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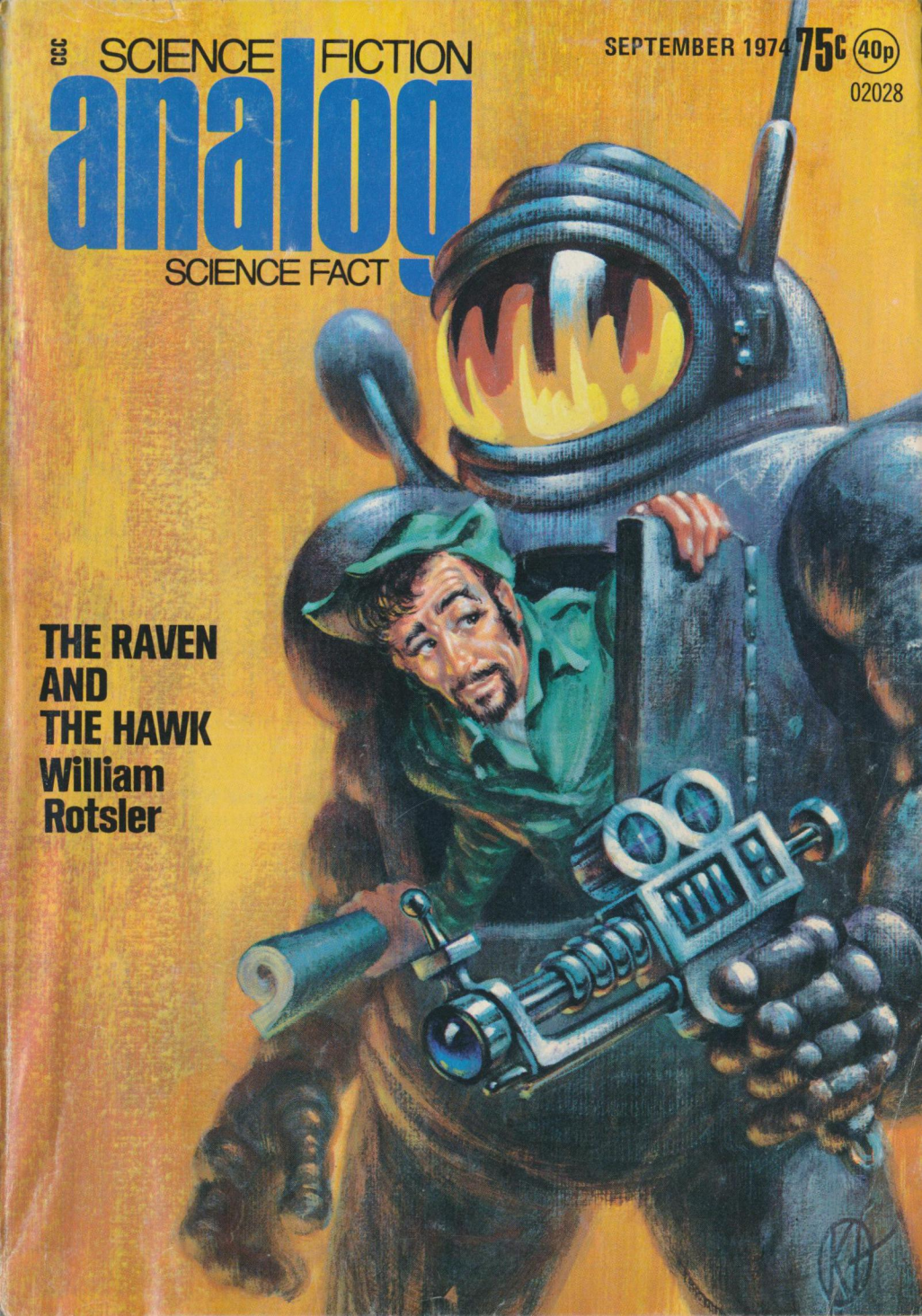
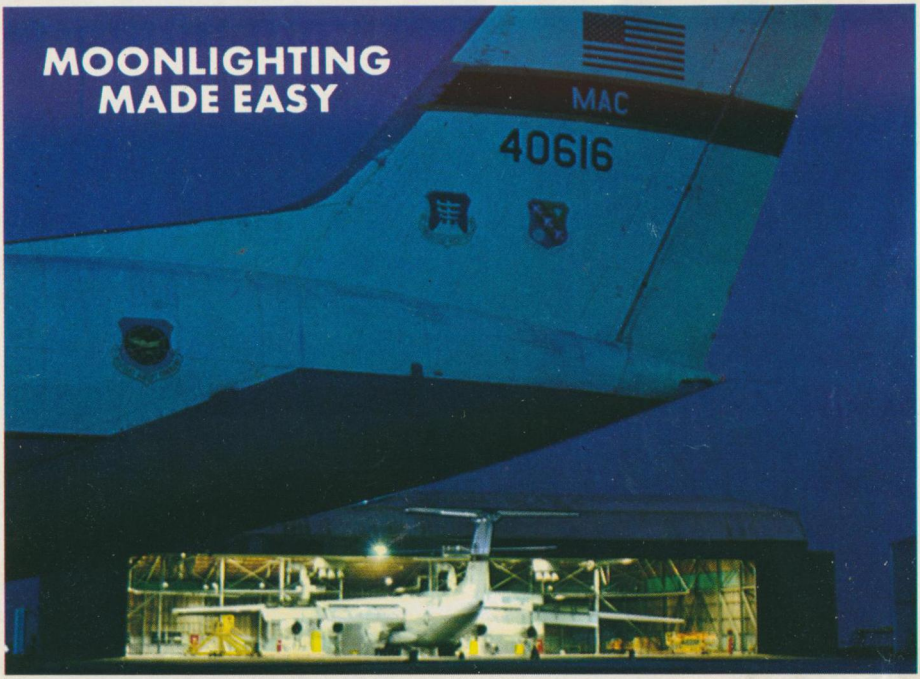


THE RAVEN AND THE HAWK

William Rotsler



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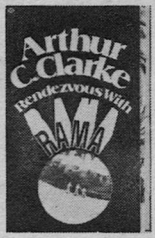

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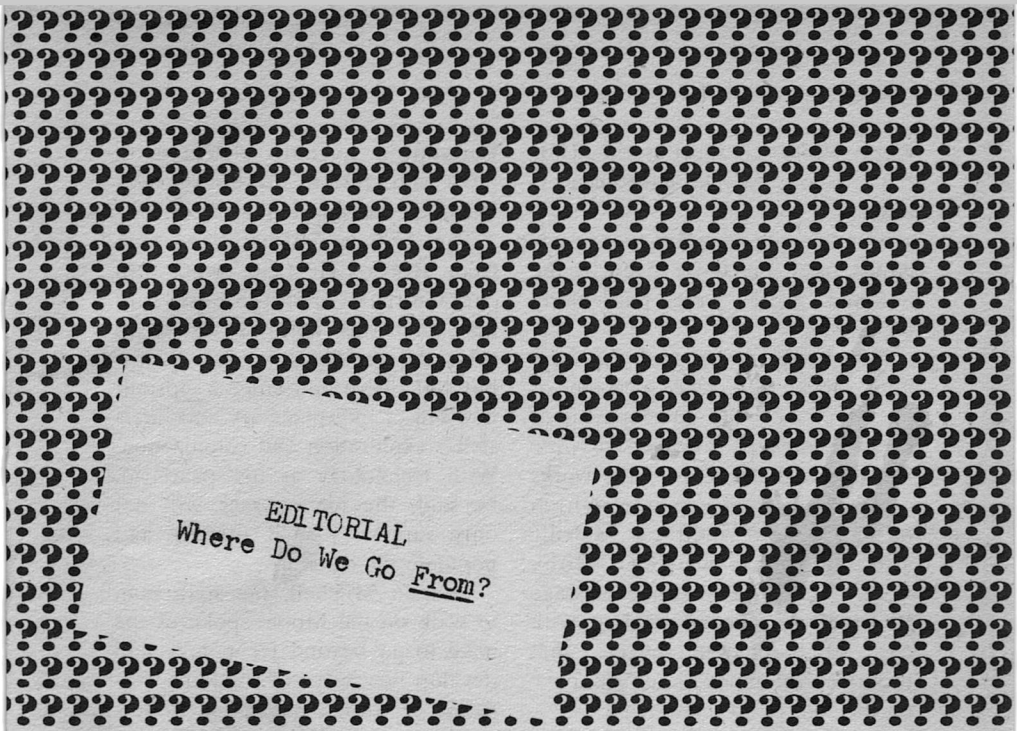

The keynote of SFWA's ninth annual Nebula Awards banquet was "Where do we go from here?" Addressing themselves to this ponderous question were superstar writers Ray Bradbury, Robert A. Heinlein and Theodore Sturgeon; astronauts Alfred Worden and Edgar Mitchell; and scientists Bruce Murray and Harrison Brown.

The Science Fiction Writers of America presented their annual Nebula Awards in posh style this year, in fabulous Hollywood. The Nebulas went to:

Best Novel: "Rendezvous with Rama," by Arthur C. Clarke

Best Novella: "The Death of Dr. Island," by Gene Wolfe

Best Novelette: "Of Mist, and Grass, and Sand," by Vonda McIntyre

Best Short Story: "Love Is the Plan, the Plan Is Death," by James Tiptree, Jr.

Best Movie: "Soylent Green," from Harry Harrison's novel "Make Room, Make Room"

Vonda McIntyre's novelette was, of course, published in Analog. Other Analog stories that were nominated, but failed to win the Nebula, were Poul Anderson's novel "The People of the Wind," plus "A Thing of Beauty," by Norman Spinrad, "With Morning Comes Mistfall," by George R. R. Martin, and "How I Lost the Second World War and Helped Turn Back the German Invasion," by

Gene Wolfe—all short stories. (For more details, see The Reference Library.)

The keynote speeches were mercifully brief, but those given by the honored guests were particularly depressing.

Ray Bradbury ignored the keynote theme and read a poem of his, about how the development of large-sized type allowed myopic Herman Melville to read the works of William Shakespeare—which opened a new world for Melville and led to his writing "Moby Dick." There was a subtle message in Bradbury's poem, dealing with the usually-ignored effects that technological innovations can have on the soul of an artist.

Colonel Worden, Command Pilot of the Apollo 15 mission, read a couple of his own poems, which dealt much more straightforwardly with humankind's need to explore. There was a wistful, vanished-Camelot resonance to his poems. Apollo is dead; whence comes the next great wave of exploration? Too late for Worden to participate in it; too late for many of the people in the sumptuous banquet room.

Ted Sturgeon, Dr. Murray (Cal Tech planetary scientist), and Dr. Brown (Director of Population Studies at Cal Tech) struck the gloomiest notes of all. We must stop using fossil fuels. The world is dividing into rich and poor nations, with the poor growing more openly hostile while the rich grow richer. Population burdens threaten to bury civilization under an avalanche of starving human flesh.

The only optimistic note came from Robert Heinlein, who—with characteristic forthrightness—said that man was not only going to solve the problems we face today, but will thrive and enter a glorious new era of interplanetary and interstellar exploration and colonization. With technology as its spearhead, he said, the human race will not only survive, it will prosper and populate the stars.

Captain Mitchell, the sixth man to walk on the Moon, spoke of the need to go beyond technology and develop new ways of thinking, new forms of consciousness. He is now president and founder of the Institute of Noetic Sciences, which is devoted to examining the psionic (or psychic) forces of the human mind. Mitchell feels that the human mind has untapped powers, and the only solution to our present impending catastrophe is to go beyond technology, beyond our present ways of perceiving the world.

It was a long evening, as most awards banquets are. Thinking back on all that was said—and left unsaid—two main points emerge:

1. The speakers, and most of the audience, agreed that the human race faces a terribly critical, perhaps decisive, moment of history. Population pressure is at the heart

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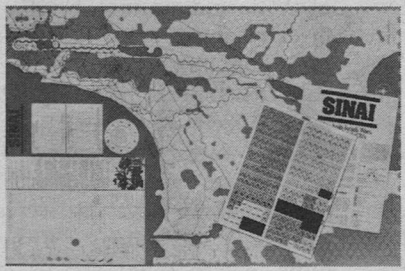

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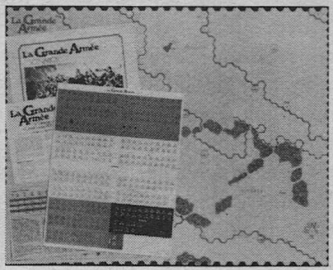

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of it, leading to worldwide hunger, pollution, political unrest, and war. Modern technology has lowered the death rate, created polluting industries, developed worldwide communications and nuclear weapons; all of these were considered by most of the speakers to be the main causes of our problems. If they didn't view technology as inherently evil, they insisted that technology by itself cannot solve our problems.

2. None of the speakers had anything really new to say about the possible solutions to these problems. In fact, instead of telling the audience what they perceive for the future, they mainly recited the woes of the present. With the exception of Heinlein's youthful optimism and some gloomy extrapolations of the recent Arab oil embargo, the speeches concentrated on the disease and ignored the possible cures.

And technology was identified as the disease, either by name or by implication.

If there's one thing that science fiction is good for, it is to give us the long view of human history. Science fiction requires a mind-set that encompasses millennia and parsecs, not merely weeks and nose-lengths. So it was rather surprising that, at a gathering of the nation's science-fiction writers, the speeches were so shortsighted.

Where do we go from here? Is technology the villain? Must we search "beyond" technology to find another way of life?

The answer to those questions lies in another question: Where do we go *from?* In other words, what are the origins of our present situation? How and why did technology become such a powerful force in human life?

Before there was man there was technology.

Fossil remains of our predecessors dating from more than a million years ago show that our remote ancestors made tools out of pebbles and animal bones. And that's what technology is: toolmaking. The human animal doesn't have the speed of a horse, the fighting teeth of a chimpanzee, the wings of an eagle, the claws of a tiger, or the protective fleece of a sheep. But we have discovered (or invented) technology. We make tools, where other species make physiological adaptations. We have fire and all the energy-producing engines stemming from it. We travel faster than the horse, fly higher than the eagle, fight much more devastatingly than any predator, and protect our bodies with not only sheep's wool, but artificial fabrics as well.

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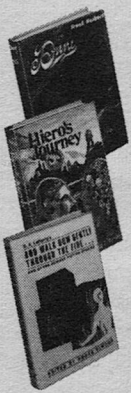

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Pleistocene dwindled, humankind was the supreme ruler of every land mass on Earth, except isolated Antarctica. And we ruled with fire, spear, awl, scraper: technology.

Instead of adapting physiologically to solve our survival problems, we have adapted psychologically and sociologically. In the great glaciations we now call the Ice Age, we didn't grow long shaggy coats of fur, as did the mammoth. We invented *culture,* the adaptation of individuals that allows them to share their abilities and knowledge while minimizing their weaknesses. The price we paid was to give up some measure of our individuality.

But how much? We are mammals. We aren't hatched from untended eggs, as the dinosaurs were. No human being can survive without the company and care of another human being. Solitary adults are so rare among us that hermits are an object of curiosity and humor.

The invention of culture depended on another human invention, the greatest one of all history: speech. Other animals communicate over limited ranges of data-sharing. A chimp, in the wild, can warn of danger or give a show of friendship. Only humans—and perhaps dolphins—can discuss what communication is all about. Perhaps those who are looking for a human development that goes beyond technology—as Captain Mitchell is—are actually seeking a new and more effective means of communication.

The means is here today.

It is not telepathy, nor any other psionic or psychic technique. Those abilities may be present as latent forces in all human minds. Some people can apparently use them, but on a very random, "wild card" basis. Psionic communications may be a future possibility, but today it has still not left the laboratory (or circus tent).

The "new" form of communication we have today is technological in nature. It consists of a complex of electronic links, including satellites, and computers that can assimilate and handle more information than a campus full of scholars could, over the course of centuries.

Back in the Ice Age, we did not grow fur pelts or dagger-sharp fangs. Instead of trying to imitate the musculature of the cave bear we used our heads—and our tools—to take possession of the caves for ourselves.

In the Nuclear-Space-Electronics Age, we have not yet developed a brain capable of thinking in a fundamentally different way from the thought-modes of our Ice Age ancestors. We have not developed psionic abilities. But we have developed tools that communicate immensely more data than our human brains could handle, unassisted.

Is data equivalent to information? Is the vigorous and growing

network of computerized machinery that surrounds us a force for human advancement and freedom, or a force for human misery and slavery? Again, a look at where we go *from* will help to show us where we can go from here.

Technology is part and parcel of the human experience. To envision a human being without technology is to envision a dead naked ape, not a happy noble savage. Anti-technologists have pointed out that the powerful men of society have always used technology as a tool for keeping their power and dominating the poor and the weak. Yes, just as they have used superstition and sheer physical force. Over the long run, however, technology has led to a broadening of human freedom, a sharing of wealth and power among the common people, a leavening of the power of the elite.

All the other forces in human society—religion, tradition, politics, law—are essentially conservative. They are backward-looking. They seek to maintain the Establishment, the *status quo,* the same situation today as prevailed yesterday. Technology, by its nature, is dynamic, forward-looking. Every development, every invention, every improvement upsets the *status quo,* changes the people and society, threatens the Establishment.

Certainly a man who belongs to a primitive hunting clan is not as

free to do what he wishes as he would be if he were a solitary hunter. Yet solitary hunters die much more quickly than those who hunt in groups. And a solitary human being misses many of the kinds of experience that make life worth living. We *are* mammals; we thrive in the company of our fellow humans. There must be a balance, though: every human psyche needs a degree of privacy, as well as companionship.

Modern technology is threatening our need for privacy. It can dehumanize us, reduce us to statistics. But this is merely a short-range problem. The long-range effect of modern technology will be to liberate us, allow us to be freer, more fully human. This is what technology has always done for us; there's no reason to suspect that it won't continue this millennia-long trend.

Without technology, we would not have survived the Ice Age. If technology had been stopped before the invention of steam power, slavery would still be a major institution in all human societies. If technology had been stopped before the invention of the internal combustion engine, most of us would be working on farms from predawn to dusk, and wondering if we'd survive through the next winter.

If technology is stopped now, most human beings will die. They are already dying in gruesome famines in Africa, mainly because our social institutions can't distribute food properly, and partly because our technology cannot yet control geophysical forces such as climate.

We will never go "beyond" technology. We may develop technologies that are nonpolluting, nonobtrusive, clean and quiet and completely reliable. But we will no more forsake technology than we could grow the fangs of a rattlesnake.

With technology, we are producing a true revolution in our ability to communicate. Modern computers and electronics are producing a new human freedom: the freedom from repetitive tasks. This is merely the beginning of the so-called Second Industrial Revolution. The day will come when people will be hard-pressed to believe that humankind ever existed without automated machinery and computer-powered information systems to assist us.

And much, much more.

Carl Jung, the eminent psychologist, once mused that we will never be able to truly understand how our minds work until we have another species of mind to work against, to serve as a mirror for our own thought processes. The long-awaited (and feared) self-aware computer might be that reflecting mirror.

Technology is where we are going from. Intelligent technology is where we are heading. THE EDITOR

analog

A Calendar of Upcoming Events

August 29-September 2, 1974: DISCON II (32nd World SF Convention), Sheraton-Park Hotel, Washington, DC. Guest of Honor, Roger Zelazny. Fan Guest of Honor, Jay Kay Klein. The SF Achievement Awards (Hugos) and John W. Campbell Award for Best New Writer will be presented. Info: Discon II, Box 31127, Washington, DC 20031.

September 10-September 12, 1974: Earth Environment and Resources Conference, Marriott Motor Hotel, Philadelphia, Pennsylvania. Info: Meetings Inquiries, IEEE, 345 East 47 Street, New York City 10017.

September 26, 1974: The Science and Technology of X-ray Astronomy by Rockets and Satellites, Architecture Lecture Theatre, University College, Gower Street, London WC 1 (all day meeting). Info: Executive Secretary, BIS, 12 Bessborough Gardens, London SW1V 2JJ, England.

September 27-September 29, 1974: PgHLANGE VI (Pittsburgh Regional SF Conference), Sheraton Motor Inn North, Pittsburgh, Pennsylvania. Guest of Honor, Joanna Russ. Registration: $3.50 in advance; $4 at the door. Info: John Curlovich, 108 Montville Street, Pittsburgh, Pennsylvania 15214.

September 28-September 29, 1974: BRITISH STAR TREK CONVENTION. Registration: $9 till September. Info: STAG, 16 Stafford Drive, Wigston, Leicester, England.

September 30-October 5, 1974: Space Stations, Present and Future (25th International Astronautical Congress of the IAF), Amsterdam, Netherlands. Info: IAF, 250 Rue Saint-Jacques, 75005 Paris, France.

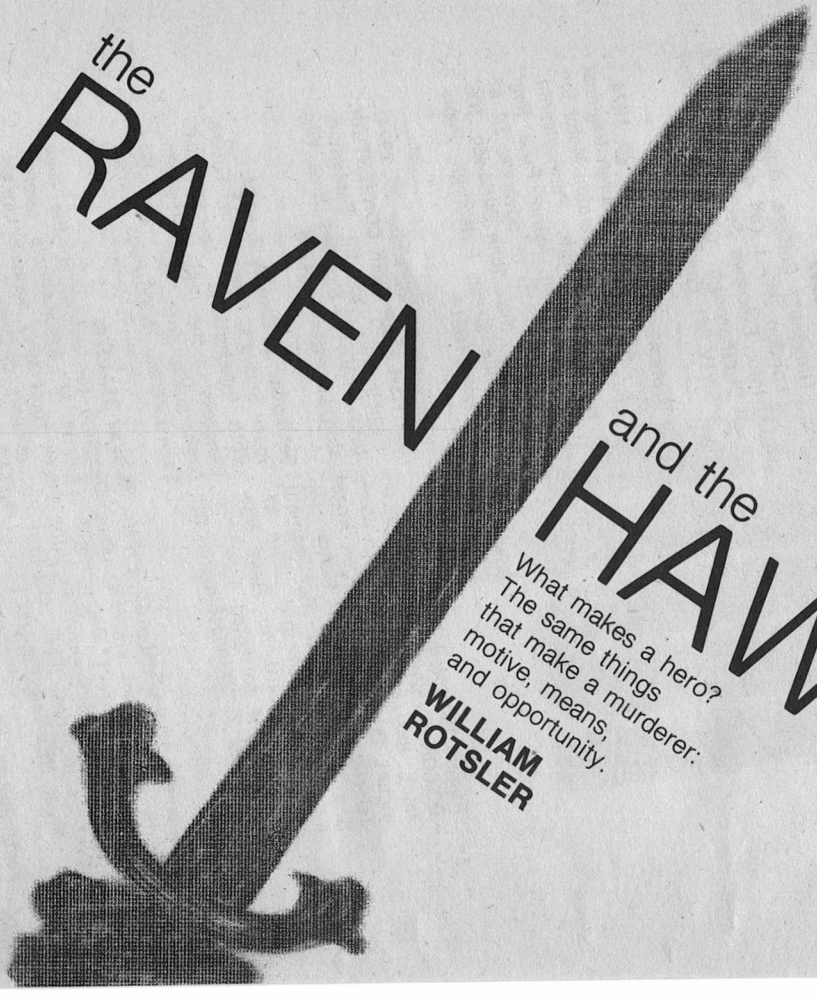
October 31, 1974: Deadline for entries in the New England SF Association's science fiction short story contest. Limited to residents of New England and NESFA members. Info: NESFA, Box G, MIT Branch, Cambridge, Massachusetts 02139.

—ANTHONY R. LEWIS

the RAVEN and the HAWK

What makes a hero?
The same things
that make a murderer:
motive, means,
and opportunity.

WILLIAM ROTSLER



KELLY FREAS

Fargin sat hunched in the bar booth and wondered how he was going to get out of it. All his life he'd read stories about brave, inventive lads who found the one chink in the armored layers of a totalitarian government and brought it crashing down. In story after story the handsome hero met and fought the sluglike Mindmasters of faroff Cygni IX or the dread Martinets of Hydrae III and always emerged triumphant, free arm around the Golden Princess or the Lyre of Rainbow or the faithful slave girl, the other hand grasping a bloody sword or a nearly-depleted laser.

The scrawny Fargin gulped a mouthful of bitter Martian beer and arranged his face into a new set of wrinkles. *Dammit,* he thought, if he could just invent a new *something* or stumble on a new law of nature—*anything!* Hell, a lot of discoveries in history were made by accident. Why couldn't it happen to him?

The normal din of the low-ceilinged bar was suddenly lowered, then dwindled to silence as the Patrolman appeared in the doorway. Eyes shifted away from beer mug and low-cut neckline to the helmeted man in the black uniform. His visored face prevented them from seeing his expression, but a sudden nervous shifting rustled the barful of drinkers.

The appearance of a second Patrolman brought a quick new life to the patrons as they made elaborate efforts to resume the normal barlife, ignoring the officers of the United System Patrol.

The second blackcoat stood in the door, not particularly menacing, not particularly casual. The first officer surveyed the crowd with a single turn of his helmeted head, then began checking papers.

Fargin thrust the Patrolman from his mind with another long swallow of the strong Martian beer. His thoughts grew bitter. Rot their putrefying skulls, anyway, he grumbled to himself. Every time Raven Blacksword had trouble with bugs like that he outdrew, outfought, and outthought them!

I bet that writer works off all his hostilities, Fargin thought, just blasting Crelbian Patrolmen, Vegan Monitors, and scrafy Ring Nebula Automen in every story! That last one, Fargin mused, "The Black Patrol," had the bad guys so much like the Patrol here that it was funny.

"Papers."

"Huh?"

"Papers, mudballer!" The visor of the Patrolman gleamed in the dim barlights, his face masked, his gloved hand held out. His other hand rested on the marwood stock of his Colt Laser.

"Yeah, sure . . ." Fargin fumbled at his jumper pocket, unsealing the document pocket with the ident ring on his right hand. He handed the thin passport to the

Patrolman without fear. It was a good one this time, not like that frelking garbage Doyle had screwed him with.

The Patrolman pressed the faceplate of the passport against the identipad in his gunbelt, his body tense. If the passport was phony this was when the bastards tried to jump you.

The buzzalarm didn't sound and the Patrolman thumbed open the document.

"David Fargin?"

"Yeah." Why did they ask? The damned identipad alarm hadn't gone off.

"Says here you're a juice miner. Lots of mines here, why ain't you working?"

None of your business, you gorb! "I'm thinking of shipping home. Or maybe trying the Grandcanal Queen."

"Yeah? Well, don't hang around too long. Mars ain't the place for handouts and Ares Base ain't the spot for smart frelking ex-grubbers."

Fargin looked up at the black-filtered visor. A line from an old Raven Blacksword story came back to him and he spoke without thinking.

"Whatever happened to the famous Patrol manners, Captain?"

He should have remembered the trouble that got Blacksword in. The metalmesh glove covering the hard hand of the officer belted him into the corner of the booth. His beer splashed and some got in the black metalmesh of the uniform. The Patrolman's big hands pulled him out of the booth and threw him against the wall. Fargin watched with horrified fascination as the Patrolman's armored left hand slapped the magclip on his left hip, releasing the nervelash. He flipped it to his right hand and Fargin swore he could sense the smile on the man's face as he brought the whip down across Fargin's body.

It was as if Fargin had been split in two. The nervelash was on full power and every cell screamed. Fargin heard someone screaming during the second and third lash, but he was unconscious during the third and fourth.

He came to in jail.

Everything hurt.

There wasn't a mark on him, except a bump where he had hit his head on the booth, but he ached as if a whole tribe of Rigellians had worked him over with bloodknives.

His *fingernails* hurt. His *hair* hurt.

Fargin groaned and tried to creep back to oblivion, but it was no good. He hurt too much. He tried to channel his energy into hatred, but it was just too much work. So he lay there on the slagmelt floor and endured.

Time passed.

A Patrolman went by. Fargin supposed he looked at him. He didn't care. He heard a scream.

Sounded like a woman's scream, but men in pain sometimes sounded that way.

Raven had been in a spot like this, in "Pirates of Canis Major," but he'd been smart enough to hide a magtool in his bootheel. No, that was in "Virgin Queen of the Stars." In "Pirates" he'd been thrown in with the pretender to the Canis throne, who was a latent esper.

Why the living hell hadn't he been born somewhere else?

Fargin groaned and got stiffly to his feet, staggered to the bare plasteel bunk and fell on its mesh.

Time passed.

Unchanging time. The glowballs didn't flicker. No sun appeared. No one went by. A scream now and again. A faint steady rumbling. A distant hum. Once a door clanged open and there was the sound of rough laughter and a woman's moans, then it banged closed again.

Time crawled.

What would Blacksword have done? thought Fargin. Used the mystique of the Mindmasters of Morg to go into time displacement? Picked the maglock? Feign sickness and clobber the guard? *God, he was hungry!*

He tried sleeping and was as unsuccessful at that as he had been at juice mining or cargo hauling or even assembly jockeying back on Earth. *God, those jobs had been boring!*

Fargin sighed. He didn't care *what* the psychcharts and the peepers said! There was something better waiting for him! There *had* to be! Life couldn't be the frelking bore that it was! It's *got* to be something more than grub, work and sweat!

Fargin twisted on the meshwork of the bunk. He stared up at the featureless ceiling. I just haven't found my niche, he thought. Somewhere there is just the job for me. I could handle those gorbs at the mine if they gave me the super's job! But I just couldn't take that frelk's lording it over me, just because he's got a pair of PhD's and I've only got one stinking Master's! So he could stick it all the way through the education mill. So I couldn't! He didn't have a set of snotty gorbs sneering at *him,* I bet!

The ex-miner's face twisted in anger. It had always been that way for him. A-Number-One-First-Button *Loser!* All the way! Loser father, fat loser mother. Loser sister, letting that dumb frelk husband of hers stick her with the taxes on the third kid.

Loser Fargin.

Can't win for losing, Fargin.

You're fired, Fargin.

buzz CLICK f-a-r-g-i-n, d-a-v-i-d, W-M/NA 565-2925-9906, j-o-b c-l-a-s-s-i-f-i-c-a-t-i-o-n-9-6-4-4-j-12-t-e-r-m-i-n-a-t-e-d *buzz CLICK*

Beat it, Fargin. We don't want your kind around here!

Listen, Fargin, stop that frelking dreaming! Get your nose out of those stupid stories and get your

ass in mesh! What's that? Oh, yeah? Well, you're fired, buddyboy!

Fired.

Terminated.

Not wanted.

Useless.

buzz unemployable at present classification *buzz* request re-classification procedures instigated per labor department manual seventeen dash six dash one hundred *buzz CLICK*

Fargin stared with sleepless eyes at the seamline where the rock walls met the ceiling. You're at the bottom, Fargin, he told himself. There ain't no more down.

