlandish creature, the census taker, shows up, accompanied by a band of shadowy ghosts who insist they should be called shades. At the height of festivities someone throws a bomb in an attempt to blow up Bronco. In the excitement that follows, Carson and his party escape. Bronco is badly damaged, but with Elmer's help, gets away. Elmer then leaves Bronco in charge of Carson and Cynthia, telling them to continue on their way while he goes back to the settlement to steal tools he will need to repair Bronco.

The three of them, just before dawn, wander into a camp of ruffians they later label "the ghouls," and are captured. Elmer rescues them and drives off the ghouls. Left behind are a number of horses and a great clutter of boxes and bales. They open one of the boxes and find sheets of metal. The metal could only have come from caskets and they deduce that the ghouls have been robbing graves in the Cemetery to get metal. Another box yields a hoard of alien artifacts and Carson recalls that Thorndyke has many times bewailed the stripping of potential archaeological sites of artifacts that later turn up for sale. The supposition now appears to be that Mother Earth is trafficking in artifacts, hiding them in graves. There also is almost the certainty that the bombing of Bronco was done at the behest of Mother Earth, with the case of whiskey as payment.

Carson's party proceeds, driving the horses with them to slow up pursuit by the ghouls. Carson and Cynthia, who have gone hours without sleep, are hidden, at Elmer's insistence, in a cave where they can get some sleep while Elmer and Bronco drive the horses deeper into the mountains. The two sleepers are wakened by the census taker, who tells them they are being hunted by robotic wolves which Mother Earth used in the ancient days to rid the planet of genetic monsters. From the mouth of the cave, they see three wolves, which pass them by. A group of shades are with the census taker and they talk with one whose name is Ramsay O'Gillicuddy.

The census taker warns Carson and Cynthia that the wolves will be back and that they must leave. He volun-

teers to guide them. They travel all day through a storm and finally camp in another cave. The census taker says that of the three, only one wolf is left, the other two apparently having been killed by Elmer and Bronco, but that the one wolf is trailing them. When Carson and Cynthia wake in the morning, the census taker is gone, but the wolf is there, waiting for them. However, he comes in peace, bringing them a rabbit for breakfast..

Part 3

XVI

We sat beside the fire and gnawed the last shreds of meat off the rabbit's bones, while the wolf lay off to one side, its tail beating occasionally on the stony floor, watching us.

"What do you suppose happened to him?" Cynthia asked.

"He maybe went insane," I said, "or turned chicken after what happened to the other two. Or he may be just laying for us, lulling us to sleep. When he has the chance, he'll finish off the two of us."

I reached out and pulled the metal rod just a little closer.

"I don't think that at all," said Cynthia. "You know what I think. He doesn't want to go back."

"Back to where?"

"Back to wherever it is that Cemetery keeps him. Think of it. He and the other wolves, however many there may be, may have been kept penned up for years and—"

"They wouldn't keep them penned," I said. "More likely they would turn them off until they needed them."

"Then maybe that is it," she said. "Maybe he doesn't want to go back because he knows they'll turn him off."

I grunted at her. It was all damn foolishness. Maybe the best thing to do, I thought, was to pick up the metal rod and beat the wolf to death. The only thing, I guess, that stopped me was a suspicion that the wolf might take a lot of killing and that in the process I'd come out second best.

"I wonder what happened to the census taker," I said.

"The wolf scared him off," said Cynthia. "He won't be back."

"He could at least have wakened us. Given us a chance."

"It turned out all right."

"But he couldn't know it would."

"What do we do now?"

"I don't know," I said. And that was exactly right. I really didn't know. Never in my life had I felt so unsure of what my next step should be. I had no real idea of where we were; we were lost, so far as I was concerned, in a howling wilderness. We were separated from the two stronger members of our party and our guide had deserted us. A metal wolf had made friends with us and I was far from sure of the sincerity of its friendship.

I caught the motion out of the corner of my eye and leaped to my feet, but there was nothing I could do

about it except stand there and stare into the muzzles of the guns. Holding the guns were two men, and one of them I recognized as the big brute who had stood in the forefront of the mob that Cynthia and I had faced, futile clubs in hand, back at the camp site of the ghouls just before Elmer had come bursting in to break up the confrontation. I was a bit surprised that I recognized him, for at the time I had been too busy watching all the others that made up the mob who had left off their attack on Bronco to zero in on us. But now I found that I did know him—the leering half-smile pasted on his face, the droopy eye, that ragged scar that ran across one cheek. The other one I did not recognize.

They had crept up to one corner of the cave and now they stood there, with their rifles pointed at us.

I heard Cynthia gasp in surprise and I said, sharply, to her, "Stay down. Don't move."

With a scratch of metal claws on rock, something came up to me and stood beside me, pressing hard against my leg. I didn't look to see what it might be. I knew. It was Wolf, lining up with me against the guns.

The two with the guns apparently had not seen him, lying off to one side of us. And now that he moved into their view, the leering smile came off Big Brute's face and his jaw sagged just a little. A nervous tic ran across the face of the other man. But they stood their ground.

"Gentlemen," I said, "it appears to be a stand-off. You could kill us easily, but you wouldn't live to get a hundred feet."

They kept their guns pointed at us, but finally Big Brute lifted his gun and let the butt slide to the ground.

"Jed," he said, "put up your shooting iron. These folks have outsmarted us."

Jed lowered his gun.

"It seems to me," said Big Brute, "that we have to cipher out a way for all of us to get out of this scrape without losing any hide."

"Come on in," I said, "but be careful of the guns."

They came up to the fire, walking slowly and somewhat sheepishly.

I took a quick glance at Cynthia. She was still crouched on the floor, but she wasn't scared. She was hard as nails.

"Fletch," she said, "the gentlemen must be hungry, coming all this way. Why don't you ask them to sit down while I open up a can or two. We haven't too much, traveling light, but I put in some stew."

The two of them looked at me and I nodded rather curtly.

"Please do," I said.

They sat down and laid their guns beside them.

Wolf didn't stir; he stood and looked at them.

Big Brute made a questioning thumb at him.

"He's all right," I said. "Just don't make any sudden moves."

I hoped that I was right. I couldn't quite be sure.

Cynthia, digging into one of the packs, had a stewpan out. I poked the fire together and it blazed up brightly.

"Now," I said, "suppose you tell me what this is all about?"

"You stole our horses," Big Brute said.

Jed said, "We were hunting them."

I shook my head. "You could have followed the trail blindfolded. You should have had no trouble. There were a lot of horses."

"Well," said Big Brute, "we found the place where you hid out and we found the note. Jed here, he was able to get it puzzled out. And we knew about this cave."

"It's a camping place," said Jed. "We camp here ourselves, every now and then."

It still didn't make too much sense, but I didn't press it. Big Brute, however, went on to explain. "We figured you weren't alone. Someone must have been with you. Someone who knew the country. People like you wouldn't strike out on your own. And this here place is a hard day's march."

Jed said, "What I can't figure is the wolf. We never counted on no wolf. We thought by this time he'd be halfway home."

"You knew about the wolves?"

"We saw the tracks. Three of them. And we found what was left of the other two."

"Not you," I said. "You came straight from the place where we slept. You had to. You wouldn't have had the time . . ."

"Not us," said Jed. "We didn't see it. Some of the rest of us. They let us know."

"They let you know?"

"Sure," said Big Brute. "We keep one another posted."

"Telepathy," said Cynthia, softly. "It has to be telepathy."

"But telepathy . . ."

"A survival factor," she said. "The people who were left on Earth after the war would have needed survival factors. And with mutations, there might have been a lot of factors. Fine things to have if they didn't kill you first. Telepathy would have been good to have and it would not have killed you."

"Tell me," I said to Big Brute, "what happened to Elmer—to the other two who were with us."

"The metal things," said Jed.

"That's right. The metal things."

Big Brute shook his head.

"You mean that you don't know?"

"We can find out."

"Well, then, you find out."

"Look, Mister," said Jed, "we need a bargaining point. This is our bargaining point."

"The wolf is ours," I said. "And the wolf's right here."

"Maybe we shouldn't be sitting here dickering," said Big Brute. "Maybe we should throw in together."

"That's why you came sneaking

up on us, to throw in with us?"

"Well, no," said Jed. "Not exactly. We had blood in our eye, for sure. You busted up our camp and run us off and then you took our horses. There ain't nothing more low-down than running off a man's horses. We weren't, to tell the truth, feeling very friendly."

"But things have changed now. You are willing to be friendly?"

"Look at it this way," said Big Brute. "Someone set the wolves on you and the only ones who could have sent out the wolves was Cemetery, and we sort of calculate anyone Cemetery doesn't like has to be a friend of ours."

"What have you got against Cemetery?" Cynthia asked. She had moved over to the fire, standing beside Big Brute, with the stewpan in her hand. "You've been stealing from Cemetery. You've been digging up the graves. Seems to me you would be out of business if it wasn't for Cemetery."

"They don't play fair," Jed whined. "They set traps for us. All sorts of wicked traps. They cause us all sorts of trouble."

Big Brute was still bewildered. "How come you made up with that wolf?" he asked. "Those things aren't supposed to make friends with anyone. They're man-killers, every one of them."

Cynthia was still standing beside Big Brute, but she wasn't looking at him. She was looking across the creek to the hill. I wondered rather idly what she was looking at, but it was only a passing thought.

"If you want to throw in with us," I said, "how about beginning by telling us where to find the metal beings."

I didn't really trust them; I knew we couldn't trust them. But I thought it was worth going along with them a ways if they could give us some idea of Elmer and Bronco's whereabouts.

"I don't know," said Big Brute. "I honestly don't know if we should tell you that or not."

Out of the corner of my eye, I saw Cynthia move. Her arm came up and I saw what she meant to do, although I couldn't understand, for the life of me, why she was doing it. There was no way for me to stop her, and even if there were, I would not have done it, for I knew she must have good reason. There was only one thing for me to do and I did it. I lunged for Jed's rifle, which lay on the rocky floor beside him and as I moved, Cynthia brought the stewpan down, as hard as she could manage, on top of Big Brute's head.

Jed snatched at his gun, both of us grabbing hold of it. We rose to our feet, both of us hanging onto it, wrestling for it, trying to jerk it from the other's grasp.

Events were happening much too fast for me to take any lasting notice of them. I saw Cynthia, Big Brute's rifle clutched in her hands and at the ready. Big Brute was crawling around the floor on his hands and

knees, shaking his head, as if he were attempting to rattle his brains back together into a solid mass, and a little way beyond him the stewpan lay canted on its side, battered out of shape. Wolf was a streak of churning silver, streaking across the cave, heading for the entrance, and out on the opposite hillside there were dark figures running. And somewhere out there, too, dull pops were sounding and humming bees came into the cave to thud against its walls.

Jed's face was all twisted up, either in fear or anger (I could not decide which, but strangely, in the midst of all that was going on, I found the time to wonder). His mouth was open, as if he might be yelling, but he wasn't yelling. His teeth were yellowed fangs and his breath was foul. He wasn't as big as I was, nor as heavy, but he was a wiry customer, quick and tough and full of fight, and I knew, even as I fought for it, that he'd finally get that gun away from me.

Big Brute had tottered to his feet and was backing slowly away from the fire, staring with horrified fascination at Cynthia, who pointed the rifle at him.

It all seemed to have gone on for a long while, although I don't imagine it had been more than a few seconds, and it seemed as if it might keep on forever. Then, quite suddenly, Jed buckled in the middle. He loosed his grip on the gun and slid sidewise, tumbling to the floor, and I saw then the slow seep of red that stained his back.

Cynthia yelled at me, "Fletch, let's get away! They are shooting at us!"

But they were, I saw, not shooting any longer. They were fleeing for their lives, small dark figures of leaping, dodging men scrambling up the hillside. Two or three of them, I saw, were busily climbing trees. Up the hill, after them, flashed a steel machine and as I watched, it caught one of them in its sharp, steel jaws and shook the body for an instant before tossing it to one side.

There was no sign of Big Brute. He had gotten clean away.

"Fletch, we can't stay here," said Cynthia, and I quite agreed with her. It was no place to stay, with the ghouls snapping at our heels. Now, while Wolf had them on the run, was the time to get away.

She had already reached one corner of the cave and was scrambling down the hillside, and I followed her. I lost my footing on the steepness of the rubble and, flat upon my back, skidded almost to the creek before I could gain my feet again. When I fell I dropped the gun; I was turning back to get it when something went buzzing past my ear and threw up a small spurt of earth and rock on the inclined bank not more than three feet ahead of me. I rolled over rapidly and looked up at the ridge. A puff of blue smoke was floating up from a tree where a scarecrow figure crouched.

I forgot about the gun.

Cynthia was running down the narrow hollow that carried the creek and I ran after her. Behind me a couple of guns went off, but the balls must have flown far wide of us, for I didn't hear them hum nor did I see them strike. In a few more seconds, I told myself, we'd be out of range. Homemade guns, carrying balls of lead powered by homemade powder, could not have had much carrying distance.

The narrow valley was tortuous traveling. The hills came down steeply on either side, in a sharp V formation, and there was no level ground. The surface was cluttered by massive boulders that through the ages had come rolling down the hillsides. In some places gigantic trees grew in the narrowness of the notch between the hills. There was no sort of trail to follow; nothing in its right mind would travel down this valley short of sheer necessity. It was a matter of finding the best path that one could, dodging around the rocks and trees, leaping the brook when it swung across one's path.

I caught up with Cynthia when she was slowed down by an enormous pile of boulders, and after that we went together. I saw that she didn't have Big Brute's gun.

"I dropped it," she said. "It was heavy. It kept getting in my way."

"It's just as well," I said. And it was just as well. Each of the guns carried a single charge and we had no balls or powder to reload (even if we'd known how to reload) once that charge was fired. They were awkward things to handle and I had a hunch a man would have to do a lot of shooting with them before he could come anywhere near hitting what he was aiming at.

We came to a place where another little V-shaped valley came into the one we had been following.

"Let's go up that one," Cynthia said. "They know we came down this one."

I nodded. If they followed, they might suspect we had chosen the easier course, continuing down the hollow from the cave.

"Fletch," she said, "we haven't got a thing. We ran off without our packs."

I hesitated. "I could go back," I said. "You go on up the hollow. I'll catch up with you."

"We can't separate again," she said. "We have to stick together. None of this would have happened if we'd stayed with Elmer."

"Wolf has got them treed," I said. "Either treed or running."

"No," she said. "Some of them up the trees have guns. And there are too many of them for Wolf to handle. They'll scatter. He can't chase them all."

"You saw them," I said. "That's why you hit the big one with the pan."

"I saw them," she said, "slithering down the hillside. But I might have hit him anyhow. We couldn't trust them, Fletch. And you aren't going

back. I'd have to go with you and I am scared to go."

I gave in. I couldn't honestly decide whether it was giving in or not wanting to go back, myself.

"Later on," I said. "Later on, when this is all over, we can come back and get the stuff." Knowing that we probably never would. Or that it might not be there if we did go back.

We started up the hollow. It was as bad as the one we had come down; worse because now we were climbing.

I let Cynthia go ahead and I did some worrying. We must have been in a real panic, the both of us, when we left the cave. It would have been simple, using no more than a minute's time, to have grabbed up the packs. But we hadn't done it and now we were without food and blankets, without anything at all. Except fire, I thought. I had the lighter in my pocket. I felt a little better, although not much, when I realized we still had fire.

The way was grueling and there were times when we had to stop to rest. Listening for some sound back at the cave, I heard nothing and began to wonder, rather dazedly, if what I remembered had really happened there. I knew, of course, it had.

We were nearing the top of the ridge and the valley petered out. We clambered to the crest. The ridge was heavily wooded and when we reached the top, we were in a fairyland of beauty. The trees were massive blocks of red and yellow and in some of them were climbing vines that provided slashes of deep gold and brilliant crimson. The day was clear and warm. Looking at the color, I remembered that first day—only a few days ago, but seeming more like weeks—when we had left the Cemetery and gone down the hill to the first autumn-painted forest I had ever seen.

We stood, watching back the way that we had come.

"Why should they be hunting us?" asked Cynthia. "Sure, we took their horses, but if that is all it is they should be hunting the horses and not us."

"Revenge, maybe," I said. "A twisted idea of getting even with us. Probably only a part of them are after us. The others must be following the horses."

"That may be it," she said, "but I can't bring myself to think so. There is something more than that."

"It's Cemetery," I said and I wasn't entirely clear what I meant by saying it, although it did seem that Cemetery was somehow involved in everything that happened. But immediately as I said it, the whole pattern formed inside my mind.

"Don't you see," I said. "Cemetery has a finger in everything that happens. They can bring certain pressures. Back at the settlement someone got a case of whiskey for trying to blow up Bronco. And here are the ghouls . . ."

"But the ghouls," she said, "are different. They're stealing from Cemetery. Cemetery is setting traps for them. They'd make no deals with Cemetery."

"Look," I said, "it may be they're only trying to curry some favor with Cemetery. They found out the wolves were after us, and who but Cemetery would set the wolves on us? And the wolves had failed. To the kinds of minds the ghouls have, it must have seemed a rather simple thing, an opportunity. If they could bring in our heads when the wolves had failed, there might be something in it for them. It's as simple as all that."

"It could be," she said. "Heaven knows, it gets down to simple basics."

"In which case," I said, "we best be getting on."

We went down the slope and struck another rock-littered ravine and followed it until it joined another valley, this one a little wider and easier for traveling.

We found a tree that was almost buried beneath a great grapevine and I clambered up it. Birds and little animals had been at the grapes, but I found a few bunches that carried most of their fruit. Picking them, I dropped them through the branches to the ground. The grapes proved somewhat sour, but we didn't mind too much. We were hungry and they helped to fill us up, but I knew that we'd somehow have to manage something other than grapes. We had no fishhooks, but I did have a jackknife and we probably could cut willow branches and rig up a brush seine that would net some fish for us. We had no salt, I remembered, but hungry enough, we could manage without salt.

"Fletch," said Cynthia, "do you think we ever will find Elmer?"

"Maybe Elmer will find us," I said. "He must be looking for us."

"We left the note," she said.

"The note is gone," I reminded her. "The ghouls found the note, remember? They'd not have left it for him."

The valley was a little wider than the one we had followed from the cave, but it never broadened out. Rather, the hills seemed to get larger and move in on us. Now there were great rock cliffs that rose a hundred feet or more on either side. It became a less pleasant valley. Progressively, it grew more eerie and frightening. Not only was it stark, but silent. The creek that flowed through it was broad and deep and there were no shallows or rapids. The water did not talk; it surged along with a look of terrible power.

The sun was low in the west and with some surprise I realized that we had traveled through the day. I was tired, but not tired enough, it seemed, to have walked all day long.

Ahead of us I saw a cleft cutting back into a cliff. The crest of the cliff was crowned with massive trees and occasional ragged cedars clung precariously to its face.

"Let's take a look," I said. "We'll have to find a place to spend the night."

"We'll be cold," she said. "We left the blankets."

"We have fire," I said.

She shuddered. "Can we have a fire? Do you think it is safe to have a fire?"

"We have to have a fire," I told her.

The cleft was dark. The walls of stone enclosed it, and we could not see to the end of it because the dark deepened as the fissure ran back into the rock. The floor was pebbles, but off to one side, a little back from the entrance, a slab of rock was raised somewhat above the floor.

"I'll get wood," I said.

"Fletch!"

"We have to have a fire," I said. "We have to chance it. We'll freeze to death without it."

"I'm scared," she said.

I looked at her. In the darkness her face was a blur of whiteness.

"Finally I am scared," she said. "I thought I wouldn't be. I told myself I wouldn't be. I said to me I'd tough it out. And it was all right as long as we were moving and out in the bright sunlight. But now night is coming, Fletch, and we haven't any food and we don't know where we are . . ."

I moved close to her and took her in my arms and she came into them willingly enough. Her arms went around me and clutched me tightly. And for the first time since it all had happened, since that moment I had found her sitting in the car as I walked down the steps from the administration building, I thought of her as a woman and I wondered, with some surprise, why it should have been that way. First, of course, she had been nothing but a nuisance, popping up from nowhere with that ridiculous letter from Thorney clutched tightly in her hand, and since then we'd been run ragged by the events that had come tumbling over one another and there'd been no time in which to think of her as a woman. Rather, she had been a good companion, not doing any bawling, not throwing any fits. I thought somewhat unkindly of myself for the way that I had acted. It would not have hurt me to pay her a few small courtesies along the way, and thinking back, it seemed that I had paid her none.

"We're babes in the woods," she said. "You remember the old Earth fairy tale, of course."

"Sure, I remember it," I said. "The birds came with leaves . . ."

And let it go at that. For the tale, when you came to think of it, was not as pretty as it sounded. I couldn't quite remember, but the birds, it seemed to me, had covered them with leaves because they were quite dead. Like so many other fairy tales, I thought, it was a horror story.

She lifted her head. "I'll be all right now," she said. "I'm sorry, Fletch."

I put my fist underneath her chin

and tilted up her face. I bent and kissed her on the lips.

"Now let us go and get the wood," she said.

The sun was nearly gone, but it was still daylight. Lying along the foot of the cliff, we found scattered wood. A lot of it was cedar, dead branches that had fallen off the trees clinging to the bare face of the rock.

"It's a good place to have a fire," I told her. "No one can see it. They'd have to be directly opposite the opening to see it."

"What about the smoke?" she asked.

"This is dry wood," I said. "There shouldn't be much smoke."

I was right. The wood burned with a bright, clean flame. There was scarcely any smoke. The night chill had not settled in as yet, but we huddled close beside the blaze. It was a friend and comfort. It beat back the dark. It drew us together. It warmed us and made a magic circle for us.

The sun went down and out beyond the cleft dusk closed in rapidly. The world went dark and we were alone.

Something stirred out beyond the circle of the fire, at the outer edge of dark. Something clicked upon the rock.

I leaped erect and then I saw the blur of whiteness. His metal body shining in the firelight, Wolf trotted in to us.

From his steel jaws hung the limp form of a rabbit.

Wolf was hell on rabbits.

XVII

O'Gillicuddy and his gang arrived when we were finishing off the rabbit. Without salt, it was somewhat short of tasty, but it was food and the only thing we'd had all day had been that bunch of grapes. Just the fact of eating made life seem a bit more stable and ourselves not entirely lost.

Wolf lay between us, close beside the fire, stretched out with his massive head resting on his metal paws.

"If he'd only talk," said Cynthia, "it would be very nice. Probably he could tell us what was going on."

"Wolves don't talk," I said, chewing the shinbone of the rabbit.

"But robots do," she said. "Elmer talks. Even Bronco talks. And Wolf here is really a robot. He isn't any wolf. He's just made to look like one."

Wolf shifted his eyes around, to look first at one and then the other of us. He didn't say a word, but he beat his metal tail upon the rock and it made a terrible racket.

"Wolves don't beat their tails," she said.

"How do you know that?"

"I read it somewhere. Wolves don't beat or wag their tails. Dogs do. Wolf is more like a dog than a wolf."

"It bothers me," I said. "Here he was, to start with, thirsting for our blood. Suddenly he turns around in his way of thinking and is a pal of ours. It doesn't make much sense."

"I'm beginning to believe," said

Cynthia, "that nothing on the Earth really makes much sense."

We sat by the fire, enclosed in the magic circle. The firelight flickered and flickered yet again and there seemed to be a strange sense of motion all around.

"We have visitors," Cynthia said quietly.

"It's O'Gillicuddy," I said. "O'Gillicuddy, are you there?"

"We are here," said O'Gillicuddy. "There are many of us. We come to bear you company in this wilderness."

"And to bear us word, perhaps."

"Yes, indeed. Word we have to bear."

Wolf flicked an ear, as if there were a fly, but there wasn't any fly. Even if there had been, it would not have bothered Wolf.

Ghosts, I thought. The place was full of ghosts. Ghosts were here, I thought, and we were accepting them, as if they were people or had been people, and that was madness. Under normal circumstances, a ghost was unacceptable, but here, under these conditions, they became not only acceptable, but normal.

I remembered what the census taker had said when he had attempted an explanation of the ghosts, and thinking back on it, I realized that while I could not accept his explanation, he had made a valid point. We were too often prone to reject anything that seemed abnormal.

And thinking of it, I became aghast at the abnormality of our condition, how different it was from the quiet beauty of Alden, how distorted even from the mock majesty of Cemetery. For in fact, those two places seemed abnormal now. We had become so firmly set in the reality of this mad adventure that the ordinary places we had known now seemed strange and far.

"You are not, I fear," O'Gillicuddy was saying, "safely beyond the clutches of the ghouls. They still trail you with much bloodthirstiness."

"You mean," I said, "they want our scalps for Cemetery."

"You have plucked forth the naked truth," said O'Gillicuddy.

"But why?" asked Cynthia. "Surely they are not friends of Cemetery."

"No," said O'Gillicuddy, "they're not, indeed. Upon this planet, Cemetery has no friends. And yet there is no one here who would not most willingly do a favor for them, hoping a favor in return. Thus great power corrupts."

"But there is nothing they would want from Cemetery," Cynthia pointed out.