He grinned wryly to himself, his face hurting. All up from heah, boss! Yeah . . . sure. There's always more *down.* There's always more pain, more humiliation, more frustration. There's a lot of *down* in the universe, Fargin thought wearily.

Death is down.

Down is death.

After death there could even be more down. Hellfire. Or nothing with the realization of nothing.

I don't feel so good, Fargin thought, and shifted his gaze to the slit of corridor he could see. Frelking Patrol! Who do they think they are? I didn't do anything. Raven Blacksword was in a spot like this in "The Black Patrol." Thrown into a Zorian prison after a beating. But the young princess that he had saved from the Dir tribesmen had slipped a stunner between the bars.

Fargin looked gloomily at the three unpierced stone walls and the bars across the face of the cell. No window. No stunner. No Zorian princess smelling of weirflowers and spice.

A door clanged open down the corridor and heavy footsteps approached. A bulky Patrolman in a jumper soiled with spots of food demagnetized the lock and motioned Fargin out.

Suddenly Fargin didn't want to go. "What's up?" he asked.

"Come on, mudballer," the guard said in a tired voice. Fargin slid from the bunk and preceded the guard down the corridor. A quick glance into the two occupied cells showed a snoring, shabby drunk with a bloodied face, and a sulking, ferretlike youth.

The guard pulled open the door and put his hand on Fargin's back. The miner expected to be catapulted through the door violently, the way they often treated Blacksword when they brought him before the Flame of Zomba or the king of the desert tribes. But the guard just grunted and shoved him slightly and Fargin stepped through into the guardroom.

Three Patrolmen, two without their black jackets, looked at him without interest, then went back to the holograph with the pretty blond dancer, jellying her way through a Viking production number.

"That way," the guard pointed and Fargin went down another rock corridor until he came to the Commandant's office. "In here," the guard grumbled.

A stern-faced woman sat behind the desk. Behind her was a huge Commandbank, the biggest control center Fargin had ever seen. Two grim-faced Patrolmen were manning it, acknowledging spacer calls and referring them to the proper posts.

"This is Fargin, Sergeant," the guard said.

"Very well," she said crisply, her gray eyes sweeping over him impersonally and with faint hostility. "Leave it."

The guard shambled off and Fargin stood a long time, waiting for something to happen. The woman sergeant ignored him, her fingers busy with a monometer and a Patrol code computer built into her desk. Fargin looked past her at the massive bulk of the Commandbank and listened to the incoming calls and tried to make sense out of them.

An FL-2 needed a GR-6.

There was a five-o-six at Icemountain and a duster down near Bradbury.

Northaxe needed a power isotope at Station Twelve.

A juice miner dead at Grandcanal. Rock fall when a pocket oozed out.

Customer complaint at the Redplanet Inn. Fargin grinned inside. Probably some cleanboot trying to gyp one of the girls.

Jupiter Mining had a ship in parking orbit and was requesting a shuttle. UNINEWS was doing a story on the crash at Wells and was asking for Patrol cooperation. The observatory on Phobos wanted a Patrol ship to vacate Sector 30. An Ares Center FD-2 needed a technician with knowledge of A-7 converters.

"The Commandant will see you now, Mr. Fargin."

Fargin stared at her. *Mister* Fargin? His hand felt for his tunic edge and he tugged it straight and ran a hand across his face. The stern-faced woman made a kind of wince that Fargin interpreted as a smile as she pointed at the door marked *Commandant, Ares Center Station One.*

Fargin stopped at the door and looked back. The woman just looked at him, then a dark frown crossed her face and she motioned with her fingers for him to enter. The rumpled miner knocked on the door and a voice inside said, "Come."

The plastic sign on the desk said, *Norton Marris, Lt. Col.* To Fargin he *looked* like a Patrol colonel. Tanned, gray at the temples, tough, lean, mean as a snake. He was looking at Fargin as he came in and Fargin wasn't too happy about that. This Patrolman had a look like an angry falcon, he thought.

"Fargin?"

"Yes, sir?" Fargin managed to make it into a question.

"Sit down." It was not a request.

"Yes, sir."

"You're a juice miner. Ever mine for anything else?"

"Uh, yes, sir. Gold in the American Rockies and uh, uranium and telite in Tycho and Copernicus. Selenium and tin on Farside. Uh, juice here, all over."

"Been out to Jupiter?"

"Uh, yes sir. Had a tour with the Hera Company on Ganymede, near Winecup."

"Want to go again?"

"Oh . . . I dunno. Why?" Fargin gulped. "Why, sir?"

"We could use a man like you out there."

"We? The . . . the Patrol, sir?"

The colonel looked at him in disgust. "Yes, *we.* The System Miners Union is suspected of subversion and of possible rebellion. We want you to infiltrate and find out what's going on."

Fargin's relief almost overcame his shock. They weren't going to beat him up again . . . but they wanted him to be a *spy!* A Patrol spy! A frelking ferret! A Judas!

"Well?" The colonel's voice was a knife cutting through a dust-tent.

"Uh . . ."

The Commandant looked down at some papers on his desk and his voice was softer as he said, "Did you know that the penalty for striking a Patrol officer is two years in a Federal prison?"

"But I didn't—"

"Quiet! The report from Patrol-

man O.M. Cragan states that you attempted bodily injury during a routine identification check. There are witnesses." The colonel waved a fax sheet languidly. "There's a Federal penitentiary out near Northaxe. Of course, that's a summer camp compared to St. Ives out on the red flats. Shipping you back to Luna for a stretch on the monorail tunnel digs might be worthwhile, but of course, your sentence would have to be longer to do that."

Blackmail. Fargin's heart sank and he felt wet inside. They wanted him to do a dirty job and he happened to do a stupid thing at just the wrong moment. They had him. His word against theirs and when in Hades had *that* ever worked?

"Gee, Colonel, I sure have missed that bloated old Jupe. Going back there might be just the thing to change my fortune."

The colonel's thin lips managed a faint smile. "You'll report to Major Corey at Winecup. He'll brief you. You'll do it as a part of your regular check-in. You will *not* make yourself conspicuous. You will *not* lose your frelking head. You will *not* talk of this to *anyone.* You will *not* fail."

"Yes . . . sir."

Colonel Marris fixed him with his falcon's eyes. "Find out what they're up to. Major Corey thinks the Commies have a cell working there. There's a certain Senator back home that thinks it's the Reds, too. That Senator has a strong interest in keeping things just as they are. Do you follow me?"

"Yes, sir." The obscene end of the stick, Fargin. Between the Devil and the Deep Black. Damned if you do and damned if you don't.

"How do I get there?"

"Jupiter Mining and Metals has a ship in orbit. You'll sign on at their office here, make your agreement for passage and labor, and the *Alfred Krupp* will take you out."

"Uh, OK . . . sir." Fargin turned to go.

"Fargin." The voice of steel. Did Raven Blacksword have that kind of voice, with the built-in command?

"Yes, sir?"

"Don't frelk it up, Fargin. You're a long time cold out at Northaxe."

"Yes, sir, I won't. I'll try."

"You won't *try,* Fargin, you'll *do."*

"Yes, sir. Can I go now?"

The colonel looked at him a moment and Fargin felt the ice in his gut. Then the lean strong hand hit a rocket button. "Sergeant, pass Fargin out."

It was a long trip out and they treated Fargin with callous contempt. *They* were elite spacers and *he* was a mudballer, only a little better than a groundlover or a cripple. He shared a cramped cabin

with a grumpy bureaucrat named Palumbo, who was to replace a minor mining official. Palumbo didn't like space, miners, cramped quarters or the boredom. Fargin didn't like Palumbo, and a silent truce was achieved without bloodshed.

The next cabin had two burly miners returning to a third tour of Ganymede's mines who were contemptuous of a scrawny cleanboot like Fargin, so Fargin didn't have anyone to talk to except the ship's computer.

The long elliptical orbit took two months shy three days, and Fargin had a chance to catch up on the Raven Blacksword adventures he had missed. He especially liked "King of the Plunder Planets," but he kept his finger on the button and if Palumbo came into the cabin he'd flick to a pornography channel, which was more acceptable. He didn't want to give the plump official any chance to harass him.

Any dealings he had with Blacksword were private, Fargin figured.

But at last the long trip was over and the crescent of Ganymede showed up bright against the giant hulk of Jupiter. Fargin sighed and went to his cabin to strap in for orbit maneuvers.

Major Allen Corey looked up from his scanner and stared gloomily at Fargin, his eyes plainly showing his feelings. "*You're* the big spy they sent me?" he sneered.

Fargin grunted assent then moodily said, "I didn't ask for the job."

"They tell you about Bitney?"

"Who's he?"

"The last spy they tried to sneak in."

Fargin had a sick feeling. "What happened to him?"

"Accident. Air bottles ran out and the lock jammed so he couldn't get back in. A Richter lock, too. Good old unjammable Richters."

"Thanks for telling me. I feel really great about my big adventure out here in the glamorous outworlds."

"These boys don't play sissy games. You been out here before?"

"Yeah, in—"

"Yes, *sir!*"

"Yes, sir . . . I . . . opened Hera One five years ago."

"Do any rock snagging? Any asteroid cutting?"

"Did five months for the Hera Company between here and Callisto. Enough to know my way around."

Major Corey smiled a vicious wolf's smile. "I hope for your sake you do. That stupid Bitney tried to fake it. You might last longer. But if they get on to you you've had it. They won't let you know until they can arrange a good accident, understand? Nothing for us to bust them on."

Fargin nodded gloomily. "That's all?"

"You've got it. See Bodrell at the Union hall. Check in normally. Check in with the Jupe Mining office for assignment. You might try for a room at Ortega's. I have reason to believe they have an active cell there."

"You got it bugged?"

Major Corey looked at him, his face like a rock, and then said, "Just do your job, mudballer, and leave the thinking to us. You might hit Nell's Place once in awhile. One of the girls might have heard something. If you get sent to Colony Two, talk to Fruehauf. He's one of us."

"Patrol agent?"

Another rockface stare. "Just say he's sympathetic to the right causes." Another see-through-Fargin-look and a brusque, "Get out of here."

"You Bodrell?"

The broad-shouldered miner turned away from the telestat and looked down at Fargin. One swift up-and-down and Fargin had been taped. "The *Krupp,* huh?" Fargin nodded. "Let me see your papers."

Fargin passed them over and watched as they were scanned, checked, recorded and validated. "You were with Layton at Hera One, right?"

"Yeah, then with Siegal and Nugent, rock snagging."

"I remember now. Got too gulpy for you, huh?" The big miner grinned nastily.

"Naw," protested Fargin, "I got a raw deal and decided to get out. I could never prove those guys shorted me, but I got my suspicions."

Bodrell's mouth twisted in a nasty smile. Fargin got another contemptuous up-and-down. "Uh-huh . . ." Bodrell said. He handed Fargin back his papers and told him where the Jupiter Mining and Metals office was.

Winecup is and maybe always will be, a frontier town. There are posts farther out, on Triton, but they are basically very similar. A complex of big plasteel pressure domes bubbled with observation and light ports, covering a semi-orderly shambles of huts, topless structures, workshops, storage domes, pleasure palaces, "hotels," bars, office buildings and the like. In the smaller outposts everything is in two or three domes, or even one, but in a place as big as Winecup they can segregate functions roughly into various domes.

Dome One has the repair shops, storage sheds, and a few offices. Dome Two has Nell's Place, Farmer's Provisions, Victor's, the Winecup Hotel and Ortega's, a rabbit warren of a "hotel" which is part whorehouse and part hotel. Plus a few miscellaneous bars and homes, and Union Hall.

Dome Three has the Jupiter Mining and Metals office, the Patrol Headquarters, a Patrol barracks, several ship's chandlers and a number of warehouses. Dome Four is small and holds mostly private homes and official personnel quarters. Dome Five is farther out and is really a cluster housing the main processing plants for Jupe Mining's outworld empire. Dome Six has a hospital, more offices, warehouses and other structures.

Winecup. The biggest "city" in the Outworlds. Rough, bawdy and real. The tridee back on Earth kept running shows about it likening it to the Old American West, complete with laser shootouts, dome collapses, alien race invasions and power-mad paranoids. But to Fargin it was more like a mousetrap.

The Patrol and the unseen forces that pressured the Patrol wanted him in. If the miners found out he was a spy, however reluctant, he'd not get out. Fargin didn't see how he could win. Something was bound to go wrong. It always had.

On the way to the mining office Fargin passed Ortega's and went in to see about a room. A crippled exminer gave him a small, second-floor room with discolored pink plastic walls and stained blue plastofoam furniture. Some previous tenant or tenants had left a worn collection of photoplastics taped to the walls. The collection leaned heavily toward naked bosomy blonds in lush greenery or in cool waters.

The man in charge at the office of the Jupiter Mining and Metals

Company looked over Fargin's papers, stamped them grumpily and told him everything was fine. He started work in twenty hours when the *Melafalana* was ready to go on a ten-day scoop of Band Twelve, out near the eighth moon, a tiny little forty-mile-diameter rock recently named Vishnu.

"Logan Jampel's the captain. Bunks at the Winecup. Look him up."

On the way to the Winecup Hotel Fargin saw Major Corey on the opposite side of the narrow street. The trim figure of the black-clad spaceman made Fargin shiver and when the eagle eyes pinned him Fargin shook.

The first thing Fargin thought was, *I haven't been asking any questions. They'll get on my back about that. I better ask questions.* The hard eyes of the Patrolman had pushed buttons in the head of David Fargin and he reacted automatically.

At Nell's Place he asked casual questions.

"Uh, what's happening around here lately?"

"Same old thing. Dome leak in Three last week. New holofilm coming in. Bettyjo over at Victor's turned up pregnant."

"No, uh, I mean, I heard about trouble . . . uh, trouble with the Patrol."

"Those bastards. They're nothing more than glorified company police with the Terran guvamint behind them. Muscle for the company and taking it on the side from the miners to keep the heat from getting *too* hot."

"Um, I heard stories about, uh, well, independence for the Outer Worlds."

The big miner's scarred face turned like a turret. Fargin saw his fingers whiten around his mug of imported Martian beer. "Where'd you hear stories like that, cleanboot?"

"Ah, hey, I've been around. I was with Hera and over at, uh—"

The miner had a big paw crunching up Fargin's tunic. "You keep your mouth shut about things that don't concern you, boot!"

"Hey, uh, they concern me, they concern me. I'm a miner, too, fella, remember?"

The husky miner released Fargin, looked at him suspiciously, grunted and turned his attention toward the small stage where a girl had just entered. Fargin breathed a sigh of relief, but his enthusiasm for questions had dimmed.

The last thing on his mind then was sex, but his attention was caught by the girl on the stage. She was young and pretty and not at all like the tired girls back at the Redplanet Inn or Chris's place, on Mars. She was an obvious favorite of the gathering of rough and lusty miners and she flirted with them as she danced around the stage to the sensuous music from a synthesizer. Fargin recognized the tape as a fa-

vorite on Mars many months before.

Fargin heard her name called out gleefully several times: Camille, Camille Grant. Despite his many problems, Fargin was drawn to her. She was a Raven Blacksword type of woman: lusty, wild, long-haired and full-breasted, with a golden apricot skin and large dark eyes.

Blacksword would know how to handle her. A touch of bigmouth from her and he'd belt her into a corner of the control room. And she'd love it. She'd smolder and then come on like a Venusian tigercat. They all loved the touch of rape. Knights in silver armor. Adventurers in crystal ships. Laughing pirates with bloodied swords. Bronzed, strong men with hard hands and the eyes of eagles. She wouldn't stand a chance with Raven Blacksword, boy. She'd get tossed on some bed of sham fur and watch with wide eyes as Raven Blacksword took off his harness and came toward her.

"You Fargin?"

"Huh?" A tall, lean miner stood next to Fargin, partially blocking his view of the golden-skinned Martian princess on the stage.

"I'm Logan Jampel. You're going out with me, right?"

"Oh, uh, sure, Captain . . . uh, do you mind?"

Captain Jampel grunted and moved aside to give Fargin a better look. "You like Camille, huh?"

Fargin pulled his gaze away from the girl, who was now nearly nude, to say in a tough voice, "She'll do . . . for awhile."

Jampel swung his eyes from the writhing body of the dancer, now bathed in changing prismatic lights, to look down at Fargin. "Oh?" he said softly.

"Yeah," Fargin said, his thoughts far away. In this light she looked a little like the Queen of Malenkor in "Blacksword's Revenge." If she were just a faint blue she'd also look like a zinzir wench or a slave-girl out of "The Slavers from the Crab Nebula."

Yup, she was a Blacksword woman, all right.

Which made her Fargin's type of woman.

I'll come back and get you after this is all over, wench.

Captain Jampel poked Fargin in the side and said, "Pad Four at 1300."

"Right, spacer," Fargin answered. The captain gave him a puzzled look, shrugged and left. Fargin's gaze never left the woman on the stage. She looked very good under the changing lights, her body gleaming and moving sinuously.

Fargin's head hurt. He looked with red eyes at the console before him, trying to monitor the doings of the ground crew. Man can get to the outer planets, he thought, but can't cure hangovers and the common cold.

Raven Blacksword never caught cold or had a hangover worthy of the name, he thought. He wished he had been born big and bronzed.

"Fargin!" Jampel's voice boomed up the hatch well. "Dammit, Fargin, the crew chief wants a verification!"

"Right!" Fargin cleared his console, forcing his attention to the screens. They were ready for takeoff. There was a final clearance, some blinking lights, then a jolt that made Fargin groan. Ganymede curved and fell away to the left and the big globe of Jupiter swung into the screen. They were in space.

A week went by. They tagged two rocks about the size of the ship for pickup on the way back, as they worked their way around the giant multimillion-mile Belt Twelve. They worked close in to the myriad chunks of flotsam and jetsam of the largely unexplored space between and around the many moons of the biggest planet. Their scanners gave them a certain rough grading and a priority, and then they climbed into suits to set samples which gave them their final grading.

The ship's computer kept track of every rock and moonlet they scanned, for future use and for general information. Eventually, years from now, all the space debris would have been tagged, coded and logged and a ship could speed swiftly through the orbits of the moons without much attention given to the orbiting rocks. The computers would keep watch.

But right now, at this stage of development of the twelve-moon system, it was all rough and rugged and mostly unexplored. Thor, the outermost moon, was nearly fifteen million miles from the surface of Jupiter and was only twenty miles in diameter. There was a lot of unknown between it and Jupiter's surface.

It was in the second week that Fargin discovered that a lot was going to remain unknown if the System Miners Union had anything to say about it.

A hint came in from the routine messages he overheard sent from ship to ship. It was his watch and he sat in the control room as the computers took them past the fifteen-mile chunk of Hathor. He was listening with half an ear to ship traffic and wouldn't even have been listening to that except that any sort of information at all he could pass on to the United System Patrol would keep them off his back.

One ship told another it was going to land on it. Only the *it* had quotes around it. We're going to land on "it" they said. Fargin got interested.

An hour later another message said cryptically, "Target sighted, Ganymede Four-Twelve out."

Fargin ran a scan and checked where the messages were coming from. They converged on Band Fif-

teen, near the forty-mile-diameter rock of Vishnu. Curious, Fargin brought up the magnification on the radar and saw one of the ship-dots merge with a tiny blob of flotsam not much bigger than itself. A few minutes later the second ship matched velocities and seemed to land on the tiny moonlet.

"That's a mess of ships for one tiny piece of Jovian real estate," he said quietly to himself. He grew very thoughtful and when the watch change came he casually asked Jampel about the ore to be found in the outer bands.

"I heard that Gilgamesh was pretty rich, it being a captive moon from out there some place."

"Yeah," Jampel muttered, sliding into the molded control chair. "It's OK."

"Heard Vishnu was even better. Heard there was some rich chunks just floating around out there. Gold-in-the-streets sort of thing."

"Yeah?" Jampel said absently.

"Yeah . . . why don't we take a crack at it out there?"

The captain gave Fargin a sudden quick look, then his eyes masked over and he said very casually. "Good idea. We'll have to clear it with the Union, of course. These belts are pretty well organized. Seniority, equipment, that kind of thing. Listen, did you get us a good fix on Hercules and Hathor?"

It was obvious that the captain wanted to change the subject, so Fargin let it drop. He was convinced that something was going on out around Vishnu and that he'd never find out from Jampel.

Fargin did his work quietly, just waiting, keeping his eyes open and his mouth shut, a virtue he was learning late. He thought about Camille Grant, the girl at Nell's Place, and built elaborate sexual fantasies about her and how it would be when he was tall, dark and handsome, standing on his wealth. He imagined taking her back to Earth, where she would be crowned Queen of the Outer Planets at the Spacemen's Ball. The fact that the Ball was a grossly commercial venture never deterred him.

He dreamed of stroking her satin curves and of all the wildly erotic things she would ask him to do, begging humbly for his attention.

Fargin had many variations on this theme.

Three more weeks went by before Fargin picked up another clue. Another communication relayed from ship to ship around the big bulge of Jupiter passed through Fargin's ship, *Melafalana,* on the way to something coded "Intruder One":

REGRET CALLISTO COMPUT-COMPLEX UNABLE SOLVE NINTH PUZZLE INFO SUGGEST DOMINIC TRY HOFFMAN SERIES 78-6-SQ OUT WINECUP CENTRAL.

Fargin passed on the message, but he kept a copy secretly and mulled over it for several days until he finally gave up. He decided to wait until their return to Ganymede to continue his investigation, and went back to wrestling rocks.

Their tour ended finally and a quick sweep around the orbit scooped in all the tagged rocks. They were one pebble from finishing when they got a call.

"*Melafalana,* this is *Commercial Ranger,* Ganymede Four-Twelve. Ganymede Control says you are nearest, soonest, for Condition Yellow."

Jampel shouldered into the control room, droplets of depilatory on his cheeks. "*Commercial Ranger,* this is Jampel, Ganymede Five-Six. Advise on Condition Yellow."

"Dominic here, Logan. We have a problem with our main drive reactor. It's overloading intermittently and we can't seem to locate the trouble."

"Oh, that's a bitch," Jampel grumbled. "You want me to troubleshoot by ear or come over?"

"You're the one with the top reactor rating between here and Winecup. If you can think of something we haven't tried we'll buy you a case."

"Where are you?"

There was a hesitation and Fargin grew more alert. Ganymede Four-Twelve was one of those that had landed on the speck of planetary dust weeks before.

"Intruder One."

Jampel shot a quick glance to Fargin, who was pretending to pore over a secondary priority chart of Band Eight rocks. "OK, understand. Are you worried about blowup?"

"Not now, but if we try takeoff Blauweiss says he'd like to be on the other side of the rock."

"Did you replace the Michaelson dampers?" asked Jampel.

"First thing we tried."

"Have you checked the automatic ratio controls for ground loops, Jim?"

"Nothing shows in the scopes."

"Dammit," swore Jampel, "I guess I've got to go over there. Will you inform Ganymede Control we are pulling out of Band Eight?"

"Right. I hope you can help us.

We've got a . . . uh, core sampling we'd like to have Haydock check out."

Jampel's face was calm as he said, "We'll give you an ETA as soon as I punch it out of the computer. It will give us a chance to have my low man clean the converter linings."

There was a pause, then Jim Dominic said, "OK, right. You better land a quarter-round from the *Ranger,* Logan. There's a flattish spot there. I'll activate the marker when you get close, OK?"

"Right. Ganymede Five-Six out."

"Sorry to trouble you. Ganymede Four-Twelve out."

Fargin was definitely interested. *Something* was going on. A big strike? A core sampling for Haydock? He was the computer control chief, not a geologist. Something was up.

It was over seven million miles out from Band Eight to Twelve, but with Ganymede and Callisto both on the farside the *Melafalana* was the obvious choice and Jampel had to go. It took time, but this sort of help was common among the fiercely independent and interdependent miners.

The rock that the *Ranger* sat on was only a couple of hundred yards long, dead black, and roughly cylindrical. Fargin ran a scanner over the rock but picked up virtually no metal readings aside from the ship. But the proximity of the mining vessel could easily confuse the scanners.

They landed. Jampel suited up and went out with Cliffords, the third man in the team. Fargin was told to clean the converter linings. As soon as Jampel left the ship, Fargin put down the sonic brushes and went up to the control room.

The *Commercial Ranger* was too far around the near horizon of the star rock to be seen. Maybe that's good, Fargin thought. Maybe I can slip out, sneak over and take a look. *Something* must be going on.

Fargin suited up quickly and slipped out the cargo control air lock on the opposite side of the ship from the unseen *Ranger.* He estimated the gravity at about a fifteenth and practically floated toward the stubby end of the rock, hoping to come around toward the crippled *Ranger* from a different direction.

The *Ranger* was a Class IV made by Lockheed Spaceframes, Inc. and a touch bigger than the Class III-A *Melafalana* built on Mars by Universal Ford. Fargin's experienced eye checked the ship over from blunt nose to rocket tubes as he hid behind a rock outcropping. He could see light through several thick ports and occasionally a figure would pass by.

Fargin looked around for some evidence of corings or any sort of mining activity but saw nothing except a tripod laser sitting outside the ship. Maybe they planned to

tow the whole rock back and cut it up in the Breakdown Orbit over Ganymede.

But what was in this rock that would be worth anything? Fargin asked himself. Not metals, surely. Something that didn't show on the scanners, presumably. Nonmetallics?

Fargin waited, impatient and bored. He thought of going back to the ship and starting the converter lining job but he kept procrastinating. *Something* was going to happen, he just *felt* it!

Suddenly, the hatch was opening and Jampel and Cliffords were coming out, with another figure in tow. *They were going back to the ship!* They'd go straight there and he'd have to circle around so as not to be seen!

Fargin felt a quick panic. He turned and started away, bending low and yanking himself along from sharp rockedge to black obelisk, skimming the surface, his heart pounding.

They'll find out I'm a spy! They kill spies!

Fargin's eyes were blurred with sweat and his hands faltered with fear. He reached for a smooth ledge surrounding a small crater and started to skim himself across when his attention was diverted by something at the bottom of the crater. He faltered, missed his timing, and plunged into the crater.

He struck the lower crater wall but not with any damage, except to increase the adrenaline in his blood as he panicked about the delay. He attempted to scramble to his feet and stopped, his eyes wide on the bottom of the crater.

It was round and black, almost as black as the basaltic rock surrounding it. A hairline bisected it and it was faintly convex.

A hatch! Fargin stared, all thoughts of flight gone. *It's an air lock hatch,* he thought. "It's hollow," he said aloud. The rock was hollow: this is what they were hiding!

Fargin looked quickly around. There was nothing beyond or around the low crater, only the blackness of the sky and the big ball of Jupiter throwing a little light into this pocket of rock.

The frightened miner moved closer to the round hatch, saw that it was slightly oval and then saw the three depressions in the rim, near the hairline. He stepped to the edge and touched the smooth surface.

It didn't look man-made, but that didn't make it alien. Fargin thought. Raven Blacksword found that ancient underground world in "Crimson Pits of Starhell," but this was nothing like that. Fargin looked around again, then touched the depressions with his gloved fingertips.

Nothing happened.

Fargin reasoned that these depressions, as the only markings on the oval, had to be the lock release.

He tried pushing each in turn. Nothing happened. The depressions formed a small triangle and Fargin tried another combination. Nothing. He glanced fearfully around.

He was sure they were at the ship by now and knew he was gone. They'll be looking for me, he thought, his mind whirling. *I've got to hide!*

Fargin tried desperately to work a new combination but nothing happened. Then he pushed all three depressions three times in a row.

The hairline split and the halves of the oval dropped down, then slid sideways and stopped. A dim red light came on and there were wide, shallow steps going down.

Without thinking, Fargin skipped down the steps into a round, low room. Below the red light there was a second trio of depressions. Fargin touched them and the hatch closed over his head.

A second light came on and Fargin saw a hatchway that presumably led on into the interior of the "rock." He pressed another trio of depressions and the hatch slid back.

He closed it behind him and stood looking down an oval-topped corridor with several more pressure doors and a larger one at the end. He checked the air pressure. It was up to eighteen pounds. Since he had no analyzer he didn't know what the air might consist of, so he retained his helmet.

This *must* be alien, he told himself. It can't be anything else! Please, don't let it be a miner's secret-whatever! It's *got* to be alien! It's my only chance at doing anything, being anything!

Do the miners know about this, Fargin wondered. They have to, he reasoned. They've been on this rock—or whatever it is—for weeks that I know of. It isn't so big they wouldn't find that air lock.

They'll be looking for me here! When they don't find me in the ship or on the surface they'll look here! I gotta hide!

Fargin jumped to the nearest door and slid it open. Wide, low

shelves lined the walls. A curious, bulbous shape was extruded smoothly from the floor and another, with a shiny plate on one grayish extrusion, hung from the low, curved ceiling. There were curious dot and triangle patterns on various things.

There was no dust and only dim red lights.

They could be here anywhere, Fargin thought. *Aliens!* This might not be some captured derelict, but a brand-new ship! That's what the miners were hiding—First Contact!

Fargin turned and crossed the corridor to another door, suddenly realizing that there was gravity here, only slightly less than normal for an Earthman.

For an Earthman! The concept of the phrase struck him. Aliens, here, now, *now!* Or at least an alien ship.

He opened the hatch and looked into an oval room with a large sphere floating in the center. The sphere was light blue and below it, radiating outward, were wide, low pads. Dots, triangles and weaving, wiggling lines coded several objects.

Another room was a laboratory. Or at least that was what Fargin suspected it was. There were some low tables but only a few small, knobby devices lying on them. Fargin touched nothing, for he was looking for a hiding place. Treasure hunting could come later.

Another room held a second floating sphere, only this one was purple and there were no pads. The next room was empty, except for hundreds of tiny string-like tubes hanging from the ceiling to a few inches from the floor.

Fargin stood indecisively in the corridor. He looked at the larger hatch at the end and broke into a stumbling run for it. He pressed his fingers into the depressions at the edge and the hatch split and slid back. Dim red lights came on as the hatch opened.

The room was huge, perhaps a quarter of the volume of the rock, and it contained a small park; dusty-purple, grasslike vegetation lay in ovals and distorted ovals over gently rolling hillocks. Blue trees like weeping willows grew in clusters, but they had pale yellow fruit. There was a fountain to one side, a pale gold ball floating over a shallow oval. As Fargin looked, the ball began to twirl and from the edges of the oval yellow fluid shot up in slow, lazy arcs to touch the ball.

Nearby was a sculpture, or at least it seemed that way to Fargin, who was staring in wonder. The construction was seemingly a pile of crystals, all round but irregular, like river stones, with tiny interior lights that blinked and moved in an intricate pattern.

There were tiny flowers here and there, feathery things in several colors. Pathways slithered through the purple grass and there were low, wide pads at various spots. Near

each pad was a small floating sphere or a graceful slender column topped with a cluster of very small spheres.