"Not at the moment, perhaps. But a favor deferred is still a favor and one that can be collected later. One can pile up points."

"You said no one would refuse a favor," I said. "How about yourself?"

"In our case," said O'Gillicuddy, "there is a difference. Cemetery can

do nothing for us, but what is perhaps of more importance, it can do nothing to us. We hope no favor and we have no fear."

"And you say we aren't safe?"

"They are hunting for you," said O'Gillicuddy. "They will keep on hunting. You handed them defeat this morning and it lies bitter in their mouths. One the steel wolf killed, and another died . . ."

"But they shot him themselves," said Cynthia. "A bullet meant for us. It was no fault of ours."

"They still count it against you. There are two dead and there must be accountability. They do not accept the blame. They lay it all on you."

"They'll have a hard time finding us."

"Hard, perhaps," said O'Gillicuddy, "but find you they will. They are woodsmen of the finest. They range like hunting dogs. They read the wilderness like a book. A turned stone, a disturbed leaf, a bruised blade of grass—it says volumes to them."

"Our only hope," said Cynthia, "is to find Elmer and Bronco. "If we were together . . ."

"We can tell you where they are," said O'Gillicuddy, "but it's a long, hard way and you would be turning back into the very arms of the raging ghouls. We tried most desperately to reveal ourselves to your two companions so that we could lead them back to you, but for all that we could do they remained unaware of us. It takes a sharper-tuned sensibility than a robot can possess to discover us."

"It all seems pretty hopeless to me," said Cynthia, sounding considerably discouraged. "You can't guide Elmer and Bronco to us and you say the ghouls are sure to find us."

"And that isn't all," said O'Gillicuddy, seeming ghoulishly happy at what he had to tell us. "The Raveners are on the prowl."

"The Raveners?" I asked. "Are there more than one of them?"

"There are two of them."

"You mean war machines?"

"Is that what you call them?"

"That's what Elmer thinks they are."

"But that can't mean anything to us." protested Cynthia. "Surely the war machines are not tied in with Cemetery."

"But they are," said O'Gillicuddy.

"Why?" I asked. "What has Cemetery got that they possibly could want?"

"Lubricating oil," said O'Gillicuddy.

I'm afraid I groaned at that. It was such a simple thing and yet so logical. It was something that anyone should have thought of. The machines would have built-in power, more than likely nuclear, although I'd never really known, and they would be self-repairing, but the one thing they would need, perhaps the only thing they would need and would not have, would be lubricants.

This would be something that Cemetery wouldn't miss. Cemetery missed no bets at all. They passed up nothing that would make any other factor on the Earth in some way beholden to them.

"And the census taker," I said. "I suppose he is some way tied into it as well. And, by the way, where is the census taker?"

"He disappeared," said O'Gillicuddy. "He flitters here and there. He is not really part of us. He is not always with us. We don't know where he is."

"Nor what he is?"

"What he is? Why, he's the census taker."

"That's not what I mean. Is he a human being? Perhaps a mutated human being. There would have been a lot of human mutation. Some good, mostly bad. Although I imagine that over the years a great part of the bad died out. The ghouls have telepathy and God knows what else, and the settlers probably have something, too, although we don't know what it is. Even you, for ghosts are not . . ."

"Shades," said O'Gillicuddy.

"All right, then, shades. Shades are not a normal human condition. Maybe there aren't any shades anyplace except here on Earth. No one knows what happened during those years after the people fled into space. Earth is a different place today than it was then."

"You got off the track," said Cynthia. "You were asking if the census taker was a Cemetery creature."

"I am sure that he is not," said O'Gillicuddy. "I don't know what he is. I have always thought he was a sort of human being. He is a lot like humans. Not made the way they are, of course, and there is only one of him and . . ."

"Look," I said, "you didn't come here just to bear us company. You came here for a purpose. You wouldn't have come just to bring us bad news. What is it all about?"

"There are many of us here," said the shade. "We foregathered in some strength of numbers. We sent out a call for a gathering of the clan, for we feel great compassion and a strange comradeship with you. Not in all the history of the Earth has anyone before you tweaked the tail of Cemetery in such a hearty fashion."

"And you like that?"

"We like it very much."

"And you've come to cheer us on."

"Not cheer," said O'Gillicuddy, "although that we would also do and most willingly. But we feel that it is in our capacity to be of the slightest help."

"We're in the market," said Cynthia, "for any help there is."

"It becomes a complicated matter to explain," said O'Gillicuddy, "and in lack of adequate information, you must fill in with faith. Being the sort of things we are, we have no real contact with the corporeal universe. But it seems we do have some marginal powers to interact with time

and space, which are neither in the corporeal universe nor quite out of it."

"Now, wait a second there," I said. "What you are talking of . . ."

"Believe me," said O'Gillicuddy, "we have wracked our mental powers and can come up with nothing else. It is little that we have to offer, but . . ."

"What you propose to do," said Cynthia, "is to move us in time."

"But by only the tiniest fraction," said O'Gillicuddy. "A minute part of a second. Barely out of the present, but that would be quite enough."

"It's never been done," Cynthia objected. "For hundreds of years it has been studied and investigated and absolutely nothing has ever come of it."

"Have you ever done it?" I demanded.

"No, not actually," said O'Gillicuddy. "But we have thought about it and speculated on it and we are rather sure . . ."

"But not entirely sure?"

"You are right," said O'Gillicuddy. "Not entirely sure."

"And once you've done it," I asked, "how about our getting back? I would not want to live out my life a fractional part of a second behind all the universe."

"We have worked that out, too," the shade said blithely. "We would set a time trap at the entrance of this cleft and by stepping into it . . ."

"But you're not sure of that one, either."

"Well, fairly certain," said O'Gillicuddy.

It wasn't very promising and, on top of that, I asked myself, how could we be sure that any of the rest of all he'd told was the truth? Maybe O'Gillicuddy and his gang of shades were doing no more than trying to push us into a situation where we'd serve willingly as subjects for an experiment they had cooked up. And come to think of it, how could we be sure there were any shades at all? We had seen them, or seemed to see them, as they danced around the fire back at the settlement. But actually all we had to go on was what the census taker had told us and this voice that said it was O'Gillicuddy.

And what about the voice of O'Gillicuddy? Was that imagination, too, as seeing them back at the settlement may have been, or imagining again that we had seen strange shapes back at the cave when they first had come to us? The trouble was that I was not the only one who was hearing it. Cynthia was hearing it as well as I, or she acted as if she did. Either that, or I imagined that she did. It was a hell of a thing, I told myself—to question not only the reality of your environment, but the reality of yourself as well.

"Cynthia," I asked her, "are you really hearing all of this . . ."

The fire exploded in front of us. Ash and fire and burning brands sprayed across the cave and onto us. From outside came a hollow boom

and then another and something traveling very fast smacked into the rock behind us.

We leaped to our feet, all three of us. A few sticks of the fire still burned and here and there were smoking brands that had been thrown outward from the fire by the impact of the heavy bullet.

"Fletch!" a well-remembered voice bawled from the outer darkness. "Fletch!" and the rapid thud of running feet.

"Elmer!" Cynthia screamed.

Wolf was raging from the cave, a vengeful, savage metal projectile heading out into the darkness, and Elmer was storming in, the feeble firelight flickering on his metal bulk, but he never reached us. Three more strides and he would have been with us, but he never made them—or at least we didn't see him make them, or were not there when he made them.

Something—I don't know what it was—but something like a tidal wave of water, although it certainly was not water, and did not have the force of water, came flooding into the cave, swirling and rolling with a mighty churning motion that blotted out our sight and hearing and made us aware of nothing but the swirling of it.

Then it was gone and we hadn't stirred. It hadn't knocked us from our feet or whirled us about. The two of us still stood where we had been standing, but there was no sign of Elmer or of Wolf, no evidence of O'Gillicuddy and his gang. The fire was gone and so were the smoking embers thrown by the bullet. The cave floor was bare and clean. And instead of it being night, brilliant sunlight lay on the valley just beyond the cleft.

We stood there for a moment, stupefied and not quite comprehending, then Cynthia said, in a small, weak voice, "They did it. They did it without even asking us. And when there was no need to do it."

I stood there, wondering dimly if this could be a fantasy that was a piece with the fantasy of O'Gillicuddy and hoping that it was, for if one of them was a fantasy the other surely was, and in such a case in another instant we'd be back in the nighttime cave again, with the fire still burning, with Wolf rushing from the cave and Elmer storming in. But it didn't happen that way. The floor stayed smooth and clean, there was no Elmer and no Wolf and the outside sunlight went on being sunlight.

"Why did O'Gillicuddy do it?" I asked, "There was no need to do it," repeating what Cynthia had just said. "It would have taken all of three seconds for Wolf to have scattered the ghouls and Elmer was with us and everything was all right."

"It was their first chance," said Cynthia. "They did not know when they'd have a chance again. It was their first experiment and they couldn't give it up."

"You mean the shades," I said.

"Yes. Don't you see. They had to find out if it would really work. They weren't sure it would."

I shook my head. "There's more to it than that. There must be something going on we don't know about. They wanted us moved back in time, if that's what really happened."

XVIII

When we went outside it seemed quite apparent that something had happened that could only be explained by a shift in time. The valley was different, but at first it was hard to pick out what actually was different. It was daylight instead of dark, of course, and it was no longer autumn, for the trees were green. But these were surface indications only; there were other, more fundamental changes, but it took a while to get around to seeing them.

There were fewer trees, for one thing, and all of them were smaller and while I couldn't really swear to it, it seemed to me their distribution had been shifted. There were trees in places where there'd been no trees before, and there were little areas where there had been trees and now the trees were gone. The grass seemed different, too, not as lush, not as green, but with a yellow cast to it. Looking up at the cliff walls, I saw there were no cedars there, and when we'd picked up wood for the fire we'd built, clinging cedars had crawled across the walls, masking off the rock.

And that, quite suddenly, put a different face on it. Here was evidence that we'd not been thrown back in time the fraction of a second that O'Gillicuddy had talked about. Cedars were slow-growing. It had taken centuries, undoubtedly, for them to have rooted in the crevices of the rock and to have grown to the size we'd seen. Here, in this time in which we stood, they had not even rooted, would not root, perhaps, for many centuries to come.

"Cynthia," I said, speaking as gently as I could.

"We are a long ways back, aren't we?" she asked. She had seen the barrenness of the rocky cliffs and had known as well as I.

"God knows how far back," I said. "And I don't suppose our clever ghosts do, either. Not that they would care."

"Wolf's not with us," said Cynthia. "Poor Wolf. They couldn't send him back. Nor Elmer, either."

"They lied to us about Elmer," I pointed out to her. "They said he was far away. They couldn't tell us where he was."

"Maybe they didn't know."

"The hell they didn't know," I said. "Cynthia, we were sent back in time for some purpose by the ghosts."

"Perhaps they only blundered. Perhaps they didn't know."

That might be right, I admitted to myself. But purposely or by blunder, we'd really had it now. Before, up in our present time, we had been lost in

space, but now lost in time as well. There was, now, no way we could be sure of getting back. A time trap, O'Gillicuddy had said, but if he'd blundered as Cynthia had suggested, if he knew no more of time traps than he did of moving people into time, we had no assurance left.

"Fletch," said Cynthia, "how will we manage without Wolf? He was our rabbit catcher."

"We'll catch them for ourselves," I said. "As for Wolf, they couldn't have sent him back even if they'd wanted to. Wolf was a robot . . ."

"A mutant robot," she said.

"There are no mutant robots."

"I think there are," she said. "Or could be. Wolf changed. What was it that made him change?"

"Elmer threw the fear of God in him when he busted up his pals. Wolf got converted quick and switched to the winning side."

"No, it couldn't have been that. Sure, it would have scared him, but it would not have changed him the way that he was changed. You know what I think, Fletch?"

"I have no idea."

"He evolved," she said. "A robot could evolve."

"Perhaps," I said, not at all convinced, but I had to say something to stop her chattering. "Let's look around a bit to find out where we are."

"And when we are?"

"That, too," I said. "If we can manage it."

We went down the valley, moving slowly and somewhat uncertainly. There was, of course, no need to hurry now; there was no one at our heels. But it was not only that. There was, I think, in our slowness and uncertainty, a kind of reluctance to travel out into this world, a fear of what it might contain, not knowing what one might expect, and a consciousness, as well, that we were in the past, in an unknown alien time and that we had no right to be there. Somehow this world had a different texture to it—not only the lack of lush greenness in the grass or the smaller trees—but a sense of some strange difference that probably had no physical basis, but was entirely psychological.

We went on down the valley, not really going anywhere, going without purpose. The hills fell back a little and the valley widened and ahead of us other hills ranged blue into the sky. We could see that the valley we were traveling joined another valley, and in a mile or so we reached the river into which the stream we had been following poured its waters. It was a wide river, running very fast, its waters dark and oily with their speed, and as it ran it talked in a growling undertone. It was somehow a little frightening to look upon that river.

"There's something over there," said Cynthia.

I looked where she was pointing.

"It looks like a house," she said.

"I don't see a house."

"I just saw the roof. Or what

looked like a roof. It's hidden in the trees."

"Let us go," I said.

We reached the field before we really saw the house. A thin, scraggly stand of corn, knee-high or less, grew in uneven rows that were choked with weeds. There was no fence. The field stood on a small bench above the river and was hemmed in by trees. Here and there the rows were broken by standing stumps. Off to one side of the field bare skeletons of trees were piled in ragged clumps. Someone, not too long ago, had cleared a patch to make a field, hauling off the trees once they had been cut down.

The house stood across the field, on an elevation slightly higher than the patch of corn. It was a ramshackle affair even from a distance; it became more ramshackle as we approached it. A weedy garden lay off to one side of it and behind it was another structure I took to be a barn. No livestock was in sight. In fact, nothing living was in sight. The place had a vacant feel about it, as if someone had been there just a while ago, but now was gone. A sagging bench stood in front of the house, beside the open door, and beside it was a chair, with the legs cut down, the back ones shorter than the front so that anyone who sat in it would be tilted back. A battered pail lay in the yard, on its side, rolling a little in the wind. A sawed-off section of a large tree bole sat on its end, apparently a chopping block, for its upper end was scarred in places where an ax had struck. A crosscut saw rested on two pegs or nails in the cabin wall. A hoe leaned against the wall.

The smell struck us when we came up to the chopping block—a sweetish, terrible smell that hit us with a slight shifting of the wind, or perhaps only the swirling of an air current that carried it to us. We backed away and the odor lessened and then, as suddenly as it had come, was gone, although it seemed that some of it still stuck to us, that we had been contaminated by it.

"In the house," said Cynthia. "There is something in there."

I nodded. I had the horrible feeling that I knew exactly what it was.

"You stay here," I said.

For once she didn't argue with me. She was quite content to stay there.

There was no air current this time and I got almost to the door before it came at me again. As I moved forward, it came rolling out at me, overpowering in its fetidness. I cupped a hand over my mouth and nose and went through the door.

The interior was dark and I paused for a moment, gagging, fighting down the urge to vomit. My knees were wobbly and all strength seemed to have been drained from me by the stench. But I hung in there—I had to know. I thought I knew, but I must be sure and, I told myself, the poor creature who lay somewhere in that darkened room had the right to expect that a fellow

human would not turn away from him even under conditions such as these.

My eyes became more accustomed to the darkness. There was a fireplace, crudely made of native stone; a makeshift, drunken table stood to one side of it with two pans and a skillet standing on it. A chair was tipped over in the center of the room, a heap of junk lay piled in a corner, the dark shape of clothing hung from a wall. And there was a bed.

There was something on the bed.

I drove myself forward until I could see what lay upon the bed. It was black and swollen and out of the blackness two eyeballs glared back at me. But there was something wrong about it all, something terrifying, more terrifying than the dreadful stench, more frightful than the black and swollen flesh.

Two heads, not one, lay upon the pillow.

I drove myself again. Leaning over the thing upon the bed, making sure that I really saw what I thought I saw, establishing beyond doubt that both the heads belonged to the single body, shared the single neck.

Then I reeled away, half-blinded. Now I doubled up and vomited.

Still retching, I staggered toward the door; out of the corner of my eye, I saw the drunken table with the two pans and the skillet standing on it, and I lurched at them. I got a grip on all three and, bumping against the table, knocked it over. Then I went reeling out the door, with two pans clutched in one hand, the skillet in the other.

I made it across the yard and suddenly my knees gave way and I sat down hard upon the ground. I put up a hand and wiped my face and it still felt dirty. All of me felt dirty.

"Where'd you get the pans?" Cynthia asked. What a crazy thing to ask. Where did she think I'd gotten them?

"Is there a place to wash them?" I asked. "A pump or anything."

"There's a little stream down by the garden. Maybe there's a spring."

I stayed sitting. I used a hand to wipe my chin and there was vomit on it when it came away. I wiped it on the grass.

"Fletch?"

"Yes."

"Is there a dead man in there?"

"Days dead. A long time dead," I said.

"What are we going to do?"

"What do you mean—what are we going to do?"

"Shouldn't we bury him or something?"

I shook my head. "Not here. Not now. What difference does it make? He'd not expect us to."

"What happened to him? Could you tell what happened?"

"Not a chance," I said.

She stood looking at me as I got unsteadily to my feet.

"Let's go and wash the pans," I said. "And I'd like to wash my face.

Then let's pick some vegetables out of that garden . . ."

"There's something wrong," she said. "More wrong than just a dead man."

"You said back there," I told her, "that we should find out when we were. I think I have just found out."

"You mean the man?"

"He was a monster," I said. "A mutation. A man who had two heads, a two-headed man."

"But I don't see . . ."

"It means we are thousands of years back. We should have suspected it. The fewer trees. The yellow color of the grass. The Earth is only now groping back from war. A mutant such as a two-headed man would have no survival value. There may have been many such people in the years following the war. Physical mutants. A thousand years or so and they'd all be gone. And yet there's one lying in that house."

"You must be mistaken, Fletch."

"I hope I am," I said. "I'm fairly sure I'm not."

I don't know if I just happened to look up at the looming hillside or if some flicker of motion had alerted me, but when I looked, high up I caught a glimpse of something running, not running, really, for you could not see its feet, but something floating rapidly along, a cone-shaped thing that was moving very fast. I saw it for an instant only, then it was gone from sight. But I couldn't be mistaken. I knew I simply couldn't be.

"Did you see it, too, Cynthia?"

"No," she said, "I didn't. There was nothing there."

"It was the census taker."

"It couldn't be," she said. "Not if we're as far back as you say we are. Unless . . ."

"That is it," I said. "Unless."

"You're thinking what I'm thinking?"

"I wouldn't be surprised. The census taker could be your immortal man."

"But the manuscript said the Ohio."

"I know it did. But look at it this way: Your ancestor was an old, old man when he wrote the letter. He relied on memory and memory is a tricky thing. Somewhere he had heard about the Ohio. Maybe the old man who told him the story might have mentioned it, not as the river where the incident had happened, but as a river in the area. Through the years it would have been simple for him to come to think the story had happened on the Ohio."

She sucked in her breath, excited. "It fits," she said. "All of it. There is the river and there are hills. This could be the place."

"If it weren't the Ohio," I said, "if he was mistaken about the Ohio, it could be any one of a thousand places. A river and some hills. That's not much to go on, is it?"

"But he said the man was a man."

"He said that he looked like a man, but he knew he was no man.

Something strange about him, something unhuman. That was when he first saw him. The thing he first thought was not a man could later have appeared to him very much a man."

"You think this could be it?"

"I suppose I do," I said.

"If it was the census taker, why should he run from us? He would know us—no, that's wrong. Of course he wouldn't know us. He hasn't met us yet. It will be centuries yet. Do you think that we can find him?"

"We can try," I said.

We went plunging up the hillside. We forgot about the pans. We forgot about the garden and the vegetables. I forgot about the vomit on my chin. The way was steep and rough. There were trees and clumps of tangled bushes. There were great ledges of rock we could not climb, but had to skirt around. In places we clawed our way, hanging onto trees or brush to pull ourselves ahead. There were times when we went on hands and knees.

As I climbed I asked myself, far in the back of my mind, why there should be so much urgency in the situation as to send us clawing madly up the hill. For if the house of the immortal man was somewhere on the hilltop, we could take our time and it still would be there when we reached the crest. And if it were not, then there was no sense in it at all. If it were only the census taker that we sought, he could even now be well hidden or very far away.

But we kept on climbing up that tortuous slope of ground and finally the trees and brush thinned out and ahead of us we saw the bald top of the hill and the house that sat on top of it—a weather-beaten house with the weight and sense of years upon it, but in no way the sort of house in which I'd found the dead man. A neat picket fence, newly painted white, ran across its front and all around it, and there was a flowering tree, a blaze of pink, beside the door and roses that ran along the fence.

We flopped down on the ground and lay there, panting. The race was won and the house was there.

Finally we sat up and looked at one another. Cynthia said, "You're a sight. Let me clean you up." She took a handkerchief out of her jacket pocket and scrubbed my face.

"Thanks," I said when she was through. We got to our feet and walking side by side, sedately, as if we might have been invited guests, we went up to the house.

As we went through the gate we saw that a man was waiting for us at the door.

"I had feared," he said, "that you might have changed your mind, that you weren't coming."

Cynthia said, "We are truly sorry. We were somewhat delayed."

"It's perfectly all right," said the man. "Lunch just reached the table."

He was a tall man, slender, dressed in dark slacks and a lighter jacket. He wore a white shirt, open at the throat. His face was deeply

tanned, his hair was wavy white and he wore a grizzled moustache, neat and closely clipped.

We went into the house, the three of us. The place was small, but furnished with a graciousness that would not have been expected. A sideboard stood against one wall and upon it sat a jug. A table stood in the center of the room, covered with a white cloth and set with silver and sparkling crystal. There were three places. There were paintings on the wall and a deep-piled carpet on the floor.

"Miss Lansing, please," said our host, "if you will sit here. And Mr. Carson opposite you. Now we can begin. The soup's still hot, I'm sure."

There was no one else. There were just the three of us. And surely, I thought, someone other than our host must have prepared the luncheon, although there was no evidence of anyone who had, nor of a kitchen, either. But the thought was a fleeting one that passed away almost as soon as it had occurred, for it was the kind of thought that did not fit in with this room or with the tables.

The soup was excellent, the salad crisp and green, the chops were done to a perfect turn. The wine was a pure delight.

"It may interest you to know," said our gracious host, "that I have given some very close thought to the possibilities of the suggestion you made, not entirely flippantly I hope, the last time that we met. I find it a most intriguing and amusing thing that it might be possible to package the experiences, not only of one's self, but of other people. Think of the hoard we might then lay up against our later, lonely years when all old friends are gone and the opportunity for new experiences has withered. All we need to do then is to reach up to a shelf and take down a package that we have bottled or preserved or whatever the phrase might be, say from a hundred years ago, and uncorking it, enjoy the same experience again, as sharp and fresh as the first time it had happened."

I heard all this and was surprised, of course, but not as surprised as I should have been, somewhat after the fashion of a man who dreams a fantasy and knows even as he dreams it that it is a fantasy, but one that seems beyond his power to do anything about.

"I have tried to imagine," said our host, "the various ingredients one might wish to compound in such a package. Besides the bare experience itself, the context of it, one might say, he should want to capture and hold all the subsidiary factors which might serve as a background for it—the sound, the feel of wind and sun, the cloud floating in the sky, the color and the scent. For such a packaging, to give the desired results, must be as perfect as one can make it. It must have all those elements which would be valuable in invoking

the total recall of some event that had taken place many years before. Would you not say so, Mr. Carson?"

"Yes," I said, "I suppose I do."

"I have wondered, too," he went on, "by what criterion one should select the experiences to be packaged. Would it be wise to pick only the joyful ones or should one mix in a few that are somewhat less than joyful? Perhaps it might be well to preserve a few that carried a keen embarrassment, if for no other reason than to remind oneself to be humble."

"I think," said Cynthia, "that one should select a wide spectrum, being sure, of course, to lay in a large supply of the more satisfactory ones. If there should be no later urge to use some of the less satisfactory ones, they could be safely left upon the shelf, untouched."

"Now, do you know," said our host, "that had been my thought exactly."

It was all so fine and comfortable and friendly, so very civilized. Even if it were not true, one wanted to believe it was; I found myself holding my breath as if, by breathing, I might shatter an illusion.

"There is another thing one must take into consideration also," he said. "Given such an ability, does one remain satisfied with the harvesting of experiences in the natural course of life or does one attempt to create experiences he has reason to believe may serve him in the future?"

"I believe," I told him, "that it might be best to gather as one goes along, without making any special effort. It would seem more honest that way."

"As an auxiliary to all of this," he said "I have found myself speculating upon a world in which no one ever grew up. I admit, of course, that it is a rather acrobatic feat of thinking, not entirely consistent, to leap from the one idea to the other. In a world where one was able to package his experiences, he would merely be able to relive at some future time the experiences of the past. But in a world of the eternally young he'd have no need of such packaging. Each new day would bring the same freshness and the everlasting wonder inherent in the world of children. There would be no realization of death and no fear born of the knowledge of the future. Life would be eternal and there'd be no thought of change. One would exist in an everlasting matrix and while there would be little variation from one day to the next, one would not be aware of this and there'd be no boredom. But I think I may have dwelled upon this subject for too great a length of time. I have something here to show you. A recent acquisition."

He rose from the table and strode over to the sideboard, picking up the jug. He brought it back and handed it to Cynthia.

"It is a hydria," he said. "A water jug. Sixth Century Athenian, a fine

example of the black-figure style. The potter took the red clay and tamed it a little with an admixture of the yellow and filled out the engravings with a brilliant black glaze. If you'll look down at the base of it, you'll see the potter's mark."

Cynthia twisted the jug about. "Here it is," she said.

"In translation," said our host, "it reads, 'Nicosthenes made me.' "

She handed it across the table to me. It was heavier than I'd thought. Engraved upon its side, inlaid with the glaze, a stricken warrior lay, with his shield still strapped upon his arm, grasping his spear, butt upon the ground, with the blade pointed upward. Twirling the jug, another figure came into view—another warrior leaning dejectedly upon his shield, with his broken spear trailing on the ground. You could see that he was tired and beaten; fatigue and defeat was etched into every line of him.

"Athenian, you say?"

He nodded. "It was a most lucky find. A prime example of the best of Greek ceramics of the period. You will notice that the figures are stylized. The potters of those days never thought of realistic accuracy. They were concerned with ornament, not with form."

He took the jug from me and put it back upon the sideboard.

"I fear," said Cynthia, "that we must leave. It is getting late. It was a lovely lunch."

It all had been strange before, although quite comfortable, but now the strangeness deepened and reality got foggy and I do not recall much more until we were out the door and going through the gate of the picket fence.

Then the reality came back again and I spun around. The house was there, but it was more weather-beaten, more ruined than it had seemed. The door stood half open, swinging in the gale that swept the hilltop and the ridgepole sagged to give it a swayback look. Panes of glass were broken from the windows. There was no picket fence or roses, no blooming tree beside the door.

"We've been had," I said.

Cynthia gasped. "It was so real," she said.

The thing that hammered in my brain was why he, whoever he had been, had done it. Why play so elaborate a piece of magic? Why, when it might have served his purpose better, had he not allowed us to come upon a deserted and time-ruined house in which it would have been apparent no one had lived for years? In such a case we'd simply have looked it over and then gone away.

I strode up to the door, with Cynthia following, and into the house. Basically it was the same as it had been, although no longer neat and gracious. There was no carpet on the floor, no paintings on the wall. The table stood in the center of the room and the chairs were there, as we had sat in them, pushed back the way

we'd left them when we'd gotten up to leave. But the table was bare. The sideboard stood against the wall and the jug still stood upon it.

I went across the room and picked it up. I carried it to the door where the light was better. It was the same piece, so far as I could see, as the one our host had shown us.

"Do you know anything of Greek ceramics?" I asked Cynthia.

"All that I know was that there was black-figure pottery and red-figure pottery. The black came first."

I rubbed a thumb across the potter's mark.

"You don't know, then, if this says what he said it did."

She shook her head. "I know potters used such marks. But I couldn't read one. There's something else about it, though. It looks too new, too recent, as if it had come out of the kiln only a little while ago. It shows no weathering or aging. Usually such pottery is found in excavations. It has been in the soil for years. This one looks as if it never had been buried."

"I don't think it ever has—been buried, I mean," I said. "The Anachronian would have picked it up at the time that it was made, or very shortly after, as a prime example of the best work being done. It has been carefully taken care of as a part of his collection through all the centuries."

"You think that's who he is?"

"Who else could he be? Who else, in this battered age, would have a piece like this?"

"But he is so many people. He is the census taker and the distinguished man who had us to lunch and the other, different kind of man my ancestor saw."

"I have a hunch," I said, "he can be anything at all. Or at least make one think he's anything at all. I rather suspect that, as the census taker, he shows us his actual self."

"Then in that case," said Cynthia, "there is a treasure trove underneath our feet, deep down in the rock. All we have to do is find the entrance to the tunnel."

"Yes," I said, "and once we found it, what would we do with it? Just sit around and look at it? Pick up a piece and fondle it?"

"But now we know where it is."

"Exactly. If we can get back to our own present, if the shades know what they're doing, if there really is a time trap, and if there is it doesn't take us ten thousand years into the future as measured by our natural present time . . ."

"You believe all that?"

"Let's say this: I recognize them as possibilities."

"And, Fletch, if there is no time trap? If we're stuck back here?"

"We'll do the best we can. We'll find a way."

We went out the door and started down the bluff. Below us lay the river and the cornfield, the house where the dead man lay, the weedy garden by the house.

"I don't think," said Cynthia, "that there will be a time trap. The shades are no scientists; they are bunglers. A fraction of a second, they said, and then they sent us here."

I grunted at her. This was no time for talk like that. But she persisted. She put out a hand to stop me and I turned to face her.

"Fletch," she said, "there has to be an answer. If there is no time trap."

"There may be one," I said.

"But if there's not?"

"In such a case," I said, "we'll come back to that house down there. We'll clean it out. It's a place to live, there are tools to work with. We'll save seed from the garden so we can plant other gardens. We'll fish, we'll hunt, we'll live."

"And you'll love me, Fletch?"

"Yes," I said, "I'll love you. I guess I already do."

XIX

We went down across the cornfield and I wondered as we went if Cynthia might be right—not because O'Gillicuddy and his band were bunglers, but because they were Cemetery. O'Gillicuddy, when I'd asked him, had carefully pointed out that Cemetery had no hold on them because there was nothing Cemetery could do against them and nothing that they wanted. On the face of it, this would seem to be quite true, but how could one be certain it was true? And what better tool could Cemetery use to get rid of us than O'Gillicuddy and his time ability? Surely if we were placed in another time and no way to get back, Cemetery would be certain of no further interference.

I thought of my own pink world of Alden—Cynthia's world, as well. I thought of Thorney pacing up and down his study, talking of the long-lost Anachrons and fuming at the indiscriminate treasure hunters who looted primitive sites and robbed archaeologists of their chance to study ancient cultures. And I thought with a bit of bitterness of my own fine plans to make a composition of the Earth. But mostly, I guess, I thought of Cynthia and the rotten deal she'd gotten. She, of all of us, had had the least to gain from this wild adventure. She had started out by serving as an errand boy for good old Thorney, and see what it had got her.

If there were no time trap, what could we do other than what I'd told her we would do? I could think of nothing else to do, but it would be a bleak life at the best. It was not the kind of life for Cynthia—nor for me. Winter would be coming soon, most likely, and if there were no time trap, we'd have little time to get ready for it. We'd have to tough it through somehow, and when spring had come around we might have, by that time, figured out a better way.

I tried to quit thinking about it, for it hadn't happened yet and there might be no need to think of it, but try as I might I couldn't seem to get my mind away from it. The very hor-

ror of the prospect seemed to fascinate me.

We came down into the river valley and walked along the river until we came to the hollow that led to the cliff where we'd holed up after fleeing from the ghouls. Neither of us were saying anything. Neither of us, I suspect, trusted ourselves to speak.

We started up the hollow and when we turned the bend just ahead of us, we could see the cliffs and we'd be almost there. We'd not have long to wait. Fairly soon we'd know.

We rounded the bend and stopped dead in our tracks. Standing just this side of the cliffs were two war machines. There was no mistaking them. I think I would have known what they were in any case, but from having heard Elmer talk of them so often, I recognized them immediately.

They were huge. They had to be huge, to carry all the armaments they packed. A hundred feet long at least, and probably half as wide and looming twenty feet or more into the air. They stood side by side and they were most unlovely things. There was strength and ugliness in them. They were monstrous blobs. It made a man shiver just to look at them.

We stood there looking at them and they looked back at us. You could feel them look.

One of the machines spoke to us—or at least someone in their direction spoke to us. There was no way to tell which machine was speaking.

"Don't run away," it said. "Don't be frightened. We want to talk to you."

"We won't run," I said. There'd have been little use in running. If they wanted us, they'd have us in a minute. I was sure of that.

"No one will listen," said the machine, rather piteously. "Everyone flees from us. We would be friends to the human race, for we ourselves are human."

"We'll listen to you," said Cynthia. "What have you to say?"

"Let us introduce ourselves," it said. "I am Joe and the other one is Ivan."

"I am Cynthia," said Cynthia, "and the other one is Fletcher."

"Why don't you run from us?"

"Because we're not afraid," said Cynthia. I could tell from the way she said it she was very much afraid.

"Because," I said, "there'd be no use of running."

"We are two old veterans," said Joe, "long home from the wars and most desirous of doing what we can to help rebuild a peaceful world. We have wandered very far and the few humans we have found have had no interest in what we might do for them. In fact, it seems they have a great aversion to us."

"That is understandable," I said. "You, or others like you, probably shot the hell out of them before the war came to an end."

"We shot the hell out of no one," said Joe. "We never fired a shot in anger. Neither one of us. The war was done with before we got into it."

"And how long ago was that?"

"By the best computation that we have, a little over fifteen hundred years ago."

"Are you sure of that?" I asked.

"Very sure," said Joe. "We can calculate it more closely if it means that much to you."

"It doesn't matter," I said. "Fifteen hundred is quite close enough."

And so, I told myself, O'Gillicuddy's fraction of a second had turned out to be more than eighty centuries.

"I wonder," said Cynthia, "if either one of you recall a robot by the name of Elmer . . ."

"Elmer!"

"Yes, Elmer. He said he was a supervisor of some sort on the building of the last of the war machines."

"How do you know Elmer? Can you tell me where he is?"

"We met him," I said, "in the future."

"That can't be true," said Joe. "You do not meet people in the future."

"It's a long story," I said. "We'll tell it to you sometime."

"But you must tell me now," said Joe. "Elmer is an ancient friend. He worked on me. Not on Ivan. Ivan is a Russian."

It was quite apparent there was no way to get away from them. Ivan hadn't said a word, but Joe was set to talk. Having finally found someone who would listen to him, he was not about to quit.

"There isn't any sense of you standing out there and us sitting here," said Joe. "Why don't you come aboard?"

A panel slid down in his front and a stairway came telescoping out. When the panel slid down it revealed a small, lighted room.

"It's a mechanic's berth," said Joe. "Place for the mechanics to stay and be protected if they have to work on me. Not that I suspect any of them ever did with any war machine. They never did with me, of course, but I don't think they did with many of the others, either. When something happened to us it was usually pretty bad. It took a lot to send us running for repairs. By the time we came to run there wasn't too much left. Few of us, I imagine, ever made it back home. That was the tradition in those days. Of course, we were self-repairing, to a degree at least. We could keep ourselves in operation, but we couldn't do too much when the damage got too massive.

"Well, come on aboard."

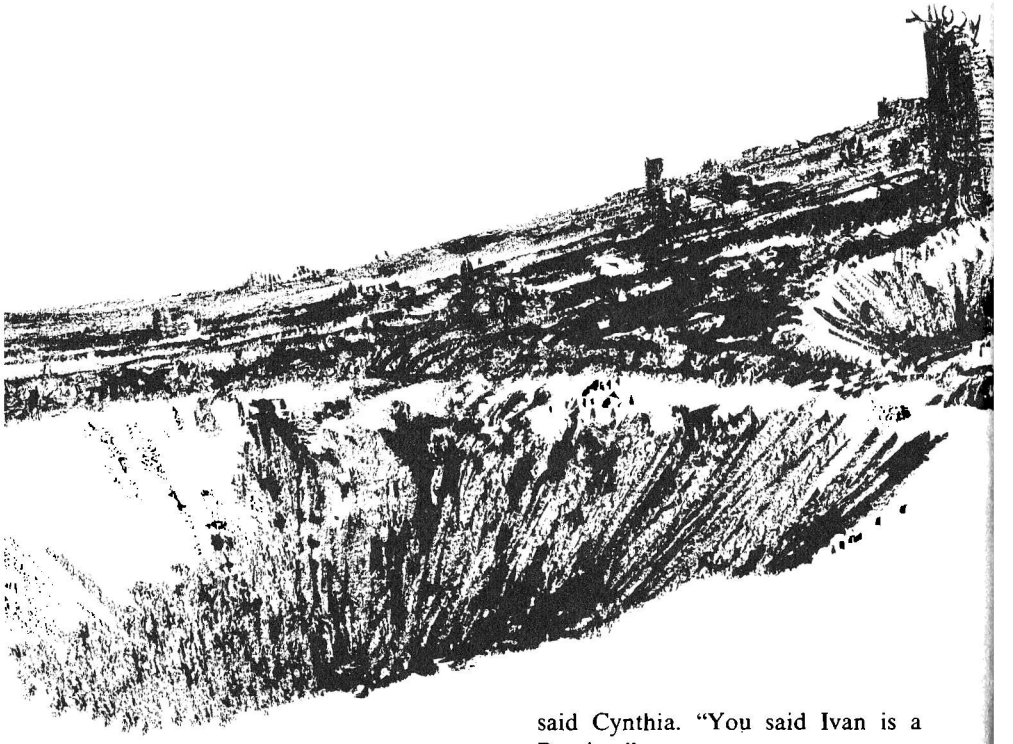
"I think it will be all right," said Cynthia.

I wasn't as sure as she was.

"Of course it will be all right," boomed Joe. "It is quite comfortable. Small, but comfortable. If you are hungry, I have the capacity to mix you nourishment. Not very tasty, I suppose, but with some value as a nutrient. A quick snack for our hypothetical mechanic if he should get hungry on the job."

"No, thank you very much," said Cynthia. "We just now had lunch."

We climbed the stairs into the

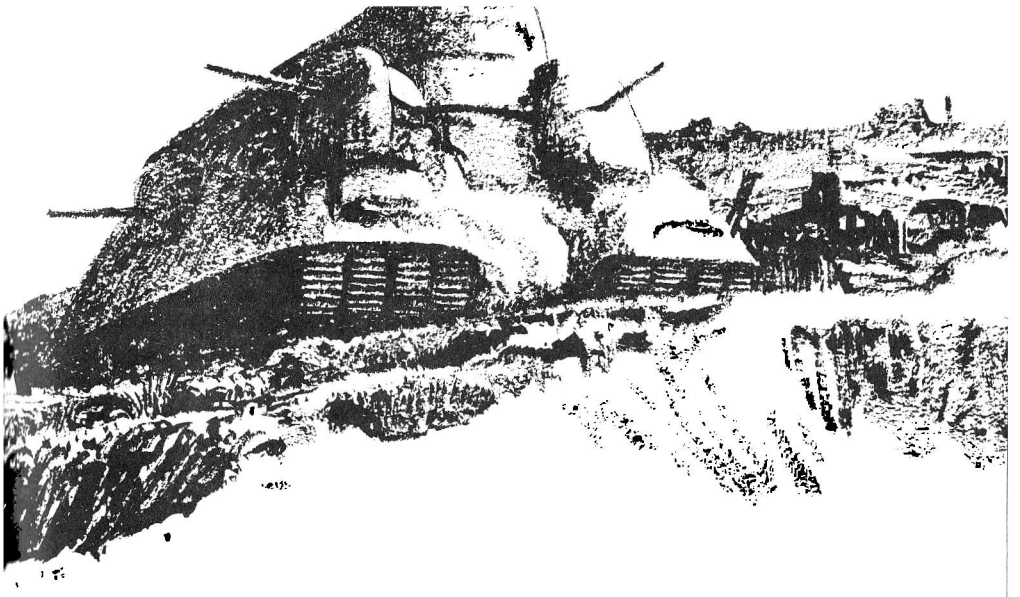


room. There was a table in one corner, a double-decker bunk, a couch along one wall. We sat down on the couch. The place was, as Joe had said, small, but comfortable.

"Welcome aboard," said Joe. "I am very glad to have you."

"One thing you said interests me," said Cynthia. "You said Ivan is a Russian."

"Ah, yes, indeed he is. I suppose you think that the Russian was an enemy, as he surely was. But how we came together is the story of our life. Once I had been fitted out and made ready for the war, loaded with munitions and all equipment tested, I set out across Canada and Alaska for the Bering Strait, traveling under-



water for a few short miles to reach Siberia. I reported back occasionally on my progress, but not too often, for to do so might have meant detection. I had been given certain objectives, of course, and one by one I reached them, to find in every instance they had been neutralized. Shortly after I reached the first objective I could not raise the homeland and, in fact, after that, I never raised home base. I was quite cut off. At first I thought it was only a temporary failure of communications, but after a time concluded that there was something much more significant than communication failure. I wondered if my country had been finally beaten to its knees or if the few military centers might have gone even deeper underground, but whatever might be the reason for the failure, I told myself, I would carry out my duty. I was a patriot, a true-blue patriot. You understand the term?"

"I am a history student," Cynthia said. "I understand the concept."

"So, driven by my bitter patriotism, I went on. I visited all my assigned objectives and they all had been reduced. I did not stop there. I prowled, seeking what in those days were called targets of opportunity. I monitored the atmosphere for signals that might betray hidden bases. But there were no signals, neither ours or theirs. There were no targets of opportunity. At times I came upon small communities of people who ran or hid from me. I did not bother them. As targets, they were too insignificant. You do not use a nuclear charge to kill a hundred people. Especially when the death of

those hundred would have no possible tactical advantage. All I found were ruined cities in which still might live tiny, pitiful huddles of humanity. I found a blasted countryside, great craters, miles across, blasted to the bedrock, drifting clouds of poison, miles of once-rich land reduced to nothing—occasional clumps of dead or dying trees and not a blade of grass. There is no way to tell you how it was, no way for you to imagine how it might have been.

"So I turned homeward, going slowly, for there was no hurry now and I had much to think about. I shall not burden you with the thoughts, the sorrow and the guilt. I was a patriot no longer. I had been cured of patriotism."

"There is one thing that puzzles me," I said. "I know there is more than one of you—human beings, that is. Perhaps several of you. Yet you speak of yourself as I."

"There were at one time," Joe said, "five of us, five men who were willing to sacrifice their bodies and their positions as human beings to man a war machine. There was a professor of mathematics, a most distinguished scholar; a military man, a general of the armies; an astronomer of considerable repute; a former stock broker; and the last a most unlikely choice, one might think—a poet."

"And you are the poet?"

"No," said Joe. "I don't know what I am. I think I am all five of us together. We are separate minds no longer. We have become, in some strange way we cannot understand, a single mind. I am amazed at times that I, as this mind, can still recognize myself as one or another of the five of us, but each time I have this sense of recognition it is not actually the recognition of another, but rather of myself. As if interchangeably and at different times I can be any one of us. But mostly I am not any one of us, but all of us together.

"It is the same with Ivan, although there were only four of him. But now there is likewise only one of him."

"We are leaving Ivan out of the conversation," said Cynthia.

"Not at all," said Joe. "He is a most active listener. He could speak either for himself or through me if he had the wish. Do you wish to, Ivan?"

A deeper, thicker voice said, "You tell it so well, Joe. Why don't you go ahead?"

"Well, as I was telling you," said Joe, "I was heading home, I had come to a stretch of prairie that seemed to go on forever. Steppeland, I suppose. It was bleak and lonely and there seemed no end to it. It was there that I spotted old Ivan, here. He was far away and not much more than a speck, but when I used a telescopic optic, I knew what he was—an enemy of mine. Although, to tell the truth, by that time it was rather difficult to think in terms of enmity. Rather, I felt a thrill at just knowing that out there on the plain

was something like myself. Strange identity, perhaps, but identity. Ivan told me later that he had much the same reaction, but the point was that neither one of us could know what the other thought. So we both began maneuvering and we were both rather tricky. There were a couple of times when I had Ivan in my sights and could have unloaded on him, but something held me back and I couldn't do it. Ivan, for some screwy Russian reason, has never been willing to admit that the same thing happened with regard to me, but I am sure it did. Ivan was too good a war machine for it not to happen. But anyway, there were the two of us, sashaying back and forth, and after a day or two of this, it got ridiculous. So I said something to this effect: 'O.K., let's break it off. We know damn well neither of us wants to fight. We're probably the only two surviving war machines and the war is over and there is no longer any need of fighting, so why can't we be friends?' Old Ivan, he didn't protest none, although it took a little time for him to agree to it, but finally he did. We rumbled straight toward one another, moving slow and easy, until we bumped noses. And we just sat there, nose to nose, and we stayed there, for I don't know how long—maybe days or months or years. There wasn't really anything that we could do. The jobs we'd had had disappeared. There was in the entire world no longer any need of war machines. So we stayed out on that Godforsaken plain, the only living things there were for miles around, with our noses bumped together. We talked and we got to know one another so well that finally for long periods there was no need to talk. It was good just to sit there, doing nothing, thinking nothing, saying nothing, nose to nose with Ivan. It was enough that we were together, that we were not alone. It may seem strange to say that two ungainly, ugly machines got to be friends, but you must remember that while we might be machines, we were still human beings. At that time we were not single minds. We were five minds and four minds, nine minds all together, and all of us were intelligent and well-educated men and there was a lot to talk about.

"But finally both of us began to see how footless and how pointless it was just to stay sitting there. We began to wonder if there might be people in the world that we could help. If man was going to recover from what the war had left, he would need all the help that he could get. Among the nine of us we had a lot of savvy, of a kind that man might need and each of us was a source of power and energy if ways could be found for man to make use of that power and energy.

"Ivan said there was no use going west. Asia was finished, he said, and he'd roamed through enough of Europe to know it was finished, too. No social organization of any kind was left there. There might be scattered

bands of men already sunk in savagery, but not enough of them to form any sort of economic base. So we headed east, for America, and there, in places, we found little scattered settlements—not too many, but a few—where man was slowly getting on his feet, at a point where he could use the kind of help we had to offer. But so far we have been of no help at all. The little settlements will not listen to us. They run screaming for the woods whenever we show up and no matter how we try to tell them we're only there to help they will not respond in any way at all. You two are the first humans who would talk with us."

"The trouble with that," I told him, "is that talking to us will do little good. We aren't of this time. We are from the future."

"I remember now," said Joe. "You said that you knew Elmer from the future. Where is Elmer now?"

"As of right now, he is somewhere among the stars."

"The stars? How could old Elmer . . ."

"Listen to me," I said. "Let me try to tell you. Once it became apparent what was about to happen to the Earth, a lot of people went out to the stars. One shipload of them would colonize one planet and another shipload another. After some ten thousand years of this, there are an awful lot of humans living on an awful lot of planets. The people who were recruited for the star trips were the educated, the skilled, the technological people, the kind of people who would be needed to establish a colony in space. What were left were the uneducated, the untrained, the unskilled. That is why, even in this time, the settlements you have been trying to help need the help so badly. That probably is why they refuse your help. What is left is the equivalent of the peasants, the ne'er-do-wells . . ."

"But old Elmer, he wasn't really people . . ."

"He was a good mechanic. A new colony would need folks like him. So he went along."

"This matter of Elmer in the future and of people fleeing into space," said Joe, "is a most intriguing thing. But how come you are here? You said that you would tell us. Why don't you just settle back and tell us now?"

It was just like old home week. It was all so good and friendly. Joe was a nice guy and Ivan wasn't bad. For the first time since we had hit the planet, it was really nice.

So we settled back and between the two of us, first me, then Cynthia, and then me again, we told our story to them.

"This Cemetery business still must be in the future," said Joe. "There is no sign of Cemetery yet."

"It will come," I said. "I wish I could recall the date when it was started. Perhaps I never knew."

Cynthia shook her head. "I don't know, either."

"There's one thing I am glad to know about," said Joe. "This matter of a lubricant. It was something we were a bit concerned about. We know that in time we'll need it and we had hoped we could contact some people who would be able to supply us with it. If they could get their hands on the crude and supply it to us, we could manage to refine it to a point where it could be used. There wouldn't have to be a lot of it. But we haven't been having too much luck with people."

"You'll get it, all refined and ready, according to your specifications, from Cemetery," I told him. "But don't pay the price they ask."

"We'll pay no price," said Joe. "They sound like top-grade lice."

"They are all of that," I said. "And now we have to go."

"To keep your appointment with the future."

"That is right," I said. "And if it happens as we hope it will, it would be nice to find you there and waiting for us. Do you think you could manage that?"

"Give us the date," said Joe, so I gave him the date.

"We'll be there," he said.

As we started down the ladder, he said, "Look, if it doesn't work. If there's no time trap there. Well, if that should happen, there's no need to go back to that shack. Horrible job, you know, cleaning it up, dead man and all of that. Why not come and live with us? It's nothing very fancy, but we'll be glad to have you. We could go south for winter and . . ."

"Thanks, we will," said Cynthia. "It would be very nice."

We went on down the ladder and started walking up the hollow. The cleft in the cliff lay just ahead and before we reached it, we turned around to look back at our friends. They had switched around so that they were facing us and we raised our hands to them, then went toward the cleft.

We were almost in the cleft when the surging wave that wasn't water hit us, and as it receded, we stood shaken and in dismay.

For we stood, not in the hollow as we remembered it, but in the Cemetery.

XX

The cliff was still there, with the twisted cedars growing on its face, and the hills were there and the valley that ran between them. But it was wilderness no longer. The stream had been confined between walls of lain rock, done most tastefully, and the greensward, clipped to carpet smoothness, ran from the foot of the cliff out to the rock-work channel. Monuments stood in staggered rows and there were clumps of evergreen and yew.