Fargin moved into the garden, and as he neared the center he saw a perfectly ordinary video camera lying on a pad. This shocked him more than the purple grass and floating spheres. He picked it up and looked at it.

It was a Kodak Spacematic with half-hour holograph shot. He ran it back a few millimeters and checked the image in the tiny viewer. A simple pan of the room he was in revealed itself.

"They know about this all right," Fargin said, then looked around quickly. There was no one there, so Fargin reasoned that they must have left the camera by accident.

They found this whatever-it-is, Fargin thought, and are hiding it from the Patrol and the Inner Worlds. *What a find!* He wondered what the floating spheres did. What were the strange rooms for? How long had this been here? Were there aliens here, or was this a derelict? It didn't *look* like a derelict, yet things often stayed unchanged in space for a very long time.

Fargin moved through the oval central space and on through a grove of blue trees and yellow flowers and past a sheet of rainbow plastic standing by itself. He went into the corridor on the opposite side and made quick looks into each room.

One room held a collection of oddly-shaped objects that were seven or eight feet long and perhaps weapons. They had bulges and sacs and shiny spots and Fargin was afraid to touch them. Another room was stacked with cubes, each with rounded edges and a coded series of colored dots on one facet.

One room did not open and another had six depressions and a white marking on the door. The last room was either a control room or a sundeck.

Fargin looked around in wonder. It was as if he had stepped into a shallow crater on the surface. There was the effect of complete openness. There was the huge round globe of Jupiter and the moons and stars.

The startled miner looked down, around his feet, where the effect was of standing in a low-profile crater. Two wide low pads and between them a floating sphere, the only bright red one he had seen. Nothing else.

Fargin stepped into the bubble—for it must have been a bubble, he knew he couldn't have stepped out onto the surface—to look around. The *Commercial Ranger* was, or seemed to be, sitting a couple of hundred feet away. Fargin automatically ducked, then grinned and straightened.

This *must* be an image projected from hidden surface projectors, he thought. It gave perfect vision. Far-

gin stepped up onto one of the low pads to get a better look. I wish I could see it better, he thought.

Suddenly the ship rushed at him, sweeping sideways until it seemed to be about to crash into the "bubble" around him. Fargin threw himself to the floor and rolled toward the corner, cowering shamefully.

Nothing happened.

He peeked out. The ship was back where it had been before!

Fargin got up warily and moved to where he could get a better look. All he had done was to step up on the pad and . . .

Wish for a better look!

Quickly, Fargin turned to look up at Jupiter.

"I want a closer look," he said aloud. Nothing happened. Fargin stepped up on the pad and looked at the great striped planet. "I want a better look," he said again.

Suddenly the entire rock rushed toward the surface of the planet at fantastic speed. They passed Gilgamesh and Hathor in a few seconds and went past the orbits of Hercules and Minerva quickly. Callisto and Ganymede were on the opposite side but in seconds he was plunging toward the surface of Jupiter.

"Stop!"

The flying rock stopped instantly. There was no deceleration whatever. They simply stopped. It left Fargin shaken and nervous.

"My God!" Very cautiously he said, "G-go ba-back to where we were before."

Blink.

They were back.

Fargin breathed a sigh of relief. It was all a sort of zoom, like with a camera. Fargin turned to look at the *Ranger* and froze.

Men were coming this way! They were coming from the *Ranger* and from where the *Melafalana* had landed. *I've got to hide! I've got to get away!*

Fargin looked around frantically. There was no door out but the one he had entered by, so he ran out and stopped. All the rooms he had looked at had been dead-ends. All but the two he couldn't open.

He ran to the door with the six depressions and stuck gloved fingers into all the spots. Nothing happened.

I WANT TO HIDE! I WANT IN! he thought frantically.

The door slid open and he plunged into the corridor beyond as the dim red lights came up. He came to a junction of the passage cut into the rock and looked at the oval of shining paleness on the way.

Was it a direction guide? A warning? Dots and triangles and the weaving lines were intertwined in a sort of rippling design. With irritation Fargin stalked past the sign and arbitrarily took the right-hand tunnel.

He came upon a niche a few

yards along and briefly thought of hiding behind the cubes stacked there, but he imagined he heard a noise behind him and he raced on. The tunnel was low and he often dinged his helmet on the rock surface which careened him from side to side.

The gravity seemed to be less as he ran along the passage until at last he was almost floating.

I must be near the surface, he thought, or whoever built this thing had something in mind.

He passed another niche, this one filled with globes and small cubes. And then abruptly he was at a hatch. A ripple of dots and markings crossed the door in brilliant white.

Fearfully Fargin looked over his shoulder and then hit all six depressions. *Let me in,* he thought excitedly. Nothing happened. Fargin pressed again and said aloud, "Let me in!"

Nothing happened.

Fargin almost cried. *They'll kill me! They're certain to kill me. Oh, God, maybe they'll torture me!*

He sagged against the hatch, his fingers still pressing at the depressions. *Let me out, please, please, let me out!*

The hatch slid silently open and Fargin almost fell through. Quickly he pressed the depressions on the inside and the hatch closed behind him. He turned to the opposite door and opened it.

Another corridor, wide and low. Fargin turned left and passed several doors. Inside were rooms similar to those he had seen farther back, but these were smaller, each with only one pad and one floating sphere. He came at last to another hatch with more bright white markings that he could not open.

Fargin turned and trotted back the way he had come.

I've got to get away!

He passed the place where he had entered and found another hatch, which did open. He stepped into another bubble-like room. Two pads, one bright red floating globe, and a view of the *Melafalana.* Fargin stepped onto one of the pads and took a look around.

Almost at once he cringed and huddled down on the pad. *Captain Jampel was looking at him from twenty feet!*

It took Fargin a moment to remember what he *hoped* was the condition of the bubble room, that it was a projected illusion and that Jampel was not seeing him at all. Cautiously, Fargin looked up again.

Jampel stood on a rock outcropping a few feet away, his hard eyes sweeping the surface of the rocks around him for hiding places. His eyes passed right over Fargin without seeing him.

Fargin felt relief flood through him. *He can't see me!* Then Jampel moved and the frightened miner saw in his hand the stubby fat shape of a Colt laser.

They're going to kill me, he shrieked in his head. Fargin cowered down on the pad and thought furiously, *I want away from here!*

The bubble went black for a second, then the rock was falling away from him. Fargin caught a quick glimpse of Jampel's figure diving behind a rock outcropping.

Then Fargin was in space and the mysterious hollowed-out rock was away and behind. For seconds Fargin was too startled to speak or move. *Was this another illusion? Was he still in the rock?*

"Stop," he said, "Please, stop!"

The moving stopped. The stars were there, and Jupiter and far away, the tiny hot spot of the Sun.

Where am I? Fargin asked.

You are fourteen million, two hundred thousand, nine hundred and two kilometers from the surface of the primary, a voice said inside his head, *which is presently four hundred and eighty-three point three million kilometers from its sun. Do you desire further information?*

"Awk!" Fargin gasped. "Who's talking in my head?"

I am the ship. My type is Crevlar-morama. My classification is Minor Vessel, Star Class. My designation is Quell/blar-klamon/two thousand six. I was activated in four million and—

"Stop it!" The voice in his head stopped and Fargin looked around cautiously. "What the hell is going on?"

You desire information on religious classifications or upon tactical situations? Please designate.

There was no one there. Smooth walls with cryptic code markings. Two pads. Floating red ball. Space out beyond the bubble. Stars. Planets. Dots.

"Uh . . . what are you? I mean, uh, are you really speaking in my head?"

I am the ship. I speak directly as I am programmed. I perceive that you are not of the race or phylum that evolved me. I have adjusted my symbology and response time accordingly.

"Are . . . are you alive?"

Not in the sense you mean, that of biological self-awareness. But I live. I have lived for pause pause pause nine million, three hundred and eight of the rotations of your home planet. I am self-aware and I function properly.

"You're . . . you're reading my mind!" Fargin felt fear rising in him. He . . . *it* would know he was afraid and if they found out he was afraid they'd take him!

You suspect serious nonfunctioning perind or terminal dispersal.

"Huh? Oh, yes—*yes!*"

Does it have any significance to approaching spacecraft?

"Where?" Fargin twirled and stared wildly into the stars. Suddenly the ship seemed to leap forward; a Patrol cruiser jumped into view and raced toward Fargin's alien ship. Fargin was too terrified to speak, even to croak out a com-

mand to stop. But abruptly the Patrol vessel stopped a few feet away and then Fargin realized it was another zoom effect used by the mysterious ship that had him.

This is a spacecraft used by your planetary police, is it not?

"Yeah, those blackskins! Those sneakin' dirty blankheads!"

You are afraid of them. Shall I destroy them?

"No!" Oh, God, thought Fargin. "No, don't destroy them! If I knocked off one of their ships they'd be after me forever!"

I have capacity to immobilize ship, including or excluding life-support functions. Shall I activate?

"No, uh, wait, huh? How far away are they?"

One million, four hundred thousand point one kilometers approaching this ship at estimated acceleration of–

"Hold it. They're still a ways off. What's happening back on that rock?"

Do you refer to the Dubrian Station which we just left?

"Yes! That asteroid or whatever it was."

Space seemed to whirl and then the zoom went swiftly to the black rock, stopping a hundred feet or so away. Fargin could see a long smooth slot in the side of the rock and a hatch in the center. Several spacesuited figures stood around the edges, looking in.

"Is . . . is that where we came from?"

That is the Dubrian Station and the humans are examining the pod depression.

"Do they know I am gone?"

Pause pause conversation monitoring suggests that is a reasonable assumption.

"Then I am safe!" Fargin smiled and sprawled back on the pad to look out at the simulated closeup of the rock base.

The vessel of the United System Patrol is no longer of danger?

"Oh, I forgot! Where is it?"

Approaching as before at a distance of–

"Never mind. It's still coming. Does it know where I am or where I came from?"

Pause pause pause tracking devices have scanned flight path since beginning of flight.

"Is it as fast as we are?"

Pause pause no.

"Then let's get out of here!"

What designation? Primary? Home planet? Would you like to see home system of Dubri?

"Later, later."

Home system of Dubri very beautiful. Pause pause will require adjustment in your biological sequences but home system of great beauty.

Fargin laughed. "You sound homesick."

On station eight million point six rotation periods of your home planet. I am long past Toi checks and Borvans.

"You mean you are busted?"

Fargin was frightened again.

Minor calibrations would be wise for optimum functioning. Power levels are only at Artala levels. Dubri home system very efficient as well as beautiful.

"How bad is the power?"

Artala level obtainable by direct contact with primary of system. Rull-skile level obtainable within two periods.

"That's good? I mean, is that what is level?"

Rull-skile level optimum for Cre-vlar-morama with bovar modifications.

"In other words you'll be OK within a short time?"

Yes. But Dubri system unique in Dubro Galaxy.

"Never mind that. Take me to Ganymede."

Barl.

"Huh?"

Pause pause aye-aye, sir. The ship started to move swiftly toward Jupiter.

Fargin sat back on the pad and put his arms awkwardly under his head. For the first time he felt relaxed. A fast ship, no navigation to do, just watch the way you told it to behave. Even Raven Blacksword had never had a ship like this!

Fargin watched the swiftly-approaching planet as the ship curved around toward Ganymede. Boy, what Raven could do with a ship like this, Fargin thought. *Immobilize* a Patrol ship! Already, Fargin realized, he was unconsciously doing what Blacksword would have done. Go back and get the girl! With her under one arm he could laugh at the Patrol, sneer at the miners, and just have one hell of a time!

Fargin sat up abruptly. *Why not?*

What had he to lose? The Patrol would probably dump him anyway, as soon as they found out what they wanted to know. The miners would kill him just for knowing about the Station.

But with this ship!

"Uh, ship . . . can I breathe the air in this ship?"

Negative. Would you like it changed to something suitable for your metabolism?

"Can you do that?"

Yes. All Cre-vlar-morama vessels are equipped with Scee-klamorma duplicators.

"You mean you *duplicate* the air, or, uh, make it, or what?"

I have several recordings of air taken from your home planet five point six million years ago. I have capacity to duplicate as needed.

"Good God, is there anything you can't do?"

Virtually an infinity of acts are beyond my capabilities. Three hundred nine are forbidden to me and I am incapable of acting in those areas. But the maintenance of life-support levels for a wide variety of intelligent life is my Priority-One instruction. As we have conversed I have drained Dubrian air and replaced it with a suitable atmosphere.

If you desire, you may remove your spacesuit.

The new air was fresh, with an exhilarating tang. Fargin breathed deeply. For years he had been breathing the slightly oily, *used* and *re-used* air of pressure domes and spaceships, and the thin, cold, flat Martian air.

This was fresh and fine and Fargin felt a glow of well-being. Then he laughed. He was getting drunk on fresh air?

May I ask the purpose of the Ganymede landing? If I am properly informed I function at optimum. In no way do I mean this query to be critical of your command functions, but since you are not of the race that evolved me you might need guidelines in maximum effective use of me.

"You certainly sound human. Stuffy, but human."

Thank you. A full grasp of your speech and thought patterns still eludes me, for I was not trained to function for another race. I have had to extrapolate. If I am in error at any time, please correct me.

"Oh, no, you're doing fine. Hey, listen, we humans have nothing like you at all. Were the miners aware of you? I mean, did they know about you or go into you?"

Negative. They attempted entry to passage leading to me, but their minds were not sufficiently motivated to open the hatch. I monitored their conversations since first arrival and they are puzzled by various equipment. A member of their first exploration team removed a limb by thrusting it into a disposal device and since then they have moved cautiously. I believe they are attempting to translate the Dubrian symbols in hope of understanding the function and direction of the Station.

"So that's what all that was about? Say, listen, where are the people that built you—uh—brought you here?"

Contact with home system is maintained by periodic checks. The personnel of the Station all went to surface of the planet you call Jupiter pause pause one hundred and ninety-six years ago. They did not return and I went into Arata mode as programmed. A replacement team will arrive in pause pause forty-one rotations.

There was a brief moment as Fargin thought about the ship trying to con him into a forty-one-year space trip, but the ship broke into his thoughts.

We are hovering above the usual landing site of the major city of Ganymede. Do you wish to land?

"Yes! At, uh, Dome Two. Can you hover just over the prime air lock?"

Affirmative. I presume at a height that permits easy access.

"Yeah . . . and . . . listen . . . if I leave, will you let me back in? I mean, suppose someone else gets in here? Would they command you?"

Yes, unless you give me a Null-Alimon command that you are in

command until further notice or until an Arata mode is activated.

Fargin started back into his spacesuit. "Consider yourself with a Null-Alimon command. I'm going into the dome and get my woman!"

Aye-aye, sir.

As Fargin swung out of the hatch and dropped to the rockmelt of the area around Dome Two he ignored the stares of two startled miners working on an atmosphere pump. What would Raven Blacksword do now? he asked himself.

He'd sweep her off her feet, that's what he'd do!

Fargin went into the Dome and down the short street and into Nell's Place. "Where's Camille?" he barked at the bartender. The man looked at him curiously, then pantomimed opening a faceplate. Fargin grimaced and flipped open the helmet's faceplate. "Where's Camille?" he demanded.

"In her room, where else this time of day?"

Fargin demanded the number of the room and then stumped up the stairs. The bartender laughed. "She won't be too happy being waked up this time of morning. But you won't get any points on originality! She's done it with a guy in a suit!"

Fargin found the door, a painted plastic panel with doves and hearts all over it. He kicked at it with his heavy boots. It took kicks, but the door gave. Camille was struggling up in bed, clutching the sheets around her lush body. A miner with a sunburned face lay next to her, his mouth open and dribbling saliva, and his snores threatened to drown out everything.

"Who the hell are you?" Camille snapped. "Listen, I conduct business during business hours. Now shove off, you zongo!" She fell back on the pillow, then immediately sat up. "And I'll get the Union to take the cost of that door out of your shares!"

"Camille, it's me! I've come to get you!"

"What? Listen, you dumb cleanboot, have you scrambled your main program or did you just get uncoupled? I said out!"

"But I've got the system by the tail, honey! I can do anything. Uh, my ship and I can do anything!" Fargin stood tall. "Anything!" he repeated.

Camille opened one eye and looked at him quite calmly. "Out. Out now. Don't wait for a dotted line to appear on the floor. Out."

Fargin stepped closer. "Camille, you're my kind of woman—"

"I'm a lot of kinds of woman, especially way out here. Right now I'm a sleepy, angry, *mad* woman! You've tumbled your gyro if you think I'm all ready for mad, passionate romance at—awk!—this time of morning!"

"Camille, I can give you anything, anything at all. I have power, Camille, real power!"

The girl uncovered both eyes and looked at him. "You strike it rich?"

"Uh, well, not like that. Now don't groan! I didn't find any rich asteroid or anything–I found something better!"

"There's nothing better," came Camille's muffled reply.

"But I've got a ship that can do anything, anything at all!"

Camille groaned. "I've heard of guys liking their ships before but this one is new! I think you were hulled in the control room, fella. Now beat it!"

Fargin moved to the side of the bed and touched her gently. "Camille, Camille? Listen, I'm very important now. The Patrol is after me and the miners are out to–"

"WHAT!" She sat up, disregarding the bosom she bared. "The Patrol is after you and you came in *here*? Out! *OUT*!" She pointed imperiously.

"Camille, you've got to come with me! A man is nothing without a woman, his kind of woman!"

"Not with the Patrol after you! OUT, you damned tank thief!" She jumped from the bed, stark naked, and Fargin gulped. She started pushing him and Fargin was frantic.

She was Blacksword's kind of woman. Wild, strong, beautiful, brazen. That made her his kind of woman, but how do you handle that kind of woman? What would Raven Blacksword do?

"Listen, you stupid mudballer, you've split your binders! You get out of–"

Fargin slapped her. She fell on the bed, bounced right back with a snarl and bit Fargin's nose through the open faceplate. Fargin howled with pain and lashed out blindly.

Camille fell unconscious to the floor, a naked and voluptuous pile of meat.

Rubbing his nose carefully Fargin gathered up the limp figure and carried her downstairs. The bartender started to come around the bar at him, then stopped and looked thoughtful.

"I guess if Camille couldn't handle you I ain't gonna try."

"Keep it that way, mudballer," snapped Fargin. He walked to the door and stopped. He turned back. "Uh, listen, would you open the door? I've got her and, uh, in these suits you can't . . . uh, thanks."

Several early risers stared at Fargin as he carried the nude girl down the street and one went running off toward the Patrol office. Fargin dumped her on a bench in the air lock and managed to pull a suit on her. He was just cycling the air when he saw Major Corey through the port, his face livid and a Colt Laser in his fist.

Fargin slammed the outer hatch open and left it open as he half-dragged, half-carried Camille to the hovering alien ship. It would take them precious seconds to override and close the outer hatch and recycle. Fargin shoved the limp girl

into the air lock and climbed in after her.

"Let's go!" he shouted.

Nothing happened.

Fargin looked back. The Patrol was in the air lock. Fargin shouted again, "Get going! Get us off of here! Go!" Nothing happened.

Frantically Fargin pulled the outer hatch shut just as the Dome port was opening, decanting angry Patrolmen. Fargin stuck his fingers in the inner lock door and burst through. He burst into the control room and shouted. "Get us out of here!"

Nothing happened.

"Are you dead? Move!" Fargin jumped onto the low pad and looked up at the sky, the white dome curving off to the left. *"Take off!"* he shouted.

The dome dropped away and the stars raced toward them. With relief Fargin dropped to the pad. "What happened? I was shouting!"

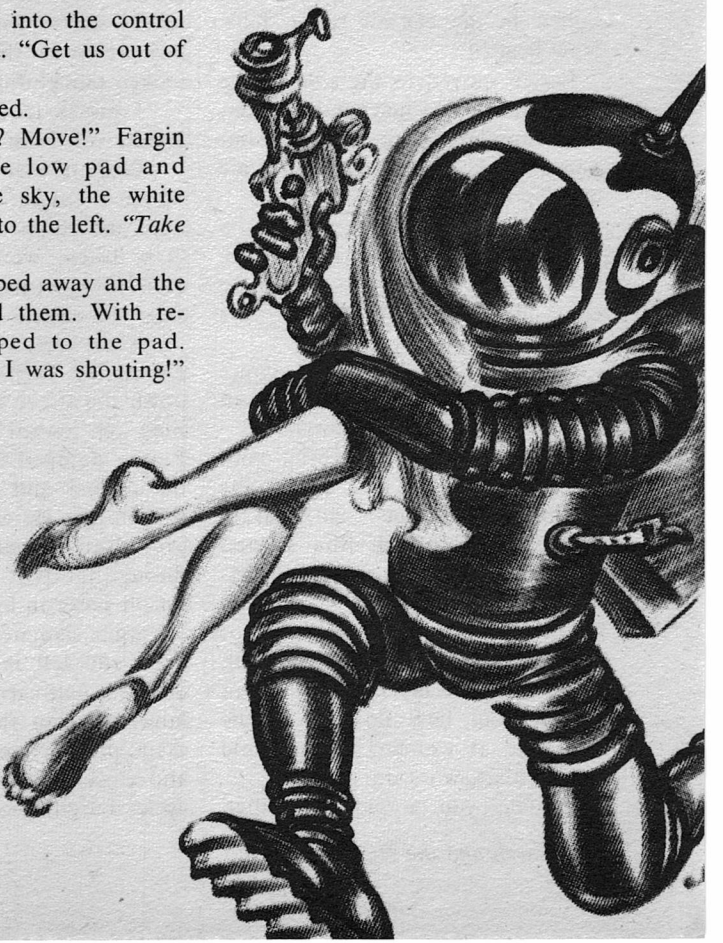
Control function necessary from control pads, otherwise vagrant thought might activate random reaction.

"Why didn't you tell me I had to be in here on these pads?"

Commander did not request specific information.

"Oh, thanks. Very funny."

It was not intended as comic remark. I am programmed to deliver



entertainment of Dubrian nature but analysis of human comedy shows no comparison.

"Never mind, never mind. Listen, ship, I'm going back and get Camille out of the lock and into one of the rooms. Can you keep her there for a while? I don't think she's too happy with me right now. Don't hurt her or anything, just keep her entertained and give her whatever she wants, OK?"

If desires of human Camille are within capability of my functions, it is possible.

"Fine. Now what's happening back there?"

Pause pause a Patrol ship is being activated. I postulate pursuit. Shall I destroy?

"No! Not now, anyway. God, you give me a feeling of power! OK, so what's going on back on that rock, on the Dubrian Station thing?"

The Patrol vessel has arrived and both ships of the miners have been deactivated. The humans have taken refuge within the Station and the Patrol humans are attempting forced entry.

"Oh, God! Can they do it?"

Eventually. A Station is not a Barimaida-crust or even an Amla fortress.

"Whatever they are. No, don't tell me now. Um . . um . ." Fargin thought furiously. "Ummm . . . hell . . . take us back there!"

Space swirled and the ship started its swing around Jupiter at a breathless speed.

"Why am I doing this?" Fargin asked.

Unable to discern reasons for—

"Never mind! Boy! Listen, ship, I'm going back there because . . . because that bunch of tank-thieving Patrolmen are going to foul everything up! With the power of this ship and that Station they can hold off the Patrol and get independence. Can you really duplicate anything?"

Yes, providing a prior scan has been made in sufficient depth.

"And you really have the power to destroy or immobilize a Patrol ship?"

Affirmative.

"Then we are in business, ship! Take us in to that rock!"

Fargin settled back into the pad. Power! He had power at last! With Camille, he—oops.

Fargin jumped up and raced into the air lock and dragged Camille into one of the rooms with a floating sphere in the center and stripped off her spacesuit. He looked longingly at the nude girl and then, as she started to regain consciousness, he fled.

Back in the control room he said, "Ship, you remember to keep her there, right?"

Aye-aye, sir.

"I don't know why that sounds silly, but what the hell. How are we doing? How soon will we be back at the Station?"

Anticipated arrival in four minutes, captain.

What am I going to do when I get there? Fargin thought. Blast the Patrol? Rescue the miners? Become a hero? What do I want to do? What would Raven Blacksword do? In "The Queen's Sword" he had shot his way right through the mercenaries in the citadel. In "Emperor of Scoraba" he blasted his way in with flameswords. In "Starmagician" he had used trickery.

Hell, thought Fargin, I'm not Blacksword. I can't fight like he can fight. He's big and strong and brawny and fast.

But he doesn't have a ship like this, Fargin told himself. *Nobody* has a ship like this! With a ship like this I can beat 'em all! There's nothing I can't do!

Dubrian Station dead ahead, sir.

"Immobilize their cruiser. Activate audio channel only to the miners inside. Hold it steady. Activate the force screen. Uh, we do have a force screen, don't we?"

Semantics being what they are, even in telepathic communication, I answer that we have a force screen, sir.

"Thank you. Is their cruiser deactivated?"

Cruiser immobilized. Do you wish me to immobilize the individual Patrolmen on the surface?

"Yes!" Power!

Audio channel to Station ready for activation.

"Activate!" By God, this was fine, thought Fargin. Power ennobles and absolute power ennobles absolutely. "Men of Earth!" he called out.

The voice of Logan Jampel came through clearly. "Who is that? What happened to the Patrol? If you're asking for our surrender you can go to hell. We're holding out to the last and if we have to we'll blow this rock up!"

"Hold it, Jampel!" Fargin snapped.

"Who's that? How do you know my name?"

"I'm . . ." Fargin hesitated. David Fargin was a loser, a nobody, as far as the System was concerned. But he commanded this ship, this beautiful supership. He needed a new name, something to go with his new status.

Fargin could hear a whispered conference on the other end of the transmission. "Is this some kind of trick?" Jampel asked. "Who are you?"

"I'm . . . Hawk Hardcase." *Oh, if Blacksword could see me now he'd die!*

"Who?"

"My name is Hawk Hardcase, mudballer. I'm the one that fixed the Patrol for you. I'm the one that can tell you how to control that whole station down there."

"How, for God's sake? We've been trying to figure out these dot and triangle squiggles for months! We've run it through the computers every way including inside-out."

"Did you know there was a matter duplicator on board?"

"I'd believe anything of this rock—it's weird!"

"A duplicator solves your problem of independence," Fargin said. "It can dupe air, water, chemicals, whatever you need." In his mind Fargin asked, *You can, can't you?*

Affirmative. Steak and eggs, starfire rubies, material for bone transplants, radioactive isotopes, lysergic acid diethylamide, fresh flowers or new shoes—I only require a sample to scan.

"You can tell us how it works? Great! Do it, man!"

"Hold up there. First, a deal."

"What do you mean, a deal?" snarled Jampel. "We found this whatever-it-is . . . we've worked for months trying to figure it out and not trigger off something hairy. The Patrol is on our tail and you are talking *deal?* What kind of guy are you, anyway?"

"I'm Hawk Hardcase, mudballer, and I do things *my* way! I can get the Patrol off your tail—and incidently there's another ship on the way—and tell you how to open that treasure chest."

"Listen, we'd make a deal with the Devil to get this system liberated from those corrupt bastards!"

"Then I'm your man." *Is my voice getting deeper?*

"So what's your way, uh, Hardcase?"

It came to Fargin. He knew what he wanted. It stunned him for a moment. He not only knew what he wanted, but for once he thought he really had the ability to get it!

"I'll take care of the Patrol and I'll show you how to operate that Station. It's a Dubrian Station, by the way. About nine million years old. You'll get your independence . . . but I want a privateer's license from the Outer World Republic or whatever-you-call-it."

"A what?"

"A privateer's license. The Patrol will always be after me anyway so

I might as well make money on it." Fargin hardened his voice even more. "Hawk Hardcase doesn't fight for nothing, fella."

"Who?"

"Me, Hawk Hardcase."

"Oh, yeah . . . uh . . . well . . ." There was some whispered conversation and the ship spoke quietly to Fargin.

Two Patrol spacecraft have come in sight around Jupiter, sir.

"Thank you."

"What was that, uh, Mr. Hardcase?"

"Never mind. Have you decided?"

"Yeah . . . uh, listen, wouldn't you rather place your ship in our fleet. I mean with appropriate rank and all?"

"I don't take orders easily, Jampel. I'm a loner."

"Sure, uh, sorry . . ."

"Hurry up, mudballer, there are two Patrol ships on the way."

"Uh . . . yeah . . . OK, you've got a deal. How do we operate this thing, anyway?"

"You know that room with the bubble?"

"Affirmative."

"Go in there and lie down on one of those pads and say, 'Explain this station to me.' "

"That's all?" Jampel's voice was incredulous. "What else?"

"That's all. You'll pardon me, gentlemen, but I must engage the enemy."

"Hardcase! Hey!"

"Cut contact!" Fargin ordered.

Aye-aye, sir.

"Head for those Patrol ships!" Fargin watched the ship turn and start its race toward the still invisible Patrol craft. He grinned and stretched. "Send me the wench," he told the ship.

Aye-aye, sir. May I inquire if you are considering coital union with this female at this time?

"Uh, maybe, why?"

It would be appropriate to have music and various scents, I believe.

"Where did you get that idea?"

I have been conducting a dialogue with Miss Grant, sir. She has led me to understand this might be appropriate.

"What's been going on back there?"

A very instructive exchange of information, sir. Miss Grant is most interesting. She is the first human female I have had an opportunity to commune with.

"And I'm the first human male. Don't forget I am boss here, ship."

Aye-aye-sir.

"Hello, David." There was a soft, warm voice coming from behind him. Fargin turned. Camille leaned languidly against the edge of the door, her golden body hung with an intricate lacework of diamonds, starfire rubies and great emerald droplets. She shimmered and glistened as she moved toward Fargin.

"Where did you get that stuff?" Fargin asked.

"The ship made it for me,

honey," she smiled. "This nice ship." She patted the floating globe as she moved next to Fargin. "The nicest ship a girl ever had . . . and just think, you're in complete charge."

Fargin watched her as she slid next to him on the wide, low pad. "Uh, you've changed," he said.

"Changed? Me? Don't be silly, but a girl has to be gentled down firmly now and again, doesn't she? Anyone named Hawk Hardcase knows that."

"Look, uh, I've got to take care of these two Patrol ships and—"

"Oh, honey, just tell the ship to do it."

"Oh . . . yeah . . . uh, ship will you immobilize those two ships?"

Gladly, sir. Sir, would it violate any privacy taboos if I watched?

"What? Why?"

Humans fascinate me, sir. You are much more complex and interesting than the Dubri. I hope you will not construe that as criticism of those who evolved me, but they were, if you'll pardon me, sir, they were without the juices of life. I find every facet of human endeavor of great interest. I hope this will not offend you. Humans are very complex and largely unpredictable and it is sometimes difficult for me to function properly on inadequate information.

"Oh, hell, yes. Watch all you want. You're only a machine."

Sir, I have been programmed for a sense of pride of accomplishment. Being a machine that must, under all circumstances, function at optimum is not an easy task.