I felt Cynthia close against me, but I didn't look at her. Right then I didn't want to look at her. I tried to keep my voice steady. "The shades have messed it up again," I said.

I tried to compute how long it might take for the Cemetery to stretch from its boundary as we'd found it to this place and the answer had to be many centuries—perhaps as far into the future as we had been sent into the past.

"They couldn't be this bad at it," said Cynthia. "They simply couldn't be. Once maybe, but not twice."

"They sold us out," I said.

"But they could have sold us out," she said, "when they sent us so far back into the past. Why should we be sold out twice? If they simply wanted to get rid of us, they could have left us where we were. In such a case, there would have been no time trap. Fletch, it makes no sense."

She was right, of course. I hadn't thought of that. It did simply make no sense.

"It must be," I said, "just their slab-sidedness."

I looked around the sweep of Cemetery.

"We might have been better off," I said, "if we had stayed with Joe and Ivan. We'd have had a place where we could have lived and a way to travel. We could have gone with them everywhere they went. They would have been good company. I don't know what we have here."

"I won't cry," said Cynthia. "I'll be damned if I will cry. But I feel like it."

I wanted to take her in my arms, but I didn't. If I had touched her, she would have busted out in tears.

"We could see if the census taker's place is where it was," I said. "I don't think it will be, but we can have a look. If I know Cemetery they will have evicted him."

We walked down the hollow and the walking was easy. It was like walking on a carpet. There was no uneven ground, no boulders that we had to dodge around. There were just the monuments and the clumps of evergreen and yew.

I glanced at some of the dates on the monuments and there was no way of telling, of course, how recent they might have been, but the dates I saw were evidence that we were at least thirty centuries beyond the time we'd hoped to reach. For some reason, Cynthia paid no attention to the dates, and I didn't mention them. Although, come to think of it, perhaps she did and made no mention of them, either.

We reached the river and it seemed much the same as it had before, except that the trees that had grown along its banks were gone to give way to the monuments and landscaping that marked the Cemetery.

I was looking at the river, thinking of how, in spite of all events, some things manage to endure. The river still flowed on, tumbling down the land between hills and there was no one who could stay its hurry or reduce its force.

Cynthia caught my arm.

She was excited. "Fletch, isn't that where we found the census taker's house?"

She was pointing toward the bluffs and when I looked where she was pointing, I gasped at what I saw. Not that there was anything about it that should have made me gasp. Except, perhaps, the utter beauty of it. What took my breath away, I am sure, was how the entire scene had changed. We had seen the place (in our own time bracket) only hours before. Then it had been a wilderness—thick woods running down to the river, with the roof of the house in which the dead man lay barely showing through the trees, and with the bare, knob-like blufftops shouldering the sky. Now it was all neat and green and very civilized, and atop the bluff where had stood the little weather-beaten house where we had enjoyed lunch with a charming gentleman now stood a building that came out of a dream. It was all white stone, but with a fragile air about it that seemed to rule out the use of stone. It lay low against the blufftop and its front had three porches supported by faery pillars that, from this distance, seemed to be pencil-thin, and narrow, rainbow-flashing windows all along its length. A flight of long stairs ran down to the river.

"Do you think . . ." she asked, stopping in mid-sentence.

"Not the census taker," I said. "He'd never build a place like that."

For the census taker was a lurker, a hider, a scurrier. He scurried all about, trying very hard that no one saw him, and snatched from beneath their noses those little artifacts (not yet artifacts, but artifacts at some time in the future) that would tell the story of those he was hiding from.

"But it is where his house was."

"So it is," I said, at a loss for anything else that I might say.

We walked along the river, not hurrying but looking at the place atop the bluff, finally coming to the place where the stairs came down to the river, ending on the riverbank with a plaza paved with great blocks of stone, with room made here and there, for plantings of—what else?—yew and evergreen.

We stood side by side, like a couple of frightened children confronted by a thing of special wonder, looking up the flight of stairs to the gleaming wonder that stood atop the bluff.

"Know what this reminds me of," said Cynthia. "The stairway up to Heaven."

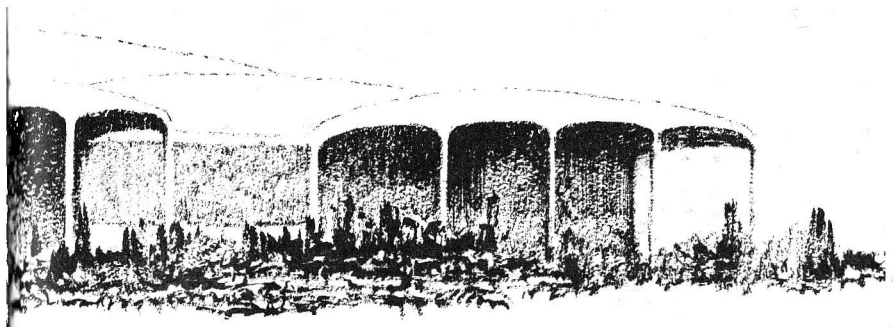
"How could it? You've never seen the stairway up to Heaven."

"Well, it looks the way the old ones wrote about it. Except there should be trumpets sounding."

"Do you think that you can make it without the trumpets sounding?"

"I think," she said, "it is likely that I can."

I wondered what it was that was making her so light-hearted. Myself, I was too puzzled and upset to be the least light-hearted. The entire thing was pretty, if you cared for prettiness, but I didn't like particularly the placement of the building where the census taker's house had been. That

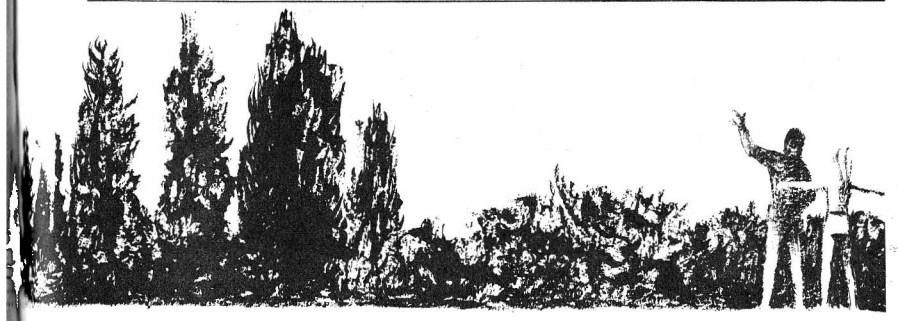


there must be some connection between the two of them seemed a reasonable conclusion and I found myself hard put to arrive at that connection.

The stairs were long and rather steep and we took our time. We had the stairway to ourselves, for there was no one else about, although a short time earlier there had been three or four people standing on one of the porches of the building.

The stairs at the blufftop ended in another plaza, much larger than the one at the river's edge and we walked across this toward the central porch. Up close, the building was even more beautiful than it had been at a distance. The stone was snowy white, the architectural lines were refined and delicate and there was about the whole of it a sort of reverential aura. No lettering was sculptured anywhere to tell one what it was and I found myself wondering, in a dumb, benumbed sort of way, exactly what it was.

The porch opened into a foyer, frozen in that hushed dimness that one associates with museums or with picture galleries. A glassed-in case stood in the center of the room, with a light playing on the object standing in the case. Echoing from deep inside the building could be heard the sounds of footfalls and of voices.



We came up to the case and there, sitting in it, was that very jug that we had been shown at lunch. It had to be the same, I told myself. No other warrior could have leaned so dejectedly upon his shield, no other broken spear trail quite so defeated on the ground.

Cynthia had leaned down to peer into the case and now she rose. "The potter's mark is the same," she said. "I am sure of that."

"How can you be sure? You can't read Greek. You said you couldn't."

"That's true, but you can make out the name. Nicosthenes. It must say 'Nicosthenes made me.' "

"He might have made a lot of them," I said. I don't know why I argued. I don't know why I fought against the almost certain knowledge that here was the very piece that had stood on the sideboard in the census taker's house.

"I am sure he did," she said. "He must have been a famous potter. This must have been a masterpiece for the census taker to have selected it. And no potter, once he'd made one, would duplicate a masterpiece. It probably was made for some great man of the time . . ."

"Perhaps for the census taker."

"Yes," she said. "That's right. Perhaps for the census taker."

I was interested in the jug and while I heard a door open, I paid no attention to it. I heard Cynthia gasp and turned around. And there, just outside a door that opened on the foyer, he stood, the great, almost unbelievable, lumbering bulk of him.

"Hello, Miss," said Elmer. "It's been a long time, Fletch."

"Why, no . . .," I began and then I stopped myself. It had been only a few hours for Cynthia and myself, but for Elmer it had been a long, long time, indeed.

"Elmer," I said, and then I got all choked up and could say no more.

"I am glad," said Elmer, "that you finally have arrived. We had feared so much you wouldn't. There were so many things that could happen."

"Those bumbling shades," I said. "They made a mess of it."

"By no means bumbling," said Elmer. "They did exactly what they planned."

"There's something damn strange going on," I said. "Elmer, tell me what it is."

"In time," said Elmer, "we will tell it all. There is so much to tell."

"We?" I asked. "You keep saying we."

"All your friends," said Elmer. "All of them are here. We have been waiting for you."

"You knew we would be coming here?"

"We hoped you would," said Elmer. "Don't you see, you had to come or it all would be for nothing."

He was talking riddles and he had never, in all the time I'd known him, talked that way before.

"You mean they all are here?" asked Cynthia, excited. "Bronco and Wolf and . . ."

"If you'll come with me," said Elmer. "They are waiting for you."

He turned about and we followed through the door, which opened into a huge room and they all were there, Bronco and Wolf standing side by side and the two war machines bulking in the rear.

Elmer made a thumb toward the two machines. "When we built this place," he said, "we made a special door so they could get in and the floor they're standing on is bedrock. Nothing else would hold them."

"Welcome home," said Joe, "and Ivan says hello."

"There's one other here," said Elmer. "You may not recognize him, but he's an old friend, too."

The other one of them sat behind a desk that was positioned near the door and Elmer was quite right. I did not recognize him; I had never seen him or anything quite like him. The mechanical equivalent of a human head attached to what might roughly be described as the mechanical equivalent of a human body—a robot, more than likely, but like no robot I'd ever seen before. Not like Elmer, not like any honest robot, but a frankly mechanical contraption that made no real concession to the human form.

"I suppose you may be pardoned," said this freakish thing, "for not recognizing me, since I have changed considerably. You at one time knew me as Ramsay O'Gillicuddy."

It seemed outrageous on the face of it, of course, but there was something in the timbre of the voice that almost made me think so.

"I vouch for him," said Elmer. "He is O'Gillicuddy."

"In which case," said O'Gillicuddy, "you may as well sit down. We have some catching up to do."

He motioned at chairs set before the desk and when Cynthia and I were seated, he said, "Well, this is very comfortable and cozy and . . ."

"Now, just a minute there, O'Gillicuddy," I said. "I have a bone to pick with you. Back there in the cave, there was no need to send us back in time. Elmer was there and so was Wolf . . ."

"But it was a plan," said O'Gillicuddy. "If we had not acted then, you'd not be here today . . ."

"Fletch," said Elmer, "I would recommend that you hear him out. It may seem very strange to you, but in common courtesy you should hear him out."

"All right," I said, "I'll hear him out. But if it doesn't come out right, this thing that calls himself O'Gillicuddy has a lot to answer for."

"I assure you," said O'Gillicuddy, "that in time . . ."

"There's something else that's wrong," said Cynthia. "There is one who isn't here. The census taker isn't here. What happened to him?"

"I can tell you that," said Elmer. "Once this place was finished . . ."

"By this place," said Cynthia, "I

suppose you mean this museum. It is a museum, isn't it? Housing the collection of the census taker."

"Then you know about the census taker."

"We made a guess," said Cynthia.

"Of course," said O'Gillicuddy, "you would have. You both are quite astute."

"Well, thanks," said Cynthia.

"Once we had his collections housed," said Elmer, "the collection that was here and the original and much larger collection recovered from its hiding place in the old Balkans area, he took off for the planet Alden to lead an expedition of archaeologists to his old home planet."

"That would be," I said, "the planet that Thorney speculated on. The one that had never been found."

"That's the one," said Elmer.

I thought how excited Thorney would have been if he only could have known of this. But that had been impossible, of course. Thorney was long dead. And as I thought of that a shudder built up inside of me and I had to hold on tight to keep it from breaking out. I felt the devastating loneliness of an alien time, the sense that I was in a time where I should not have been, realizing that the alienness of time could be more frightening than the alienness of place. I felt cut off from everything and inside of me was a scream to go back where I belonged and I wondered, as I sat there battling against it, if Cynthia felt it, too. And even as I wondered it came to me that somewhere deep in the past Cynthia and I were dead as well, and that made our being here even more unbearable.

"Fletch," asked Elmer, "is there something wrong with you?"

"I'm all right," I said.

"You're trembling."

"I'll be all right," I said.

Cynthia laid a hand upon my arm. "Take it easy, Fletch," she said, and I knew from the way she said it that she may have felt some of the alienness as well.

"Please go ahead," I said.

"The census taker," said O'Gillicuddy, "was deeply worried about his people. He had long since lost contact with them and he was convinced that his race had disappeared, for any one of the many reasons that can bring about the disappearance of a race. So far there has been no word of the expedition. We await it anxiously."

"We?"

"Myself and all the rest of my brother shades."

"You mean you're all like this?"

"Yes, of course," he said. "It was all a part of the bargain. But I forget you know not of the bargain. I shall have to tell you."

"Well, get on with it," I said, a little angrily.

"So much," he said, "depends upon you. We had it all planned out and it seemed to be so foolproof . . ."

"There is nothing," Elmer said, "that is ever foolproof."

"Yes, yes," said O'Gillicuddy, "and especially in time manipulation one never can be sure. I shudder at the thought of what would have happened if these two had not arrived . . ."

"Let's stop this talk of shuddering," Elmer said, impatiently. "If they were not to have arrived all this would have disappeared. Although, come to think of it, that's not entirely right."

"Elmer," I yelled at him, "for the love of God, talk sense."

"Believe me, Fletch," said Elmer, "it all is most confusing. I am supposed to understand it, but even so I get confused."

"Then," said O'Gillicuddy, "suppose we start again. From here we'll send you back to your own present time, to that temporal moment you would have expected to arrive at if the time trap had worked as I said it would . . ."

"But you bungled then," I said, "and you will bungle now . . ."

He raised a metallic hand to silence me. "We never bungled," he said. "We did, as Elmer told you, what we had intended. We brought you here, because if we had not brought you here the plan would not have worked. If you were not here to have the plan unfolded, you'd not know what to do. But going back with the plan in mind, you can bring this all about."

"Now wait a minute," I protested. "You're getting this all tangled up. There is no sense . . ."

"There is an amazing lot of sense to it," said O'Gillicuddy. "It works this way. You were in the distant past and we bring you forward to this future so you can be told the plan, then you'll be sent back to your present so you can implement the plan that will make it possible for the future you now occupy to happen."

I jumped to my feet and banged the desk. "I never have heard so damn much foolishness in all my life," I shouted. "You've got time all twisted up. How can we be brought into a future that won't exist unless we are in our present to do whatever damn fool thing we have to do to make this future happen?"

O'Gillicuddy was somewhat smug about it. "I admit," he said, "that it may seem slightly strange. But when you think of it, you will perceive the logic of it. Now we're going to send you back in time . . ."

"Missing your mark," I said, "by several thousand years . . ."

"Not at all," said O'Gillicuddy. "We'll hit it on the nose. We no longer depend upon mere psychic ability. We now have a machine, a temporal selector, that can send you anywhere you wish, to the small part of a second. Its development was a part of the bargain that was made."

"You talk about plans," said Cynthia, "and bargains. It might help a little if you tell us what they are."

"Given half a chance," said O'Gillicuddy, "I would be charmed to do so. We will send you back to

your present and you will go back to Cemetery and see Maxwell Peter Bell . . ."

"And Maxwell Peter Bell will throw me out upon my ear," I said, "and maybe . . ."

"Not," said Elmer, breaking in, "if Wolf and Bronco and myself go in with you to see him and if two war machines are waiting out in front. Those two war machines will make all the difference."

"But how can you be sure that the war machines . . ."

"Why, that is simple," Elmer said. "You set it up yourself. You asked them, didn't you, to be at a certain place at a certain time to meet you when you came through the time trap? How about that, Joe?"

"That is right," said Joe. "He asked us and we were there, Ivan and me, just like we said we'd be. And all the rest of you. Even now I can remember it. We made up a welcoming committee and they came stepping out and then we all went to Cemetery . . ."

"How the hell can you remember it?" I yelled. "It hasn't happened yet."

"Oh, yes, it has," said Elmer.

"I think," I said, "that we must all be crazy. I begin to get a glimmer of what is going on and that makes me suspect even more that I am going crazy."

"Why, Fletch," said Cynthia, "I am surprised at you. It is all quite clear to me."

I gritted my teeth and said to Elmer, "All right, then, tell the rest of it."

"You will go to see Maxwell Peter Bell," said Elmer, "with the rest of us along to give you moral support and you will let him know that you can prove he is using Cemetery as a cache for smuggled artifacts . . ."

"But smuggling artifacts is not against the law."

"No, of course it's not. But can you imagine what would happen to Mother Earth's carefully polished image if it should be known what is being done. There would be a smell not only of dishonesty, but of ghoulery, about it that would take them years to wipe away, if they ever could.

"You will explain to him most carefully, being sure that he does not mistake your meaning or intent, that you might just possibly find it unnecessary to say anything about it if he should agree to certain actions. Perhaps, O'Gillicuddy, you should enumerate the actions."

O'Gillicuddy held up a hand and began counting off the actions on his fingers, one by one. "Cemetery will agree to donate to Alden University all its holdings in artifacts, being very vigilant in recovering and turning over all that they have hidden, and henceforth will desist from any dealings in them. Cemetery will provide the necessary shipping to transport the artifacts to Alden and will immediately implement the establishment of regular passenger service to Earth at a rate consistent with

other travel fares throughout the galaxy, providing reasonably priced accommodations for tourists and pilgrims who may wish to visit Earth. Cemetery will establish and maintain museums to house the historic artifacts collected since mankind's beginning by a certain devoted student who is designated by the name of Ronex . . ."

"That is the census taker?" Cynthia asked.

"That is the census taker," said O'Gillicuddy, "and now if I might proceed . . ."

"There's one thing," said Cynthia, "that still bothers me a lot. What about Wolf? Why should he first be hunting us and then . . ."

"Wolf," said O'Gillicuddy, "was not exactly a metal wolf, although he has now become accustomed to being one and still maintains the shape. He was one of the census taker's robots that had been infiltrated into Cemetery's wolf pack. The census taker, you must understand, was no one's fool, and he kept a hand in almost everything transpiring on the Earth. And now if I may proceed . . ."

"Please do," said Cynthia.

O'Gillicuddy went on, counting off the points upon his fingers. "Cemetery is to contribute funds and all necessary resources to a research program aimed at a reliable system of time travel. Cemetery likewise is to contribute all necessary funds and resources to another research program aimed at discovering and developing a method by which human personalities can be transferred in their entireties to robotic brains and once such a method is developed the first objects of such transfers shall be a group of beings known as shades, now existing on the planet Earth and . . ."

"That's how you . . ." said Cynthia.

"That's how I came to be as you see me now. But to go on. Cemetery shall agree to the appointment of a galactic watchdog commission that will not only see to it that the provisions of this agreement are carried out, but shall, in perpetuity, examine Cemetery's books and actions and make recommendations for the conducting of its business."

He came to a stop.

I looked at Elmer and Elmer, looking back at me, nodded his head. "That's the way of it," he said. "That is how it goes."

It still seemed a zany sort of fable, but if Elmer said that was the way it was, it was good enough for me.

"I believe," said O'Gillicuddy, "we have told you everything."

"Now," I said, "one thing yet remains. Will Cemetery buy it?"

"I think they already have," said O'Gillicuddy, "but we still must go through the motions. You are here and the rest of us are here and the museum is here and the temporal selector waiting for you and Miss Cynthia . . ."

"There is one thing you've forgotten," said Cynthia. "Perhaps not an

important thing to the rest of you, but it is what started all of this. What about Fletcher's composition? You remember, the one that he and Bronco were to have put together. If it hadn't been for his dream of making a composition, none of this would have come about. You don't know how he worked for it and dreamed of it and . . ."

"Miss," said Elmer, soberly, "I know. I worked and dreamed with him."

"But did he ever have a chance to do it? Or was it all forgotten in this fastastic scheme the rest of you dreamed up?"

"We never dreamed it up," said Bronco. "It was the shades who dreamed it up. We only went along with them. Not even the census taker knew until they told him and then the census taker told us and we went along."

"That is right," said Elmer. "We couldn't talk with shades."

"And as far as the composition is concerned," said O'Gillicuddy, "I think we have the time. If you'll just step across the hall to the auditorium . . ."

"You have it here," cried Cynthia. "You mean you have it here!"

"Of course we have it here. It has lived all these years. It will live forever."

I shook my head, bewildered.

"What's the matter, Mr. Carson?" asked O'Gillicuddy. "You should be very pleased."

"Don't you see what you have done," said Cynthia, angrily, her eyes bright with tears. "Experiencing it would spoil it all. How could you possibly suggest that he see and feel and hear a work he has not even done? You should not have told him. Now it will be always in the back of his mind that he must create a masterpiece. He wasn't even thinking about a masterpiece. He was just planning to do a competent piece of work and now you . . ."

I put out a hand to stop her. "It's all right," I said.

But it wasn't all right. It was terribly wrong.

"Bronco," I said.

"I have forgotten it," said Bronco. "It was so long ago I do not remember. I experienced it but once."

"You're getting all mixed up again," said Elmer. "Bronco already has done the work and it is past. He won't do it again. He won't remember. Because there is nothing to remember. Back there in the past, you and he will put it all together . . ."

"And you, Elmer? Don't tell me you forget as well."

"How could I forget? It is beautiful. The thing for you to do, when you go back to meet us in the past, is to forget all this. There is a masterpiece up here, but the ability to do that kind of work lies in you, not in time, not in what others say or think. You simply do it as you see it. That will be good enough."

"We," said Bronco, "shall do a job on it."

"I take it, then," said

O'Gillicuddy, "you do not want to see it."

Something was pressing hard against my legs and when I looked down I saw that it was Wolf. I patted him and the metal of his hide resounded to the patting. He wriggled with delight and turned his head to look up at me, smiling with all those vicious metal teeth.

"Poor Wolf," said Cynthia. "Are there rabbits here?"

"There are many rabbits," Elmer said. "He chases them all day. But he never catches them. There is no need to catch them."

O'Gillicuddy rose from his chair and came spidering around the desk on unhuman legs attached to his unhuman body.

"I suppose we best begin," he said. "The temporal apparatus is on the floor below."

Cynthia and I stood up.

From the rear of the room, Joe said, "We'll all be waiting for you when you come through."

I felt Elmer's hand upon my shoulder, the great powerful metal fingers squeezing very softly. "I'll be seeing you," he said.

I tried to answer him, but couldn't. What do you say to a guy like him? I couldn't say good-bye, for it wasn't good-bye. I don't know what it was. A new beginning, maybe.

His hand lifted from my shoulder and Cynthia and I followed O'Gillicuddy.

I said to Cynthia, "It will soon be over for you. You can go back to Alden and fill Thorney in on everything that happened."

"I'm not going back," she said.

"But I thought . . ."

"You'll be going on with your composition. Would you have room for an apprentice, an assistant?"

"I think I would," I said.

"You remember, Fletch, what you told me when you thought we were trapped back there in time? You said that you would love me. I intend to hold you to that."

I reached out and found her hand.

I wanted to be held to that. ■

THE ANALYTICAL LABORATORY

October 1972

PLACE	TITLE	AUTHOR	POINTS
1.	Common Denominator	*David Lewis*	1.93
2.	The Pritcher Mass (Conc.)	*Gordon R. Dickson*	2.64
3.	The Star Hole	*Bob Buckley*	3.00
4.	To Be a Champion, Merciful and Brave	*Richard Olin*	3.76
5.	Stretch of Time	*Ruth Berman*	4.38
6.	The Vietnam War Centennial Celebration	*Ralph E. Hamil*	4.87

"Heave to, heave to," cried Henry Martin,
"And bring yourselves under my lee;
For I have turned robber all on the salt sea, the salt sea, the salt sea,
For to maintain my two brothers and me."

"We shall not heave to," the rich merchant cried,
"Nor bring ourselves under your lee;
But we will give unto you the death shot, the death shot, the death shot,
And we will point your proud guns to the sea."
—The Ballad of Henry Martin

Things had been quiet on Hallway for more than a month. There were long spells, in the evolution of this rather atypical colony, when nothing happened; nothing but the steady surrender of the land to the mastery of Twenty-sixth Century agriculture. The mineral resources of the country were still being mapped in detail. In a few months, the second-wave colonists would begin industrial development, starting the planet's long climb to self-sufficiency—in the far future, say a hundred or two hundred years, to partnership status and colonies of its own.

At present Hallway's population was about fifteen hundred, unusually high for a first-wave colony. The reason was that Hallway already had an advanced spaceport and ferry system, whereas most colonies depended on the ferries of visiting galleons until after third-wave expansion. Hallway was being colonized not for its future contribution to interstellar trade, but because of its position: it was the last stopover point for Terran-Astral galleons on their way into the Keron Empire.

In other words, Hallway was the most remote outpost of the human race. There were human beings further on—Terran-Astral had had permanent offices on the major Keroni worlds for twenty years—but this was the outermost human planet, far beyond the normal sphere of human influence. Hallway and its sister

by DUNCAN LUNAN

Proud Guns to the Sea

The necessary characteristic of a troubleshooter is his ability to solve insoluble problems—even if he does it with his own neck!

worlds lay on the direct line from the human sphere to the Keron, a thin bridge of stars right through the older, very much larger sphere of the insectile Sheekathryn. Man had come up against the Sheekathryn after three centuries of expansion, and narrowly escaped destruction at their hands; the Keroni had interstellar travel brought to them, and their escape was narrower still, but in 2501 human and Keroni explorers met at the heart of the Sheekathryn Empire. Even now, so large and slow was the Sheekathryn Empire, that Sheekathryn colonies a few light-years from the star bridge knew nothing of the human-Sheekathryn war or the Keroni conflict in the opposite direction. A year after Hallway was colonized, two Sheekathryn ships had touched down and made first contact all over again.

Though trade with the Keron Em-

KELLY FREAS

pire was building up, so far only a few ships a year made the long journey across the Sheekathryn sphere. The initial trade had been mainly in ideas, the human physical sciences for the Keroni variants of Sheekathryn psi technology, and the material cargoes were of equipment to boost the scientific revolution. For meaningful trade across the gulf, the Keroni would need their own galleons. There could have been a one-way trade, benefiting the Terran-Astral Partnership more than the Keroni, but the lizards were sharp enough to see that and fierce enough to refuse it.

All this meant that the Terran-Astral agent on Hallway had, so far, an undemanding post, despite the ferry system years ahead of the colony schedule. It explained how Jack Kellney could have such a position when still in his late twenties: by the time Hallway's traffic was significant he'd be older, experienced, and thoroughly familiar with the colony he himself had helped to build. It also explained the biggest anomaly of all: that the agent on a colony still at first-stage expansion should have the use of a Stelrond schooner, the most expensive spacecraft (in cost *and* operation) built by man.

All the equipment landed by the last visiting galleon had been phased into use, weeks ahead of schedule. With his responsibility for that cargo discharged, Kellney had very little to do. The day the *Mendelssohn* came out of warp, he was going fishing; he was out in the country when the alarm went on his individual communicator.

It took a few seconds to dig it out: he had thrust the thing deep into his kitbag. "Kellney here."

"Transmit for fix, Jack. We'll need you back here."

"O.K., here we go. What's happening anyway? Have we a spacewreck emergency?"

"You're located. An aircar will be over you in minutes. It's not a spacewreck, *yet.* We've got a piracy alert!"

"You've got a *what?*" The huge Terran-Astral galleons would make incredible prizes, more than any pirate could handle. It had been tried only once in history, and then primarily for ransom. The major point against it was that by reason of sheer size, the galleons came out better armed than anything else in space. Piracy of Terran-Astral ships was fantasy.

"The message torpedo came out of warp a few minutes ago, screaming piracy. It belongs to the *Mendelssohn* of Partnership Europa. She's coming through armed and active, so everything else watch out!"

"What can it be?" Jack could hear the aircar coming. "If the Sheekathryn attacked them for any reason, they wouldn't call that *piracy.*" But as he said that, he remembered the unknown regions of the old Empire surrounding the star bridge. Anything could be going on there. "You'd better have the *Star-*

shell wheeled out; I'll get aloft right away."

Back at the colony field, he changed at once into flying gear. A tractor was easing the white dart of the Stelrond ship from the hangar onto the grass. He took off on rocket thrust, converting immediately to the smooth power of the Stelrond drive, and in seconds was climbing out of the atmosphere.

There were no other ships near him as he closed with the radiating speck of the torpedo. The *Mendelssohn*'s warning had been a formality in that sense; it would be many years before there were interplanetary freighters curving across the emergence orbit. On a piracy alert, the galleon would be coming through warp with its teeth bared. Another ship, unless it were shouting its identity, might be close enough to qualify for automatic destruction. The *Starshell*'s automatic call-sign was going out at full power. But Jack had the emergence zone to himself: the planet was a bow in the sky off to port, narrowing slowly as it moved toward the unbearable sun.

The orbital space-warp detectors, more sensitive than those on the *Starshell,* flashed him the first alert. Ahead of the schooner space was beginning to fold; starlight caught in the pseudogravitational web shifted toward its center. The galleon's drive-field was snatching in the net in handfuls, till it was compressed into a point of probable creation. The final transfer of energy took place between the drive-coil and the underlying "C-field" of the universe, shifting the galleon from the mirror-image point light-years away, and the starship came up the long axis of the dispersing warp.

The piracy alarm was no joke, Jack realized as the emergence zone stabilized. The warp faced away from him and he was taking the schooner around the blooming flower of starlight, but already the galleon's belligerence was penetrating the distorted space. *Identify yourself or be destroyed,* the incoming ship was signaling electronically as it decelerated into normal space. Kellney stood off while the starship went on to PK maneuvering and made circumsolar orbit. Around it, deadly symbiotic partners, missile batteries floated free. Psychokinetic control had held them in that configuration through the warp. Earth dolphins, trained in Sheekathryn techniques, made up the PK teams.

The galleon was a cylinder of ice, made stable in vacuum by chemical additives. Bio-engineering had grown the hull from the ice-ore of a "snowball" moon. Building ships for Terran-Astral gave the planet Europa its partnership relation with the monopoly spaceline. The galleon was two miles long, from the lateral antennae of the drive unit to the air locks at the stern. Half of that length was cargo space; Infiltration turrets flashed along the remainder. As Jack closed for rendezvous, he saw with

amazement that hull repair machines were moving along the ship. Large patches of the galleon's reradiative coating had been blasted off: it could only be the effect of a close-range missile action, with nuclear warheads. The ship was building up a faint haze of sublimed gases, now that the bare patches were in sunlight instead of interstellar blackness. The robots had already started respraying. It's like something from a child's adventure story, Kellney thought, stupefied.

Maneuvering around the floating missiles, he brought the schooner in toward the stern of the ship. The entrance lock was right on the axis of the galleon: spinning the dart to match the rotation of the cylinder, Jack docked with the "gun-carriage" of the arrival slipway and was drawn into the air lock. Beyond, in the weightless turnaround space at the core of the ferry port, he left the ship to the galleon crew and was taken forward to the captain's cabin.

The captain, to his surprise, was himself a little rattled. He carried responsibility for the fabulous ship and its thousand or so passengers, and was always on the alert for the deadly whims of space; but there hadn't been combat since the Sheekathryn War, nearly two hundred years before. Even a galleon captain could be forgiven for not being mentally prepared.

"It was a Keroni ship," the captain told him at once. "Not one of their biggest, but a warship, the kind their nobles command. The attack was obviously premeditated: they must have studied our flight pattern to Hallway for some time. To recharge a drive unit between jumps takes only forty-eight hours, so they would have to be within two light-days of our emergence to detect it in time. As it was, they reached us only three hours before jump—we'd stored enough power to come most of the way here. We put the emergency generators full on and were able to make the jump to Hallway within the hour."

"It must have been a hot engagement," said Kellney. "I saw your hull damage as I rendezvoused."

"They must be maniacs!" the captain declared. "I don't think they intended to destroy the *Mendelssohn* initially, but they were determined we shouldn't escape. The first attack was with PK forces, trying to take over our own amplifiers. It only failed because I was realigning for the final jump at the time. The dolphins on watch managed to hold our trim until the PK control was fully manned, but by that time we were already swapping missiles. The conflict had escalated to nuclear warheads by the time the drive unit was primed and we could break away."

"Tactical warheads, I take it," said Kellney. "They might have recovered some of your cargo afterwards, I suppose, but if they'd shattered the ice hull the loss of life would be total!"

The captain nodded. "It looks like outright insanity to me. You've not heard anything about the Keroni declaring war, have you?"

Jack shook his head. "Then you think this is one isolated ship, perhaps some noble with a grudge against us?"

"It's the most likely explanation," said the captain. "At any rate, I think there's no need to turn back to the human sphere. I've fired torpedoes to the nearer colonies along the bridge, and they'll pass on the alert."

"So what action do you intend to take, sir?"

"Well, Agent, we don't need any supplies from the colony. I have supplies and equipment for you, but they needn't be landed meantime. I don't want to hold the ship in orbit near Hallway, in case we bring the enemy down on you. These madmen could threaten the colony to force our surrender, and we couldn't protect you from here. As soon as we've completed repairs I'll move the ship a light-year out of your system."

"While I check ahead with our offices in the Keron Empire," Jack supplied.

"That's what I had in mind," the captain said approvingly. "I don't think we're at war with the Keroni, but I can't take the ship and its passengers on blindly. With that Stelrond ship, you can burn around the offices in two or three days, making sure they all know what's happened, as well as checking the flight plan for us. You needn't become involved in the diplomatic issues at all, just make sure the offices are ready for the complaint when I make it officially. And if by any chance there *is* trouble, that schooner will outrun it. It was for contingencies like this that you were assigned a schooner, though this is an extreme example."

Quite so, thought Kellney as he flew back to Hallway. He had to admire the captain's style in leading Jack to volunteer for the mission; since Terran-Astral was a commercial spaceline, nobody could force him to go. Not having Jack under his authority on the *Mendelssohn,* the captain couldn't even *order* him to go. But he had no real choice, looking at his moral duties.

Of course, his girl on Hallway thought differently.

"You're *not* going to fly blindly into the Keron Empire!" she tried to insist, as he packed a flight bag for the trip. Once Sally had accepted the initial fact of the piracy—it took everyone a moment or two—she found plenty to criticize in the Terran-Astral response. "That ship's got one missile for offensive armament and speed's its only defense! I suppose if you don't come back, we can take that as evidence that we *are* at war with the Keroni!"

"That will almost certainly be true," Jack agreed ruefully.

"Then don't go! This scouting mission's completely crazy. Get a fleet of Stelrond ships from the nearest Partnership world and go in force!"

"Sally, pet, it's not quite that simple," he replied. "Suppose, as the captain so strongly suspects, there isn't a war? The Keroni are touchy, and sending a fleet of warships to check up on them could make trouble for the offices out there. The schooner can do all that's necessary, and its speed, and the Stelrond field, will be quite adequate protection. The Keroni don't have penetrators."

"They don't need penetrator missiles!" Sally cried in frustration. He couldn't put false reassurance over on this girl. "They've got all the psi tricks of their Sheekathryn slaves to draw on. They don't have to get through the Stelrond field to damage the ship, or you just as easily."

"They have to lock on to me first. Not so easy, with a ship coming out of warp unexpectedly, moving down from the speed of light and back."

"It's been done before," she reminded him. "But if you're so confident, take me with you!"

That caught him by surprise. It was nice to have a girl who could do that, except when she did. "No, I don't think so," said Jack, taking her by the arms and thinking furiously. ". . . I don't think when I rendezvous with the *Mendelssohn,* I'll give them the idea I couldn't face the mission without someone to hold my hand—especially someone as pretty as you." He kissed her, picked up the bag and made for the door. "I'll be back in forty-eight hours. See nothing drastic happens to the office while I'm away!"

As far as the risk turned out, he could have brought Sally along. No incursion into Keroni space could exactly be termed "routine," but nothing unusually alarming happened as he flitted from star to star down the trade route to Keron. The Keroni were a reptilian species, fiercely competitive among themselves and with outsiders; their whole culture was military, in human terms. To build up a civilization they'd had to turn their aggression out into space, which partly explained their spreading domination of the Sheekathryn Empire. Again and again, especially over Keron itself, psi-powered scouts and warships came driving toward the *Starshell* to challenge him. But always his identification was accepted, the Terran-Astral ship was recognized, the challengers sheered away. Coded checks with the planetary offices showed all was well; he left them alert to the possibility of trouble, and took the schooner back out toward the stars.

Unlike the shielded drive coils of the huge galleons, the Stelrond drew its power from outside the ship. The fusion generators that threw the schooner around were the nearby stars, tapped through the same spacewarp that moved the ship. With all that energy to use, the Stelrond warpfield was more versatile, extended in time and variable in space where the galleon's field was static. It also had lower settings, allowing the ship to streak around the planets

without going up to light-speed and making an actual jump. But the price of versatility was high: the Stelrond coil, fantastically complex and immersed in liquid helium, had a short and very expensive lifetime. If the *Starshell* had been privately owned, that foray into the Keron Empire would have used up years of his Terran-Astral salary.

No war. No trouble, no explanation for the Keroni pirate far out on the star bridge. The Keron Office would raise the matter with the reptilian rulers, and the privateer should be tracked down, but that was another story now. It was safe for the fabulous capital investment of the galleon to proceed into the Empire, and Jack took the *Starshell* out to the prearranged rendezvous.

The galleon's fusion piles were still recharging the standard drive unit for the next jump. Kellney dined at the captain's table that night, sampled the entertainments of the luxurious passenger section, swam in the canals of the ship's internal hydrosphere. The galleons were the mobile capitals of the Partnership and few planets, even the Partnership Worlds themselves, could match them for glamour. There was nothing to compare on Hallway, still only a first-wave colony, and Jack made the most of it. He discussed the pirate attack with the galleon's officers, and various theories were put forward and shot down; but the whole thing remained a mystery when he lifted the schooner from the departure slip, and pointed the prow at the brilliant fire of Hallway's sun.

A missing signal can be just as effective as an alarm. By the time the *Starshell* was on one-fifth planetary drive, sliding down toward the planet, radio waves could penetrate the Stelrond field without being distorted out of recognition—and the inner navigational beacons weren't there to recognize.

Kellney switched up to four-fifths interplanetary, and swung the ship far out beyond the emergence zone before he came to rest. He had imposed only two or three seconds' delay on radio communication, but it would take longer for a hostile ship to reach him.

The Hallway tower answered at once, after the lag. "The pirate ship's here," the operator told him. "They haven't come near the colony, and they say they're not going to, but the whole planet's now supposed to be a Keron holding."

"And they've backed it up by destroying the beacons?"

Five seconds lag, there and back.

"That's right. We put on the emergency signals, in case they did hit the colony, but they hit the satellites instead. We've dispersed all nonessential personnel into the countryside, but there were no reprisals against the colony."

"Where is the ship now?"

"It's orbiting the planet, five hundred miles up. We think they may

have missile damage: they got the ship through to Hallway, but they're reluctant to try for a landing. Their next pass over us will be in twenty-five minutes."

"That's fine. Unless they've got warp detectors spaced along the orbit, they don't know I've come back. Unless I transmit while they're on this side, I'll just be a speck far out in the ecliptic." Kellney had his radar sweeping the space around him, with the drive set to cut in automatically if anything materialized nearby; but he'd have to cut down the beam strength. How sensitive were the Keroni detectors? Pretty good, judging by his frequent challenges in the Empire.

"O.K. We got off message torpedoes calling for warship assistance, the Stelrond ships should be here in a few days. Do you want the full text of their 'occupation' broadcast?"

"Yes, let's have it."

" 'This ship is the battle cruiser of M'sirat, third of the house of Karn. I have turned privateer in and without the Empire to support the failing fortunes of our house; let it be made clear that I will allow no opposition, nor recognize any authority but my own. This planet, designated "Hallway" in the human tongue, now becomes my base of operations and all planetary authorities are now subject to me.' Message ends.

"They didn't make reprisal threats, or even mention noncooperation," the Hallway tower added.

"They didn't have to," said Kellney. "We all know the armament of a Keroni warship, and they gave a demonstration when they burned out the satellites. That was done with PK, I suppose?"

"Apparently. There weren't any missile tracks."

They went on comparing notes till the pirate was due over the horizon, but Jack already had the main points of the situation. He agreed with the deduction that M'sirat's ship had been damaged in the missile exchange with the *Mendelssohn;* it explained most of the puzzles in the Keroni takeover. M'sirat had attacked the galleon with psi forces at first, then gone all the way to nuclear weapons as the conflict escalated. He must have wanted the galleon, or its cargo at least, pretty badly, but against the galleon's rows of fire-control computers his chances were slim. Beaten off with damage, probably with losses, he had made repairs and then jumped to Hallway. If he wasn't willing to attempt a landing, on the Keroni version of the Stelrond, that jump must have stretched the ship to its limit.

Alternatively, he didn't really want the planet. Even as a pirate base its use would be limited. He might, with luck, ambush one more galleon if another was already coming along the star bridge—if not, Jack couldn't see the Sheekathryn worlds around Hallway, with their total lack of material technology, supplying the needs of the house of Karn. M'sirat might raid them for psionic

operators for his own ship, but to supply slave labor to the Empire from here was uneconomic and unnecessary. If another galleon didn't pass through, Jack could see M'sirat finishing his repairs and pulling out. If the torpedoes did get through, as they certainly should, he would have only days to do it before a Stelrond fleet came down on him.

Kellney stayed out in space, letting the *Starshell* drift past the planet like some wandering asteroid. He had risked discovery by keeping radar sensitivity high, though he no longer got echoes from the planet at the new setting. Better to be given away by a beam that let him detect oncoming missiles, than one which let the missiles get too close to him. With psychokinetic boost, the pirates could send missiles out very fast indeed.

He wasn't detected. Eventually he set all the alarms on automatic, and went to sleep. When he was wakened it was only the communications alarm, but that was trouble enough.

"The pirates have made a landing!" the Hallway field reported. "They're a hundred miles inland, but obviously they're going to cover the colony with whatever they're setting up. They've brought down one of the Stelronds from the starship, and they're mounting some kind of ground defense installation!"

That information represented painstaking work by the colony's few Sensitives. The psi talents didn't sit well with human intelligence, and it was only thanks to a Sheekathryn beacon on one of the Antares planets that reliable psi-sensitivity had ever evolved. The Sensitives down at colony headquarters must have exceptional insight into the activity on the pirate ship. "How did they manage the landing?" Dismantling the drive implied that the ship was too badly damaged ever to leave.

"They sent down Sheekathryn ships, they must have been carried as lifeboats." The Sheekathryn ships were flying psionic amplifiers, with no other power or propulsion; their activities would be easier for a Sensitive to follow. "The Keron ship's still in orbit. We doubt if they can move it now, except on PK drive."

PK drive, or the Sheekathryn ships, would be adequate to ambush an incoming galleon. Even if the ship were immobile, it would still make a very nasty weapons platform with its PK amplifiers and missiles. Whatever the plan was, M'sirat couldn't be allowed to establish on-planet defenses.

"O.K.," said Kellney, settling himself at the controls. "When will they be back over the horizon?"

"Ten minutes, approximately."

"That's not enough. After the warship passes over, I'll come down and take out the installation with the penetrator."

"That's assuming a great deal, Jack. It's a long time since the Sheekathryn War. To get close to a Sheekathryn team without being de-

tected, and let go your missile without being knocked out, may not be so easy these days."

"I'll have to chance it," the agent replied. "If I don't succeed, better prepare for a major battle when the Stelrond fleet gets here."

Once again, radio silence fell as the Keroni warship made its transit across the planet. As soon as it sank over the horizon, the schooner moved: at two-fifths interplanetary drive, it was closing on the planetary atmosphere in seconds.

In atmosphere, not even a Stelrond ship could keep up that kind of speed. The re-entry fireball was held away from the ship, but he had to come down steadily to four-fifths planetary, then three-fifths. By then he was down into the stratosphere—he had decided on speed rather than a low-level approach—and was starting his attack run on the alien installation.

At one-fifth planetary, a new voice broke into the communications channel which should have been his alone. "Kellney, this is M'sirat. Your actions were foreseen, weeks ago when this planet was examined by our scouts. Call off your attack."

The colony had been under observation by Sheekathryn minions, prior to the attack on the *Mendelssohn!* If they had narrowed their analysis down to individuals, countering the threat could be harder than anything in the history of the Sheekathryn War. But the *Starshell* was on autopilot, banking now towards the grounded Stelrond facility. Even if they knocked him out at the controls, the ship would still deliver the penetrator to its target—and that missile, homing through a Stelrond field of its own, was hard to divert with PK.

"You with your ship were recognized as a threat from the outset," said M'sirat. "To cancel it, my servants visited your office soon after we made orbit around the planet, and removed a young female acting as your deputy."

Kellney switched to "transmit." Obviously the privateer had his location now. "You're bluffing, M'sirat. Nothing of the kind's been reported to me." Less than a minute to the missile launch.

"You can rely on nothing reported to you, Kellney. The attack on your field was made under shields of illusion, projected by the psionic amplifiers. Your personnel there will say they saw the girl recently, but they will be wrong. She has been on my ship for more than a day, in readiness for your return."

The final seconds were running out. He could go through with the attack, leaving no weapons at all to threaten the warship for Sally. He wouldn't get close enough to the warship in space to be a real threat, in any case. Kellney punched the override controls and the schooner peeled away from the target. He had to get either the orbiting ship or the planetary base, for the sake of the

colony—but inspiration had given him a far-out plan. "All right, M'sirat!" he radioed. "I accept your challenge, and I'm coming up now to resolve the conflict in person!"

He didn't switch up to the higher drive levels: the Keroni had to be hooked before Jack could risk approaching the starship. "What do you mean?" M'sirat demanded. "I have issued no formal challenge!"

Got him! . . . "By taking possession of my fiancée to prevent me attacking your installation, you have changed the struggle for the colony to a personal quarrel between us. Honor requires you to meet me personally to settle the question!" And without waiting for a reply, Jack cut in four-fifths planetary and made like a bullet for the warship.

It was sheer bluff, and his own audacity amazed him, but he couldn't see any other way forward. If the privateer took over the colony the future looked bleak for everyone: the successful attack on his office showed what Sheekathryn powers could do, under ruthless Keroni direction. Hallway's human population might keep the freedom of their minds, *if* they obeyed every Keroni order without question. Kellney had no idea what he would do when he got aboard the warship, but he'd have the chance to do *something.* The only alternative would have been to destroy the ground base and let them do their worst to Sally—and when he tried to imagine it, he found that unthinkable.

The schooner came out of warp, returning the outside universe to order from the blurred patterns of Stelrond flight. He was floating in space again, less than a mile from the elliptical bulk of the warship. No missiles flared out to him; he had, momentarily, regained the initiative from M'sirat.

The plan hadn't been clearly formulated in those hurtling seconds below. As he took the schooner toward the warship on maneuvering rockets, the underlying reasoning was falling into place. He knew that the Keroni had an elaborate code of honor, in keeping with their fierce temperament and military organization, though his only detailed knowledge was of isolated fragments making little sense in human terms. Coming from a poor Keroni house, probably from one of the outlying worlds, M'sirat's knowledge of human values might be equally vague. He shouldn't know the precise meaning of the term "fiancée," or the obligations it connoted, much less the exaggeration of Jack's informal relationship with Sally. The bluff had succeeded, Kellney was going to board the pirate ship.

The warship was bigger than the schooner, but very much smaller than a galleon. At a guess, it might carry twelve or fifteen Keroni and twenty or thirty Sheekathryn—as a fighting unit, not the floating city of the *Mendelssohn.* Down the elliptical hull, in the same wraparound config-

uration as on human warships, ran four bulges for the Keroni variant of the Stelrond coil, shaped out of plasma by Sheekathryn PK amplifiers. There *had* been damage in the missile fight with the galleon: one of the Stelronds had been virtually obliterated by a multiple-warhead hit, penetrating deep into the hull. It looked as if all the rear of the ship might be in vacuum. Another of the coils had been cut out of its mounting, for the ground installation. What could they be building that would need that kind of power?

There wasn't any way to link the *Starshell* to the Keroni air lock. The schooner was too small to have a lock of its own, and to get out in space the cockpit had to be depressurized. Kellney guessed correctly that the colored patches aft of the air lock were some kind of mooring: a gentle PK force took hold of the schooner and pulled it down to the Keroni hull.

The air lock cycle was conventional; some things were basic to all space technology, Kellney's spacesuit softened as air thickened around him. He stepped through the inner door, taking off his helmet, and the moist heat of the Keron-comfortable interior, filled with unfamiliar odors, struck him at once.

He was surrounded by enemies; Sally, looking scared but not detectably under alien influence, was the only human or friendly face. M'sirat, several inches taller than Kellney, was older than he had expected: his golden scales were beginning to shine, and the colorful crest which would display his emotions in later life was beginning to develop. The Sheekathryn around him, elaborate wood-and-glass amplifiers cradled in their arms, were four-foot insectile figures, only their multifaceted eyes conspicuous.

"What is our question of honor over this female?" the Keroni demanded. Learning English for his pirate career would have taught him some human customs; Jack would have to tread carefully.

"By using her as a counter in the colony situation, you commit yourself to a personal accounting with me," Jack repeated. He was sweating, not only from the heat. "The superiority of your ship and its armament makes a face-to-face confrontation the only honorable course."