"I'm sorry, ship. I didn't mean to offend. It's just that I never thought that a machine would or could be insulted."

Sir, I perceive an awareness in you of my stature and I appreciate that.

"You're welcome."

If you will forgive me for saying so, sir, I think you and I shall pause pause pause get along very well.

"Honey," said Camille, "can the ship *really* make me a whole big necklace of Martian firestones if I just give him a good look at one?"

"Yes," said Hawk Hardcase.

EPILOGUE

The *Thunderbolt* lay motionless in reference to the 240-mile globe of Vesta. The man the whole system knew as Hawk Hardcase lay on the command couch.

The swords clashed and sparks flew as Hawk Hardcase fought shoulder to shoulder with a giant warrior. Hawk smashed through the guard of a four-armed Skull soldier, deflecting one sword and slicing off a descending swordhand. He and Raven Blacksword exchanged fierce grins and the giant beside him gave a great cry and cut through the cuirass of another soldier.

The Skulls climbed over the bodies of their own dead to get at the two swordsmen in the narrow passage, and the stone halls

rang with their fearsome cries.

"Get the Princess and Melani!" Hawk Hardcase shouted to Blacksword, slashing at another scarlet-clad warrior and jumping back to avoid the spill of gray guts. "Get out the back! I'll hold them off!"

"No, by the gods of Morga!" Raven Blacksword swung his blade with both hands, cutting off two heads and scratching the stone wall. "I'll not desert the best friend I ever had!"

"Go! I command you!"

"Kill! Kill! Kill for the love of killing!" screeched the Overlord from the tower.

"No!" Blacksword snarled savagely as a spear stabbed through from the melee of metal and dark flesh and sliced into his side. He cut off the haft with one blow and the two of them together made a hideous windmill of their famous blades, beating back the Skull warriors for a moment.

"Now! Together!" Blacksword cried. They turned and ran. Hawk picked up the Princess under one arm. She had not recovered consciousness and the foul costume of the Highest Sacrifice was still on her golden body. With a snarl he ripped away the symbols of her oppression and flung them into a corner.

"Ready?" he snapped at Raven Blacksword, who had Melani clinging to him adoringly.

"Ready, brother!"

They lunged at the doorway, two muscled giants in leather sword-belts and tattered loincloths, leather pouches full of the Jewels of Mira swinging from their belts. Raven cut down the first Skull soldier and Hawk cut the legs from the pair that followed.

"This way!" Raven cried and then thundered toward the light. They ran squinting into the sun and above them the Overlord screamed his anger. The eerie chant of Thomba began and the very clouds seemed to thicken and swirl faster. A lightning bolt lightened the horizon and the Overlord screamed out his chant to the dark gods buried deep within the planet. The ground began to rumble and there were screams.

Hawk seized a bow from a newly dead soldier and pulled an arrow from one of the dying Amla, who screamed anew. Notching the arrow he sent it flying toward the black robed figure on the tower.

There was a faint thud and a pause in time. The black figure stiffened and a lightning bolt struck a short distance away, on the rocky headland.

Sir . . .

The black robe fluttered and fell and there was a great sigh as the land subsided. The smoke from the burning temple drifted across the tower as Raven said, "Come! My men wait in the hills!"

Hawk Hardcase picked up the Princess where he had dropped her.

Pardon me, sir . . .

"Let's go!" He grinned, his mouth a ruthless slash.

You wanted to know when the ship was within attack range, sir.

Raven Blacksword threw the beautiful slavegirl over his shoulder and climbed into the archer's slot. "Come on, the moat's only a spear's throw down!" He let go and leapt into space.

It's time, sir . . .

Hawk Hardcase saw the last of the warriors boiling from the bloody mouth of the passage and he put the Princess down. He met the first onslaught of the demented Skull warriors and killed two in a single slash. He backed toward the door, felt back for the smooth metal edge, took a light cut on the upper arm as he beheaded the infamous Captain Morto, then slid the metal panel shut and staggered to the couch and collapsed.

The target ship is within attack range, sir.

"Uh? Oh, good, good." Hawk Hardcase took a deep breath and sighed. He'd pick it up again when he and Raven were in the nomad's tent, enjoying the lush wenches. Then maybe they'd go visit the Kingdom of Scor, on Molanu.

"What's her name?"

Guillaume Apollinaire. French Consortium registry.

"Do they have any aboard?"

Unable to determine, sir. Shall we proceed as usual?

"Yes. What is Camille doing?"

Redecorating the cabin, sir. I provided her with sheet jade carved in imitation of Barimaida. Shall I inform her of the attack? Do you wish her to be present?

"No. The last time she went with me we kept them waiting a half-hour while she had you whip her up a new costume. Let's go."

Aye-aye, sir.

The *Thunderbolt* erupted into action. Hawk Hardcase watched the big sphere of the *Apollinaire* come closer until he could see details of the domes and masts and other exterior equipment.

Ready to transmit, sir.

"Apollinaire, this is Hawk Hardcase! You are helpless! You will not try evasive action! My ship will match velocity and I will board! Any resistance will be harshly dealt with! I will see the ship's captain and the ship's librarian at the main air lock."

The massive globe of the passenger ship dwarfed the sleek, swift *Thunderbolt* but there was no defensive reaction. The whole System knew of the power that lay behind the small gray Dubrian vessel.

Hawk Hardcase said, "Keep in touch with me at all times and prepare to immobilize upon mental command."

Aye, sir.

Hawk went to his cabin and changed into the dread black of the famous Hardcase image. He slung a Dubrian multilaser from his hip and checked himself in the mirror, approvingly.

The captain and several officers awaiting him in the inner air lock were smiling broadly. "Ah, the famous Hawk Hardcase!" the captain said and saluted with a flair.

"Never mind that!" Hawk snapped. "Where's the librarian?" A young woman stepped forward, the puce jumper of the spaceline hiding not at all the lines of her figure.

"Pardon, monsieur . . ."

"You! You know what I want! What do you have?"

The girl grinned shyly and offered a small stack of book tapes. Hawk seized them and shuffled them through his hands quickly.

" 'Pirates of Canis Major'! This is an ancient one!" He tossed it to the floor and followed it with "Blacksword's Revenge." Then his eyes lit up. A new one! Two!

"Blacksword and the Time Magicians."

"The Gods of Xolotl."

Hawk Hardcase grinned wolfishly at the librarian, who fluttered her eyes and blushed slightly. "Good, good," he grunted.

"The Return of the Queen's Sword." Fantastic! That Queen Suli had been a great character. Maybe she had a sister, or maybe a captive princess that she was holding as a slave.

Hawk Hardcase looked around with a scowl. "All right, I've got what I've come for! Now don't try anything!" He backed toward the lock and frowned at the circle of officers.

The librarian cleared her throat and said, "We left before it was out, Mr. Hardcase, but next trip we're sure to have the newest one. I think it's called 'The Pirate Kings of the Stars.' "

Hawk Hardcase smiled at her. "I'll think about it. You'll see me when you least expect it."

"Maybe you could give a talk to the passengers?" suggested the captain. "I'm certain they'd enjoy it."

"No, I don't—"

"Oh, please?"

"Well, maybe next time." She did look good in that jumper, thought Hawk Hardcase. I wonder if she'd like a dress made of linked diamonds?

The hatch hissed shut and the most famous pirate in space history jumped back into his own adopted world.

"Away!" he shouted and the *Thunderbolt* dropped away from the big ship, heading for the secret base on a nameless rock in the forward Trojan position from Mars.

As he dropped into the command couch, happily fingering the book tapes, David Fargin wondered about the librarian. Was it a trap? Had they set her up just to capture the elusive Hardcase?

David Fargin watched the stars pass as the ship took a standard evasive route to Home Base, his fingers fondling the book tapes.

That librarian was really very cute. I wonder if she could ever be interested in me, he thought.

He sighed. She might be interested in Hawk Hardcase, though, he thought. The next time I see her . . . if there is a next time . . . maybe I can get a few moments alone with her.

Unless Camille goes along.

Maybe the ship can come up with a whole new jewel for her, Fargin thought, something like those idol's eyes Raven had in "Blacksword and the Temple of the Dragon God." Something to keep her busy . . .

He sighed again and took a deep breath.

Hawk Hardcase dropped the book tape into the slot and settled back for the first reading. Later, the ship would help him and he'd fight right alongside Raven against the Time Magicians or the Queen's enemies.

But this first time Raven would have to go it alone.

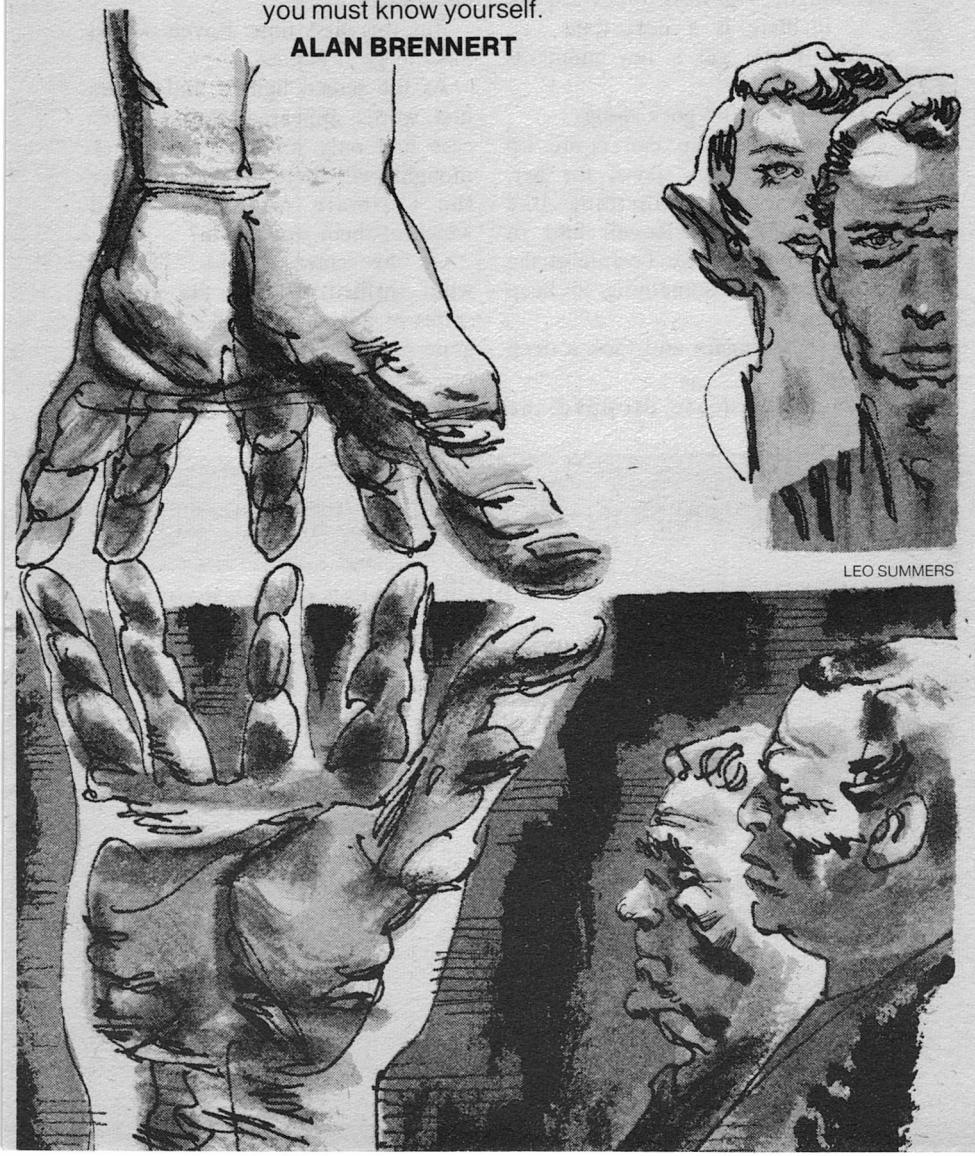
As the screen lighted and as the first words appeared Hawk Hardcase had only time for one quick thought: will there come a time for the Ultimate Adventure? And which of them would win?

On the screen it said, "The icy wind shrilled through the eroded spires of ancient rock like banshees gone mad. Raven Blacksword lifted his shaggy dark head and tasted the scent of the alien air . . ." ■

TOUCHPLATE

Before you can truly
know someone else,
you must know yourself.

ALAN BRENNERT



LEO SUMMERS

Washington summer strangled the city, hot white buildings under a nightblind sky. Mankiewicz on his terrace stood ashen in the moonlight, stiff and impassive and poised ready like the *Kouros* statues of ancient Greece. He felt neither poised nor ready for the long night to come.

Inside the second-floor home, Charlene rattled through the dinner-makings: as if dinner really mattered now. Mankiewicz kept the irritation to himself, determined not to question anything tonight. That was how the brief, flickering wars always began, with him searching for a question and finding only an accusation. God, but he didn't want that now. All he wanted were words, the right words. Why did they never come?

The touchplate lay bone-pale on the polished tabletop, catching whitely the frowns and stares of the two men who stood above it. In its oval face fingers poked and pointed and swept close but never made contact. Never touched.

"Ed?" Behind him, Charlene in the living room. He stepped through the half-opened glass door, turning his back on the starless night above Washington.

The room was cool and bright, insulated from the night. Charlene's dark hair and darker eyes seemed the only shadows in the room, somehow. She wore a forced smile but Mankiewicz couldn't complain; his, too, had been purchased at cost. The maid and the cook were gone—she'd dismissed them for the evening—and they were alone. The entire evening was being pushed, painfully, into their joint conception of what such a night should be—as forced as their lovemaking had been these past months, clawing at a peace that was never more than tentative.

"They're clawing, too." The President's voice was as much a dim reflection of a past confidence as the tired stares suspended in the touchplate. "They're reaching for anything that will keep this world afloat. But how do we know the surface of this thing isn't too sheer, too slick?"

"We know it works," Halvorsen said, his deep-set eyes staring almost pleadingly. "We've used it to transmit information—symbols, data—from one mind to another. It's as strong a psionic bond as we can make it."

"Information," the President repeated. "Symbols. Data. This conference would entail a hell of a lot more than that. It's going to mean hopes and dreams and fears, all melting and merging. Should anyone have to account to the whole damned country for their fears and prejudices?"

"Yes," Halvorsen said. "You have to."

"But what if something in my

mind sparks war?" His voice was edged in anger, defensive.

Halvorsen smiled weakly. "Then we're back where we started. We're on the brink of war now, or else we wouldn't be attempting this. We're boxed into a corner—and that with us." And he nodded toward the touchplate.

They sat quietly on either side of the low table, polite dolls for a summer's night. Eating in the living room, alone, was the *right* thing to do; they were trying hard to be sensitive to each other's feelings, but empathy came slowly after so long.

Mankiewicz looked at her finely-drawn features, wondering why he could never tell her anything beyond what he could see, anything beyond that which she had rejected as a catalog of surface qualities. Wondering why she had rejected that beauty in the first place. Wondering why "beauty" had become an epithet: an epithet that seemed to constitute Mankiewicz's entire vocabulary. Wondering about that, too . . .

The Oval Room was choked with odors old and stale: smoke, sweat, and the last traces of dreams gone to dust. Halvorsen, late of the late UN, watched as the President eyed the touchplate cautiously.

"Are they using *their* top men, I wonder?" the Chief Executive said at last.

Halvorsen shrugged. "I don't imagine they want to. No one wants to risk presidents and premiers to go mucking about in each other's minds. If we send an ambassador or a go-between, chances are China and Russia will send ambassadors or go-betweens. And that won't do a hell of a lot of good, since none of them will have any real power. But if we send our President, as a gesture of strength, they'll have to send their premiers to save face—or at least their party leaders." Halvorsen's voice became hard, firm. "Mr. President, you've got to go."

The President hesitated. "I'll have to think about it."

"Dammit, how much time do you think we *have?*" Halvorsen snapped. "I'm sick of this damned sidestepping. Yes, you may reveal national secrets! Bloody likely that you will. Every missile configuration, every defense plan that you've committed to memory—there's no way to hide them. They'll become common psionic knowledge. But dammit, it's a two-way street! You'll know their secrets, too. Lord, what's to lose?"

The President looked at him, eyes hard and intent. "Losing's not the worry," he said after a moment's hesitation. "It's winning. Coming away from that peace table knowing, beyond any doubt that we may have now, that we can positively destroy each other because we'll know exactly *how*, right down to

the very last strike zone."

"But that would waste the whole damned planet. Do you think anyone is going to chance something like that?" He shook his head. "Your argument's weak as hell and you know it." Halvorsen stared at his President a long moment. "Yes, of course you know it. What the hell *are* you afraid of?"

Mankiewicz watched his hands as he ate. They weren't the hands, tanned and acromegalic, of a truck-driver or a garbageman or a field-laborer, the kind of person you're brought up to think of as dull and blunt when it comes to words and love and touching; they were quick hands, competent hands. Maybe they'd been desensitized from shuffling papers for so long, he thought. Maybe—

He looked up to find Charlene staring at him, brown eyes wide with a sadness and a fear. "It's not going to work, is it?" she said softly.

Mankiewicz sighed, pushed himself away from the table and sat slumped in the low chair. "Not this way. Not with each of us playing out a role, trying to live something we can't. I keep looking for the cue cards but they're never there."

She brushed aside a lock of long black hair, stared down at the table. "Damn it," she said quietly. "If we can't even face the end of the world together, Ed, what kind of people are we?"

"It's not just the defense secrets, is it?" Halvorsen said. "It's every secret that you've ever had. Isn't it?"

The President sucked in a breath sharply. "Hal—"

"Dammit, listen to me! Whatever you betray . . . remember: they'll be as naked as you. Just as exposed. Maybe man just can't fight without his clothes on. We'll find out." He spread his hands in summation. "Good Lord, we've *got* to find out."

The President looked at the touchplate again. Psionic bond: the sound of that made him think of ionic bonds, atoms sharing electrons. And then he had an image of three men drifting in secret orbits, a sudden reaction spinning them together, and then they were one molecule, one mind.

"How long before we have to send someone to Geneva?" he said.

Halvorsen sighed. "We can have Air Force One ready by nine tomorrow morning. That's almost sixteen hours. If the Bloc is as frightened as we are, they won't attempt anything until we make some stab at a treaty."

A treaty of the mind, the President thought. A treaty of souls . . . .

He sat down behind his desk. "I'll let you know by dawn. Have an emissary standing by. I'll tell you whether or not we'll need him."

Halvorsen almost said something, then checked himself and nodded.

"Yes, sir. I'll . . . I'll be ready to go."

The President glanced sharply at him. "You?"

"I can't ask anyone else," Halvorsen said. "Could you?"

There was brief, icy silence, and then Halvorsen left the Oval Room, very quickly indeed.

Charlene sat across from Mankiewicz on a bloated red cushion, staring out beyond the terrace into the night. Was she searching for the same words? Why should she—he wanted nothing from her; it was only she who needed the words from him. Jesus. On a night like this. Maybe the last night, maybe the first. Either way it was frightening.

"Charlene?" She looked at him when he spoke, but there was no expectation in her eyes. "Charlene, what do you want me to say?"

She sighed shallowly. "Only what you want to, Ed, nothing more."

"Dammit, I've said it. I love you, you know that."

"Yes," she said without much conviction.

He rubbed his forehead. "I can't give you a sworn affidavit. Who's going to notarize it? God?"

"I don't want an affidavit," she said. "Just the why of it. Something that couldn't be said equally as well of my photograph. God, Ed, you make me feel like a painted paper doll."

Mankiewicz couldn't answer. He flexed his hands nervously on his knees, loving her and knowing why but unable to verbalize it. But . . . why did it have to matter?

Loving her, an inkling of it struck him. Still mute, still unable to tell the why of his love.

"You can't either, can you?" he said.

She stared at him, stunned.

Then she shook her head. "No," she said quietly.

He felt the shock and tried to hide it. He didn't succeed: her eyes became wide, searching for empathy.

"What did you feel just then, Ed? Please."

Like ice, he wanted to tell her, somehow hollow and somehow cold. He straightened. "I'll admit," he would admit nothing, "something of a shock, but," oh God maybe she didn't, maybe she *didn't,* "but . . ."

Stop lying! "Like ice," he admitted, surrendering. "Like doubt and fear and—I was thinking that maybe you didn't love me, Charl. So help me God I was."

"Because I couldn't say why."

"Yes, dammit!" Then, softer: "Why should it be important to us? Why should we care why—why can't we just accept it?"

Her gaze moved to the night again, remained fixed on her own dark reflection in the glass. "Shadows of rape, maybe. Of being used, laid, forgotten. You grow up terrified of your own reflection—alone

and lonely if plain and flat, assaulted in the coatroom if not."

He hesitated. "Do you feel I'm using you now, Charlene?"

She looked for all the world like that plain and lonely girl that had never stared out at her from her mirror. "I don't know, Ed. I don't think I know anything right now . . . least of all myself."

He stood up, suddenly tired. "I know the feeling. Deaf, dumb, and blind—we make a lovely pair." He moved over to the window. Charlene stood up behind him, unmoving beside the cushion.

"Are you coming to bed?" she said quietly.

He nodded, not turning. "Yes. In a while."

The President sat staring at the desk in front of him. The smoke and the silence hung over the room. He was alone now—perhaps he had always been alone—and he felt a cold fear.

President Edward Mankiewicz stared at the touchplate that lay whitely at his fingertips, his face reflected in its frosty depths. He sat there a long while before finally reaching out to take it.

President Edward Mankiewicz stared at the touchplate that lay whitely at his fingertips. He squatted uncomfortably in front of the closet in which he had hidden it, staring, debating, at length deciding as he stood up, taking it with him when he went.

Charlene was in the bedroom. Without pause he headed for her, his hands trembling slightly, hoping that man *can't* fight with his clothes off, can only make love and show love and be loved . . .

The bedroom was dim; the blinds on the window crippled the moonlight, turned it weak and pale. Mankiewicz had to wait for his eyes to adjust to the dark, but even without seeing he could feel Charlene's presence in the room. Like an animal sensing the presence of an enemy?

"Charlene?"

She backed away from the closet, pale in a light blue nightgown. Mankiewicz felt almost betrayed by

his erection that followed his glimpse of her: *Oh Lord . . . do I want to love her—or use her?*

"Ed? Ed—"

Mankiewicz moved over to the unmade bed, dropped the touchplate onto the sheets. His movements repeated themselves in the mirror on the far wall of the room. Charlene stared at the plate.

"I thought you were going to send an emissary," she said softly.

"I may. But not for now. Not for us."

Charlene's eyes, ink-black in the darkness, turned slowly to the touchplate, then, hesitantly, met his. They remained there for as long as Mankiewicz's breath hung suspended in his chest.

Silently, Mankiewicz slid his fingers beneath the touchplate, lifting it to show her.

"We'd know why," he said gently, as gently as he knew how. "Why we're so glib in war, so mute in peace. Maybe even why we have to use a machine to touch."

Charlene hesitated. "Just touching?"

He nodded, putting the plate back down. "Just touching."

"Why we need each other," she said at last. "The chinks and pockets and lonely corners we fill for each other. The weaknesses. Isn't that what love does—fill them, mortar them over? You'd know mine, I'd know yours. Is that it?"

He drew a deep breath. "We'd know ourselves. Each other and ourselves. It scares the hell out of me, Charlene . . . but so does death."

Dear God, what's to lose?

She put her hand to the shining touchplate.

Losing's not the worry . . .

He put his hand on hers, waited.

It's winning.

Very early in the dark morning, five-o'clock blackness hanging blind and restless over the city, Mankiewicz slid away from the woman who lay naked beside him. He shambled into the bathroom, avoiding his reflection in the mirror, then forcing himself to accept his own image. And then he vomited for some minutes.

When he was finished he walked slowly into the living room and picked up the phone: the click of fingers stabbing out a number punctuated the silence.

"Hal? Yes . . . You were right, damn it. You never can ask anyone else. Not to face . . . that. Not to do your trusting for you. . . . No, I won't be seeing you until it's over. No, I'm all right. Thanks."

The click of communication ended, the chill of another begun, the memory of another. Mankiewicz glanced toward the bedroom and managed a wan smile; then he went over to the window and stood nude before the city. He stared at the night a long while, a *Kouros* statue, and hoped that the glow off the eastern horizon was the sun. ■

In the ultradense core of a collapsed star, a temperature of 10^7 degrees can be *cold!*

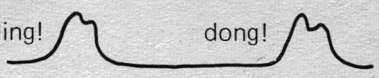
inside a NEUTRON star

JOHN W. CLARK

I. OF CHINESE "GUEST STARS" AND SIGNALS FROM SPACE

In the year 1054 AD a supremely bright "guest star" suddenly appeared in the constellation Taurus. Its visit was recorded by Chinese and Japanese astronomers, who used the term "guest star" for what we now call novae—stars which, momentarily on the astronomical scale of time, burn manyfold their normal brightness. The "guest star" in Taurus was something special, a gigantic stellar explosion, a *supernova.* The remains of the explosion, known today as the Crab nebula, still blaze away impressively, 5,000 light-years distant. Strangely, there is no European record of the event. It could hardly be missed and, to the Medieval mind, must have been truly frightening—the violation of the permanence of the celestial sphere by a point of light so brilliant it was visible during the daytime for 23 days.

Nine hundred years later, A. Hewish and collaborators at Mullard Radio Astronomical Observatory in Cambridge, while carrying out a routine radio survey of the heavens, detected sharply defined, beautifully regular signals ("beeps") at 81.5 MHz, coming from a discrete source in a different part of the sky. The signals were clearly of galactic origin. The beeps, while of erratic amplitude, were heard precisely at 1.337301134-second intervals, and had widths of about 0.1 second. Pulse shape averaged over many periods (two pulses):



Soon other "pulsars" were discovered, including, most significantly, one in the center of the famous Crab nebula. The Crab pulsar pulses not only at radio frequencies, but also in ordinary light and in X-rays, with a period of 0.033 second, and a pulse width of about 0.0002 second. The period lengthens ever so slightly at the nearly constant rate of about 38 billionths of a second a day. There are now some sixty known pulsars. The periods of many of these have lengthened to a measurable extent, but many are "clocks" accurate to one part in a million billion from one pulse to the next. The "clock" in the Crab is running down the most rapidly; it also ticks most rapidly. Measured periods lie in the range from 0.033 second to 3.75 seconds.

At the time of the Cambridge discovery, there was rampant speculation that LGM ("little green men") were trying to signal us or each other from galactic radio stations (conveniently broadcasting at FM and TV frequencies!). Two hard facts quickly ruled out this hope. First, the signals from a given pulsar were found to cover a broad, continuous spectrum, the whole MegaHertz band. Second, an

inordinately high energy is involved—in some cases *more* energy radiated per second (power) in pulses than the Sun gives off in all forms of energy! The LGM would have to have *some* technology!

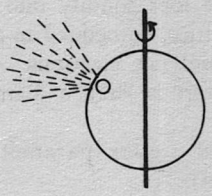
Clues to a natural, or physical, explanation are:

1. Very narrow pulses and pulse substructure, characteristic of a given pulsar (at least when averaged over many periods). The size of the region emitting such signals can be no larger than the distance light travels during a pulse—otherwise one side of the source would not have time to know what the other side was doing, and so wouldn't be able to do its job at the right time (in phase). For the Crab pulse width of 0.0002 second, we get an upper limit on the source size of 60 km. *The transmitter is small.*

2. High energy output. In order to have at hand a very large supply of energy for the transmission, evidently *the pulsar must be very massive.*

3. Extreme stability of periods, with extremely gradual lengthening at essentially constant rate; large range of periods. This tells us much about the clock or *timing mechanism:* indeed, *rotation of a rigid body* is the only viable candidate.

We are led to the currently accepted pulsar model: a small (<60 km), massive ($\sim M_\odot$, the solar mass) object, in fast (~ 1 cycle/sec), rigid rotation. We imagine the pulsar to be a kind of lighthouse. Radiation is beamed (by a mechanism not yet established) in a narrow pencil from some spot on or tied to the object. If we Earthlings are in the right direction, then every time the body rotates and the beam sweeps past the Earth, we see a pulse.



II. STELLAR NECROLOGY

The only object of this type allowed theoretically is a *neutron star,* one of the three possible end points of stellar evolution, one of three possible types of stellar corpses.

As a star dies, as its thermonuclear energy sources—which generate radiation and heat—are drained, it must contract. For only when the star was hot was the internal pressure great enough to support the star in its healthy, inflated condition. Imagine a balloon, blown up with hot air. As the air cools, its pressure drops and the balloon shrinks. In this analogy, the elastic forces which make the rubber want to return to its original, unstretched state play the role of gravity.

Theorists tell us that one of three

ultimate destinies awaits any massive body. A dying star may become a *white dwarf,* a *neutron star,* or a *black hole.*

1. *White dwarf* (dense). The star collapses until the atoms are crushed so closely together that all the electrons are freed from the nuclei. The collapsed material then consists of a dense plasma of ions and electrons. As the dwarf star cools, the ions solidify into a crystalline lattice, embedded in a sea of rapidly moving electrons. A dead white dwarf is "like a diamond in the sky."

Typical stellar parameters (in shorthand):

$M < 1.2\ M_\odot$, $R \sim R_\oplus$,
$\rho \sim 10^5$-10^9 grams/cc, $T \sim 10^6$°K

Some remarks on notation are necessary. When confronted with "big" astronomical quantities, we usually express them in terms of other big quantities which are more familiar to us (which amounts to changing to more suitable units) or we keep our everyday units and use the exponential notation. Above, M is the mass of the star, R its radius, ρ its interior density, and T its internal temperature. The symbol $\sim$ means "of the order of," or "about"; the symbol $<$ means "less than." Further, $M_\odot$ is the mass of the Sun, some 2×10^{33} gm, and $R_\oplus$ is the radius of the Earth, some 6,300 km. The number 10^x means 1 followed by x zeros. The exponential notation saves us from writing lots and lots of zeros, as in the number 10^{11}, a hundred billion.

2. *Neutron star* (denser). The matter keeps collapsing beyond white-dwarf densities, until the electrons, which take up too much space, are crushed into the protons of the ions to form neutrons. This process, in which a proton absorbs an electron to become a neutron, with the emission of a low-energy neutrino (which goes off into space), is called *inverse beta decay.* The material is then composed almost entirely of neutrons, which are about as close together as they are in an atomic nucleus. For many purposes, the neutrons can be imagined as forming a superdense sea. Interpenetrating this sea are more tenuous seas composed of the residual protons and of their negatively charged electron partners. We might regard a neutron star, crudely, as a "giant nucleus" with $A = 10^{57}$ nucleons.