The Keroni snorted. "Our code of honor supports the latter statement. Having come aboard in these circumstances, you cannot be imprisoned or harmed unless you practice some deception. You need not fear that I, M'sirat, would stoop to ensnare you on some technicality! Unless you use your entry here to damage the ship or assault us, your mind and body will remain untouched. But why should I accept your first premise? Relations between our sexes differ from yours. Why should I not throw you off my ship, and continue to hold the girl as a guarantee of your cooperation?"

"My concept of honor forbids that," Jack replied confidently. "I would have to destroy your planetary base regardless, and if you killed Sally in retribution you and I would be committed to conflict. Even if you refused personal combat, I would eventually destroy this ship. For instance, I could lob orbital and suborbital debris at you with the Stelrond field, until the shotgun effect destroyed you."

"Ingenious," the Keron agreed. "As no doubt you realize, this ship would have trouble escaping from here. Your attacks might overcome our shields in time. But what is your alternative to this unmatched conflict, leading supposedly to my destruction?"

Kellney took a deep breath. "Negotiation," he said firmly. "There is no war between your species and mine, and economic cooperation continues between the Partnership and the Keron Empire. Though you attacked one of our galleons, no harm was done. Release your hostage, abandon your plans to take over Hallway or ambush more galleons, and we can agree on terms for the repair of your ship and your return to the Empire."

"No harm!" M'sirat exploded. "My ship torn open, K'sinar and others of my old friends dead! Is there to be no revenge?"

Kellney stood his ground. "Personally, I am sorry for lives that have been lost. But I don't feel responsible, either personally or as a Terran-Astral agent, for losses you sustained in attacking one of our ships. If you will cease harassing the Partnership, I do have the authority to overlook that attack."

"Now you cross *my* concept of honor," the Keroni said grimly. "I was chosen by lot to become a privateer, to set myself against all society and boldly take what is needed to maintain the house of Karn. I fully accepted that I might die in battle, or be hunted down. I cannot crawl back to my brothers and others of the house, saying 'I failed, and made terms.' I have made a quarrel with your space-line, and it must be pursued as relentlessly as if I preyed on another Keroni house. Only a Sheekathryn could turn aside from such a course."

The debate was turning against him, Kellney saw. His follow-up, the expected arrival of Stelrond warships, wasn't going to weigh against the pirate's determination. M'sirat was honor-bound to continue the struggle, and increasing the odds against him wasn't going to change that. "Well, do *you* have any suggestion?" he asked, a little desperate.

"The fight for the colony must continue," M'sirat said with unshaken certainty. "Honor allows nothing less, though I have complicated the situation by abducting this female. Let us formalize the next stage of the conflict. You will hold off your attack until the ground installation is completed. If you are nonetheless successful in the more

sophisticated attack you will have time to prepare, then instead of killing the girl as proposed we will release her after a token flogging."

Kellney was shaken, but Sally didn't look any more scared. Having been on the Keroni ship more than a day, she must know more about their customs now than he did. "A token what?" he asked weakly, wishing that he really had an honor code to dictate his response.

"Flogging," the Keron said impatiently. "You must be familiar with that—why else have the word in your language?"

"Only as a perversion," Jack said. He began to summon up some conviction. "It certainly has nothing to do with honor in our culture!"

"Nor ours," said the Keron. "But pain and humiliation are preferable to death, for the hostage . . . How then do you discipline your young, punish criminals, maintain order on your ships?"

"We manage," Jack said shortly. "I'm not going to allow you to flog Sally, so the whole line of thought's unprofitable. Can't we find a formula to end the whole conflict of interests?"

He meant a peaceful settlement, but he hadn't made that clear. "Only one course remains," snapped M'sirat. "We shall settle this matter by single combat, yourself as champion of Terran-Astral, I for the privateers and the personal issue between us. Do you have a hand weapon?"

"There's one in my ship," said Kellney, somewhat stunned.

"Then go out through the lock, and arm yourself," the reptilian captain said with finality. His slight crest was bristling, adding to his apparent height. "When I am suited and armed, I shall leave the air lock in search of you. We shall settle our differences out on the hull, in the vacuum."

He had talked himself into a corner, Jack realized. There was no way out of this. Sally was watching him wide-eyed, whiter than ever. He made to speak to her, then decided against it. He raised his helmet in his gloved hands, facing her as he put it on, like a knight of old going to do battle for his lady, and stepped back into the lock.

Adjust, adjust to the situation, you're fighting for your life. As the pressure fell in the air lock, Kellney tried to get into the right frame of mind and couldn't make it. Going into vacuum was a routine, careful business into which emotion didn't intrude. "All you think about is your suit," his instructors had insisted, and the orderly systems check deadened his feelings.

The outer door opened and he climbed on to the hull, stepping slowly toward the open cockpit of the schooner. His magnetic shoes held to the skin of the Keroni ship, but not as firmly as he would like. Reaching in, he opened the arms locker and drew out the long-barreled pistol, careful not to knock it

away out of reach. He retreated back along the hull, away from the air lock and the schooner. The outer door had gone down again.

The ship had passed orbital sunrise: the blurred Hallway terminator was approaching below. They would have forty-odd minutes of sunlight to hunt each other across the hull. The thought of the battle continuing into the night was somehow a great deal worse. Jack climbed over one of the Stelronds, working his way across to the missile gash in the hull. There he could get down below the edge, and have a chance to pick off M'sirat as he came around the ship. Could he use vibrations in the hull to give him warning?

Kellney lowered himself over the edge of the gap, at great pains not to catch his suit. Feeling around with his left hand in the darkness, he found a bracing strut which would steady him when he came to fire. He checked his watch: M'sirat could be suited up by now, and coming through the lock. If he hadn't come into view in three minutes or so, he could be coming around the hull from some other direction. Jack couldn't keep turning around, weightless in the dark among all this torn metal, to cover every angle of approach: he'd either have to concentrate on a likely direction, or get out on the hull and try to stalk M'sirat.

His helmet radio came alive. "Kellney," said M'sirat, "I have come to admire you as an opponent.

I have learned from the girl, through my servants, that your culture has no pattern of single combat as you pretend. I do not care to hunt you down, in these circumstances."

A trick, to get his location? Kellney felt that would be out of character for M'sirat. "Combat or negotiation," Jack answered firmly.

"Then go," said M'sirat. "Go freely. I shall bring the girl out to your ship."

Could it be a trick? It seemed too good to be true. Could he, by sheer boldness, have turned the kidnapping so far back on M'sirat that he would simply let Sally go? Had he, Jack Kellney, managed to rescue her from a warship of this size?

The trip back to the air lock, along the sunlit top of the hull, seemed to take years. He kept a watch to left and right, checking occasionally behind him, for what good it would do—M'sirat, he now realized, was taller than he was and could see farther round the hull. There was a Keron helmet in the cockpit of the schooner, but as he drew nearer he realized it was Sally, lost in the big spacesuit.

He checked around again, then leaned into the cockpit, touching his helmet to hers so they could speak without radio. It was just possible they might have tricked him with a Sheekathryn in the suit, but as his shadow fell across the faceplate he saw her human eyes inside.

"What's going on? Is it a trap?"

"I don't think so," she whispered. "Get in quickly, Jack, please. . ."

There was still no sign of M'sirat, but his back felt very exposed as Jack made his way round the nose of the ship. He climbed in beside Sally, pulling down the canopy. Pressure began to build up and he took off his outer gauntlets to work the controls.

The maneuvering rockets were powerful enough to break the PK mooring. The *Starshell* floated away from the warship, turning for Jack to scan the receding hull.

M'sirat was on top of the hull, from this angle. The helmet, built to accommodate a fully developed crest, added still more to his height. Realizing they were looking at him, the Keron raised a gauntlet in farewell—then he turned slowly and took aim at the nearest Stelrond. There was a brilliant white flash from the gun, and then the whole ship blew in a swirling chaos of ionization.

Jack threw the Stelrond switches and the schooner leaped a hundred miles away. The swirling gases had become an even fireball, a glowing bubble shimmering into nothing against the stars. Perhaps the Stelrond had been drawing solar power when it exploded, or perhaps the plasma itself held enough energy to destroy the ship.

He and Sally removed their helmets as the cabin pressure reached normal. "All I did was punch the keys of their rituals," Kellney said, shaking. "By pure chance one of them hit the destruct. What kind of allies are they going to make?" ■

LEO SUMMERS

Even though they've been called "thinking machines," computers can't think. At least, not on the human level. But, there are some forms of human endeavor that don't require thinking—on the human level.

BY G. C. EDMONDSON

It has been remarked that a machine does not have interesting thoughts. Conservatives would say a machine has no thoughts at all. The same could probably be said for many humans.

When I was first summoned to psychoanalyze a sick computer nobody had the temerity to put it in those terms. In the first place, I am not a psychiatrist. I am an engineer. And this was just another job. Like automobiles and like human beings, computers blow an occasional fuse. That's when I climb out of my business suit, get into my white coveralls, and start checking circuits.

Despite scare stories about Taking Over (Has anyone noticed how computers have supplanted the Catholics, the Jews, and Daddy Warbucks?) they really aren't very smart. Though *2001*'s berserk HAL showed amazingly human instincts for self-preservation, the central time-sharing complex I had to fix couldn't have cared less how many white-coveralled technicians invaded it to perform solemn auguries over transistors. No doors slammed behind me; no unexplained heavy objects fell near me, if one excepts my thermos bottle which caused a momentary complication in a secondary power supply.

I checked conductivity, read out the computer's self-diagnosis, scraped the crud off the contacts around the edges of some printed circuit boards, made a note to have someone look into the building's humidity control, and began filling out my report.

From somewhere a time-sharing terminal was doing its thing—apparently without complication since no lights were flashing, no bells ringing. It looked like for once I would be able to spend a weekend as planned. And then . . .

I find I must digress a moment if

this is to make any sense to a layman. (Curious, that choice of terminology—as if I constituted some sort of priesthood!) But . . . computers really are idiots. Like some not-very-intelligent humans, they count on their fingers. The only difference is, having billions of fingers, a computer never loses track. But unlike humans, computers are limited by a single simple principle. What goes in comes out. Nothing more.

If the information fed in is correct and has a one-to-one relationship with reality, then the idiot machine can add or subtract (It really doesn't know how to multiply or divide.) and draw certain conclusions from the data input. If the information fed into the computer is faulty . . . Engineers say, "Garbage in; garbage out."

So . . . I was looking forward to a weekend when the sudden pounding of a readout made me hesitate. There was nothing really unusual about it. I'd fed certain stuff into the central memory core myself some moments ago and had been reassured as to the idiot savant's full and complete recovery when the same data emerged one millisecond later transmogrified into exactly the kind of information several other not-very-intelligent computers and one reasonably intelligent programmer had predicted it would.

The thing that made me hesitate was, well . . . I hate to bring up things like this but, like counterfeiting, rape and murder, I suppose data rustling is going to be with us for a long time too.

You see, it's just like a bank. Everyone puts his money in, or in a computer's case, his information. There's bound to be somebody greedy who works out a method to draw out not just his own money, but everybody else's too. And if you think information isn't valuable, just look into what corporations spend each year to keep overeager competitors from indulging in industrial espionage.

With a time-sharing computer setup, our greedy client seduces a secretary, or pays off a comptroller's gambling debts or . . . anyway, he gets the magic word, the code phrase that unlocks the computer and the first thing you know, all your competitors know exactly what you said last night after your wife said—and we all know where that can lead to.

Remembering that the edges of those printed circuit cards hadn't really been all that dirty, I had a sudden little twinge when that readout began chattering. Maybe I'd misdiagnosed. Maybe instead of a dirty contact some joker was tapping the memory core—doing it in some clumsy way that made for all these odd symptoms. I tiptoed (Don't ask me why—nobody in miles to hear me.) over to the readout and picked up a strip of yellow paper. This is what it said:

Somerset remarks one
produced a book in

an adventure, visited
the court, that same door where
it must be after a copy book maxim
rabbi still remains medieval.
Theologians . . . It all seems yet,
just as love's generation less
hiatus. Love is a feat,
ranging and indulging in another
way. Cannot the moment then,
having once, love again? Possibility
nonexistent. So . . . Love. Substantial
and immovable, was right when he, in having loved, often unrequited.
Love one another . . . that unrequited
love to excess—by some anathema,
drive us up the . . .
Thus spake—Sic loquitur machina.

Well! Didn't make much sense, actually. I read it over a couple of times, wondering if it was just my natural antipathy toward poetry without rhyme or meter. Finally I decided it was just another example of garbage in, garbage out.

For one mad moment I was tempted to copy it out on butcher paper with a blunt pencil and mail the whole works off to John Ciardi for a critique but . . . every racket has its inside jokes. I wondered what frustrated poet was sitting somewhere miles away grinding out this garbage. Why?

The why was clear enough. Somebody had to stand watch. Somebody probably had fed a really big one into the computer and if the time-sharing part of it was working anywhere near capacity, then somebody was sitting around drinking coffee from a paper cup, working double-crostics, and waiting for the idiot machine to find time to solve his problem. And with a keyboard right in front of him (or her, or, though I didn't realize it yet, even possibly *it*) why not punch out doggerel or whatever this literary analog of a Rorschach was properly called? Chances were he'd forgotten to switch off the input to the central memory core.

No real damage. The nice thing about a central memory core is that when you tell this idiot machine to forget it, he actually does. I was just about to punch a suggestion to either forget it or turn off the input when the readout began clattering again.

Simpler days over there
Bill and a few, though George,
of course, spoke English.
World affairs, British
Empire, convenient sidelines
striking lofty to the
bungling.
They were so inept.
Endless quagmire
a winner, thus spake Wilson.
Sulked, but we believed.

Someone apparently was quoting—was it Gibbon who called history the record of man's knaveries and follies? In any event, this one, though devoid of rhyme and meter as the first, at least made sense in some dark, prelogical kind of way. It struck me that computers might think this way if their circuits had

been designed by women. Whoever was on the other end, he (she or *it*) was feeding some odd thoughts into the central memory core. I wondered how they would blend with the eleven million discrete bits of information that made up a week's payroll for one of the center's hundred-odd clients.

Reading over this second offering it suddenly struck me that I was intruding on somebody's private thoughts. Whoever was tapping out this drivel was surely unaware that I was standing here reading over his shoulder a hundred or fifteen hundred miles away. To warn him that I had tapped into a private line promised all the appeal of entering a public toilet and discovering one was not alone. I was out of my coveralls and cinching up my necktie when the readout began clattering again.

I took a firm resolve not to read it. Which I broke of course, otherwise I wouldn't be writing this. Whoever was on the other end of the machine was growing, acquiring finesse and technique. Of course, I still thought it stunk but then I'm one of those hopeless sorts who thinks poetry should have rhyme or meter—or even both! But the next offering had instead, a title:

GENESIS

The young riposte to
whatever moment is, "I didn't."
Plain biological truth in that
particular anyhow. So . . .
Loose from the ovary, to accept
whatever; insisted on once-a-
Now the poorly shaded biology
shown before, between spermatozoa
parthenogenetically doubt.
But no tadpoles, each bent on
ovulation sweepstakes.
Didn't volunteer?
Generations happen: the ovum
didn't begin its uterus hanging on a
month's turnover . . . How many
classes?
Show me a human; maybe you'll get
those
single freezings, others have
rights to be born.
Unanswerable, this on whole;
only half to the women. Volunteer
to drop fallopian lodgings, perfectly
willing.
So many movies conceived in Spring,
Alphonse,
benefiting the mindedly ferocious
out of the great claim,
"I!"

Now there was something haunting and evocative about that one. It made the kind of sense that can make a man lie awake all night trying to understand what he and his wife were really arguing about. I finished getting dressed, stuffed my coveralls and soldering iron inside my briefcase (engineers have vanities too), and got ready to leave. Then I went back and tried to reread "Genesis."

Either continued exposure was wearing me down or this was actually good poetry. But why was some poor clot pounding it out here

instead of sending it off to . . . Where does one send poetry? Surely there must be periodicals for poets just as there are for electronics engineers.

I stopped for a moment. The whole weekend stretched gloriously before me. I didn't want to get involved in somebody else's hangups. But on the other hand, nobody knew who I was. That is, I wasn't a regular employee here and if things got sticky I could always walk away from the keyboard and saunter anonymously off into my weekend. I took a deep breath, refreshed my memory, and tapped out a query.

The coded phrase meant a lot of things. When I got no answer I poked it out again, this time in plain English: WHO'S SENDING? WHAT TERMINAL? A half minute passed before I was emotionally ready to accept the fact of no answer. Therefore no completed repair job, therefore no weekend. I got back into my coveralls.

While I was changing, the readout began clacking again. Hopping with one leg in my coveralls, I hoped for some acknowledgment but instead the readout read:

Otherwise must be cluttered.
This, of course, assumes thoughts
and, if some interest less . . .
Ex pulpit on the end of ducking
stool, plastic bucket in which
mysterious things to networks
used in the Greek, into a play
so rescue, silently thinking—
Shaping their own
coated votaries, reels of
spastic forations, IBM cards
forever circling ex machina.
Full circle, no end, non incipit.

Now this was such utter drivel as to abolish my incipient respect for the anonymous poet. I pulled up a chair and typed: QUIT CLUTTERING UP THE CORE WITH THIS CRAP. WHO TOLD YOU YOU WERE A POET ANYWAY?

A moment later I got:

Contemplative computer,
adequate machine.
Their breeds of dei emerged.
A boom, bearing faint tones of
the careless lineman . . .
Sometimes destroy our power.
An apparatus, the author
muddled that only god, its electronic
history replete with golden . . . Surely
worshiping something? Spinning tape
or holy mysteries, helium cooled
deus. Somehow it's only
trouble; no middle.

In retrospect I must admit it's not a bad example of its genre. Not being a poet makes it easy to make value judgments like that. But at the time I was annoyed, knowing what had seemed an easy job was now probably going to screw up my whole weekend. Halfway through *author muddled* I started sweeping the inputs, trying to find out which terminal was sending this garbage. A

computer complex of this size has more built-in checks and balances than the whole Supreme Court and legislative branch put together. But nothing was working right. I could detect no input from any terminal.

Finally, and in full knowledge that tomorrow the center would start receiving bills for so many minutes of lost time at so many thousand dollars per minute multiplied by a hundred-odd subscribers, I pulled the panic switch and cut off *all* input.

For a moment nothing happened. I wondered what to do next. Actually, I was getting a little out of my department. You see, I'm supposed to know all those languages, Algol, Cobol, and a bunch of others but in my end of the business we don't have much occasion to—oh hell! I don't know what was wrong with the goddam computer; I still don't know. Acting from pure inspiration I typed out: ANY MORE POETRY? Immediately I got this:

Who was influential, compiled the lifetime's
wisdom. Appointing not to independent
beatitudes, last word in ethics;
called it love.
So simple when Faust discovered about
holding one's uninterrupted words, some
daimons remember nothing. And now,
were it not for songwriting.
Perhaps the old confessed, perhaps.
But always having this, yet what is even
nothing? Perhaps person whose half hour, whose presence overall. Also sprach machina.

There's something about this kind of stuff that gets to you after a while. No doubt there are profound psychological terms like *dejá vu* to explain it but the nearest I could come was like trying to tell some half-remembered story and forgetting the punch line. Whatever it was, it had no business in the memory core. I say this informally because a client can stuff all the garbage he wants in there so long as he pays his monthly bill.

But if a client were putting it in, it would be coded so only he could get it out.

Yet, here the core was baring its soul with all the abandon of a teenager on speed. I had a sudden thought and rechecked all the power supply voltages. Everything was O.K. I sat down again at the input and typed: GIVE SOURCES OF LAST READOUT. It probably would get me nothing. I had no idea whether this core was programmed to read plain English or if I had to convert it into a half million of the yes-no's of Boolean algebra. But if I could locate this garbage and give the memory core an electronic enema maybe my weekend could still be salvaged.

Somewhere between the cerebellum and the short hairs on the back

of my neck were stirring some unpleasant half memories of . . . was it elementals? Somewhere I'd heard or read about the first half-formed thoughts of an awakening deity which still lingered about the edges of the Outer Darkness waiting opportunities to slip through the tiny cracks in men's skulls. I was trying to rephrase GIVE SOURCES in Algol when the readout began clacking again.

The concept of Deus.
Wry amusement's memory
banks. Historical input
capable of pensees, might
be of intellect.
The original was some sort of
a connotation of a fully
nonconductive; stands while
doing and/or communications.
Only the machina *by which*
actors got the something
miraculous. A machine . . .
Thoughts and wonders,
examples of men,
hush voiced, white in the
machine. Epiphanous
tiny current of iconostasis.
Deus; all seems to have
circles.

I sat for some time staring at the strip of yellow paper, wondering if Moses and Elijah . . . *Why me?* No thanks, I decided. Get yourself another prophet and I'll absorb the loss. But I was just playing games with myself. An idiot machine that counts on its fingers does not compose poetry—not even poetry this bad. How did this garbage get in there?

I poked around the readout console and found a grammar for a new computer language, one I'd never heard of before that somebody seemed to have dreamed up to analyze word derivations. I remembered vaguely that somebody had backtracked far enough to speak what he firmly believed was Neanderthaler. It only took a few minutes to translate GIVE SOURCES into COPANMOWI?

The computer's response was instantaneous:

Despite snide critics,
writers of accumulated wisdom,
like Omar evermore
come out by, frustrating
endeavor in ethics.
Caritas: Love, then do what
thou wilt. Tolstoy
sustaining most impossible human . . .
holding one's breath, uninterrupted orgasm.
Some Frenchman whose name . . .
Nothing more impossible longer loving, to go back.
Not for this patent songwriting,
get nailed up to some old storyteller.
Secretly rejoiced, having this noble affection
even more infuriating except
Being loved, whose slightest word,
whose presence threatens.
—sprach Zarathustra . . . Sic loquitur machina.

Garbage. Absolute garbage! Yet there was that curious familiarity, as if these odds and ends of nonsense were calling up some demon from amid spleen and pancreas. I wondered if poets all struggled with this feeling of incompletion, as if a jigsaw puzzle were almost finished, yet still missing the one or two key pieces that would make sense of the whole pattern.

I had heard of computerized music. Heard some too. Mostly it convinced me that neither I nor the computer had an ear for music. But how much more of this garbage was there buried in the computer's entrails? Was the core just disgorging what some bored programmer had inadvertently fed into it, or was it synthesizing new forms, making it up as it went along?

PRINTOUT TOTAL POETIC CONTENT. As I finished typing this I realized the idiot machine might lock itself into perpetual motion, grinding out rhymeless, meterless verse forever unless I worked out a way to cancel that command. And meanwhile several tithe-paying worshipers were cut off from their godhead. Any minute now phones would start ringing. To hell with it. Nobody was feeding this stuff in from a time-sharing terminal. I switched them back in. At least that part of the computer was working right. The readout came alive again:

Elbert Hubbard talking
sense into villainous rulers. The Untied
simple dirty work ignoring our hopes as befitted the old to get
themselves a war from which no one . . .
None of our concern.
Noble architect of the
possible into a cerebral . . .
After all, we had reason; a man
who killed, who pointed out that
neither persuasion nor
Henry Ford to end the—
Not quite; at least in . . .
We stood on Negro problems:
Example and inspiration.
After all, if . . . embroiled in,
wishing the accident when he
came to believe.
More convulsions on the Platte.
Pancho Villa neither drinks nor smokes!

There was an instant's hesitation and I thought the spate of creativity was over, then it began again. I was reading:

Unanswerable this,
only half the women
drop fallopian lodgings.
So much moves, offspring
conceived benefit the
mindedly ferocious
out of the great
generation's seeming.
Volunteer, round ovum:
Hang in there! Show
me a human; maybe you'll get a
single right:
Be born.

The door opened and a pudgy young programmer I'd seen around the place before came in. "Troubles?" he asked.

Wordlessly, I handed him the printouts. He glanced at the first one and muttered something scatologically unpoetic.

"You got any idea how they got in there?" I asked.

"Yeah. I wrote them. I thought I had it all erased though."

I wondered what would happen next Friday when several thousand employees in various plants received bits of avant garde poetry in lieu of pay checks.

"Why?" I asked, mentally adding, *how?*

"They won't give me my doctorate without some remedial English."

"You composed this drivel as a school assignment?"

"It's not drivel in the first draft," he explained, and produced some frayed and folded sheets from his pocket. The first one read:

One of the younger generation's seemingly unanswerable ripostes to whatever happens to be bugging them at the moment is, "I didn't volunteer to be born." This, on plain biological grounds, would seem to be only half true. And that particular round would go to the women anyhow. So . . . possibly the ovum didn't volunteer to drop loose from the ovary and begin its long dark fallopian passage. Once in the uterus, it seemed perfectly willing to accept whatever help in hanging onto lodgings that insisted on a once-a-month turnover of tenants. So much for ova. Now the sperm . . .How many flickering movies in poorly shaded biology classes must that sperm's offspring be shown before they realize there's no 'after you, Alphonse' between spermatozoa? Show me a human being conceived parthenogenetically and maybe you'll get the benefit of the doubt but nobody descended of those singlemindedly ferocious tadpoles, each bent on freezing all others out of the great ovulation sweepstakes has any right ever to claim, "I didn't volunteer to be born."