Characteristic parameters:

$0.26\ M_\odot < M < 1.5\ M_\odot$,
$R \sim 10$ km, $\rho \sim 10^{14}$–10^{16} g/cc
$g \sim 10''\ g_\oplus$, $T \sim 10^8$°K

A neutron star is about as big in cross section as the city of St. Louis. Its density ρ is fantastically high. To give some down-to-earth illustrations: A piece of neutron-star matter the size of a grain of sand ($\sim 1/1{,}000$ cm or about 1/2,000 of an inch across) would

weigh, on Earth, some thousand tons (a light destroyer). Or take a planet like Earth and squeeze it to neutron-star density—it would fit neatly into a football stadium. Or squeeze all the people on Earth to that density—they would take up a space no larger than a normal teardrop. The surface gravity, as measured by the acceleration g, is also incredibly great. Any mythical LGM inhabiting the surface would have to be genuine flatlanders. No neutron-star mountains could be higher than about a centimeter—but even so they would be far, far more exhausting to scale than Everest—something like climbing an earthly mountain a million miles high. Finally, the interior temperature T seems outrageously *high* by earthly standards, yet we have said the star is dying or dead and so it should be very *cold.* The resolution of this paradox lies in quantum mechanics and is coming up later. In truth, neutron stars are about the *coldest* objects in the universe, colder than the coldest liquid helium on Earth. For all practical purposes, a piece of neutron-star matter can be considered to be in its ground or lowest energy state—it is a piece of completely dead matter.

3. *Black hole* (densest). If the mass of the dying star is too great, its gravitational field grows so intense as it contracts that the star just keeps collapsing forever, beyond any intrinsic ability of the matter to restrain the collapse and sustain a static configuration (a definite size). From the point of view of an observer lucky enough to be far away from the scene of the catastrophe, the radius of the body rapidly approaches but never reaches a value R_S, the so-called Schwarzschild radius. (Curiously, from the point of view of an unfortunate observer moving with the collapsing body, the radius becomes *vanishingly small* in a very short time.) The name "black hole" comes from the fact that the gravitational pull of such an expiring star becomes so great that virtually no light can escape it. Only its gravitational field can tell us that it is there. The stuff of the dying star goes down the *oubliette,* the "cosmic garbage disposal," and we have neither time nor right to ask its nature.

Parameters:
$M > 1.5\ M_\odot$, $R \to R_S$,
$\rho \sim M / \frac{4}{3}\pi R_S^3$ (from outside)
(For $M = 2\ M_\odot$, $R_S = 6$ km and $\rho \sim 10^{16}$ g/cc.)

White dwarfs are thought to form (typically) from ordinary stars by long, slow contraction, a peaceful, lingering death—"with a whimper, not a bang." About a tenth of the stars in the galaxy are thought to be white dwarfs.

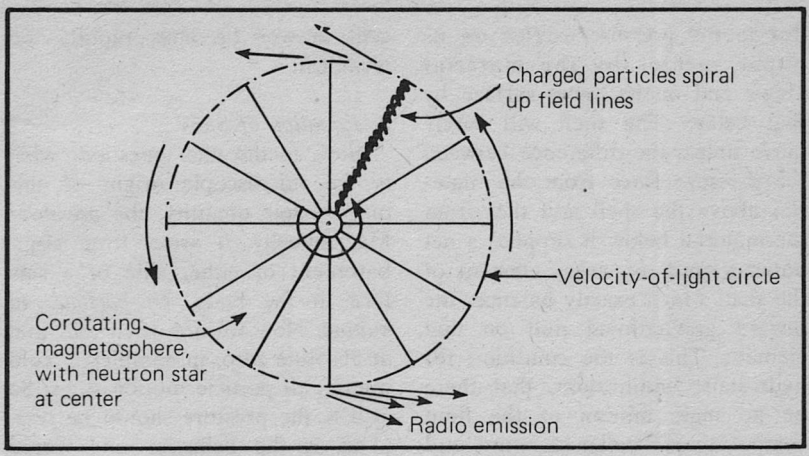
But theorists believe that neutron stars are (typically) formed in supernova explosions. A supernova

explosion is one of the most spectacular events in the universe, a star suffering a catastrophic death—with a bang and not a whimper. Like the Chinese guest star of 1054, it really goes out in a blaze of glory; briefly, as it spends its last energy store in one gasp, it may even light up a whole galaxy. The collapse of the core of the star squeezes out most of its gravitational energy. This energy is converted to radiation, which blows off the outer envelope of the star. So a supernova is a sort of *gravitational bomb!* The collapsed core, the burned-out cinder of the implosion-explosion, may be a neutron star. Perhaps 1/1,000 of the stars in the galaxy are neutron stars, assuming a supernova frequency of one every 30 years.

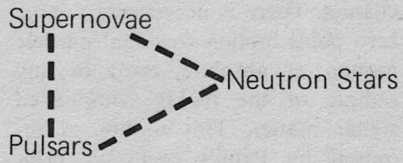
Nobody can really say how black holes are formed, especially since none have been positively identified. But they may also result from supernova events, if the collapsing core is too massive to stop at the neutron-star stage—that is, if enough matter is not blown off.

I have already said that a pulsar has been found in the Crab supernova remnant (and there are two other such pulsar-supernova associations known or suspected). The rotating-neutron-star explanation of pulsars is dramatically supported by the finding that, based on this model, the rate of energy lost by the proposed neutron star in the Crab (estimated from the pulsar's slowdown rate—the rotation rate of the star decreases as it loses energy) is just what is needed to keep the nebula expanding and ablaze. The vast, glowing supernova remnant is powered by the minute pulsar at its center, spinning 30 times per second! The power required is some 10^{38} ergs/sec. The pulsar sends out only about 10^{36} ergs/sec in pulsed radiation; most of its energy output goes into high-energy particles, which power the Crab.

As to how the rotational energy of the neutron star is transformed into particle energy and radiation: threading the star and the surrounding space is a magnetic field of huge intensity, the flux of the original star having been conserved in the collapse. Neutron-star material is highly conductive; the surface of the rotating star will be subject to immense electric fields, which will strip off charged particles from it, to generate a plasma magnetosphere which rotates rigidly with the star. At the velocity-of-light circle, where the corotating charged particles approach the velocity of light, shock waves appear and the primary energy loss takes place—very gradually draining the rotational energy of the star. Somehow coherent, beamed radiation plus highly energetic particles (cosmic rays) are sent on their way. For the Crab pulsar the radius of the velocity-of-light circle is about the radius of the Moon, some 1,700 km.



We have, by now, established all three logical links in the following diagram connecting the observational phenomena of supernovae and pulsars and the theoretical concept of neutron stars.



III. THE BATTLE BETWEEN GRAVITY AND DEGENERACY PRESSURE

So far I have just made claims about what white dwarfs and neutron stars are like and tried to make the implications of their fantastic compression understandable in human terms. But I have yet to offer a satisfying explanation (from first principles!) of why they can exist at all as static objects. I have yet to answer the obvious question: What properties of matter keep them from collapsing further, if they are really cold and dead?

There is a dictum that in an expository article it is unwise to introduce more than one new idea, but I will try for two, one global or macroscopic in nature, the other local or microscopic. Actually I have already laid the intuitive basis for the first idea, the global one.

1. *Hydrostatic Equilibrium*

Consider a spherical shell in the star, which is supposed to be a spherically symmetric distribution of fluid. There is an inward gravitational pull on every element of the shell, tending to collapse the shell (like a balloon) toward a point at the center of the structure. What prevents this? If the star is not rotating, and has no global magnetic or electric fields, the only other forces on the shell will be

due to the pressure exerted on its upper surface by the material above and on its lower surface by that below. The shell will surely move unless the difference between the pressure force from the material above the shell and that from the material below it supplies a net outward push on every element of the shell which exactly balances the inward gravitational pull on that element. This is the condition for hydrostatic equilibrium, that there be no mass motion of the fluid composing our stellar structure, and therefore no collapse or expansion. We represent this condition as an equation thus: for a shell at any radius r,

$$\frac{dp(r)}{dr} = \frac{GM(r)}{r^2}\rho(r)$$

where p(r), $\rho(r)$, and M(r) are, respectively, the pressure at the distance r from the center of the object, the density at r, and the mass within a sphere of radius r. On the left-hand side, $\frac{dp}{dr}$ is the rate of change of p with r; note this must be negative—the pressure must increase toward the center of the star. On the right-hand side, G is the gravitational constant.

There is the additional important question of the stability of a given equilibrium configuration—for example, how must the pressure behave to prevent the equilibrium from being upset by a small radial disturbance? Unfortunately, a decent answer becomes rapidly too technical.

2. *Equation of State*

Now, to the vital question: what is the microscopic origin of this macroscopic quantity, the *pressure?* Mechanically, it arises from bombardment of either side of a surface in the body, by *particles in motion.* Now we are often told that at absolute zero, in completely cold matter, all particle motion stops. So at 0°K the pressure should be *zero.* (This is the behavior one would have if the stellar substance obeyed, for instance, the ideal-gas equation of state $P = b\rho T$, where b is a constant.) Our dying star, cooling to T=0°K, would collapse indefinitely. But what we are told is wrong, according to quantum mechanics. There is necessarily a large zero point motion (residual particle motion at absolute zero) in any sample of the highly compressed stellar matter. This motion is required by Pauli's exclusion principle, which applies to any particular fermion species which may be present in the sample. A fermion is a particle with half-odd integral intrinsic spin. Examples are electrons, neutrons, protons, hyperons, neutrinos, . . . Pauli's principle states that two like fermions, *e.g.,* two electrons with spins pointing up, cannot move in the same orbit—there is only room for one. If all the low-energy orbits for a given kind of fermion are already occu-

pied, a newcomer of this kind must have enough energy to ride along in the lowest-energy unoccupied orbit. Otherwise the new fermion can't join the system. It's just like going to a theater, only to find that all the low-priced seats are sold; if you can't pay the higher price, you can't see the play. You are forbidden to sit on top of somebody else! Now, when the matter is as dense as in a white dwarf, there must be lots and lots of electrons in a given sample (far, far more than in the same volume of ordinary matter), which means that the electron orbits are occupied up to a very, very high energy level. In the high energy orbits, the electrons are moving very fast. Lots of electrons moving very fast means very high pressure. The greater the compression, the faster the electron motion on the average, and the greater the pressure. This *electron* zero-point pressure or Pauli *degeneracy pressure* increases rapidly enough with density to satisfy the condition of hydrostatic equilibrium and sustain stable white dwarf stars, even at absolute zero. Similarly, it is the *neutron degeneracy pressure* of neutron stars which, along with the short-range repulsive forces between nucleons, is responsible for the stability of neutron stars.

Incidentally, the Pauli exclusion principle is also crucial to an understanding of the resistance to collapse of matter as we know it on Earth. (The arguments involved are similar, but the densities and energies are much smaller.) Pauli, a very rotund and ample man, was reminded of this fact rather painfully when he had to have a new formal suit made for his appearance at a dinner given in his honor. His colleague Ehrenfest commented that it was no fault but his own that the suit needed so much material and was so expensive—after all, his exclusion principle made things much bigger than they ought to be!

Back to space: we are now equipped to see why a neutron star, even with a temperature of 10^8°K, a hundred million degrees, can be cold. The reason is that, even at this extreme temperature, neutron-star matter, because it is so dense, remains highly *degenerate.* In a degenerate system, the number of states available energetically is not much greater than the number of particles. A degenerate system is a cold system, because it is essentially dead, essentially in its ground state. In the ground state of a system of noninteracting fermions, all the orbits are filled, in the order of increasing energy, up to some maximum energy, the *Fermi energy.* If the system is very dense, the Fermi energy must be very high, because there are lots of particles per unit volume and the Pauli principle says there must be an equal number of distinct orbits. To excite a substantial fraction of particles from these orbits—which is required if

the degeneracy is to be destroyed and the system made hot—requires a very large injection of thermal energy. Clearly this energy of thermal agitation, per particle, must be of the order of the Fermi energy. For neutrons at a density of 10^{14} g/cc, this energy is therefore some tens of millions of electron volts, corresponding to a temperature of at least 10^{11}°K, a thousand times greater than the expected internal temperature of a neutron star. White dwarfs are also rather cold, but not so cold as neutron stars.

A quantitative theory of cold white dwarfs and neutron stars requires, in addition to the hydrostatic condition on the density and the pressure, a second relation between these quantities. The second relation is supplied by the equation of state of the matter. In symbols, simply, $P = P(\rho)$. The hydrostatic condition expresses the global or macroscopic nature of the structure; the equation of state, its local or microscopic nature. It should come as no surprise that a knowledge of the local structure is necessary to a determination of the global structure. A quantitative derivation of the equation of state of high-density matter requires all the apparatus of quantum mechanical many-particle theory, but in any case must embody the physics of the Pauli exclusion principle, which we have discussed at length.

Finally, now that we believe we understand why white dwarfs and neutron stars can exist, we might well wonder how a black hole can come about. Electron degeneracy pressure is not enough to sustain stable white dwarfs of mass beyond a certain maximum (1.2 $M_\odot$) because the density in the center gets so high that the electrons are mostly crushed into the nuclei—and the body collapses on to neutron-star densities. But why is there a maximum mass for neutron stars (1.5 $M_\odot$)? The answer (so far) lies in general relativity. When the mass of the star passes a critical value, certain nonlinear effects of general relativity become so important that the neutron degeneracy pressure, and even nucleon-nucleon interactions which are *infinitely* repulsive inside some nucleon-nucleon distance, cannot prevent collapse. Obviously, then, if we want to treat neutron stars in all their glory, we should reformulate the hydrostatic condition general-relativistically. This is normally done; only the properties of the heavier stars are significantly altered. There is no need to bring general relativity into the consideration of the equation of state, though special relativity is necessary in describing the electrons, even for white-dwarf matter. (Incidentally, I said "so far" because another kind of instability, due to some kind of "phase transition," due (for example) to some kind of catastrophic elementary-particle reaction analogous to inverse beta decay for white dwarfs,

might set in at a lower mass than 1.5 $M_\odot$.)

IV. THE GRAND TOUR

Let us now take a grand tour of a typical, spherically symmetrical neutron star, starting from the surface and proceeding toward the mysterious central core. The local density rises sharply from zero to perhaps half its central value within the first couple of kilometers, then rises more gradually to the central maximum. We encounter four principal regions in such a world: beneath an iron atmosphere and sea a meter or so thick, we encounter, in concentric shells, the *outer crust,* the *inner crust,* and the *quantum fluid interior.* These shells surround a *hadronic* core of largely unknown nature.

The nature of the material at any local density ρ in these four regions is determined by the fact that every little sample of matter is supposed to be completely cold, that is, in its quantum-mechanical ground state. The properties that interest us most are the concentrations of each type of particle present and the phase structure—solid, liquid, gas, et cetera—which these particles display in interaction. In other words, we are curious about the kinds of inhabitants residing at each location of the stellar world, their population distribution, and their social organization. These properties may be found (in principle) as follows: put a given number of baryons in a small box, so that the mean number density is some prescribed high value n. (A baryon is a heavy particle like a proton or a neutron, that can experience strong interactions.) Turn on the strong, electromagnetic, and weak interactions of these baryons (along with their mutual gravitational interactions, if you like), and let the sample seek its lowest energy state subject to conservation of baryon number and to the maintenance of electrical neutrality. With occasional nudges, there will then ensue elementary particle reactions and shuffling and rearrangement of particles until the particle concentrations in the box and the phase structure of the sample are those of neutron-star matter at baryon number density n. How to relate the baryon number density n to the mass (-energy) density ρ? It turns out that for cold, dead matter there is a unique relation between them, which will come out of the theoretical description of the above process. For our purposes, this relation is well approximated by $\rho = mn$, where m is the neutron mass.

With this process in mind, we start our tour:

1. *Outer Crust* (8×10^6 g/cc $< \rho < 4.3 \times 10^{11}$ g/cc)

Here the inhabitants are completely ionized nuclei and free electrons. The electrons are highly relativistic. They move too fast to

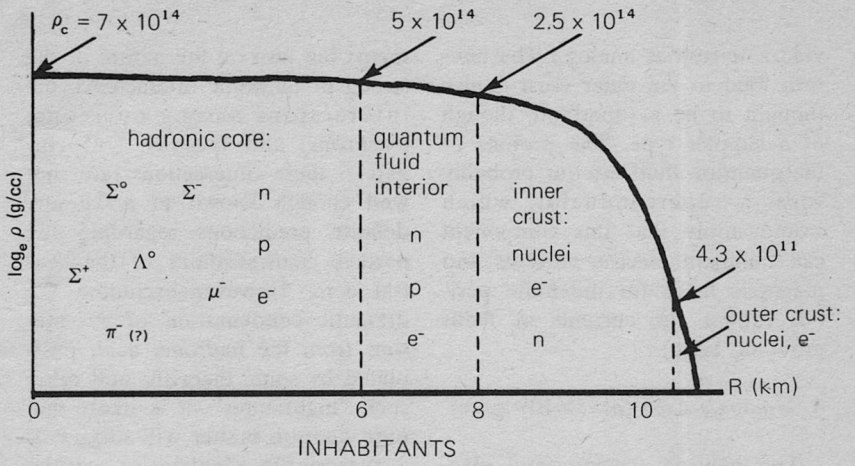
screen the charges of the ions from one another, as bound electrons do very effectively in ordinary matter. The ions are strongly repelled from one another. To battle against repulsions costs energy, so they stay as far apart from one another as possible, consistent with the density imposed at their location by the gravitational field. They can do this best by arranging themselves into a (body-centered-cubic) crystalline lattice, called a Coulomb or Wigner solid. (This solid may be melted at the outer edge of the density range given above, but over most of the range the melting temperature will exceed 10^8°K.) The electrons form a uniform background sea interpenetrating the lattice. (The material in this regime is similar to that near the centers of white dwarfs, but the sequence of lattice nuclei—the nuclear physics—will differ somewhat.) At lower densities than 8×10^6 g/cc, the nuclei at the lattice sites would, for completely cold, completely dead matter, be Fe^{56} nuclei. The iron Fe^{56} nucleus has, in free space or on Earth, the largest binding energy per particle of any nucleus. However, in the outer crust the electron Fermi energy is so high that the net energy is lowered, relative to that for an $_{26}Fe^{56}$ lattice, by absorption of electrons from the most energetic orbits, via inverse beta decay. In inverse beta decay, a proton in a nucleus combines with an electron to form a neutron, with release of excess energy through neutrino emission. As the density increases, the electron Fermi energy increases, and the lattice nuclei grow more and more neutron rich. At the top of the outer crust $_{28}Ni^{62}$ is the lattice nucleus; at the bottom, it is $_{36}Kr^{118}$, an unheard-of nucleus with 36 protons and 118–36 = 82 neutrons.

2. *Inner Crust* (4.3×10^{11} g/cc $< \rho <$ 2–3×10^{14} g/cc)

As we progress deeper, the nuclei eventually get so neutron-rich that the nuclear forces are not able to bind any more neutrons with negative energy. At this point of "neutron drip," we enter the inner crust. If another neutron is added to one of the nuclei, it drips off, and a background sea of neutrons begins to form. Very soon, this fluid accounts for a major fraction of the nucleons. So, the inhabitants of the inner crust are electrons, nuclei, and free neutrons. As before, the nuclei form a rigid Coulomb lattice, exceedingly strong compared to terrestrial solids; this lattice is interpenetrated by electron and neutron fluids. Much current work is concentrated on the nuclear physics of this regime, which is very complicated but fascinating.

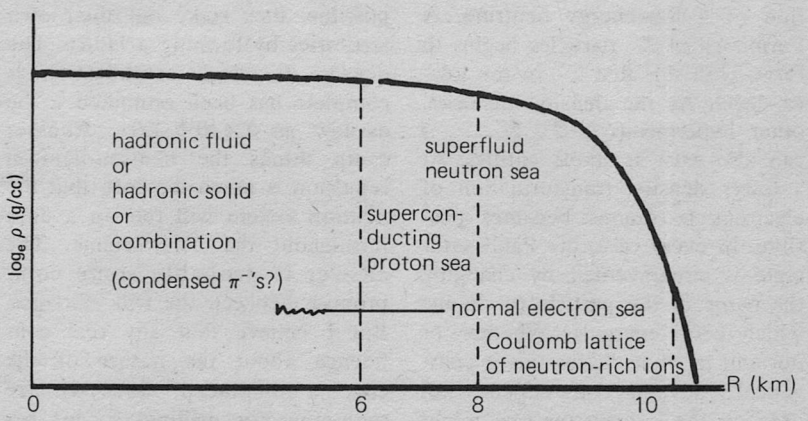
3. *Quantum Fluid Interior* (2–3×10^{14} g/cc $< \rho <$ 5×10^{14} g/cc)

Still deeper, we come to



INHABITANTS

densities at which it is energetically advantageous for protons to begin deserting the nuclei. As the nuclei dissolve, we enter the quantum fluid interior, which consists of a mixture of neutron, proton, and electron fluids. The protons account for only a few percent of the total nucleon or baryon concentration; by charge neutrality, there must be an electron for every proton. So we have a sort of impure neutron sea. The neutrons are thought to form into a *superfluid*, which would imply that the neutron component has vanishing resistance to flow under certain circumstances and can conduct heat with tremendous ease. (Liquid He^3 cooled to near absolute zero may, in many ways, pro-



SOCIAL ORGANIZATION

vide a terrestrial analog.) The neutron fluid in the outer crust is also thought to be a superfluid, though of a simpler type. The protons of the quantum fluid interior probably form a superconductor, which would imply that this component can maintain electric currents and magnetic fields for indefinite periods (unless the currents or fields grow too large).

4. *Hadronic Core* ($\rho > 5 \times 10^{14}$ g/cc)

The neutron, proton, and electron Fermi energies keep rising with the density. At some density (perhaps higher than the central density of the star dissected in the figure!) a neutron added at the top of the neutron sea has just enough energy that by grabbing an electron at the top of the electron sea it can change into a heavier baryon, a hyperon called the Σ^-, with emission of a low-energy neutrino. A Fermi sea of Σ^- particles begins to form, with this first Σ^- in the lowest level. As the density increases, other hyperons (Λ°, Σ°, Σ^+, . . .) can also exist as stable entities. At a lower density, transformation of electrons to muons becomes possible. In every case, the Pauli principle is circumvented by changing the name of the particle (a change which costs energy!). Whether or not and to what degree this is energetically advantageous depends not only on the density (as one might think from my oversimplified argument) but also on the nature of the strong or hadronic interactions, the interactions among nucleons, hyperons, and mesons. Unfortunately these interactions are not well enough known to make any definite predictions regarding the particle concentrations of the central core. However—excluding the dramatic condensation of π^- mesons from the hadronic field, postulated by some theorists, and other such "nightmares"—it is likely that pure neutron matter will survive as a reasonable idealization of the material in the core. What phase would be chosen by the neutrons at the superdensities of the core? This is, at present, a highly controversial question. One camp believes that the matter will solidify, basically for the same reason that the ions of the crust do. The neutrons strongly repel one another at short range; to avoid these repulsions as much as possible, they stake out their own territories by forming a lattice. The density at which solidification is complete has been estimated to be as low as 5×10^{14} g/cc. Another camp thinks the neutron-neutron repulsion is much too soft, that the neutron system will remain a fluid throughout the core regime. The answer is probably some compromise between the two extremes. But I believe that any real confidence about the nature of the core is misplaced, since we are swimming (or drilling) so far beyond any known physics.

V. GLITCHES, STARQUAKES, AND SUPERFLUIDITY

Already we can say something about the possible relation between the *theoretically predicted* nature of neutron-star material and *observable* phenomena. First, the outer and inner crusts provide an extremely stable platform for anchoring the magnetic field lines which define the corotating magnetosphere, thus are responsible for the extreme stability of the pulsar periods. Second, one can imagine "starquakes" occurring in the crust when strain, built up as the rotation slows and centrifugal forces decrease, is suddenly relieved. The surface settles abruptly toward a more spherical shape; by conservation of angular momentum the rotation will speed up. Readjustments of about a twentieth of a millimeter would suffice to explain the sudden speedups ("glitches") of some two parts in a million, observed in the Crab pulsar frequency (February, 1969, and August, 1971). Third, if the interior neutron and proton seas are superfluid, it will take some time (days, weeks) for the sudden change in crustal rotation period to be communicated to the more massive portions of the star. The observed post-glitch relaxation behavior lends strong support to this picture. In addition, larger "glitches" in the Vela pulsar may be associated with cracking of a neutron-solid component of the core of the neutron star.

VI. TWO MORALS OF THE STORY

1. What's big, what's little are determined by the physical system we are studying, not by our everyday experience (unless we have everyday encounters with neutron stars!). For we have seen that a hundred million degrees is indeed a low temperature, for a neutron star. At that temperature, it is essentially dead cold. And one rotation per second is slow—a neutron star won't break up due to centrifugal forces until it is turning some thousand times per second! The star's magnetic field of 10^{12} Gauss wouldn't even come near to destroying its proton superconductivity.

2. On the other hand, by extrapolation of our earthly experience we have come to a decent understanding of these exotic (and fundamental) objects. Admittedly, the earthly experience we extrapolate comes largely from experiments on rather exotic (and fundamental) pieces of terrestrial matter—atomic nuclei and liquid helium. Even so, we have a dazzling illustration of the extent and power of the scientific world view. Ironically, we may know more about the interior of neutron stars than we know about the interior of Earth!

VII. SUMMARY

Remembering that the matter of our Sun, and of ourselves, was

spewed forth from dying stars, we may summarize with Shakespeare:

Full fathom five thy father lies;
Of his bones are coral made;
Those are pearls that were his eyes:
Nothing of him that doth fade
But doth suffer a seachange
Into something rich and strange.
Sea-nymphs hourly ring his knell:
Ding-dong.
Hark! Now I hear them—Ding-dong, bell.

ABOUT THE AUTHOR

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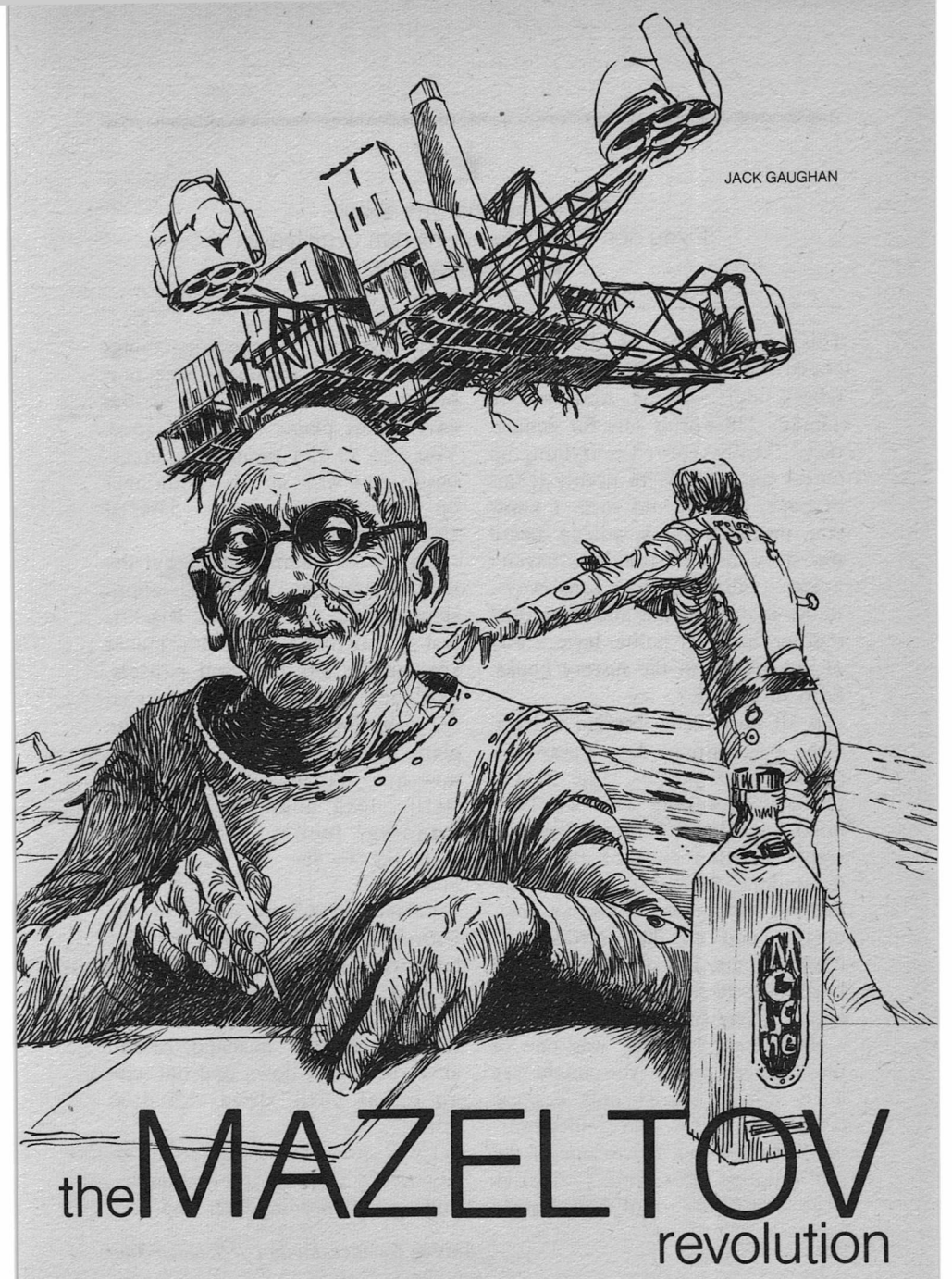

JACK GAUGHAN
the MAZELTOV
revolution

Remember that line about,
"If you don't like it here, why don't you leave?"

JOE HALDEMAN

This is the story of the ☐venerated/☐despised Chaim Itzkhok (check one). And me. And how we ☐made 238 worlds safe for democracy/☐really screwed everything up (check another). With twenty reams of paper and an old rock. I know you probably think you've heard the story before. But you haven't heard it all, not by a long way—things like blackmail and attempted murder, however polite, have a way of not getting in the history books. So read on, OK?

It all started out, for me at least, when I was stranded on Faraway a quarter of a century ago. You're probably thinking *you* wouldn't mind getting stranded on Faraway, right? Garden spot of the Confederation? Second capital of humanity? Monument to human engineering and all that, terraformed down to the last molecule. I tell kids what it was like back in '09 and they just shake their heads.

Back then, Faraway was one of those places where you might see an occasional tourist, only because it was one of the places that tourists just didn't go. It was one of the last outposts of George's abortive Second Empire, and had barely supported itself by exporting things like lead and cadmium. Nice poisonous heavy metals whose oxides covered the planet instead of grass. You had to run around in an asbestos suit with an air conditioner on your back, it was so damned close to Rigel.

Still is too damned close, but the way they opaqued the upper atmosphere, they tell me that Rigel is just a baby-blue ball that makes spectacular sunrises and sunsets. I've never been too tempted to go see it, having worked under its blue glare in the old days; wondering how long it'd be before you went sterile, lead underwear notwithstanding, feeling skin cancers sprouting in the short-wave radiation.

I met old Chaim there at the University Club, a rundown bar left over from the Empire days. How I got to that godforsaken place is a story in itself—one I can't tell because the husband is still alive—but I was down and out with no ticket back, dead-ended at thirty.

I was sitting alone in the University Club, ignoring the bartender, nursing my morning beer and feel-

ing desperate when old Chaim came in. He was around seventy but looked older, all grizzled and seamed, and I started getting ready an excuse in case he was armed with a hard-luck story.

But he ordered a cup of real coffee and when he paid, I sneaked a look at his credit flash. The number was three digits longer than mine. Not prejudiced against millionaires, I struck up a conversation with him.

There was only one opening gambit for conversation on Faraway, since the weather never changed and there were no politics to speak of: What the hell are you doing here?

"It's the closest place to where I want to go," he said, which was ridiculous. Then he asked me the same, and I told him, and we commiserated for a few minutes on the unpredictability of the other sex. I finally got around to asking him exactly where it was he wanted to go.

"It's interesting enough," he said. Two other people had come into the bar. He looked at them blandly. "Why don't we move to a table?"

He got the bartender's attention and ordered another cup of coffee, and must have seen my expression—the tariff on two cups of coffee would keep me drunk for a week—and ordered me up a large jar of beer. We carried them to a table and he switched on the sound damper, which was the kind that works both ways.

"Can I trust you to keep a secret?" He took a cautious sip of his coffee.

"Sure. One more won't hurt."

He looked at me for a long time. "How would you like to get a share of a couple of million CU's?"

A ticket back cost about a hundred thousand. "That depends on what I'd have to do." I wouldn't have, for instance, jumped off a high building into a vat of boiling lead. Boiling water, yes.

"I can't say, exactly, because I really don't know. There may be an element of danger, there may not be. Certainly a few weeks of discomfort."

"I've had several of those, here."

He nodded at the insignia on my fading fatigue jacket. "You're still licensed to pilot?"

"Technically."

"Bonded?"

"No, like I told you, I had to skip out. My bond's on Perrin's World. I don't dare—"

"No problem, really. This is a system job." You need to be bonded for interstellar flight, but planet-to-planet, within a stellar system, there's not that much money involved.

"System job? Here? I didn't know Rigel had any other—"

"Rigel has one other planet, catalogued as Biarritz. It never got chartered or officially named because there's nothing there."

"Except something you want."

"Maybe something a lot of people want."

But he wouldn't tell me any more. We talked on until noon, Chaim feeling me out, seeing whether he could trust me, whether he wanted me as a partner. There were plenty of pilots stranded on Faraway; I later found out that he'd talked to a half-dozen or so before me.

We were talking about children or some damn thing when he suddenly sat up straight and said, "All right. I think you'll be my pilot."

"Good . . . now, just what—"

"Not yet, you don't need to know yet. What's your credit number?"

I gave it to him and he punched out a sequence on his credit flash. "This is your advance," he said; I checked my flash and, glory, I was fifty thousand CU's richer. "You get the same amount later, if Biarritz doesn't pan out. If it works, you'll also get a percentage. We'll talk about that later."

The other fifty thousand was all I wanted—get back to civilization and I could hire a proxy to go to Perrin and rescue my bond. Then I'd be in business again.

"Now. The first thing you have to do is get us a ship. I'll arrange the financing." We left the bar and went to Faraway's only public (or private) stenographer, and he made out a letter of credit for me.

"Any kind of a ship will do," he said as I walked him back to his hotel. "Anything from a yacht to a battlewagon. We just have to get there. And back."

On any civilized world, I could have stepped into a booth and called Hartford; then strolled down to the nearest port and picked up a vessel: local, interplanetary or, if I was bonded and could wait a day or two, interstellar. But Faraway was Faraway, so it was a little more complicated.

Let me digress, in case you were born less than twenty years ago and fell asleep in history class.

Back then, we had two governments: the Confederation we all know and love, and New Hartford Transportation Rentals, Ltd. There was nothing on paper that connected the Confederation with Hartford, but in reality they were as intertwined as the skeins of a braid.

New Hartford Transportation Rentals, Ltd., owned virtually all of the basic patents necessary for interstellar travel as well as every starship, including the four clunkers left over from George VIII's disastrous imperialistic experiment.

Tired of your planet? Seek religious freedom, adventure, fresh air? Want to run from creditors? Get enough people together and Hartford would lease you a ship—for an astronomical sum, but at very generous rates. In fact, the first couple of generations hardly paid anything

at all (while the interest built up), but then—

Talk about the sins of the fathers coming home to roost! Once a colony began to be a going concern, Hartford was empowered to levy a tax of up to fifty percent on every commercial transaction. And Hartford would carefully keep the tax down to a level where only the interest on the loan was being paid—the principal resting untouched, to provide Hartford an income in perpetuity. It was a rigged game (enforced by the Confederation), and everybody knew it. But it was the only game in town.

Hartford had a representative on every planet, and they kept him fueled with enough money so that he was always the richest, and usually the most influential, citizen of the planet. If a planetary government tried to evolve away from the rapacious capitalism that guaranteed Hartford a good return on its investment, their representative usually had enough leverage to put it back on the right road.

There were loopholes and technicalities. Most planets didn't pass the Hartford tax on directly, but used a sliding income tax, so the rich would get poorer and the poor, God bless them, would go home and make more taxpayers rather than riot in the streets.

If you ever patronized the kind of disreputable tavern that caters to pilots and other low types, you may have heard them singing that ancient ballad, "My Heart Belongs to Mother, But Hartford Owns My Ass."

Hartford owned that fundamental part of everybody on Faraway, too. But that didn't mean they'd supplied Faraway with a nice modern spaceport, bristling with ships of all sizes and ranges. No, just the bi-weekly vessel from Steiner that dropped off supplies and picked up some cadmium.

I had to admit there wasn't much reason for Faraway to have a short-run, plain old interplanetary ship—what good would it be? All you could do with it would be to orbit Faraway—and it looked bad enough from the *ground*—or take a joyride out to Biarritz. And there were more entertaining ways to throw away your money, even on Faraway.

It turned out that there actually was one interplanetary ship on Faraway, but it was a museum piece. It had been sitting for two hundred years, the *Bonne Chance*, the ship Biarritz herself had used to survey the clinker that retained her name by default. It was being held for back taxes, and we picked it up for six figures.

Then the headaches began. Everything was in French—dial markings, instruction manual, log. I got a dictionary and walked around with an indelible pencil, relabeling; and Chaim and I spent a week of afternoons and evenings translating the manual.

The fusion engine was in good shape—no moving parts bigger than a molecule—but the rest of the ship was pretty ragged. Faraway didn't have much of an atmosphere, but it was practically pure oxygen, and *hot*. The hull was all pitted and had to be reground. The electronic components of the ship had been exposed to two hundred years of enough ionizing radiation to mutate a couple of fruit flies into a herd of purple cattle. Most of the guidance and communications gimcrackery had to be repaired or replaced.

We kept half the drifter population of Faraway—some pretty highly trained drifters, of course—employed for over a week, hammering that antique wreck into some kind of shape. I took it up alone for a couple of orbits and decided I could get it twenty AU's and back without any major disaster.

Chaim was still being the mystery man. He gave me a list of supplies, but it didn't hold any clue as to what we were going to do once we were on Biarritz: just air, water, food, coffee and booze enough for two men to live on for a few months. Plus a prefab geodesic hut for them to live in.

Finally, Chaim said he was ready to go and I set up the automatic sequencing, about two hours of systems checks that were supposed to assure me that the machine wouldn't vaporize on the pad when I pushed the *Commence* button. I said a pagan prayer to Norbert Wiener and went down to the University Club for one last round or six. I could afford better bars, with fifty thousand CU's on my flash, but didn't feel like mingling with the upper classes.

I came back to the ship a half-hour before the sequencing was due to end, and Chaim was there, watching the slavies load a big crate aboard the *Bonne Chance*. "What the hell is that?" I asked him.

"The Mazel Tov papers," he said, not taking his eyes off the slavies.

"Mazel Tov?"

"It means good luck, maybe good-bye. Doesn't translate all that well. If you say it like this"—and he pronounced the words with a sarcastic inflection—"it can mean 'good riddance' or 'much good shall it do you.' Clear?"

"No."

"Good." They finished loading the crate and sealed the hold door. "Give me a hand with this." It was a gray metal box that Chaim said contained a brand-new phased-tachyon transceiver.

If you're young enough to take the phased-tachyon process for granted, just step in a booth and call Sirius, I should point out that when Chaim and I met, they'd only had the machines for a little over a year. Before that, if you wanted to communicate with someone light-years away, you had to write out

your message and put it on a Hartford vessel, then wait around weeks, sometimes months, while it got shuffled from planet to planet (at Hartford's convenience) until it finally wound up in the right person's hands.

Inside, I secured the box and called the pad authorities, asking them for our final mass. They read it off and I punched the information into the flight computer. Then we both strapped in.

Finally the green light flashed. I pushed the *Commence* button down to the locked position, and in a few seconds the engine rumbled into life. The ship shook like the palsied old veteran that it was, and climbed skyward trailing a cloud of what must have been the most polluting exhaust in the history of transportation: hot ionized lead, slightly radioactive. Old Biarritz had known how to economize on reaction mass.

I'd programmed a quick-and-dirty route, one and a half G's all the way, flip in the middle. Still it was going to take us two weeks. Chaim could have passed the time by telling me what it was all about, but instead he just sat around reading—"War and Peace" and a tape of Medieval Russian folk tales—every now and then staring at the wall and cackling.

Afterwards, I could appreciate his fetish for secrecy (though God knows enough people were in on part of the secret already). Not to say I might have been tempted to double-cross him. But his saying a couple of million were involved was like inviting someone to the Boston Tea Party, by asking him if he'd like to put on a loincloth and help you play a practical joke.

So I settled down for two weeks with my own reading, earning my pay by pushing a button every couple of hours to keep a continuous systems check going. I could have programmed the button to push itself, but hell . . .

At the end of two weeks, I did have to earn my keep. I watched the "velocity relative to destination" readout crawl down to zero and looked out the viewport. Nothing.

Radar found the little planet handily enough. We'd only missed it by nine thousand and some kilometers; you could see its blue-gray disc if you knew where to look.

There's no trick to landing a ship like the *Bonne Chance* if you have a nice heavy planet. It's all automated except for selecting the exact patch of earth you want to scorch (port authorities go hard on you if you miss the pad). But a feather-light ball of dirt like Biarritz is a different proposition—there just isn't enough gravity, and the servomechanisms don't respond fast enough. They'll try to land you at the rock's center of mass, which in this case was underneath forty-nine kilometers of solid basalt. So you have to do it yourself, a combina-

tion of radar and dead reckoning—more a docking maneuver than a landing.

So I crashed. It could happen to anybody.

I was real proud of that landing at first. Even old Chaim congratulated me. We backed into the surface at less than one centimeter per second, all three shoes touching down simultaneously. We didn't even bounce.

Chaim and I were already suited up, and all the air had been evacuated from the ship; standard operating procedure to minimize damage in case something did go wrong. But the landing had looked perfect, so we went on down to start unloading.

What passes for gravity on Biarritz comes to barely one-eightieth of a G. Drop a shoe and it takes it five seconds to find the floor. So we half-climbed, half-floated down to the hold, clumsy after two weeks of living in a logy G-and-a-half.

While I was getting the hold door open, we both heard a faint bass moan, conducted up from the ground through the landing shoes. Chaim asked whether it was the ground settling; I'd never heard it happen before, but said that was probably it. We were right.

I got the door open and looked out. Biarritz looked just like I'd expected it to: a rock, a pockmarked chunk of useless rock. The only relief from the grinding monotony of the landscape was the silver splash of congealed lead directly below us.

We seemed to be at a funny angle. I thought it was an optical illusion—if the ship hadn't been upright on landing, it would have registered on the attitude readout. Then the bright lead splash started moving, crawling away under the ship. It took me a second to react.

I shouted something unoriginal and scrambled for the ladder to the control room. One short blip from the main engine and we'd be safely away. Didn't make it.

The situation was easy enough to reconstruct, afterwards. We'd landed on a shelf of rock that couldn't support the weight of the *Bonne Chance.* The sound we had heard was the shelf breaking off, settling down a few meters, canting the ship at about a ten-degree angle. The force of friction between our landing pads and the basalt underfoot was almost negligible, in so little gravity, and we slid downhill until we reached bottom, and then gracefully tipped over. When I got to the control room, after quite a bit of bouncing around in slow-motion, everything was sideways and the controls were dead, dead, dead.

Chaim was lively enough, shouting and sputtering. Back in the hold, he was buried under a pile of crates, having had just enough time to unstrap them before the ship went over. I explained the situation to him while helping him out.

"We're stuck here, eh?"

"I don't know yet. Have to fiddle around some."

"No matter. Inconvenient, but no matter. We're going to be so rich we could have a fleet of rescuers here tomorrow morning."

"Maybe," I said, knowing it wasn't so—even if there were a ship at Faraway, it couldn't possibly make the trip in less than ten days. "First thing we have to do, though, is put up that dome." Our suits weren't the recycling kind; we had about ten hours before we had to start learning how to breathe carbon dioxide.

We sorted through the jumble and found the various components of the pop-up geodesic. I laid it out on a piece of reasonably level ground and pulled the lanyard. It assembled itself very nicely. Chaim started unloading the ship while I hooked up the life-support system.

He was having a fine time, kicking crates out the door and watching them float to the ground a couple of meters below. The only one that broke was a case of whiskey—every single bottle exploded, damn it, making a cloud of brownish crystals that slowly dissipated. So Biarritz was the only planet in the universe with a bonded-bourbon atmosphere.

When Chaim got to *his* booze, a case of gin, he carried it down by hand.

We set up housekeeping while the dome was warming. I was still opening boxes when the bell went off, meaning there was enough oxygen and heat for life. Chaim must have had more trust in automatic devices than I had; he popped off his helmet immediately and scrambled out of his suit. I took off my helmet to be sociable, but kept on working at the last crate, the one Chaim had said contained "the Mazel Tov papers."

I got the top peeled away and looked inside. Sure enough, it was full of paper, in loose stacks.

I picked up a handful and looked at them. "Immigration forms?"

Chaim was sitting on a stack of food cartons, peeling off his suit liner. "That's right. Our fortune."

" 'Mazel Tov Immigration Bureau,' " I read off one of the sheets. "Who—"

"You're half of it. I'm half of it. Mazel Tov is the planet under your feet." He slipped off the box. "Where'd you put our clothes?"

"What?"

"This floor's cold."

"Uh, over by the kitchen." I followed his naked wrinkled back as he clumped across the dome. "Look, you can't just . . . *name* a planet . . ."

"I can't, eh?" He rummaged through the footlocker and found some red tights, struggled into them. "Who says I can't?"

"The Confederation! Hartford! You've got to get a charter."

He found an orange tunic that clashed pretty well and slipped it

over his head. Muffled: "So I'm going to get a charter."

"Just like that."

He started strapping on his boots and looked at me with amusement. "No, not 'just like that.' Let's make some coffee." He filled two cups with water and put them in the heater.

"You can't just charter a rock with two people on it."

"You're right. You're absolutely right." The timer went off. "Cream and sugar?"

"Look—no, black—you mean to say you printed up some fake—"

"Hot." He handed me the cup. "Sit down. Relax. I'll explain."

I was still in my suit, minus the helmet, so sitting was no more comfortable than standing. But I sat.

He looked at me over the edge of his cup, through a veil of steam rising unnaturally fast. "I made my first million when I was your age."

"You've got to start somewhere."

"Right. I made a million and paid eighty-five percent of it to the government of Nueva Argentina, who skimmed a little off the top and passed it on to New Hartford Transportation Rentals, Ltd."

"Must have hurt."

"It made me angry. It made me think. And I did get the germ of an idea." He sipped.

"Go on."

"I don't suppose you've ever heard of the Itzkhok Shipping Agency."

"No . . . it probably would have stuck in my mind."

"Very few people have. On the surface, it's a very small operation. Four interplanetary ships, every one of them smaller than the *Bonne Chance*. But they're engaged in interstellar commerce."

"Stars must be pretty close together."

"No . . . they started about twenty years ago. The shortest voyage is about half over. One has over a century to go."

"Doesn't make any sense."

"But it does. It makes sense on two levels." He set down the cup and laced his fingers together.

"There are certain objects whose value almost has to go up with the passage of time. Jewelry, antiques, works of art. These are the only cargo I deal with. Officially."

"I see. I think."

"You see half of it. I buy these objects on relatively poor planets and ship them to relatively affluent ones. I didn't have any trouble getting stockholders. Hartford wasn't too happy about it, of course."

"What did they do?"

He shrugged. "Took me to court. I'd studied the law, though, before I started Itzkhok. They didn't press too hard—my company didn't make one ten-thousandth of Hartford's annual profit—and I won."

"And made a credit or two."

"Some three billion, legitimate profit. But the important thing is that I established a concrete legal

precedent where none had existed before."

"You're losing me again. Does this have anything to do with . . ."

"Everything, patience. With this money, and money from other sources, I started building up a fleet. Through a number of dummy corporations . . . buying old ships, building new ones. I own or am leasing some two thousand ships. Most of them are loaded and on the pad right now."

"Wait, now." Economics was never my strong suit, but this was obvious. "You're going to drive your own prices down. There can't be that big a market for old paintings and—"

"Right, precisely. But most of these ships aren't carrying such specialized cargo. The closest one, for instance, is on Tangiers, aimed for Faraway. It holds nearly a hundred thousand cubic meters of water."

"Water . . ."

"Old passenger liner, flooded the damn thing. Just left a little room for ice expansion, in case the heating—"

"Because on Faraway—"

"—on Faraway there isn't one molecule of water that men didn't carry there. They recycle every drop but have to lose one percent or so annually.

"Tonight or tomorrow I'm going to call up Faraway and offer to sell them 897,000 kilograms of water. At cost. Delivery in six years. It's a long time to wait, but they'll be getting it for a hundredth of the usual cost, what Hartford charges."

"And you'll lose a bundle."

"Depends on how you look at it. Most of my capital is tied up in small, slow spaceships; I own some interest in three-quarters of the interplanetary vessels that exist. If my scheme works, all of them will double in value overnight.

"Hartford, though, is going to lose more than a bundle. There are 237 other planets, out of 298, in a position similar to Faraway's. They depend on Hartford for water, or seed, or medical supplies, or something else necessary for life."

"And you have deals set up—"

"For all of them, right. Underbidding Hartford by at least a factor of ten." He drank off the rest of his coffee in a gulp.

"What's to stop Hartford from underbidding *you?*"

"Absolutely nothing." He got up and started preparing another cup. "They'll probably try to, here and there. I don't think many governments will take them up on it.

"Take Faraway as an example. They're in a better position than most planets, as far as their debt to Hartford, because the Second Empire financed the start of their colonization. Still, they owe Hartford better than ten billion CU's—their annual interest payment comes to several hundred million.

"They keep paying it, not because of some abstract obligation to Hartford. Governments don't have

consciences. If they stopped paying, of course, they'd dry up and die in a generation. Until today, they didn't have any choice in the matter."

"So what you're doing is giving all of those planets a chance to welsh on their debts."

"That bothers you?" He sat back down, balanced the cup on his knee.

"A little. I don't love Hartford any more than—"

"Look at it this way. My way. Consider Hartford as an arm of the government, the Confederation."

"I've always thought it was the other way around."

"In a practical sense, yes. But either way. A government sends its people out to colonize virgin lands. It subsidizes them at first; once the ball is rolling, it collects allegiance and taxes.

"The 'debt' to Hartford is just a convenient fiction to justify taking these taxes."

"There are services rendered, though. Necessary to life."

"Rendered and paid for, separately. I'm going to prove to the 'colonies' that they can provide these services to each other. It will be even easier once Hartford goes bankrupt. There'll be no monopoly on starships. No Confederation to protect patents."

"Anarchy, then."

"Interesting word. I prefer to call it revolution . . . but yes, things will be pretty hectic for a while."

"All right. But if you wanted to choreograph a revolution, why didn't you pick a more comfortable planet to do it from? Are you just hiding?"

"Partly that. Mostly, though, I wanted to do everything legally. For that, I needed a very small planet without a charter."

"I'm lost again." I made myself another cup of coffee and grieved for the lack of bourbon. Maybe if I went outside and took a deep breath . . .

"You know what it takes to charter a planet?" Chaim asked me.

"Don't know the numbers. Certain population density and high enough gross planetary product."

"The figures aren't important. They look modest enough on paper. The way it works out, though, is that by the time a planet is populated enough and prosperous enough to get its independence, it's almost guaranteed to be irretrievably in debt to Hartford.

"That's what all those immigration forms are for. Half of those stacks are immigration forms and the other half, limited powers of attorney. I'm going to claim this planet, name it Mazel Tov, and accept my own petition for citizenship on behalf of 4,783 immigrants. Then I make one call, to my lawyer." He named an Earth-based interplanetary law firm so well-known that even I had heard of it.

"They will call about a hundred of these immigrants, each of whom

will call ten more, then ten more, and so on. All prearranged. Each of them then pays me his immigration fee."

"How much is that?"

"Minimum, ten million CU's."

"God!"

"It's a bargain. A new citizen gets one share in the Mazel Tov Corporation for each million he puts in. In thirty minutes MTC should have almost as much capital behind it as Hartford has."

"Where could you find four thousand—"

"Twenty years of persuasion. Of coordination. I've tried to approach every living man of wealth whose fortune is not tied up with Hartford or the Confederation. I've showed them my plan—especially the safeguards on it that make it a low-risk, high-return investment—and every single one of them has signed up."

"Not one betrayal?"

"No—what could the Confederation or Hartford offer in return? Wealth? Power? These men already have that in abundance.

"On the other hand, I offer them a gift beyond price: independence. And incidentally, no taxes, ever. That's the first article of the charter."

He let me absorb that for a minute. "It's too facile," I said. "If your plan works, everything will fall apart for the Confederation and Hartford—but look what we get instead. Four thousand-some independent robber barons, running the whole show. That's an improvement?"

"Who can say? But that's revolution: throw the old set of bastards out and install your own set. At least it'll be different. Time for a change."

I got up. "Look, this is too much, too fast. I've got to think about it. Digest it. Got to check out the ship, too."

Chaim went along with me halfway to the air lock. "Good, good. I'll start making calls." He patted the transceiver with real affection. "Good thing this baby came along when it did. It would have been difficult coordinating this thing, passing notes around. Maybe impossible."

It didn't seem that bloody easy, even with all those speedy little tachyons helping us. I didn't say anything.

It was a relief to get back into my own element, out of the dizzying fumes of high finance and revolution. But it was short-lived.

THE ANALYTICAL LABORATORY/JUNE 1974

PLACE	TITLE	AUTHOR	POINTS
1.	A Song for Lya	*George R.R. Martin*	1.62
2.	Stargate (Pt. 1)	*Tak Hallus*	1.95
3.	The Four-Hour Fugue	*Alfred Bester*	3.04
4.	Aberrant	*Sydney J. Van Scyoc*	4.10
5.	Death Sentence	*William T. Silent*	4.16

Things started out just dandy. The reason the control board was dead was that its cable to the fuel cells had jarred loose. I plugged it back in and set up a systems check.

The systems check ran for two seconds and quit. What was wrong with the ship was number IV-A-1-a. It took me a half-hour to find the manual, which had slid into the head and nestled up behind the commode.

"IV" was fusion power source. "IV-A" was generation of magnetic field for containment thereof. "IV-A-1" was disabilities of magnetic field generator. And "IV-A-1-a," of course, was permanent disability. It had a list of recommended types of replacement generators.

Well, I couldn't run down to the store and pick up a generator. And you can't produce an umpty-million-gauss fusion mirror by rubbing two sticks together. So I kicked Mlle. Biarritz's book across the room and went back to the dome.

Chaim was hunched over the transceiver, talking to somebody while he studied his own scribblings in a notebook.

"We're stuck here," I said.

He nodded at me and kept up the conversation. "—that's right. Forty thousand bushels, irradiated, for five hundred thousand CU's . . . so *what?* So it's a gift. It's guaranteed. Delivery in about seven years, you'll get details . . . all right, fine. A pleasure to do business. Thank *you,* sir."

He switched off and leaned back and laughed. "They all think I'm crazy!"

"We're stuck here," I said again.

"Don't worry about it, don't *worry,*" he said, pointing to an oversized credit flash attached to the transceiver. It had a big number on it that was constantly changing, going up. "That is the total assets of Mazel Tov Corporation." He started laughing again.

"Minims?"

"No, round credits."

I counted places. "A hundred and twenty-eight billion . . . credits?"

"That's right, right. You want to go to Faraway? We'll have it *towed* here."

"A hundred and twenty-nine billion?" It was really kind of hard to grasp.

"Have a drink—celebrate!" There was a bowl of ice and a bottle of gin on the floor beside him. God, I hate gin.

"Think I'll fix a cup of tea." By the time I'd had my cup, cleaned up and changed out of my suit, Chaim was through with his calls. The number on the credit flash was up to 239,605,967,000 and going up slowly.

He took his bottle, glass and ice to his bunk and asked me to start setting up the rescue mission.

I called Hartford headquarters on Earth. Six people referred me to their superiors and I wound up talking to the Coordinator of Inter-

stellar Transit himself. I found out that bad news travels fast.

"Mazel Tov?" his tinny voice said. "I've heard of you, new planet out by Rigel? Next to Faraway?"

"That's right. We need a pickup and we can pay."

"Oh, that's not the problem. Right now there just aren't any ships available. Won't be for several months. Maybe a year."

"What? We only have three months' worth of air!" By this time Chaim was standing right behind me, breathing gin into my ear.

"I'm really very sorry. But I thought that by the time a planet gets its charter, it should be reasonably self-sufficient."

"That's murder!" Chaim shouted.

"No, sir," the voice said. "Just unfortunate planning on your part. You shouldn't have filed for—" Chaim reached over my shoulder and slapped the switch off, hard. He stomped back to his bunk—difficult to do with next to no gravity—sat down and shook some gin into his glass. He looked at it and set it on the floor.

"Who can we bribe?" I asked.

He kept staring at the glass. "No one. We can try, but I doubt that it's worth the effort. Not with Hartford fighting for its life. Its corporate life."

"I know lots of pilots we could get, cheap."

"Pilots," Chaim said without too much respect.

I ignored the slur. "Yeah. Hartford programs the main jump. Nobody'd get a jump to Rigel."

We sat in silence for a while, the too-sober pilot and the Martian-Russian Jew who was the richest person in the history of mankind. Less than too sober.

"Sure there's no other ship on Faraway?"

"I'm sure," I said. "Took me half a day to find someone who remembered about the *Bonne Chance.*"

He considered that for a minute. "What does it take to build an interplanetary ship? Besides money."

"What, you mean could they build one on Faraway?"

"Right."

"Let me see." Maybe. "You need an engine. A cabin and life support stuff. Steering jets or gyros. Guidance and commo equipment."

"Well?"

"I don't know. The engine would be the hard part. They don't have all that much heavy industry on Faraway."

"No harm in finding out."

I called Faraway. Talked to the mayor. He was an old pilot (having been elected by popular vote) and I finally reached him at the University Club, where he was surrounded by other old pilots. I talked to him about engineering. Chaim talked to him about money. Chaim shouted and wept at him about money. We made a deal.

Faraway having such an abundance of heavy metals, the main

power generator for the town, the only settlement on the planet, was an old-fashioned fission generator. We figured out a way they could use it.

After a good deal of haggling and swearing, the citizens of Faraway agreed to cobble together a rescue vehicle. In return, they would get control of forty-nine percent of the stock of Mazel Tov Corporation.

Chaim was mad for a while, but eventually got his sense of humor back. We had to kill two months with six already-read books and a fifty-bottle case of gin. I read "War and Peace" twice. The second time I made a list of the characters. I made crossword puzzles out of the characters' names. I learned how to drink gin, if not how to like it. I felt like I was going slowly crazy—and when the good ship *Hello There* hove into view, I knew I'd gone 'round the bend.

The *Hello There* was a string of fourteen buildings strung along a lattice of salvaged beams; a huge atomic reactor pushing it from the rear. The buildings had been uprooted whole, life support equipment and all, from the spaceport area of Faraway. The first building, the control room, was the transplanted University Club, Olde English decorations still intact. There were thirty pairs of wheels along one side of the "vessel," the perambulating shantytown.

We found out later that they had brought along a third of the planet's population, since most of the buildings on Faraway were without power and therefore uninhabitable. The thing (I still can't call it a ship) had to be put on wheels because they had no way to crank it upright for launching. They drove it off the edge of a cliff and pulled for altitude with the pitch jets. The pilot said it had been pretty harrowing, and after barely surviving the landing I could marvel at his power of understatement.

The ship hovered over Mazel Tov with its yaw jets and they lowered a ladder for us. Quite a feat of navigation. I've often wondered whether the pilot could have done it sober.

The rest, they say, is history. And current events. As Chaim had predicted, Hartford went into receivership, MTC being the receiver. We did throw out all of the old random bastards and install our own hand-picked ones.