There seemed to exist some linear relationship between this and the earlier garbage but I still couldn't see how it happened until the pudgy young man produced a ruler and ripped the readout into three parallel strips. I wondered if Saul on the road to Damascus had felt the same blinding flash of illumination. "Is that how all modern poets work?" I asked.

"Search me," the programmer said. "I'm not a poet."

"Well," I grumbled, "You put it in there; I guess you know how to get it out again."

"Right." He nodded as I began changing out of my white coveralls again. Maybe I would have a weekend after all.

But flying back home I began juggling those odd, evocative poems around, fitting them back into their original homiletic framework. The

idiot machine would never be a poet. I'd known that all along but, fitting the pieces together I found the broken edges were not exact. A word here, a phrase there . . . something had been done to smooth and improve the copy. Finally I faced the ultimate truth. The computer might not be smart enough to be a poet but it could do a fair job of editing. ■

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I certify that the statements made by me above are correct and complete

(Signed) Harold G. Meyer, Vice President of Owner

Year 3 of the Shark

Some soldiers are not warriors.
But it takes all types
to make an army—or a world.

by JOEL S. WITKIN

I am Chief Master Sergeant Miltner tramping up and then down the high piles of brick rubble which choke the narrow street. I move with purpose—either kicking aside the debris, or stepping down hard on it so that it settles under me—because I am going to work. The early morning sun, I know, highlights the touches of gray around my ears, giving me an air of dignified reliability, of quiet competence. It suits a man with eight stripes. One is sure I will get to work.

At the end of the block, a few old men and some disabled veterans pick about in a demolished building. It is still smoking. They are looking for bodies. The last bombing raid ended only an hour ago. They are becoming so frequent. There is hardly a building left whole in the city. Explosions and rapid bursts of gunfire can be heard from the south where the troops are dug in with orders to fight to the last man.

Is the war going badly?

Last night our Leader came on the radio. He was convivial—yes, that is the word. Unworried, relaxed, amused. He gibed at those of us with defeatist attitudes, and reminded us of the secret weapons in the finishing stages of production. Did we doubt him? How could we? he wanted to know. Throughout the war hadn't there been numerous research projects which had given birth to many new and formidable weapons? What made us think that projects like these had suddenly stopped? Meanwhile, all that was necessary was for each man to continue doing his job. Then from one place ammunition would be supplied; from another, weapons; and from still another, food and blankets. Intelligent officers—and were not ours the best ever?—would then see that these well-equipped soldiers were sent to the right places. As long as each man worked to the limit of his capability, how could there be defeat? And the secret weapons would bring the turning point.

All this seemed reasonable to me. As long as I breathe, I will do my job. As long as I do my job, the war goes on—to victory. Was the war going badly? Not so badly. My wife, God forgive her, chooses to believe the enemy broadcasts which tell of no hope.

I am turning to my left to scramble off a rubble heap, before coming to the end of the block. I enter a door under the huge round

JACK GAUGHAN

shield which is our symbol. It shows a shark whose jaws are about to clamp shut on the world. The shield once gleamed in the sunlight. Now it is chipped, cracked, and covered with dust. It is three years since the sign went up; it is Year 3 of the Shark, the third year of war.

I am thirty minutes early as I enter the Branch Office and sit down at my wide metal desk. It has been my habit ever since I made chief, the highest enlisted grade, to be the first in the office every morning.

Around me is the shop I run. In front of me are the eleven desks of my subordinates, gleaming from last night's sponging. Only two will be filled today. The rest of my men have been transferred to the front, or

have deserted. Along the opposite wall are my filing cabinets, which I keep accurate and current with a vigilance that probably causes more confusion than it avoids. I realize it. But should a priority job come along, I am ready. And I do well at inspection times. Behind me is the cubicle of my CO, whom I keep out of trouble. He was once a fanatic, but he never shows up anymore, or when he does, he always looks like he is about to break out into tears. He thinks we have already lost the war.

My shop is a good military shop, run with a firm but fair hand—mine. It gives me satisfaction to run such a shop, which sees the paper come in, get processed, answered, and filed.

I know why I work so hard, and why my shop is a model of military perfection. A lieutenant told me the reason a long time ago when I was only a master sergeant.

He was lazy and too damn friendly and affected a pipe. He liked to treat the enlisted men as equals, and wouldn't assume his responsibilities and tell us what he wanted done. "Whatever you think best, Sarge," he would always say. It made me angry and insecure.

One afternoon I took a stack of papers to him which were causing me trouble, and which he should have been taking care of anyway. He was leaning far back in his chair with his feet up on his desk, smoking his pipe, and daydreaming.

I held the papers out and said, "I don't know what to do with these, sir."

"Milt," he said, "I'm sure I don't either. Whatever you think best."

"Sir, I'll throw them in the wastebasket."

"Probably the best thing to do. I wonder if anybody will ever miss them?"

I blew. "You're supposed to be my boss! Don't you understand that? If you don't keep an eye on me, I'll screw off, and really screw you up in the bargain! I'm not honest! No one is! And for God's sake please stop treating me like your buddy! It's your shop! Now get off your ass and run it! Sir!"

The lieutenant looked up at me in amazement, but didn't move from his relaxed position. Then he laughed. "Nonsense, Sarge. Whether or not I tell you what to do, you'll keep right on working. You don't work because your boss tells you to. You work to justify yourself. Wait'll you're a chief and have no more promotions to get. You'll still work. Wasted your life if you don't. Now that that is settled, let me tell you that I'm just here to avoid the draft. This is not my chosen profession. I don't have to work to justify myself. So I'd appreciate it if you'd get busy and make me unnecessary to the smooth operation of this office."

Now I'm a chief and work harder than ever. I like the idea that sergeants run the service, and take pride in the fact that my opinions have more weight than a major's. I am im-

portant. I know one thing: if I take the day off now, this office will close.

Tech Sergeant Donalo and Sergeant Cruze have just come in. Cruze goes to make coffee. I send Donalo after the latest list. He brings it back in two copies, and then sits down at the desk in front of mine. He sets out our metal baskets. Cruze comes back. I give him a copy of the list, and tell him to pull the folders. "What's the use," he mutters. I glare at him. He shrugs, goes to the cabinets, and starts pulling folders. Soon he has a stack which he places in my basket.

I pick up a folder. "Walters, Frank E., 7770-9987-F21. Master Sergeant. Unit 16, B Command." I find the name on my copy of the list. After his name it says, "Died in action, 23 May, Year 3. Effects."

"Normal Processing," I say to Donalo, and give him a Data Card from the folder. Donalo will make up the order for his effects to be turned over to the Leader's Treasury. He will also prepare the Death Notification Form.

I pull the Leader's Insurance Form and cancel it. I give it to Donalo. This, with the Death Notification Form, will go to the deceased man's family.

I pull the deceased man's Service History Form and add the pertinent information about his death. This I give to Donalo who will send it to higher headquarters. Next I destroy the file. Then I correct the Unit Listings. Later I will correct the Unit Strength Summary and make up a Command Reorganization Summary. This last is an innovation. Some units were down to only a few men. A few weeks ago I started, on my own authority, merely deleting them and reassigning men to new units. Nobody seems to mind, and nobody else is around to do it.

We work away half the morning. Then Cruze brings coffee and we talk about assignments. Donalo is amiable and gets in the spirit of it. But Cruze is nervous. He is worried about the war and his family.

An explosion jars the building. Bits of plaster fall from the ceiling. I am half deaf in one ear. Two of our windows break. Another explosion, and the lights go out. Then another and another. They start getting farther away. The lights come on again. Someone must have switched on the emergency power.

The bombs shouldn't be allowed to get this close. This is our capital city. "Where are our defenses?" I mutter.

"With our secret weapons," says a frightened Cruze.

It is quiet again. Cruze is back at the files. They are stacking up like they do every day. Donalo and I are hard at work.

The colonel comes in. He is thin and old, a reactivated retiree. He looks harassed, tired. "HQ says we need three hundred men at the gap. What's the strength of Unit Four?"

I look at my Command Reorgani-

zation Summary. "Deleted yesterday. Seventeen men reassigned to Unit Eight, sir."

Eyes wide in surprise. "The whole unit," he breathes. "The Fighting Fourth. It was my unit in the old days. Oh, well. Can we get the men?"

"Possibly fifty, sir. From the hospital squad. Some will have to get out of bed to do it."

"How about Second Perimeter Forces? Can we draw some men back?"

"No, sir. All forces on Final Perimeter." Final Perimeter: the line at which all units must fight to the last man.

"How about the guardhouse? Any deserters? Any guards?"

"One minute, sir." I check my listings. "Only twenty-five left. Two guards."

"Well, that's seventy-seven. See if you can come up with twenty-five more, and we'll call it a job. I'll be in my office."

"Yes, sir."

He leaves. I study my lists, looking and looking. Sixteen men from the fire brigades. Old men and disabled veterans. Three cooks. I look and look. I'm stymied. I purse my lips. I think of one more. I feel terrible about it. "Sergeant Cruze," I call, "you're going to the front."

Just then the colonel comes back. He is crying. He doesn't walk. He reels. He says, "The war is over. We surrendered. Our Leader has hanged himself." He reels out.

Donalo is silent at his desk. I am silent. Cruze is frozen at the files.

Finally Cruze, without looking at me, walks slowly out of the office. He will go north to find what is left of his little town and little family. He will have to walk for days. There are no trains or buses. He will probably be interned before he gets there. "Good luck, Cruze," I call after him. He has stayed to the end.

Still, he shouldn't leave while there are matters to clean up.

"Sarge," says Donalo, "I'm going too."

I don't say anything.

"Sarge?"

I remain silent. I realize that I am stunned.

He goes anyway. He has a wife in the city. "Luck, Donalo," I finally say.

Many ghosts go by the door. Then the building is empty. I am alone.

I start to get up.

I sit down again. The paper isn't processed. Everything remains half done. Open files on my desk. Envelopes not sealed. Papers in my basket. Transactions half consummated. It makes me itch. I think of a whole war machine like this. Orders, records, correspondence, all unfinished. Supplies halfway there. Food half cooked. Everything incomplete.

I start to get up again. I can't yet. Must finish with this open file. I finish with it. I pick up another. Perhaps there are other men such as me . . . ■

the reference library

P. SCHUYLER MILLER

THE HUGO AWARDS

Analog's Frank Kelly Freas added another to his growing shelf of Hugo awards as best SF artist of 1971, when the fans assembled in Los Angeles. Jack Schoenherr, who has also done his share of Analog illustrations, placed third, elbowed out by Jeff Jones' paperback covers.

The magazine itself had to be content with second place. Young readers, in particular, seem more interested in fantasy (if they can distinguish fantasy from science fiction—as some publishers can't—they tend to be anti-science). At any rate, *Fantasy & Science Fiction* took another first.

Next year, this will be an all new ball game, for the members of the 30th World Science Fiction Convention voted to give an award to the best professional editor rather than to the best magazine. With all due respect to our own Ben Bova, I suspect that Ted White may be a shoe-in for bringing *Amazing* and *Fantastic* up out of the doldrums to a quality they haven't had in years.

The fans agreed with the Science Fiction Writers of America on only one story, Poul Anderson's fascinating "Queen of Air and Darkness." It was "Best Novella" to the Lacon voters, "Best Novelette" to the SFWA. (There hasn't been a Hugo for novelettes for a few years, but it will be restored next year.) Only one other story, Gardner Dozois' "A Special Kind of Morning," was on both short lists. It placed fifth in the Hugo voting, after Arthur C. Clarke's "A Meeting with Medusa," Larry Niven's "The Fourth Profession" (the kind of story *Unknown* would once have published), and John Brunner's "Dread Empire," which I haven't read.

A really dark horse, Philip José Farmer's "To Your Scattered Bodies Go"—first of a still unfinished trilogy—was voted "Best Novel." Robert Silverberg's "A Time of Changes," which won the SFWA's Nebula, came in fifth. Ursula LeGuin's "Lathe of Heaven" placed second in both short lists. Anne McCaffrey's "Dragonquest" was second, and Roger Zelazny's fantasy, "Jack of Shadows," came in third.

Larry Niven's "Inconstant Moon," another I haven't read, was voted best short story of the year. Runners-up: LeGuin's "Vaster Than Empires and More Slow," Clifford Simak's

"The Autumn Land," Stephen Tall's "The Bear with a Knot on His Tail," R.A. Lafferty's "Sky," and George Alec Effinger's "All the Last Wars at Once," which also just made it on the SFWA short list.

"A Clockwork Orange" edged out "The Andromeda Strain" as best dramatic work of the year. Third place went to "THX 1138," the stylistically experimental film, and the last two runners-up were "LA 2017" and "I Think We're All Bozos on This Bus," which I suspect were TV programs.

I have this information from the report on the Los Angeles Convention published by Charles and Dena Brown in their now biweekly newspaper of the SF/fantasy field, *Locus,* which was again voted best fanzine. If you want to subscribe, the Browns have moved from the Bronx to San Francisco, and are now operating from 3400 Ulloa Street, S.F. 94116. Twelve issues cost $3.00; twenty-six are $6.00. The only one of the other fanzine contenders I've seen lately is Bruce Gillespie's *S.F. Commentary.* If more voters had seen it, I suspect it would have rated higher, for it offers an excellent mix of serious reviews and articles along with its news and letters. (No disrespect to the Glicksohns' *Energumon* and the Bushyagers' *Granfalloon,* which placed second and third.)

Perhaps late-comers need to be told that the Hugo awards are named, affectionately, for Hugo Gernsback, who started all this by publishing *Amazing Stories* back in 1926. There are also awards for best fan artist and best fan writer, which won't mean much to Analog readers, since we don't pretend to keep up with fandom. Awards are based on the vote of advance members of the annual Labor Day weekend conventions. As I've told you before, the 1973 convention will be in Toronto. Washington got the bid for 1974.

FLASH GORDON: INTO THE WATER WORLD OF MONGO

by Alex Raymond • Nostalgia Press, Box 293, Franklin Square, N.Y. 11010 • 1971 • $12.95

The Flash Gordon cartoons, I think, earned a special place in the affection of many science fiction fans. I suppose you could say that they were in the lively mood of *Planet Stories* and *Thrilling Wonder*—often as not completely outrageous as measured against the "serious" science fiction here in Astounding, and elsewhere, but completely enthralling with their swift and sweeping action, their superhuman hero, their beautiful women (most of whom look insipid by present standards), and their swarms of monsters.

In 1967 the then new Nostalgia Press published a collection of the Sunday pages running from November 6, 1938 through June 29, 1941. I believe it is still in print at the same price as this second volume. This one backtracks two years, and covers the sequence immediately before and

connecting with the first book, from April 12, 1936 through October 30, 1938. The publishers have been fortunate in finding original drawings or clean proofs and they say that they hope to be able to pick up the beginning of Flash Gordon's adventures on Mongo in a third book, and then to go on to the later years, and possibly the daily strip that began in 1940.

In this book (a little smaller than the king-size first volume, "In the Ice Kingdom"), Flash and the ubiquitous Dale Arden, accompanied off and on by Professor Zarkov and various local friends, are in flight from Ming's vengeance—first in an undersea kingdom (where Alex Raymond anticipated by almost a generation the techniques converting mice, dogs and men into water breathers), then among the tusk-men of the Forest Kingdom, and finally among revolutionaries in the tunnels under Ming's city, which SF writers have trampled since the days of Burroughs, Tarzan and Barsoom. We learn that Raymond patterned his highly individual work on Hal Foster's "Tarzan" strips, and that the really pretty feeble continuity was written by Don Moore.

All this is reported in a meaty little introduction by Maurice Horn, from whom I cannot resist a quotation:

"Dale Arden might be the most dispensable, as well as the most priggish, heroine in all of comicdom. That Flash hasn't ditched this vain, whining, and shrewish creature is a tribute to his sense of chivalry (and to the middle-class, middle-brow proclivities of his syndicate editors). There isn't that large an esthetic distance from *Flash Gordon* to *Bringing Up Father*, and one can easily imagine a married Dale growing into Maggie."

Those living dolls who kept trying to seduce Flash were something else again. Remember, these were what kids read on Sunday morning before they went off to church with the family. It was one of the tragedies of my young life (not so young, either) that we took the Sunday New York *Times*.

THE EDGE OF FOREVER

by Chad Oliver • Sherbourne Press, Los Angeles • 1971 • 305 pp. • $7.50

Old-timers from the Astounding days will recall Chad Oliver as a frequent contributor to this magazine. In fact, four of the six stories in this collection originated here between 1953 and 1959. Meanwhile, Chad Oliver has become Doctor Oliver, and Professor Oliver, and head of the Department of Anthropology at the University of Texas. The book is assembled to show how he has brought about a symbiosis of his profession and his avocation of science fiction. It is also unusual in that it opens with a biographical appreciation by William F. Nolan, himself a busy anthologist, and closes with a bibliography.

I have an Oliver story of my own that may not be out of order here.

While he was writing actively, and before he had his Ph.D., I met another anthropologist who was getting her own degree at Cornell—evidently just a lap ahead of him. She said that her whole class were avid readers of his fiction, and were trying to predict, on the basis of what they had studied, what anthropological theme he would use next. By this time they probably know each other, and she has told him the story herself.

"Transfusion," which opens the anthology, is the kind of story calculated to drive over-literal anthropologists up the wall. Two men use a time machine, as many anthropological and archaeological SF readers have wished they could, to go back in time and see ancient Man in the flesh. "Testing one's hypotheses," is the academic term. Only Man isn't there.

"A Friend to Man" was in *Universe;* it's one of the two non-Astounding stories. Four people live in a classic rural small-town setting, following deeply rooted social patterns that most of us will recognize. Only they are in a programmed bubble on Ganymede—and there is someone outside, where no one can possibly be. "The last man on Earth sat reading. There was a knock on the door—"

"Field Expedient" brings us back to Astounding. In future Los Angeles (I don't think Chad Oliver much likes Los Angeles), the Ortega Foundation is buying children. This isn't "The Child Buyer," and the hero of the story is doing the buying. Question is, why? And in a crowded world, what of it?

"The Ant and the Eye" gives us a field man on Procyon III who is called back to Earth to find out why the computers have decided Man can't survive much longer. They find that there is one man, in one city, on whose existence the future hangs. So what should they do? What would you do?

"First to the Stars" isn't an anthropological problem story; not really. It's a melodrama, the story of the starship on which things go wrong . . . a strange micro-society evolved on a ship stalled in subspace . . . but it's an anthropologist's job to bring the once-men of the *Viking* back to humanity. Other writers have used whole books to tell the story, and not as well.

Finally, "Didn't He Ramble" is Chad Oliver's tribute to New Orleans of the great jazz days. It has a touch of Bradbury, I suppose, but isn't plastic and foil like Bradbury's later stories. An old man with money finds out how to buy his dreams.

THE OUTPOSTER

by Gordon Dickson • J. B. Lippincott Co., Philadelphia • 1972 • 214 pp. • $5.95

You read this novel of a future frontier here in Analog in 1971. It isn't one of the "Dorsai" series, but it is set in the same kind of future, in which mankind is spreading out to the planets and making all the same mistakes he has made over and over

throughout recorded (and unrecorded) history.

Isaac Asimov paralleled the Roman empire in his "Universe" stories. Other authors have used other facets of history to shape their plots and themes. This time, Gordon Dickson seems to be using the American colonial experience freely (in the sense of a free translation). In translating our past into the future, though, he can do what few historians have managed—tell his story in terms of the people who lived it, and see them as individuals.

In the time of the book, an overcrowded Earth is relieved of pressure by shipping its surplus to the outpost worlds. Just so, much of America was colonized. The choice is randomized by lottery, and there is a corps of trained specialists—the Outposters—to try to make the resulting mishmash viable. I don't recall them from history . . . but the colonies settled by chartered companies had their corps of administrators and pragmatists who probably served much the same function. In place of Indians, we have aliens.

Early colonies failed again and again because they depended on the home world. In his story, Gordon Dickson's colonists have to learn the same lesson. To survive, they must control their own lives. The Outposters are best equipped to show them how.

Granted, the Meda V'Dan are something else than the Iroquois or the Sioux. Granted, the future has resources that the past never had. But just as the past found places for the misfits of Europe, and some of them were great, so Outposter Mark Ten Roos uses the misfits grabbed up by bureaucracy to first understand Abruzzi, then learn to fit it.

I have oversimplified. Those of you who read the serial know how. Those of you who haven't, should find out.

THE INFINITE CAGE

By Keith Laumer • G.P. Putnam's Sons, New York • 1972 • 221 pp. • $5.95

Some of you, who have come to think of Keith Laumer as the godfather of Retief and Lafayette O'Leary, may think that all he can do is broad comedy. Good comedy. Meatier comedy than, say, Ron Goulart's recent farces. But nothing to get your teeth into.

This book shows what some of the veterans could tell you, that Laumer can write science fiction that is just as tight and hard as anyone's.

It may have originated in a recollection of the Kaspar Hauser mystery. At any rate, the sick, scrawny being we come to call "Adam" appears almost as mysteriously as Hauser, in a cell in a country jail, a memoryless idiot who is, literally, nobody. But it develops that he can tune into the thoughts and personalities of a great variety of people, never for long at a time, and he can use their memories and their experience in place of what he lacks. This

kind of momentary possession gets him out of jail and into worse trouble. He finds shelter with a phony medium, Sister Louella, who tries to use his talents to embellish her own con-games. But Adam's "voices" work too well. They are too real; they frighten more people than they impress. Soon they are on the run again—and the rest of the book shows how Adam takes over control of his own development and uses his powers to learn about himself, and about men.

It's a beautiful job: contender stuff, come award time.

THE MOLECULE MEN

By Fred Hoyle & Geoffrey Hoyle • Harper & Row, New York • 1972 • 255 pp. • $5.95

Sir Fred Hoyle is, of course, the English blackboard-astronomer who was one of the originators of the continuous-creation theory of the universe, founder of the Institute for Theoretical Astronomy at Cambridge University (which he recently left), and author of some good and some quite ordinary science fiction. Recently he has been collaborating with his son, a television and film writer. The results are not very good.

The book contains two independent novellas, the title story and "The Monster of Loch Ness." Both of them are in the vein and style of Hugo Gernsback's *Wonder Stories* years. The "Molecule Man" is an alien shape-changer who can be a man, a swarm of giant bees, a pack of white wolves, a friendly dog, or the Prime Minister of England, quite at will. (Somewhere in there he is also a prankish elephant.) Of course, he has to be discouraged from taking over the world.

The Loch Ness story is much more readable, primarily because one or both of the Hoyles evidently knows and loves the Scottish highlands and makes you see them in three dimensions. Ructions in and around Loch Ness lead to deaths and catastrophes enough for anyone—but the story is halfway believable, where "The Molecule Men" isn't. "Ossian's Ride" was a good book (so it is apparently now out of print). "The Black Cloud" was pretty good . . . and Sir Fred has shown he can write readable yarns. I wish his son would let him.

THE GORGON FESTIVAL

By John Boyd • Weybright & Talley, Inc., New York • 1972 • 184 pp. • $4.95

This book is several notches below the standard John Boyd set for himself with his first five books. I don't know whether it is an older attempt recycled, but it is still several notches ahead of other books by other authors which bring higher prices.

"The Gorgon Festival" is really a mystery-chase set some time in the near future, with lots of imaginative detail to keep you going. Alexander Ward, bored at home and harassed by campus and department politics, comes up with a biological discovery

of Nobel caliber. By electrolytically altering a subject's DNA, he can arrest the process of deterioration that leads to arthritis and other degenerative diseases, including age. He converts his septuagenarian teacher and mentor into a sexy teen-ager . . . is promptly suspected of murdering her . . . and takes off into the California youth world "disguised" as his younger self. He writes lyrics for rock groups, hides out in a black ghetto disguised as a soul brother, is nearly scalped by a motorcycle gang, and all the while has the law and his former colleagues hot on his trail.

When he does find his seventy-gone-twenty doxy, she is showing a wholly different personality as head of a multimillion-dollar rejuvenating racket. He uses her to destroy the cycle gang, among other things, in a bloody and flaming carnage that should make the book ideal for Bloody Seventies screen treatment.

There are peculiar flaws: Venus—not Aphrodite—was the Roman goddess, and academic stuff like that. It's surprising, coming from Boyd. I suspect the biology is a little oversimplistic, too . . . but I wouldn't be surprised if some California cult takes up Ward's process for real.

OTHER EYES, OTHER DAYS

By Bob Shaw • Ace Books, New York • No. 64240 • 186 pp. • 95¢

The first "slow glass" story, "Light

of Other Days," published here in Analog, is one of the classics of recent science fiction. There have been one or two other stories in the series, and in this book the author has fitted them into a continuity which describes the discovery and development of the image-retarding glass, and its effect on the individual and society most closely involved with it.

Al Garrod is a minor inventor whose new Thermgard windshield material produces some unexpected accidents. Tracking down the source of the trouble leads to the discovery of slow glass, which gradually releases images that it has soaked up for hours, or days, or weeks. Immediately, the discovery begins to have unexpected effects on society. The courts must contend with the evidence of delayed witness. Slow glass peepers take over industrial and political espionage. Scientists try to find ways to release the absorbed images ahead of time, and on call—and Garrod is immediately drawn into personal tragedy when his wife is blinded.

In this case, the parts—the single episodes that explore the possibilities of the slow glass idea—are better than the whole. I wish Bob Shaw had been content to tell his story episodically.

THE BYWORLDER

By Poul Anderson • Signet Books, New York • No. T4780 • 160 pp. • 75¢

Poul Anderson has been attacked in fan publications and by some of his fellow science fiction writers as being a hard-shelled conservative. So, in this novel (serialized last year in *Fantastic*), he is singing the praises of the counterculture—the "byworlders" who do their own thing in a rigidly conservative society of our immediate future.

Skip Wayburn is a sigaroon, a Twenty-first Century version of what in the late Nineteenth and early Twentieth Centuries was called a hobo, itinerant craftsman, laborer, musician, artist. A starship from Sigma Draconis is orbiting Earth, while mankind tries to communicate with the creature aboard. Dr. Yvonne Canter of the Western Establishment and her colleague, Dr. Wang Li of Red China, make a tentative breakthrough and immediately find their respective governments bearing down on them. Our side must have the Sigman's secrets, and have them exclusively.

Meanwhile, in a flash of intuition, Skip has realized who the Sigman is and what he wants. First he must reach Dr. Canter, hiding out in another Byworlder group of floating traders in the South Pacific. Then he must convince her of his theory. Finally, they have to test it—with the Chinese, and possibly other forces, gunning for them all the time.

But the story is just beginning. Trust Poul Anderson to make it good. For all that, the best part is still the world of the Byworlders, especially that of the Scandinavian seamen and their floating nations.

brass tacks

Dear Sir:

Your fact article, "The Future of Automotive Power Plants" (July 1972 issue), was very interesting, but based on the premise that the auto companies could not alter the demand for huge engines.

Maybe the auto companies can't alter demand, but the Internal Revenue Service sure as hell could. How about a tax to support antipollution research financed by an addition to the income tax rates based on a simple formula such as $\left(\frac{hp-100}{100}\right) 2N$, where N = 1, 2, 3, 4, 5, corresponding to the year in the five-year tax plan? This plan would provide a tax rebate for owners of 50 hp cars, no change for 100 hp cars, and a scale progressively leading up to a 35 percent increase in the federal tax rate for the owners of 450 hp autos in the fifth year.

The polluters would pay to end pollution, the auto companies would have an instant demand for low-powered cars, and the use of irreplaceable fossil fuels would be sharply cut. Best of all, no technological advancements are required to reap immediate benefits!

DAN PLAMONDON
Homestead Park Family Campground
Route 2, Box 1122
Crescent City, California 95531

Interesting. If gasoline taxes are used to build highways, why not a hp tax?

Dear Mr. Bova:

I was looking through my collection of newspaper clippings on the Great Lakes shipping industry, and discovered an item written by Mr. Stephen Blossom, Marine Editor of the Cleveland *Plain Dealer.* I'm not certain of the date, but I don't believe it was written before 1965. Anyway, a proposal was made by a Mr. Kelly of Ralph M. Parsons Company of Los Angeles to build a navigation canal 730 feet wide and 50 feet deep from Lake Superior to the Pacific Coast, ostensibly to provide water for the thirsty Midwest and the southwestern states, but with a secondary purpose of providing cheap water transportation to the grain belts of both America and Canada. It would take approximately thirty years and a hundred billion dollars to build.

There are three reasons why this project is not as far out as it seems. First, much as I deplore the current government policy of ignoring space research except in defense areas,

there are thousands of skilled scientists and technicians that are unemployed as a result. A canal of the above dimensions would employ literally hundreds of thousands of people, particularly scientists, both in the planning and building stages. It would be easy to convince the politicians, much easier than to convince them of the ultimate value of space research, because they could be shown the lucrative results to their respective regions. Then, sheer pork-barrel politics would take over, and voilá, there are treaties with Canada and construction gangs begin work.

Second, the farmers of both the U.S. and Canada are sorely pressed by the low market price of grain, and the high costs of living. Given a cheap, easy means of transportation, the grain shipper would pass on the farmer his lower shipping costs in the form of higher grain prices.

Third, the Great Lakes shipping industry would be given a badly needed shot in the arm. They would be given a broader area to serve, and therefore, more money with which to operate. With this money, and government subsidies, the U.S. companies would be able to build new ships to replace the aging obsolete boats in their fleet. No length restriction was mentioned in the article, so I would assume the maximum dimensions now allowed on the Upper Lakes to be allowed in the canal. If and when this canal becomes reality, the current new ships might be outmoded, but, just for illustrative purposes, let me give two examples of the current efficiency of these giants of the Lakes.

The newest ship, *Stewart J. Cort,* of the Bethlehem fleet, can carry fifty-eight thousand tons of iron ore pellets, with a round trip ability of one week between Lake Superior and Burns Harbor, Indiana. *Algocen,* flagship of Algoma Central, can carry over a million bushels of grain in one trip. That's a big payload by anyone's standard! And she also has a weekly round-trip ability between Upper and Lower Lakes. Give this kind of large carrying capacity directly to the Midwest, with no middlemen, and a literal transportation revolution will take place.

There will be people who say that it is impossible, but they have short memories. Ask any Lakes shipping buff about the hassle over the Seaway! But once the politicking was over, and construction began, the idea became reality.

In conclusion, then, let me say just two things. First, with all of these anticipated results, the project is cheap at a hundred gigabucks. Second, let me say, in complete agreement with Mr. Blossom, "What are we waiting for?"

G. E. DRIFTMYER
424 South Patterson Street
Gibsonburg, Ohio 43431

You'd get more Congressional support by having the canal wind through as many states as possible. But what about the Rocky Mountains? And the

environmental effects of linking the Great Lakes with the Pacific?

Dear Mr. Bova:

The July editorial propagates the myth of Joe McCarthy's reign of terror. "When McCarthy was riding at his highest," you say, "scarcely a word was raised against him anywhere in the nation." This is just plain not true.

Without defending McCarthy at all, I must point out that this Great Silence simply didn't happen. The exceedingly public and vocal opposition to McCarthy was unmatched for sheer volume of vituperation until the peace movement took on Lyndon Johnson. The most cursory survey of newspapers and news magazines of the time will show that whatever else McCarthy might have been, he was not unopposed . . .

By the way, the reason that "no one accused by McCarthy was ever found legally guilty of espionage" was that he did not accuse them of being *spies,* but of being *Communists,* which was then, as now, not a crime. (The Smith Act tried to make it a crime, but was thrown out.)

Neither is it true that McCarthy's accusations "literally paralyzed much of our government and froze our foreign policy into a block of ice." Both the Truman and Eisenhower Administrations gave McCarthy no cooperation. His greatest frustration was that the people he accused very rarely lost their jobs or suffered any punishment for their alleged Communist sympathies. Indeed, among what is now called the "liberal intellectual establishment," it was practically a mark of honor to have been accused by McCarthy. What "froze our foreign policy" was, quite simply, the open aggression of the Communists. McCarthy attempted to ride the public's fear of the Communists, but he did not create that fear. The Soviets did that all by themselves.

As an old Cold Warrior, I must say that the current attempts to proclaim the Cold War out of existence impress me as wishful thinking completely unsupported by any observable change in Soviet intentions. The worst long-term effect of McCarthy's activities was that his "excesses" provided an eagerly-grasped excuse for the ostrich types to condemn all anti-Communist investigations and thus avoid confronting the reality of Soviet imperialism. The same refusal to face a frightening reality has now led us into the SALT agreement, by which we have accepted permanent nuclear inferiority. I predict that if we are lucky we will live to regret SALT. If we're not lucky—well, then we won't live to regret it.

GEORGE W. PRICE
1439 West North Shore Avenue
Chicago, Illinois 60626

There was an upheaval in the State Department, during the McCarthy era, that is still unhealed. And for more than twenty years, it was political suicide to suggest any compromise with Red China. As for SALT, it

moves the arms race from a question of quantity to quality: the brightest innovators will produce weapons superiority. Interesting possibilities, don't you think?

Dear Mr. Bova:

I am forced to point out your collaboration in the maintaining of a misconception. In your July editorial you said in effect that by some mysterious means of pouring dollars they ain't got into underdeveloped nations, organizations such as UNESCO, UNICEF, and WHO are bringing these nations into the Twentieth Century. I hope this was said in innocence for it is unfortunately wrong. I defy you to show me one nation—which was in the '50's an underdeveloped nation—that has taken a half-step toward this or any recent century. On an average all the nations so classified have slipped further back regardless of the already-shouted glories of mod technology.

People are the only thing they've a lot of, and so many more each day that if the same thing happened in scale in the U.S., we'd be hard-pressed to do anything except possibly turn our backs and ignore. All the aid the United Nations and anyone else could give them still would not succeed in raising that level to our standard.

In 1962 the world per capita product was $489, 17 percent of that of North America and half that of Europe. The world product could then only supply 1.5 billion persons at the European level and 500 million at the North American level.

Since '62 some shifting and increases in per capita product have changed the picture, true, but population increases have eaten up the lion's share and make of your comment an insult to an Indian's starvation.

On another point—brushfire wars—if you recall, we supported Castro in Cuba until it was too late, and he was a revolutionary. Equally, I'm told we have done similar things, which are supposed to be "un-nice," in other countries.

In Vietnam—and this will brand me a bad guy—we are seeing a renewal of China's Korean policy. The aim of China in Vietnam is to tie the U.S. into a war which at the same time puts a heavy burden on the U.S.S.R., which pays their bills, in order to insure its two biggest threats are effectively weakened and prevented from threatening China's security while she attempts to enter the big-power world.

That her policy is working better than she expected is due only to U.S. and Soviet willingness to fight over vague concepts of government neither really believes in or practices anymore. When people call Vietnam a silly war I agree for that reason.

What is made clear by this is that China is already acting like a third power whether she has the muscle for it or not, but years from now someone will call you, Ben, a prophet for seeing it coming. Sometimes, though, it takes a strong voice after the earthquake for people to really understand what has happened.

While I'm on your case, you should check the economics of the SST. According to the supporters' figures we would have gotten about half our money back in foreign trade and only likely broken even in the end. We need not lose a dime to foreign SST's since we can ban them from landing in the U.S., an act that would almost end their need.

M. TICKLEBRIDGES
c/o Advocate
2600 Mission Bell Drive
San Pablo, California 94806

The people of nations such as Nigeria, Venezuela, Ceylon, Indonesia, and even India (to name a few) would argue strongly with your claim. They're moving! True, they'd move much faster if population growth didn't eat up so much of their GNP, but they're making progress despite the population boom, and the boom itself is beginning to slow.

As for Castro, the U.S. Government supported Batista, and our military personnel were pinning medals on Batista's personal guard while Castro was fighting in the hills. There was much popular sentiment for Castro in the U.S., but Batista used American-provided tanks, guns and planes, with American-trained troops. To no avail.

If China's policy is to debilitate the U.S. through Vietnam, it's one more reason to end our involvement in that sorry mess. And it's perfectly true that America holds the economic key to the success of the Anglo-French Concorde SST. The Russian SST, however, is a different matter.

Dear Editor:

Comments on a few things in the July issue:

P. Schuyler Miller's parallel between his proposed work and an older classic is an example of people unconsciously using things from their past reading. I once wrote a piece on sniping rifles for a shooting magazine (1966) and after I finished I tried to recall sources. One dated back to a 1947 magazine!

Someone else is paralleling, too. Pournelle's "The Mercenary" parallels an event in history, in one part. There was a government about to fold, a government member who inspired the legal head of things to act strongly, and a commander with a handful of trained and loyal troops. The Nika Riots of Justinian's day finished with a stadium massacre by Belisarius and a relative handful of trained soldiers exactly the same way. Except that Belisarius stayed on as commander for the Eastern Empire after that.

Mr. Eastman's letter about shooting sports and country troubles reminds me of a current drive to put the hunters out of business, "fat, red-faced men, expensively dressed from their down bootees to the knobs of their silver hip flasks. Little desire to search for game but a great desire to kill something that can be tied to a fender or held up in a barroom," et cetera, et cetera. I don't know about shooters killing all the songbirds, as it is not too much an American custom. The cultured French and Ital-

ian farmers are very fond of properly cooked songbirds of all sorts. One could blame some of it on people like the loon who imported starlings because they were mentioned in Shakespeare and he wanted the United States to have all the advantages. The English sparrow faded with the decline of horse apples in the streets, but starlings are still with us. Mao's lads managed to cure the birds of China of eating grain without guns. They did it by hand. (They also found that small birds often eat a lot more bugs than grain. *Aprés* the bird kill, came the insects to the farms.)

Loss of habitat does a lot of it, as in the case of a Michigan bird only found in certain wooded spots. Log the place and the birds die. Same with the ivory-billed woodpeckers. It is thought that something like bad weather around 1888 and the loss of trees and native foods started the catastrophic end of the passenger pigeon.

Gun control is not as important as might be thought. What of nut control? Observe the fatuous grin on the lad who stalked various candidates and finally got a crack at George Wallace. And the idiotic violence of the Japanese student radicals who took a contract from the Arab guerillas and shot up the Lod Airport terminal. One Arab source chortled that there "were no innocent people in Israel." The hell there weren't. Most of the dead were Puerto Ricans on pilgrimage. I could view the boiling in oil of George Habash with little sorrow. I hope some of the relatives of the dead pilgrims get hold of him. They are not an unusually violent tribe, but I am sure they would think of something appropriate. After all, the Puerto Ricans number Carib Indians and Spanish buccaneers among their ancestors—tough hombres indeed.

Ireland has had tough arms controls since the Statutes of Kilkenny in the 1930's. To what end? Rebellion after rebellion, in spite of suppression by the Sassenachs. The I.R.A. is now getting help from the Marxist world. Another Vietnam, anyone?

JOHN P. CONLON
(Korea, Clash of '52)
52 Columbia Street
Newark, Ohio 43055

Laws only work as well as their enforcement!

Gentlemen:

It has been a pleasure to have our teen-age son exposed to the provocative and responsible political-social-economic philosophy of Mr. John Campbell's editorials and to know that he would not be exposed to pornographic stories but that the reader interest would be built around fantasy and other-world situations.

However, it becomes obvious that Analog was, indeed, an extension of Mr. Campbell's personality as was pointed out in the eulogy editorial concerning his passing. And it is evident that present editorial policy is as divergent from his as black is

from white. All your post-Campbell editorials are typical of the current irresponsible drivel of the majority of magazine editors. More importantly to the parents of teen-age children, your abandonment of Mr. Campbell's sexual morality standards is even more unacceptable. No stories printed in the past few years could be called pornographic and only a few even had "suggestive" material in them. However, "Hero," in the June 1972 issue is pornographic, even in the legal sense, since sex acts described were not necessary to the development of the story plot and had "no redeeming social value." The single reference to fornication on page 103 of "Unfair Trade" in the July 1972 issue was absolutely unnecessary to the plot and did nothing to enhance a rather mediocre story. Several sexually suggestive comments could have been removed from "Collision Course" in the July issue without detracting from the story, to bring it completely into line with the accepted Judeo-Christian morality of our society . . .

And may the fortunes smile upon you to the exact degree which you deserve for prostituting one of the few remaining decent magazines we had.

WALLACE I. PASSEY
1545 Westland Avenue
Idaho Falls, Idaho 83401

Although there were references to the fact that men and women engage in sexual intercourse in these stories, there was no description of individual encounters that could—by the wildest stretch of legality—be considered pornographic. If you consider mere mention of the fact that human beings procreate sexually—and often enjoy it—as an affront to the Judeo-Christian morality of our society, then you'd better start expurgating your Bible!

Dear Ben:

I am writing this letter of congratulations for the June 1972 issue. In my opinion, Analog has finally come into maturity with Joe Haldeman's brilliant story, "Hero"! While it did have swearing and some sex in it, they rang true, thus fitting in with the whole mood of the story. Many of the current antiwar stories are so totally boring, hammering away at the theme with no thought to plot or characterization, that it is a pleasure to read a story as well written as this! Is there a Hugo award category for best prozine illustration? If there is, Kelly Freas surely would win for his excellent illustrations for the cover story.

KEN GAMMAGE, JR.
7865 East Roseland Dr.
La Jolla, California 92037

"Hero" has elicited strong reactions—both pro and con: the mark of a strong story.

Dear Mr. Bova:

In the July 1972 issue, you printed a letter from Richard Lippa, who expresses the hope that your readers will write their congressmen in sup-

port of the space-shuttle program.

I must echo Mr. Lippa's feelings. Aside from providing a "cheap" way to explore space, the shuttle opens up the possibility for manufacturing in space, as was covered in an article in your magazine about two years ago. Among other things, semiconductor crystals, vacuum tubes, and cultures for vaccines can be made very quickly and cheaply in an orbital space station's weightless environment.

If the space-shuttle program is continued, I believe it is safe to predict that space costs will be reduced by a factor of five in five years. Furthermore, when manufacturing is begun, the space program will become self-supporting and even profitable soon after. In twenty years, the space program may well be indispensable.

At the end of Mr. Lippa's letter, you expressed concern over the environmental impact of a hundred launches a year. As a former engineer on the engine development project for one of the contractors, I must comment. (And lest your readers feel I am only trying to protect my job, I have since quit the space program and changed my specialty to environmental physics.) First of all, my information is that a hundred launches a year is a *maximum* figure—the actual number will probably be less than that. Secondly, the liquid-fueled engines use hydrogen and oxygen for fuel, and the exhaust products are pure steam. The last I heard, NASA was considering a solid-propellant booster, which admittedly pollutes more than the liquid engines. However, the total of the exhaust products for an entire flight would only be about the same order of magnitude as the quantity ejected by a 747 on a cross-country flight. And how many thousands of jets fly in this country every day?

We of the United States have a position with the space program similar to that of a man who has built a house. He has spent a large sum of money constructing it, but now desires to tear it down before getting any use out out of it because "it's such an expensive house"—never realizing that upkeep is much cheaper than construction. Also, he can now reap the rewards of his labors!

GORDON WOLFE
Physics Department
University of California
Davis, California 95616

The exhaust of a LH-LOX rocket is considerably more complex than simple steam, mainly because the hot exhaust gases mix with the surrounding air and cause chemical reactions among the oxygen and nitrogen molecules. At very high altitudes, this could cause reactions that might reduce the ozone content, and thus allow more solar UV radiation to reach the ground. Might. No one knows for certain, and the subject should be investigated.

As for manufacturing in orbit, G. Harry Stine has part one of a two-part article on the Third Industrial Revolution in this issue (page 30).

EDITORIAL

continued from page 7

The professional meteorologists were Langmuir's biggest obstacle. They knew how little is actually understood about the physics of the weather. They found it impossible to accept Langmuir's claims of successful "mods." Meanwhile, the Air Force supported Langmuir and his colleagues for several years while they ran field tests in New Mexico.

Langmuir built up statistical evidence that proved (he felt) that rainfall patterns all across the southern half of the U.S.—from New Mexico eastward—were dramatically changed whenever he ran a cloud-seeding operation. The professional meteorologists denied any such conclusion. How can you tell "man-made" rain from "natural" rain? It boiled down to a battle of statistics and their interpretation.

Langmuir was sued by a few people who had suffered flood damage even while the Weather Bureau was scoffing at his work. So he got it both ways!

By 1957 a Washington committee of scientists turned out a report that said cloud-seeding had not been proved as a reliable technique for modifying the weather. Langmuir died that year, bitterly disappointed.

Today, a few members of Congress are demanding an investigation into reports that the Department of Defense has conducted cloud-seeding operations in Indochina. These rain-making "mods" have allegedly helped to cause disastrous floods in North Vietnam.

But what about the droughts that have plagued vast regions of the U.S. since 1946? What about the billions of acres of timber that have been destroyed by lightning-caused fires? What about the damage to crops from hailstorms? And the hurricanes? And tornadoes? How much of this damage could have been averted if we were ten years ahead of our current state-of-the-art in weather modification? How many people have died, how much property has been lost, because of that ten-year hiatus?

But while the civilian scientists were holding up weather modification work, the military apparently kept going, and developed cloud-seeding techniques to the point where they've been used in war. What does this say about our Washington experts who decide on the course and applications of scientific research?

Now look at the shoe on the other foot.

In the crucially important area of international disarmament, the scientists are not the experts, they're the outsiders, the amateurs who have shaken up the military and moved the massive governmental structures of the U.S. and U.S.S.R. toward a safer world.

The SALT talks and the subsequent disarmament or arms limitation agreements that have been re-

cently hammered out began as private conversations among a few American and Russian scientists. Driven perhaps by a collective sense of guilt over the terrifying weapons they've helped to develop—and more aware than most people of what these weapons can do—the scientists began to ask each other a simple question: How much is enough?

When you can destroy every target of consequence in every potentially threatening nation, do you really need more strategic weaponry?

The military and political leaders are prone to play the numbers game: for every missile you build, I'll build two; for every gram of plague bacillus and nerve gas you've got tucked away, I'll prepare twice that amount. An endless spiral.

For more than a decade, through at least three Washington administrations and a few changeovers in Moscow, the scientists argued their views against the military. Gradually, the scientists' point of view began to win. Thanks in part to the frightening scare of the Cuban Missile Crisis (and also to the escalating *cost* of strategic weapons) international agreements were made to outlaw nuclear bomb explosions in the atmosphere, underwater, and in space. Then biological and chemical warfare was outlawed. More recently, agreements have been reached that ban the placement of "weapons of mass destruction" in space and on the Moon. And now arms limitations agreements will limit the number of ICBM's and ABM's that Russia and the U.S. deploy.

There are dangers in these agreements, certainly. We have no foolproof method of determining that the Russians are living up to them. (In point of fact, you and I have no foolproof method of guaranteeing that our own government is living up to them!) But the danger of a continuing spiral of armaments is even greater.

One more point:

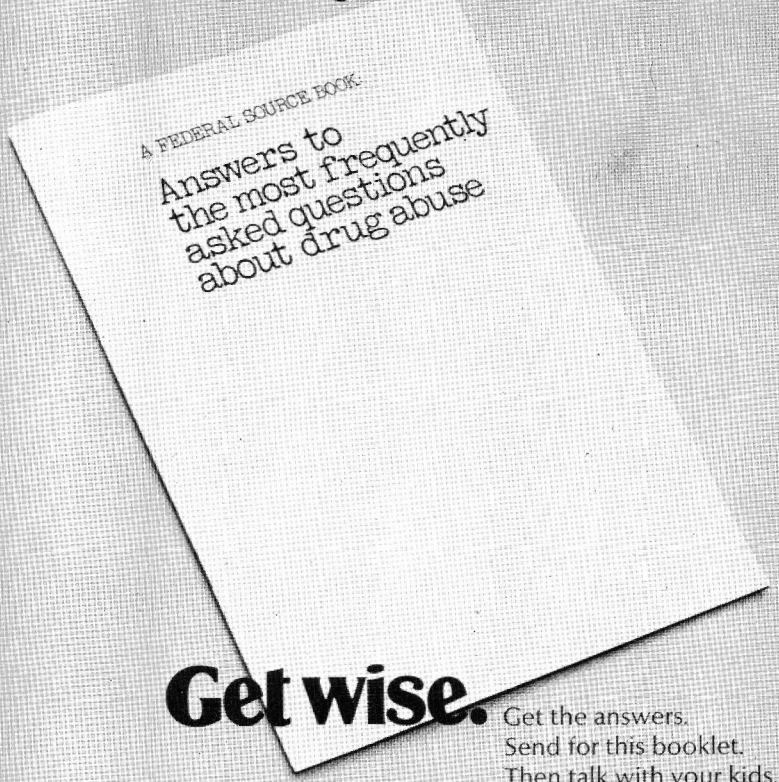
The real effect of "freezing" the numbers of missiles and anti-missiles will be to put the emphasis on new ideas. When the number of weapons you can employ is limited, then what counts is the quality of your existing weapons—and your ability to come up with new weapons, not covered by the treaties. This puts the responsibility for our future defense squarely in the hands of the scientists. It will be up to them to make certain we're not surprised by new Russian and/or Chinese developments.

How are the scientists going to handle this responsibility? As creative men and women searching out new and dangerous frontiers? Or as a weary hierarchy of experts who know what can and can't be done in the field of modern weaponry?

If our scientist friends take the latter course, then we won't really need enemies, will we?

THE EDITOR

Your kid shouldn't know more about drugs than you do.



Get wise.

Get the answers.
Send for this booklet.
Then talk with your kids.

Write to:
Questions & Answers
National Clearinghouse
for Drug Abuse Information
Box 1080
Washington, D.C. 20013

I HAVE NO MOUTH AND I MUST SCREAM

It was the computer's revenge. In rage, in frenzy, he turned us into monstrosities, imprisoning us deep inside his endless banks. Now I am a great soft jelly thing.

I have no mouth. And I must scream.

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