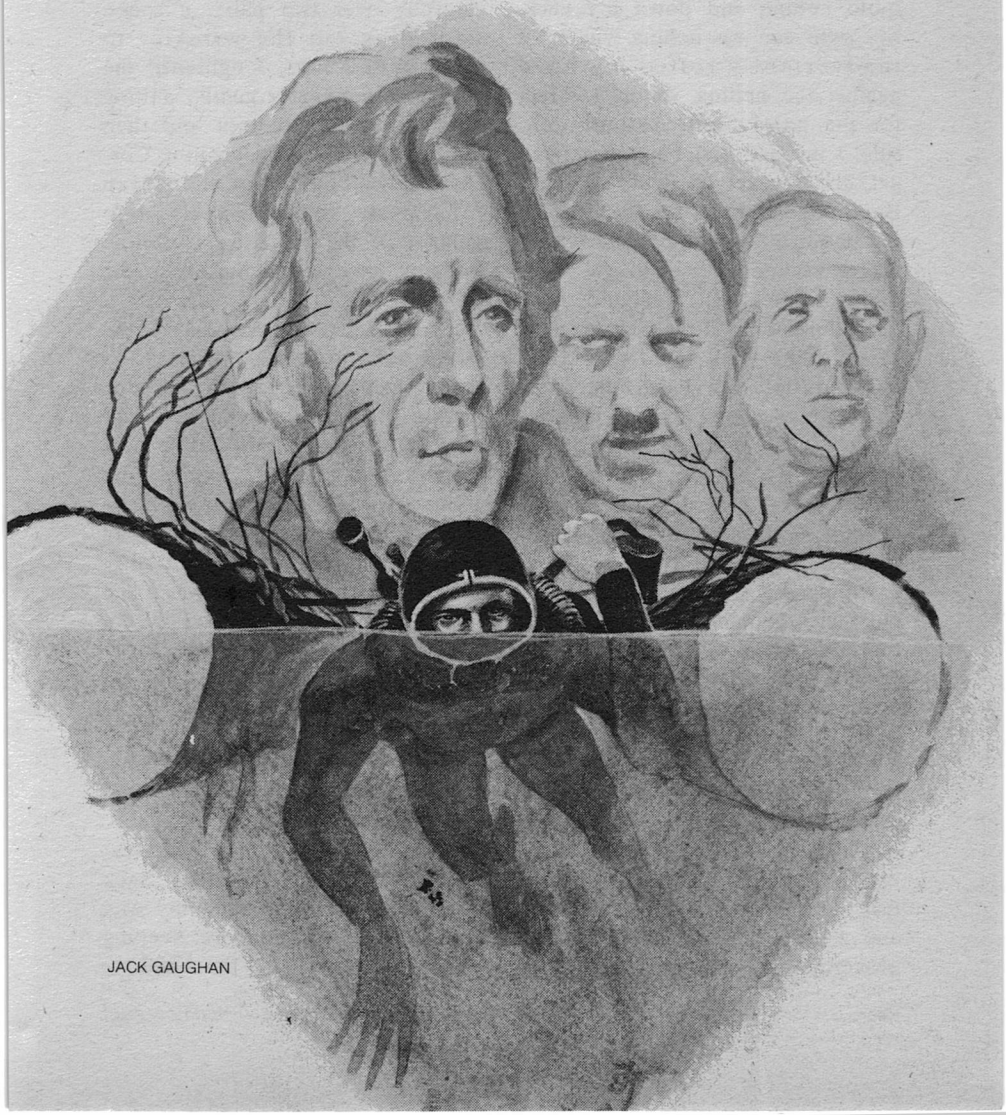
I shouldn't bitch. I'm still doing the only thing I ever wanted to do. Pilot a starship; go places, do things. And I'm moderately wealthy, with a tenth-share of MTC stock.

It'd just be a lot easier to take, if every ex-bum on Faraway didn't have a hundred times as much. I haven't gone back there since they bronzed the University Club and put it on a pedestal. ■

BLACK FLY

A modern assassin needs modern technology.
So does his victim.

GEORGE M. EWING



My goddam strings were dripping. The run-off ties on the cords of my beat-up old jungle hammock were either frayed or missing altogether, and the North Ontario fog was condensing on the strands and dribbling through the faded mosquito netting and down my neck. My right ear was itching where I'd inadvertently rolled my head against the netting, an easy target for the greedy little bastards outside. I decided that I might as well get up and get on with it. God! Bugs, fog, and no fire because of the damn infrared snoopers. It sure was a heck of a way to go about killing somebody. I should have been born some Joe Cool superspy, blasting the bad guys with a silenced pistol and chasing beautiful lady agents around Europe in a hot sports car, a carnation in my dinner jacket lapel. Well, anyway, the fog would make it harder for the Red Hats to see me coming, at least until the sun burned it off.

I popped the quick-release zipper on the hammock, peeled off my foil-and-paper sleeping bag, and eased my way out of the canvas cocoon. Canvas coffin would be more like it if the security people caught me lying around after daylight. It was light enough to see the mosquitoes sniffing away at the netting, so I'd best be on my way. No point in even thinking about a hot breakfast. The bush was still too cool, and a fire would show up like the proverbial sore thumb. I was probably running some risk just with my body heat, but most of it would be masked by the vegetation. In any case, there wasn't a whole lot that I could do about it.

I munched on a couple of pemmican bars as I pulled my boots carefully over two pairs of socks, smoothing out the wrinkles to avoid blisters later. I tightened the parachute cord laces gently, putting weight first on one foot and then the other. These were genuine Corcoran jumpboots, not the cheap "McNamara Special" ankle-wrappings that the American airborne troopers have been stuck with for years.

I finished dressing, packed the hammock, and stashed it in a cranny in the rock face at the edge of the little inlet where I had landed last night. There was a pegmatite dike in the granite just above the waterline, and the winter ice had fractured the rock along the lower contact, leaving a nifty hiding place the size of a beer keg or so. I wouldn't be needing the hammock again, most likely, but I kept the foil bag along with my gun case and swimming gear. It would come in handy as a shield against the snoopers, or to keep warm if I had to go to ground someplace cold and wet.

I set out, crossing the next several rocky ridges running back from the water. I worked my way along parallel to the shore, keeping far enough back into the brush to

avoid being spotted from any patrol boats, not that they were likely to have very tight security this far from the villa. There was no point in being careless, though, so I took my time, keeping to the less exposed ravines and gravelly hollows as much as possible.

I stopped for a break and a snack well after sunup. The sun had warmed the rocks nicely now, and I decided to risk a fire. There was a big black diorite outcropping that was overhanging a partly concealed patch of gravel and that was already uncomfortably warm to the touch. I got out my little alcohol-pellet stove, added some canteen water to a foil pouch of lurp-rations, and checked over my gear while lunch was warming.

I went over the stuff mechanically, checklisting things mentally to keep my mind off the reason I was here. If I allowed myself to brood and rationalize what I was doing, I'd either cop out and sneak back home or I'd be too brave and make a careless blunder. Either way, I'd be out of it, and the SOB would survive to cause a lot of other decent people grief. I tried to convince myself that it wasn't just a personal vendetta, though God knows I'd be happy to see Tsiolokov dead for what he'd done to Tamara and Aristedes, to say nothing of all the other Latvians and Czechs and Poles and even his fellow Georgians during his old days as party security chief. I realize that with a name like Nick Scarfone, people would probably think that all this was a result of some dark, sinister Mafia blood oath on my part. It really wasn't, though. I was just doing the world a favor.

I finished my inventory with the rifle, a Czech AK series assault carbine that I'd customized myself. It was a rugged, accurate hunk of machinery, and it pleased me to think about the Chairman's fat hulk stopping one of those big armor-piercing 7.62's that I'd hand-loaded myself, the ones with the very special points. Rumor had it that he wore a bulletproof vest at all times when he was out of the Soviet Union. Fat lot of good it would do him when the Dubcêk Express came calling. Welcome to Canada, from Prâha with love, sweetheart.

I closed the desiccant-filled case on the rifle, checked out the light-amplifier module that plugged into the sights, the filters, and all the rest of the precision optical garbage that seems to be necessary to shoot people efficiently at long range or in dim light these days.

I fiddled around for a while, finishing up the reconstituted lunch and convincing myself to go ahead with the project. I wasn't really committed yet. I could have turned around right then and made my way home, if you could call it a home. Tammy and Ari wouldn't care; they were dead, lured back

behind the Iron Curtain on a "Youth World Peace Visa" and snuffed out in a stupid student protest uprising. Tsiolokov probably didn't even remember them, though he'd personally ordered the university dormitory shelled, and the Canadian Government had lodged an official protest. He'd ignored the diplomatic wrist-slaps, but I intended to lodge an unofficial protest he couldn't ignore—lodge it right between his eyes.

Still, there was another side to the whole thing. I might be getting innocent people killed myself before this was over, to say nothing of acutely embarrassing the Canadian Government, which had never done me any harm. I wasn't going to lose much sleep about endangering my own skin, or any of the Chairman's flunkies and secret police, but how about the poor Mounties who had to stand around and be official honor guards and security people, even though they might hate the Russians personally? What the hell, if I called it off right now, I could make my way leisurely back through Algoma District, camping and swimming and goofing off. The old bastard would probably get himself killed off in a purge or something, though he had endured amazingly over the years. I thought again about Tammy, and about that smug toad flying in to the PM's fishing villa to trade oil and Jews for wheat and trucks and "substantive concessions toward world *détente*" and I nearly threw up. My mind was made up.

I packed my stuff and set out toward the edge of the river. I activated my little homemade radar detector, and stuck it on my belt. It was supposed to detect the antipersonnel radar used to protect government installations and warn me before the reflected echoes from my body alerted the operator. Well, we'd see about that. I worried a bit to myself as I finally reached the edge of the river and found my hiding place in a cedar clump to wait for dark.

Dark was a long time coming. While I waited, I studied the first quarter mile or so of the river with the scope from the rifle. The last half hour before it got really dark, I had a cold supper of more concentrates and got into my swim gear. I had already selected the log I wanted, and it was still there, a ten-inch-diameter pulp stick beached on a gravel bar a hundred yards downstream. It looked not too dry, not too waterlogged, but as if it still had just the right amount of buoyancy.

One last check on the watertight seals on the gun case, a tug on the straps of my flippers, and it was dark enough to start. I slithered down the bank, protecting the case slung along my belly with my knees and elbows. It was really getting dark now. I bumped into the log before I realized that I had reached it. I rolled over on my

side, the case scrunching in the gravel a bit, and tugged on the log. My end of it was floating free, but the other end was buried in the coarse sand. After an awkward minute or two, I hauled it free and pushed off downstream again.

The first couple of miles down the river were fairly smooth and uneventful, but I did have one scare. As I floated around a bend, stretched out behind the log with just my snorkle tube and an eye above the surface, I found myself steaming down on a little wood enclosure, like a doghouse set out on pilings at the water's edge. I got a glimpse of wires running off into the bush, and thought for a moment that I had barged into an alarm setup. Then I recognized it as an old Ontario Hydro water-level sensor, with honest-to-God toilet tank floats on wires clunking in the current.

The next couple of miles were somewhat hairier. The current was a lot faster now, and the meander pattern of the stream bed was more twisting. The rock piles and log-jams were bigger and more dangerous, and I was being carried down on them a lot faster and more frequently.

It was getting a bit lighter now, a crescent moon that would precede the sun by a few hours. It didn't help much, though. I was still navigating mostly by the feel of the water forces on the log, and by dragging my flippers along the bottom. I got one good crack on the shin from a submerged deadhead that way, but mostly I avoided getting banged up. I had done this river before, of course, but the details change. Anyway, I had been paddling a canoe then, not playing driftwood.

The current slacked off, the bottom dropped away rather abruptly, and I found myself paddling serenely in the middle of the beaver pond, a little sooner than I had expected. I also found trouble. I heard a noise that wasn't water gurgling over the dam, or anything else that fitted. I had just recognized the distinctive *pup-pup-pup* sound of an overhead chopper rotor when the infrared sensor on my suit began tickling my arm. I submerged, and drifted over against the mud and sticks of the beaver dam, keeping as much of the log over me as possible. Somebody was up there with an IR searchlight, and maybe other gadgets as well. My suit was camouflaged, of course, but I lay absolutely still, trying to look, sound, smell, and feel as much like an innocent pulp log as I could.

I was doing a great job, and was just about to congratulate myself on a fine bit of impersonation, when something hit the water about two feet from my head with an explosive *crack!* I was numb for a few seconds until I realized that it was only an angry beaver who didn't like helicopters and people

with guns playing hide and seek around his living room. Justifiably so. That's what you get for having a national symbol with a flat tail and a mean temper.

As soon as the chopper had gone away, I went over to the spillway, pushing my log ahead of me as I went. There wasn't much water going over. This was August, and the levels were low. Most of the water was leaking between the poplar sticks of the dam itself, but there was some rushing over the reverse slope of the dam and into the lake inlet below. I banged my shin again, this time on a plank protruding from the inner face of the dam.

This spillway was the same place that Aristedes and I had portaged the canoes down into the lake the summer we worked for the university geology department. We'd been the department gophers, ferrying loads of cores and specimens back to the main camp, and cold beer, bug dope, and other essential supplies out to the field crews. We had surveyed a lot of bush that summer, fought a lot of bugs, and become pretty good friends. I met Tammy for the first time at the department beerbust at the park in Thessalon. She was just a skinny high-school kid then, with only a hint of potential physical excitement in an angular, coltish frame. She'd been watching the guys in the two diamond drill crews screwing around with some improvised highland games: tossing a pulp log caber, dancing on crossed machetes, the usual kind of nonsense. I think she was a little shocked at the way some usually staid academic types were guzzling beer and carrying on.

I did the caber bit myself now, shoving the log over the edge of the spillway. It rattled over some planks and rollers left there by some people portaging a motorboat and splashed into the inlet. I followed, dragging my case and trying to keep as low and inconspicuous a profile as possible. I eased myself back into the water, found my log, and continued on my way.

There were a lot of floating and half-submerged logs along the shore as I came out into the lake from the inlet, and in fact this whole end of the lake looked like a floating woodpile or the boom yard at a paper mill. It didn't look as if there was any place between here and the arm of the lake that was clear enough of logs to land a Caribou on. This was fine with me, as it would make me just that much harder to spot. I pushed my way along for a couple of miles, weaving in and out of the floating junk until I was nearly to the place where the east arm of the lake branched down to the PM's compound. I maneuvered my log in among the jumble lining the shore, left it, and crawled cautiously up on a scrap of sandy beach and into the undergrowth.

I moved as slowly and as carefully as I could now. The villa was on the island just around the next point, and the security measures would begin in earnest soon. I dragged the case completely into the bushes, opened it, and took out the starlight scope. A quick pan of the horizon showed nothing but a generally higher light level in the eastern sky, where it would be dawn in an hour or two.

Leaving the gun case and swim gear concealed, I took my homemade pyrotechnics box, the scope, and a bush knife and started the climb up the ridge that separated me from the next inlet, directly across from the villa on its own island. I took about ten minutes to crawl the last hundred feet or so to the top of the ridge, where I'd have a clear view of the villa, the island, and the surrounding water.

When I reached the crest, I had a long snoop around with the scope. The security precautions really didn't seem to be all that stringent, though it might be that I was overlooking something. Tsiolokov hadn't survived all those purges and assassination attempts in the tough years with Stalin and Beria and the likes by being just lucky. The sky was really beginning to lighten now, and through the amplifier things were at least as clear as television on a cloudy day at the ballpark. There was a wire fence with a brush-cleared strip on either side of it about halfway between my vantage point and the water's edge. I couldn't see any insulators, so the fence was probably just bugged with alarms. With a little time and study you can get around most alarm systems, but it didn't look as if I was going to have to cross that fence anyway. I did see some other security precautions, though. There was a lookout tower on the north end of the island, and I could see several guards around the perimeter of the compound. Still nothing on the IR or radar detectors, which was all right with me. I'd have enough problems setting this up without showing up as a sinister squeal on somebody's earphones.

I decided on a location and set up for my getaway. I got out the pyro box, wedged it under a quartzite fragment the size of a manhole cover, and aligned the sights on the compound below. It was more than a quarter mile to the edge of the island from here, and a bit farther to the villa itself. Even downhill, I really didn't expect to hit anything at this range, but I had to come close enough to make it believable.

I finished with the sights, raised the little camouflaged antenna in some ferns at the edge of the rock slab, and turned to go. Some noise, very slight, made me turn and settle down again for a last look. It was light enough to see outlines of objects with the naked eye now, and you could have seen almost

anything with just a pair of good night-glasses. Two people were working their way toward me, moving along the cleared strip on this side of the fence. I swung the scope back into place and looked them over.

They weren't in uniform, just bush pants and heavy wool shirts. One of them was carrying an automatic rifle, possibly a Belgian FN. The other had a new-model Motorola walkie, the kind cops use, strapped in a holster on his belt. They weren't making any real effort at concealment, and walked on down the fence line. I waited a while, to see if maybe there would be a third man sneaking along after them to trap the unwary, but nobody else showed.

I made one last check to see if my little gadget was armed and then made tracks back down the hill to my cache. I was moving a little faster and less carefully than I'd have liked to, but time was running out. It was nearly daylight when I reached the shore again. I lashed three pulp sticks together, and added a little brush for camouflage. I tucked the rifle case on the little raft and got back into my swim gear. I carefully launched several other branches and logs into the water alongside the raft, and then got on, lowering myself into the water between the logs. I lashed the open gun case in place with a couple of scraps of parachute cord to make a shooting platform and to stabilize things. I covered everything with brush and my sleeping bag, camouflage-side out, so that I could just see out the front and everything else would be hidden. Then I began to swim slowly around the point.

It took me almost an hour to paddle around to where I could even see the island, let alone the villa. I really had to take my time. This was one place where the old saw about not making waves was for real. Even a stupid security man was going to look with some suspicion at a pile of driftwood that came steaming up to him, leaving a wake. As I rounded the point a slight breeze began to nudge me along, roughly in the right direction. My extra weight didn't help much in moving the raft, but the ripples in the water and the additional logs floating along with me would help keep things from looking too fishy. I was nearly in range of the compound now, and I stopped kicking with my flippers and drifted slowly. There was some activity around the house, and several people were standing around on the veranda. I eased the rifle into place and looked through the scope. Two servants were setting a table with some dishes. A couple of other people had that alert-but-a-little-bored look of the cop on a stakeout. There was no sign of the early-rising Chairman from Tiflis, though if he followed his usual

routine he'd be showing his ugly face any time now. It's a wonder what healthy exercise and a Spartan lifestyle can do for a shrewd Georgian farm lad. Tsiolokov was old enough to be my grandfather, at least. For all I could tell, he predated the October Revolution. Yet rumor had it that he had repeatedly beaten Khrushchev and several other younger party huskies in the wrestling and vodka-inspired grab-ass sessions that had served as amusement around the Kremlin between intrigues and late-night film showings. He'd survived Lord knows how many assassination attempts before this. It was uncanny, really. Hopefully, here in the boonies with most of his security being handled by bored Mounties and the OPP, he'd be more vulnerable.

While I waited for Georgi to show his puss, I got out the specially prepared magazine for the AK and stripped the waterproofing and safety caps off the cartridges, being *very* careful not to scratch my fingers, not even slightly. One little nick, even by the ablative sabot that surrounded the armor-piercing core of the bullet itself, and the neurotoxins would go to work with embarrassing speed.

I had drifted a little farther from the shore now, and closer to the island. The range was a little over four hundred meters, a long shot but not too difficult. I fiddled with the rangefinder in the scope, verifying the distance. Then I tied myself to the logs, just head and shoulders above the waterline, and munched a snack while I waited.

The irony of the whole thing bugged me. Here I was, up to my armpits in intrigue in the same lake where we razzed Tammy for wearing her first bikini, calling her "Bug Bait" and "Answer to a Black Fly's Prayer." She had looked good enough to nibble on, even then. It wasn't until later that the Ari, Nick, and Tammy show got to be more than three goofy kids horsing around the lake. In a way, I had been a kind of surrogate parent for the both of them, though I really hadn't been much older than Aristedes. Tammy's mother had died in a railroad car, fleeing one of Stalin's death camps, shortly after Tammy had been born. Mikhail had been killed in a lumber camp accident up by Hawk Junction, soon after they had moved to Canada. I never had been able to resolve my feelings for Tammy. We had been lovers, but I also felt a big brother responsibility.

There was a good deal of scurrying around on the veranda now, and it looked as if I might be getting some action. I took out the little control box for the pyros and wedged it between the logs, with its stubby antenna protruding up through the zipper of the camouflage bag among the branches. One last detail, screwing the flash

hider on the muzzle brake, and I was ready.

Tsiolokov was taking his own sweet time, and I had to paddle with my feet from time to time to stay on station. I worried some about the guards on the fence line behind me, but I was nearly out of range now, and at any rate, I was between them and the Chairman's little *dacha* away from home. When the shooting started, they would probably be hesitant about blazing away in his direction, especially over water. One thing was for sure, though: once they spread the word, that chopper would be out here in nothing flat, and the crap would really hit the rotors.

There was some more milling around, and finally old ferret-face sauntered onstage, resplendent in faded OD peasant pajamas. He was towing along the Right Honorable Monsieur Somebody-or-other, a hack separatist politician from Quebec who had been implicated in an FLQ bomb scandal some years back. Apparently they would be sitting at the same table for breakfast. Sorry to spoil the morning for you, Monsieur.

I settled myself in the water, resting lightly against the ropes with both hands free for the rifle. This surely was a neat way to shoot people if you had to do it. The water should cushion the recoil from the hot cartridge and give me a stable platform with just enough give. I was glad that I wasn't going to shoot him from land cover. With over thirty-two hundred fps muzzle velocity and a three hundred and fifty grain bullet, a guy could dislocate his shoulder firing prone.

He was standing at the table now, facing nearly toward me. I probably wouldn't get a better shot if I waited around all morning, and he might be called back inside for some crisis if I waited too long. Battle sight zero for most infantry weapons is about three hundred meters, and I had set the scope up that way. I was using a flatter cartridge than normal though, so I held the collimated light spot at the center of the crosshairs and diffraction rings of the sight just a little above his breastbone and started to squeeze the second trigger. I had one last, fleeting thought about calling the whole thing off, and then the rifle fired itself with a hard, flat *twack*. I bobbed around on the logs for a second and then got the sights back on. I'm pretty good at calling shots, and that one had been close in at two o'clock, right in his pajama breast pocket. Georgi didn't seem to have felt it. He was just standing there, solid as a tractor.

I squeezed off a couple more rounds, holding a shade lower. Beautiful, beautiful shots. I could see the holes. Neat, lovely little holes in his barrel chest. All hell was breaking loose in the compound. The shots were echoing all over the lake, making it sound like

a regular gun battle. Georgi just stood there, stupefied, with three holes in his chest, *but no blood!*

Somewhere a chopper engine was starting up, and I could hear shouting from the fence line behind me. I didn't have much time. As calmly as I could, I leaned into the soft recoil pad on the AK butt plate, forced myself to take a deep breath and let half of it out, and sighted on his head. *Georgi Petrovich Tsiolokov, you old bastard, you may have nine lives and iron underwear, and be a good party man, but this is getting bloody ridiculous. Kapow!*

That did something. I couldn't believe it. He was still standing there, but leaning at an impossible angle, as if his shoes were nailed to the floor. His facial expression hadn't changed from the first shot.

Somebody was shooting on the beach behind me. Bullets were whizzing overhead, and the guard in the tower was shooting back. Good. I was going to need all the time and extra confusion I could get. Georgi was leaning at nearly a forty-five-degree angle now, and his right arm was vibrating like an out-of-balance crankshaft. I turned the selector on the rifle to full automatic, and held the sight on his crotch. Three rounds—three rounds more, and I held the trigger in and emptied the magazine. The muzzle climb stitched him precisely up the long diagonal. His head came off, fell, and bounced along the veranda with a distinct clanging. Smoke and sparks were pouring out of the severed neck, and there was a noise like a railroad flare in a bucket of water. I decided it was time to bug out.

I thumbed the detonator control a couple of times, and several realistic-looking tracer bullets zipped into the compound. Several of the guards at the house stopped shooting at their own men on the beach and began blazing away at the ridge line. The chopper roared into the air, zoomed across the lake like a demented dragonfly, and began sniffing along the ridge line. I triggered off another burst to keep the crew busy, and began packing up to leave.

I disassembled the makeshift raft carefully, not leaving a scrap of cord or a spent cartridge. The next step hurt, but was necessary. I inserted a special cartridge into the chamber of the AK, filled the barrel about half full of water, and corked it with a rubber stopper. I squeezed the trigger, and there was a pop from the primer and then a hissing sound as the acid from the cartridge destroyed whatever rifling the hot handloads had left in the barrel. After a few minutes, I emptied the barrel and chamber of smoking slush, fieldstripped the rifle, and was ready to go.

The helicopter had disappeared behind the military crest of the hill, and I could hear shouting and scattered shots. I emptied the pyro

magazine with a few more flicks of the finger, and then sent twelve more pulses. There was an explosive thud up on the ridge, and I caught a glimpse of a saucer of rock rolling down the hill toward the fence. Then it was time for a nice, long swim.

There really isn't too much to tell after that. I swam about a mile down the east arm of the lake, surfacing just the tip of my snorkle when I had to. I found the cairn of rocks on the lake bottom without trouble, and my scuba gear was there in a watertight case, right where I'd left it in the spring. I stashed the ruined rifle and other junk in a crevice under a Gabbro boulder the size of a Volkswagen. I kept the optical garbage, screwing it into a 35mm camera with an adapter. I hated to leave all the nice homemade equipment there, and besides, it would fit my new cover as an underwater photojournalist once I got a bit farther from the scene of the crime, if roboticide is on the books in Ontario. If nothing else, I could probably get nailed for malicious destruction of property.

The battery scooter, scrounge-built from a couple of car batteries and a conventional trolling motor, was a bonus. If it worked, so much the better; if it didn't, I'd simply have to swim a few more miles. Part of the charge had leaked out of the batteries despite the watertight casings, but it ran, and I was within sight of the Algoma Central Railroad bridge at the far end of the lake before it quit entirely, and was stashed behind another boulder.

I loafed around under the bridge until sundown, taking pictures of some weeds and a couple of bored-looking northern pike to pass the time. As soon as the last trainload of sleepy tourists and freightcars full of pulp chips rattled on down the line for Sault Ste. Marie, I retrieved a cache of conventional camping gear from behind a bridge truss. It took a few minutes of failing light to bolt together some innocent-looking junk along the side of the tracks into a flange-wheeled bicycle, and then I peddled a leisurely twenty miles to where my Land Rover was parked.

I watched the papers and news broadcasts for a while with interest, to see if they had any spare Tsiolokovs handy. Apparently so; he is still in the news. What worried me a lot more was the announcement that the RCMP was looking for the FLQ fanatics who had assassinated a certain leftist Quebec politician. Fortunately, the Mounties don't always get their man; their motto is actually "Maintain the Right." I suppose I may have nicked him with a shell fragment, or he may have stopped a stray bullet when the guards were shooting at each other, but I don't think so. It's dangerous to have potentially embar-

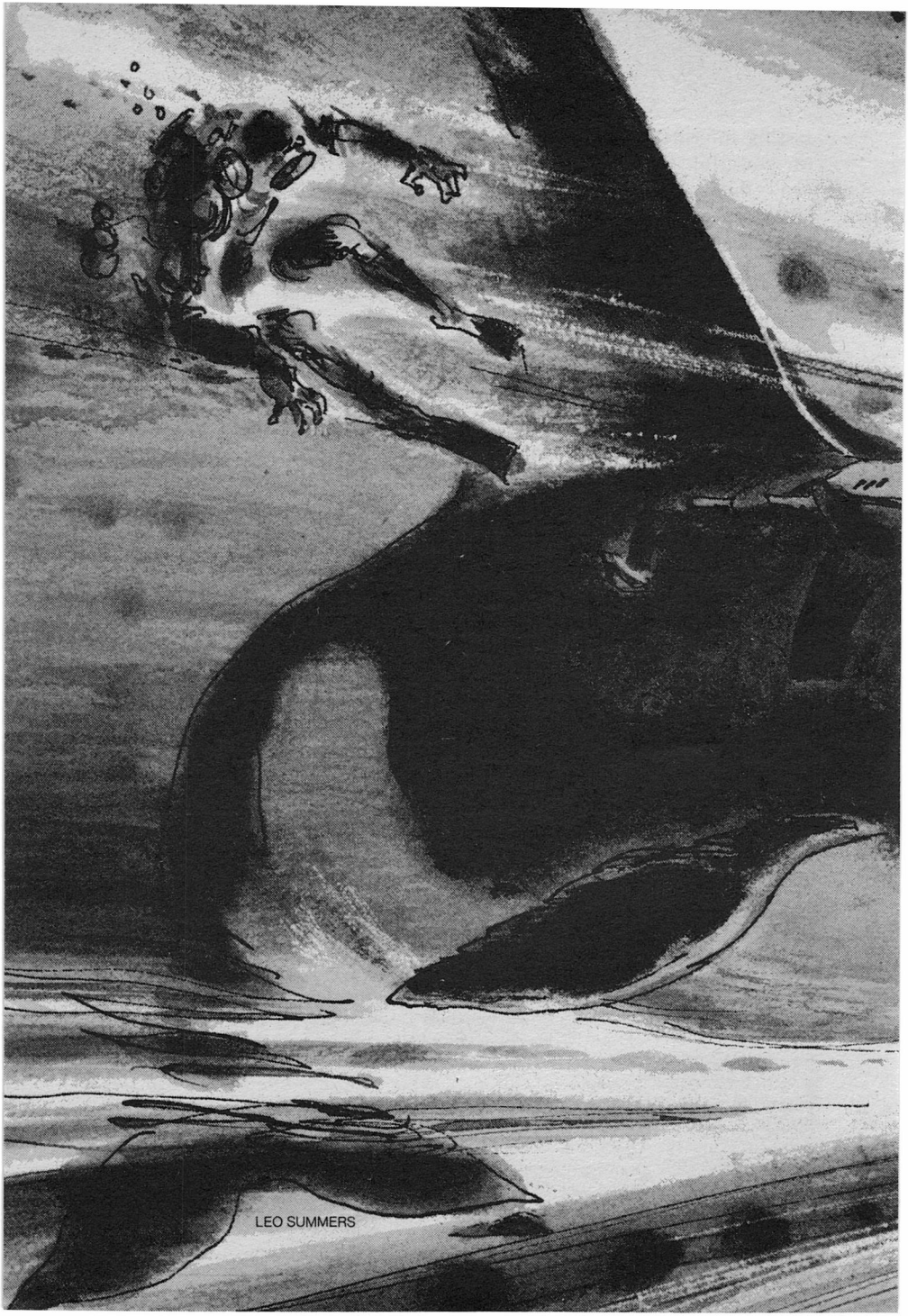
rassing information about someone as powerful as Tsiolokov, and I can't think of many things more embarrassing than to be seen with your head rolling around on the floor. In any case, M. Gilbert had been very much alive, frantically doing groundhog imitations on the villa floor when I last saw him.

As to the larger implications of the Chairman's bouncing cranium, there are several possibilities, none of them comforting. It all may have been a clever ruse by an ingenious Soviet security officer, but again I think there is more to it than that. I can't help but ponder the fact that a great many important figures in this century haven't been too popular, and that some of them were, and are, singularly hard to kill. I continually think of Hitler sauntering out of a bomb-demolished staff meeting, or De Gaulle climbing out of a bullet-riddled Citroen, or even, if you want to be paranoid with an historical perspective, Andrew Jackson taking two pistol shots at point-blank range and then beating the tar out of his assailant with a cane. There was some talk at the time that the whole thing might be a fraud, that the pistol had only contained blanks or had misfired; nobody could take two pistol balls in the belly and survive.

I've shelved my vendetta plans for the time being. There isn't much point in shooting holes in hardware. I have a pleasant job as a tourist guide at a uranium mine on Highway 17 south of Wawa, with plenty of time for fishing and prospecting. Once in a while, though, I notice a slender young tourist girl who has a perky way about her and fills her clothes just right, and likes the outdoors. And I have black, violent thoughts. I can always take out my frustrations with a pickax, breaking out gumite samples. Or I can swat the bugs. We have a lot of them up here. ■

IN TIMES TO COME

IMMANUEL VELIKOVSKY. ISAAC ASIMOV. FREDERIC B. JUENEMAN. JOE HALDEMAN. HARLAN ELLISON. ☐ All those names will be on the cover of next month's special issue, which is devoted to the quarter-century-long battle over the startling (some say heretical) theories of Dr. Immanuel Velikovsky. ☐ Frederic B. Jueneman, one of the nation's most widely read scientist-writers, offers an article tracing the roots of the Velikovsky controversy, together with an eyewitness description of the hectic and contentious special Velikovsky session at the national AAAS meeting earlier this year. ☐ Another well-known scientist and writer, Isaac Asimov, weighs in with *his* interpretation of the continuing battle between the established scientific community and those who see it as a stifling "Establishment." ☐ There will be fiction, too: stories by Joe Haldeman, Andrew J. Offutt (who takes on the von Däniken *mythos*), and Harlan Ellison—no stronger to controversy, himself. Plus a few surprises and a stunning cover by Rick Sternbach that will help to make the October 1974 issue a collector's item.


LEO SUMMERS

WHALE SONG

The ties that bind
all intelligent creatures
go deep . . . very deep.

TERRY MELEN

I

The concussion is terrible.

Drifting pain.

I hang in a world of silence and blackness, and because the sea is never silent nor to me completely dark, I know that I have been blinded and my hearing taken from me.

But I am a land animal, so I think: Santa Lucia, Queen of Light, Lady of the Halo of Candles, guide me from the darkness . . .

Consciousness returns, silence and pain; but this time there is light, blue light, the calm crystal blue of the level of the sea that I must inhabit, between the sunlit surface above and the black depths below. The sea is beautiful, the sea is home. When I am here I pity the land creatures in their dusty world of glaring sun and harsh, unfiltered colors.

Calmer now, I examine my situation and equipment. I hang at neutral buoyancy about thirty feet below the surface. My faceplate is cracked but not shipping water, the gill-pack on my back seems to be functioning properly, the water compressor under it still working to provide ballast. My right arm, however, is broken, as probably are several ribs, and my right leg is stiff and painful, all results of the collision with the saddle that the explosion caused. My nose is bloody and I can taste blood in my mouth, although whether this is from internal injuries or from biting my tongue I cannot tell. I am still completely deaf. The eliminatory slit on my wetsuit has popped open, and my right-hand glove has been torn off and dangles at the end of the sleeve, but otherwise the insulation appears to be intact. I do not feel cold. Power and communication telltales on my left arm have all gone red, however, so I am completely cut off from the outside. And where is Ka-dhrill?

The shark appears out of nowhere. It is a blue shark, some fourteen feet long, a dreadnought floating amid its flotilla of small striped pilot fish. It maintains a calm, almost lazy speed circling me, the powerful muscles on its great frame flexing slowly under sleek skin, its outline razor-sharp against the blue background haze. The five branchial clefts open and close slowly in the easy current, and just below them and under the shark's mouth, tiny remoras hang attached to it, waiting. Its great expressionless eye is forward near the long pointed snout, dark against the rich blue of its body, giving the shark an open-mouthed look of constant surprise. It moves with easy grace through the clear mid-ocean water, sending slow pressure waves toward me that I can sense more than feel. Its streamlining is extreme and utterly functional, and the long pectoral fins move only

slightly to provide steering. Its stomach is flat and probably empty.

There is no certain way to predict what a shark will do, its size advantage over me is enormous, but the hereditary caution of its kind keeps it from attacking immediately, and it waits, considering. It is likely to continue circling for a while, gradually drawing closer and closer, then finally making its first attack. This could end in many ways; perhaps it will only bump against my leg—its method of tasting. This used to terrify divers who never realized that the disagreeable taste of the old neoprene wetsuits has probably saved more than one of them from losing a leg, although it is no sure deterrent to a hungry shark. Perhaps it will attack in earnest, and if I resist strongly enough it may retreat, or it could fly into a killing frenzy—in which case it will all be over. It may also give up the attack altogether and swim away, although this is unlikely. No, if its first attack fails it will continue to circle for a while and then make another, and another, until the end.

Noise is certain to attract its attention, so I hang silently, keeping it in sight, but making no unnecessary movements. It is closer now, its underslung jaw moving up and down, flexing perhaps in anticipation. I can see the old battle scars on its back, and the pressure wave is a palpable reality. With it come renewed sensations of pain in my arm and chest. I remain as still as possible and wait.

Time has passed; I'm not certain how much. I don't see the shark at first, but then I locate it circling farther out, moving faster now, the strange sideways motion of its powerful body more pronounced. Have I been unconscious? Has the shark already made a tasting run and then retreated to consider? Then I realize that I am nearer the surface now, the sunlight through the waves above casting strange, flickering patterns across the shark's back. This is wrong; the compressor on my back should be maintaining me at neutral buoyancy. Then I see the thin line of bubbles rising behind me; the gill-pack takes oxygen directly from the water, but inside it there are several small bottles of compressed helium which allow me to dive down to six hundred feet, and evidently one or more of these, damaged in the explosion, has been leaking a slow giggle of bubbles, lightening my weight beyond the tolerance the compressor can handle. On the surface I will be completely helpless against the shark, if I am not that already.

Wait and watch. Several of the shark's dozen-odd pilot fish are swimming directly in front of it now, riding the pressure wave only inches from those huge jaws, but it pays them no attention. The eye is

dark green and very large, seemingly out of proportion to the rest of its head. There is no sign of movement or personality in its stare, no hint to the complex set of patterns and influences that determine its behavior. A sonic resonator would drive it away, but of course I don't have one; it is the team that usually protects me, but they are gone, and I am rapidly becoming aware of my helplessness in this water-world without them.

Suddenly the shark gives a violent thrash of its notched tail and turns to charge at me head on. Instantly the symmetry is broken and there is only the ugly triangular cast of the three great fins around the gaping, tooth-lined mouth. Desperate, I twist around to put myself in a position to repel the attack. Pain ripples through me, and the utter futility of my gestures comes home on me. But then I remember how the attack will take place, and any thoughts of giving up without a fight leave. "Lucia," I say; "Santa Lucia."

Then, a bare couple of meters from me, the shark suddenly veers away and turns its left side to me. My head is spinning badly now and I don't understand what it is doing—then a gray streak flashes by me, buffeting me in its afterwave. It crashes with rending force into the side of the shark's head, crushing the branchial clefts, destroying the delicate gill structures and impairing its ability to breathe. The shark wheels and twists savagely, emptying its bowels in shock and fury, and the dolphin has to dart away quickly to escape those massive jaws. But then another dolphin appears and drives its hard beak into the shark's pale abdomen, ripping apart delicate inner organs unsupported by ligaments as in most other animals. More team members appear and continue the attack, striking again and again in the same spot, giving their old enemy no chance to launch a successful counterattack. But the shark is intent only on fleeing now, deserted by its pilot fish, badly wounded. It is too late of course, for within minutes it will be dead. But it is outside my field of vision now, so I will not see its death throes. Which I do not mind in the least; I understand that the shark must die if I am to live, but I take no pleasure in watching.

Turrel, battle-scarred old dowager, leader of the dolphin team, darts about me, ruefully shaking her head as if in displeasure, but in reality carefully sonaring every inch of me and my equipment. Then she turns her great brown eye directly into my faceplate. She is probably speaking to me, using the trade language which is the only way men and dolphins can communicate, but with my hearing gone I cannot understand her. "Kadhrill . . ." I try to say, but the world has already become light and uniformly featureless, and with a

quiet, faraway shudder I drift off into the greater darkness.

II

Waves lap against my back. I feel them, but can still hear nothing.

Two of the dolphins, flippers entwined under me, are supporting me face down on the surface, keeping the gill-pack out of the water to aid breathing. Their soft, rubbery bodies are warm even through the insulated wetsuit, and it is very comfortable hanging between them, the sun on my back and the blue-green darkness of the depths looming beneath me. They work their flukes slowly and in unison, bringing all three of us above the surface every couple of minutes to allow them to breathe, but otherwise trying to stay relatively still.

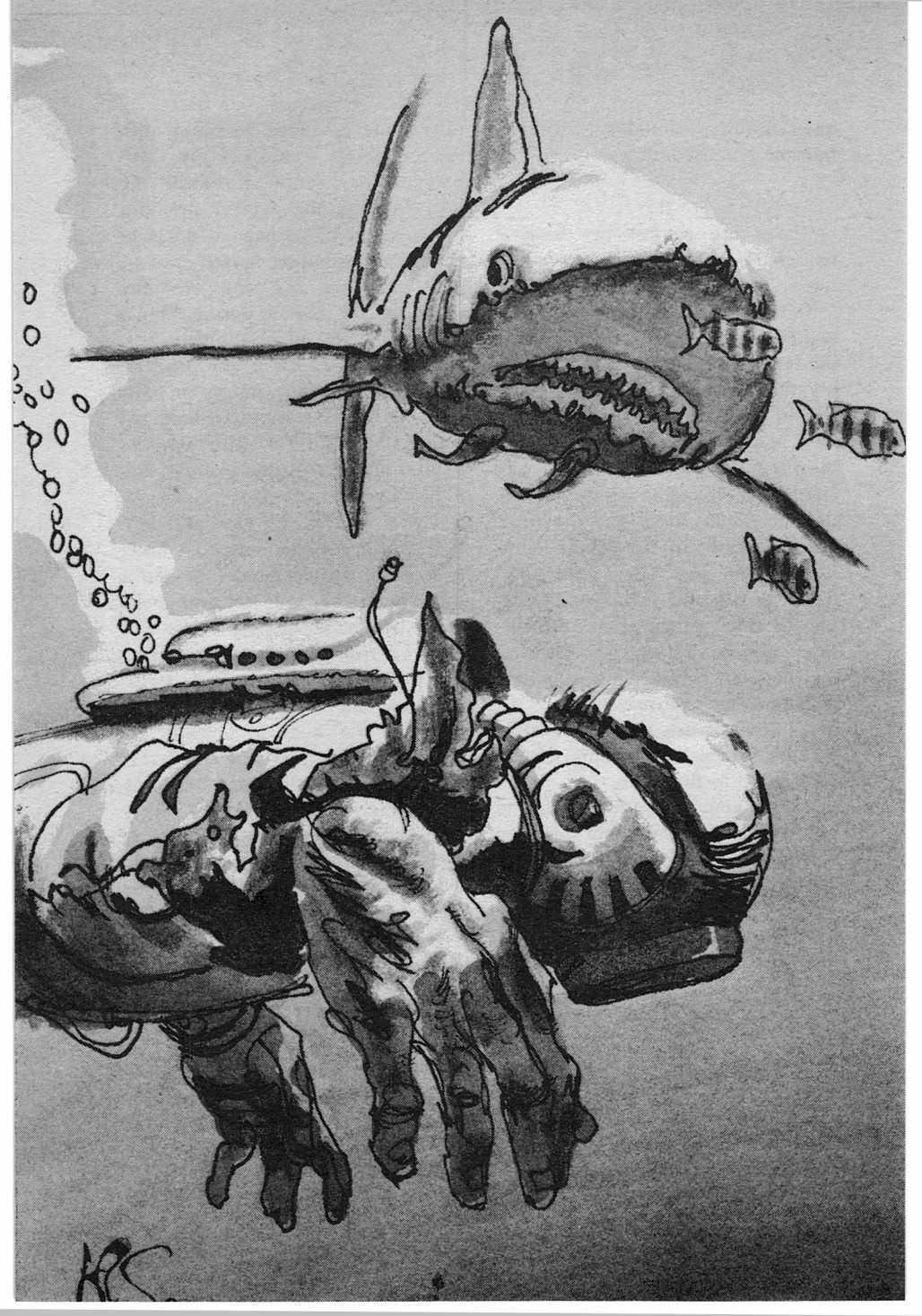
Kohleny, awash in the torrent of her love begins to swing rapidly back and forth below us, almost panic-stricken, not knowing what to do to help, and sending pressure waves that make it difficult for the two supporting me to stay in position. Turrel intervenes, slapping Kohleny soundly across the head with her flipper and driving her away. She begins to circle farther out where her movements do not disturb us.

Turrel again moves close to my faceplate, and is probably saying something to me, although I cannot hear her.

"Ka-dhrill," I say in the whistling trade language, speaking into the breathing section of my faceplate. "Try to find Ka-dhrill; he may be injured." Turrel hesitates for a moment, perhaps wishing to handle the situation herself; but finally she turns and sends Kohleny to search for him, ordering Thine, a young male, to accompany her. Kohleny pauses for a few seconds, uncertain whether to go or not, then starts—probably at a sharp rebuke from Turrel—and streaks away, Thine following close behind.

Turrel moves off to my left, holding most of her nine-foot body out of the water by the powerful thrashing of her tail. Returning, she wags her head quickly back and forth in front of me, not sonaring this time, but telling me with a gesture that she has picked up from me that the boat is nowhere in sight. Which is just as well since I do not feel much like continuing the battle. The herd, most likely scattered by the explosion, has had time to regroup, and my greatest fear is that the boat may have gone after them.

It was a small boat, an antiquated hydrofoil probably making a fast raid out of some South American port, hoping to secure a whale and haul it away before anyone was the wiser. This is illegal of course, both under UN law and the Sentients' Treaty, and bears penalties up to life imprisonment. But the profits can be high also. Ka-



dhrill and I had noticed them following the herd and had gone to investigate. The depth charges came down on top of us almost before we realized what they were. Ka-dhrill sounded, but not quickly enough to escape, and the concussion tore me loose from my harness and threw me against the saddle, possibly injuring Ka-dhrill as well. If he is unconscious I am not sure what the dolphins—a third of his length and an even lesser fraction of his weight—will be able to do to help him.

Ka-dhrill is a true orc, *Orcinus orca,* and calling him a killer whale is both as accurate and as misleading as referring to me as a "killer ape." It is especially ironic that we should designate his species so, for the almost inbred affection that killer whales have for men despite the crimes of the past is still one of the great unsolved mysteries of the ocean. Ka-dhrill claims it is simply the ability of one sentient species to recognize and cooperate with another, and uses his own career as a good example. When he was still well short of his full manhood he applied for entrance at the Special Studies School at Kyoto University in Japan under a UN grant, although whether he was ordered to do so by his pod leader or whether he felt called upon to sacrifice to rescue his herd from the persistent pleas of the UN Sentients Committee he has never made clear. Once there, however, he studied for and received degrees in languages, marine biology, ichthyology, zoology, oceanology, delphinology, human psychology and physiology and comparative anatomy as well as taking side courses in human beliefs and customs. The fact that he did so in shortly under three years is not really surprising; of the four sentient species thus far recognized on Earth, including man, killer whales have consistently proven to have the highest average IQs. Ka-dhrill and I had collaborated on a paper before I left Sweden, but we first met at UCLA while taking postgraduate courses in ketaphonation, and when it came time to seek a UN marine research grant, it seemed only natural that we do so together. We were already recruiting our team when it came. The dolphins are nonspecialists, taught only to assist us in our experiments and observations, and to offer protection, mainly to me of course. Our field of study is the great sperm whale, *Physeter catodon,* and some sacrifices are demanded of both of us. I have to spend two-week periods inside an insulated wetsuit (metal shapes, such as a submarine, tend only to frighten the whales away), taking every third week off for rest and recuperation, and Ka-dhrill has to bear the indignity of the saddle. This contains most of our electronics equipment and apparatus as well as food concentrates, a gas supply, and a blowhole piece to al-

low Ka-dhrill to breathe underwater in an emergency. It is quite comfortable for him to wear, fitting on his back just in front of the tall dorsal fin and held in place by a type of static adhesion, but his hydrodynamic streamlining is highly specialized, and the drag from the saddle alone can cut his speed to a fraction of what it normally would be. The whales, however, when undisturbed usually cruise at not more than a few knots, so we have no difficulty in keeping up. Neither of us mind the inconveniences though; the insane butchery of the last century, even after it had been outlawed, has reduced the sperm whale population to a few thousand in all the oceans of the world, and even in our lifetime we may see the extinction of the species altogether. And the really insane thing about it is that it is so unnecessary.

Man will never build cities under the sea. Aside from the restrictions of the Sentients' Treaty it simply doesn't make sense. Shelf-mining and farming, in order to be carried out within ecological regulations, are primarily automatic, with only maintenance crews actually subsurface. And even among them, hardships are extreme. It is a question of adaptation; man is a land animal, sight-oriented, while in the deep seas it is the cetaceans with their incredibly complex sonaric abilities who are best able to survive. Sight is of secondary use in a world where visibility at the best of times rarely exceeds a dozen yards. And besides, with the success of the terraforming projects on Mars and the hopes held out for atmospheric alterations on Venus, the need of new areas to colonize simply doesn't exist any more. So with no need to compete for the living space of the sea, the harm man has done to its inhabitants can only be explained in terms of greed and stupidity.

My arm is beginning to ache unbearably now, and my entire chest hurts. Two other dolphins have arrived, so now there are five with me, Kohleny and Thine still off looking for Ka-dhrill. My efforts to reseal my seat flap have left me exhausted and my exposed hand is numb with cold despite the warmth of the water. Cold is the great enemy to man in the sea, and even the warmest water draws enormous amounts of heat from your body. This is the reason that there are no small cetaceans, no sea rabbits, for instance, and even the young of most whales suffer from the cold and have to be kept in warm equatorial waters while they grow their first insulating layers of blubber. I have no such layer and must depend on my thermostatically controlled wetsuit. In theory I can remain indefinitely in the sea in the wetsuit, although I usually find two weeks quite long enough; but for all the suit's engineering it can't

seem to keep out the cold now, even with two warm dolphins beside me and the hot Pacific sun overhead.

There is no question about it, I am in deep trouble. The last contact I had with the outside was my hourly transmission to one of the research outposts off the Mexican coast, and while that was some time ago, it will probably still be a while before they begin to worry about me, and even then they will still have no exact reading on my location. The nearest land is almost eight hundred kilometers away, so there is little hope in making for shore. It was a stupid thing to try, going after a whaler all by ourselves instead of letting the UN Police investigate, but the thought of one of them being on the loose is enough to damage anyone's judgment. Whalers are mindless butchers, the scum and dregs of mankind, fully several notches below the fishermen who only rape and exploit the sea, putting nothing back for what they take, or sailors who foul the midocean clarity with their wastes and illegal sludge. But it was stupid to go in alone. Kadhrill may be injured or dead, and if I do not get help soon, I may be also.

A cold uneasiness is growing throughout me, but the pain is subsiding a little, and gradually, like a deep blanket being drawn slowly across me, I drop off into unconsciousness again.

III

I dream of deserts, red deserts, and yellow and blue and black. Sperm whales raise their blunt heads out of the steaming sands, belly to belly, flippers entwined, copulating in the heat and blackness.

I wake in fever and dull pain. The dolphins still support me, another pair this time, taking turns. The sky has become overcast, and without the sun there seems to be little warmth in the upper air. When I lift my head above the surface the water seems thick and oily. Kohleny has returned and moves in slow, arching patterns around me and beneath me, a gray shadow against blackness. From her movements she may be trying to tell me something, but I am still deaf, and cannot understand her. She thrashes about, making unusual movements, perhaps trying to act out her meaning, but I am too tired to pay attention, and I can make little sense out of her movements. There is no sign of Kadhrill.

Kohleny abandons her efforts, and moving up to me, gently strokes my legs with her beak and flippers. Probably she understands my injuries better than I do; sound waves in water pass easily through skin and muscle, so what she understands of me from sonaring would essentially be reflections of my bones and the air-containing

cavities of my body. She perceives her world in this manner as I perceive mine through the surface reflections of sight, having many times my acoustic abilities, and uses her excellent eyesight as a secondary means of gaining information. How odd I must appear to her, weak, ungainly, poorly adapted despite all my equipment, and yet she loves me. I don't know why. Yet love is a delicate and a rare thing, and I cherish it when it is given to me.

Turrel leaves off her perpetual circling and churns the water in front of me in a flurry of excitement, forcing the two supporting dolphins to struggle to maintain their positions. At first I think another shark is coming, but then I see great white flashes of underbelly and side markings moving up out of the darkness below me, and I know that everything will be all right; it is Ka-dhrill.

Later now; I hang in the harness of the damaged saddle on Ka-dhrill's back. Actually "saddle" is only a term of convenience, for I lie on my stomach, legs spread out on either side of the high dorsal fin, control panel under my face, air tanks and supply pouches strung out parallel to my chest on either side. Both the radio and the sonic telephone are out of commission, so no outside contact is possible even if I could hear. In fact, about the only thing that seems to be working at all is the weather satellite relay, and that is making dire predictions of an impending storm. If so it will severely hamper rescue operations, so my troubles may be only just beginning. However, my right arm is now comfortably encased in a plastic water splint, and having been shot full of drugs I at least feel no pain. Also, the oscilloscope on the control panel is working, so I am able to pick out certain phrases of trade talk that Ka-dhrill keeps repeating, and to a degree at least understand what has happened.

The concussion tore both me and the saddle loose from Ka-dhrill's back, ramming me against it in the shock wave. Ka-dhrill was stunned and drifted for a short while hovering on the brink of unconsciousness, so that when he came to again, we had drifted several miles apart. He echo-located me almost at once, by that time safely surrounded by the dolphins, and decided to hunt for the saddle before it was completely lost. The ocean bottom here is about three miles deep, outside the diving range of even the sperm whales, but fortunately the saddle had come to rest only a few hundred feet down on the edge of a thermocline, and Ka-dhrill had little trouble in locating it. He sent Kohleny and Thine back to tell me that he was all right and would soon be joining me with the saddle. But once he had retrieved it he decided to make

a brief inspection of the herd first, and so it was later when he finally came.

All seven of the dolphins are becoming nervous now, knowing without instruments that the storm is coming, and still no signs of rescue. I begin to hear strange ringings in my ears, just at the very edge of perception, but the sea sounds are still lost to me, and for all intents and purposes I am still deaf.

The waves are becoming choppy and a wind is rising out of the northwest, and it will soon be time to dive in order to ride out the storm. The air tanks on the saddle are undamaged, so even if my gill-pack fails both Ka-dhrill and I will be able to breathe without having to surface. I feel strangely light-headed under the effects of the drugs, and it takes considerable effort to carry out a complete check on our equipment. I keep remembering things out of my childhood, the forests and farmlands around Lund, my studies at the University of Stockholm, the first time I realized the difference between the sailor's surface sea of waves and winds and the aquarian's sea, the rich, tinted world of sounds and pressures, the peoples of its kingdoms, the wisdom of its ancient knowledge . . .

The waves are beginning to rise now, forming white sheets that tear off and form ragged tatters in the wind, and walls of heavy rain begin to fall. I crouch forward in the saddle and Ka-dhrill inhales quickly several times and ducks below the surface. We dive to about forty feet, well below the surface turbulence caused by the storm, and settle down to begin a long, slow cruise. The extra pressure on the watercast shoots a dull ache through my arm and shoulder, and suddenly I feel chilled and very tired; but before doing anything else I loosen my harness and, easing forward, slip the breathing piece from the air tanks over Ka-dhrill's blowhole, waiting while he delicately opens the triangular flap and takes it in. As I duck back into the saddle once again he sends a great gush of bubbles out through the regulator, blinding me momentarily in the murky water. My head swims for a minute, then clears somewhat, but it is still with great effort that I strap myself back down again before surrendering once more to the drug-induced darkness.

IV

The huge square head moves ponderously out of the murkiness and bears directly down upon us, a scarred and wrinkled mountain of moving flesh only partially lit by the churning cauldron that forms a ceiling over us. Coming out of the darkness it seems a menace difficult to envisage in its totality, but a good ten feet from us, having already carefully sonared us, it dips

that massive head downward and dives under us, Ka-dhrill calmly riding the pressure wave up and over its back, being careful to pass well above those huge flukes. The world suddenly rings with dull sound, but the sea sounds, the clatter and crackle of the storm overhead and the low roars of the sperm whales all around us, those I do not hear.

We are moving now with the herd—or "family" to be more exact, a herd being comprised of several such groupings—its members moving like dark shadows all around us. There should be twenty-six members to it, although this number is constantly changing as the group splits up and re-forms following the callings of the seasons. Moving among them like this is unusual, for they are usually quite shy of us, but the racket of the storm has disrupted their continuous chatter back and forth, and they move on either side of us quite unconcerned by our presence. Even after all this time the effect on me is still stunning. We simply aren't trained on the land to think of animals this big. How do you comprehend something sixty feet long and weighing as many tons? The size, the sheer bulk of what you know to be an intelligent, thinking animal is very hard to grasp, much less explain to someone who has never experienced it. You expect that much mass to react like a speeding truck would, and yet they have repeatedly gone out of their way to avoid striking me when I have been among them, intent on some experiment or other, delicately lifting massive flukes so as to miss me when they pass by. All cetaceans seem to have this mysterious relationship with man, some more so than others, and it has never been adequately explained. Ka-dhrill for instance is not so bold to approach them as I can be, for they know him as a potential enemy, powerless without his herd, but still hardly to be trusted. Yet they have never gone out of their way to attack him, saving their ferocity for the battles with the giant squids that they feed on far beneath the surface.

They are making about four knots now, keeping in roughly the same pattern, and Ka-dhrill has little trouble in keeping up. No more than two or three of them are visible at any one time, but they try to stay close together during a storm, so I know that the others are not far away. Their movement is slow and almost sluggish, yet very graceful to watch, not like the sharp, muscular tail thrusts of a shark, but a calm, rhythmic undulation of their whole bodies that ends in a mighty sweep of wide, horizontal flukes that is impressive to watch.

Very little is known of their mental life, for they have not learned man-speech—unlike many of the lesser whales—and their own

stereophonic language is as yet untranslated. They do have the largest brain of any animal on Earth, only a small fraction of which is put to use on the mundane efforts of surviving, so to what use the rest of it may be put is an open question. Many mysteries exist concerning them, the solution of which will probably not be seen in my time.

We pass diagonally across the path of a great bull, who is no doubt sonaring us intently, then Ka-dhrill slows his speed to allow him to pass. Once we are out of the way he gives a great thrash of his flukes and arches his square head upward to spout into the storm above. We are thrown about somewhat in the turbulence and sharp pains in my arm remind me that I have other concerns at the moment, and we dive again, seeking solace in the safety of the herd. I am weak now and terribly, terribly cold. I set the heating control on my suit to maximum, but I know that the cold is in my fever and not in the sea. I close my eyes and cling to the saddle, a frail monkey on the back of a whale, and as I have done so often in the sea, I wait.

V

Much later now. Night. The storm is long over and the dolphins have eaten, and sleep comes now, hanging just below the surface and moving only now and again to bob up without opening their eyes to breathe. Saddled with me, Ka-dhrill has neither eaten nor slept. He has released the blowhole piece, the tanks being almost empty, and must raise his head above the surface every few minutes. Otherwise he drifts slowly, moving only enough to keep his dorsal fin and the upper part of the saddle above water. Tiny waves slap gently against my faceplate and wash softly over the glowing instrument panel.

I raise my head and look around. The air feels warm on my bare right hand, long gone numb from the sea cold; with difficulty I swing it around in front of me, the water envelope clumsy and difficult to handle in the air. There is little or no wind and the sea is calm, glass-like almost, reflecting the stars and showing tiny pinpoints of phosphorescence around me. The whales are far off to my right, their angled spouts clearly visible in the still air. The world is calm now and very beautiful; the red glare of my suit and control panel telltales seems harsh and out of place.

The whales sing to each other. It is a deep song carried over to me on the wind and through the water, filled with high-pitched intricacies that I cannot quite hear but know are there. It has a quiet and reserved sound, far removed from their usual grunting communication or the crackling sounds they use for sonaring. The quiet slap of the waves against my chest come only

faintly to me, but I can hear the whales clearly. Ka-dhrill speaks to me; at first I cannot understand him and tell him so, then he switches to humanese and says in a quivering falsetto: "How do you feel, Olaf?"

"Lightheaded," I reply, "but otherwise all right. How long do you think before they come?"

"Soon," he says, "soon. Are all the communicator lights still red?"

"Yes," I say, and for a long while we are silent, listening to the strange, moving music of the whales. "What are they doing?" I say at last. "Reciting," he replies, but he will not explain the remark when I ask. My arm begins to hurt and I lay back down on the saddle once again. "Rest now," he says. "I'll stay on the surface."

Seachange.

No, that's not right . . .

The hotel bar is dark, the lights blue and cold and turned low. People are rushing by, but they look . . . different somehow. "Seachange" they keep saying, but that isn't the word they use, nor even its meaning. They are anxious to get there for there isn't much time . . . She laughs, tosses back her head, her hair washing back like a breaking wave to settle gently on her bare shoulder. Estee, oh Estee. "Let's wait," she says. The ocean roars somewhere in the background.

Estee.

We have cocktails, then go up to our room, very North-American; waves are breaking in the lobby. The hallway is shoddy, hung with trailing kelp, shelf kelp which does not grow in the open seas. The room is wide and clean and the floor is sand. Outside we can hear the sound of people hurrying. Hurry.

Estee begins to undress and I mix drinks, light up a popper. Then we sit for a while shyly holding hands. I blow air bubbles that rise to the ornate ceiling and form clear upside-down puddles there.

Her eyes, I think to myself, are the slightly clouded, light blue of the great whales. She arches her back, her breasts straining against the bounds of the gown. "It's all your fault," I say. Then I philosophize, saying, "People are always sorry afterwards, regardless of the fact that they do it anyway, although not meaning to . . ."

We are in the streets hurrying to meet the change. The sea is higher, waves lapping against the buildings, foaming at plastic door jambs. There is singing.

Small monkey-like creatures dance back and forth in front of us; "Don't go," they cry, "don't go; come with us!" But we ignore them; we have already made our choice . . .

Estee. She laughs, a high squealing trill, and tosses back her head, sending her long hair back over her shoulders and down past her dorsal

fin toward her arched tail. She circles me in the water and the singing is louder now, more insistent. The Changemasters change themselves and go . . . Estee circles me in the water, touching me with her flippers, rubbing her warm soft flank across my back. "You're confused," she says, laughing . . .

"Confused," I say.

"Are you awake?" asks Donald Duck from somewhere.

Awake? Am I? "Yes," I say more to myself than to Ka-dhrill. The mask is unbearably hot, stuffy, difficult to breathe. I fumble at it weakly, trying to find the catch. Then things become clearer, and I relent.

The stars seem brighter now, and much closer. The whales are no longer singing, but my hearing is completely restored, and I can hear the quiet slapping of the water around me very clearly. I am very thirsty, but something keeps bothering me, something I want to remember. Then I know. "Dolphin," I say. "She became a dolphin."

"They have gone off to feed again," says Ka-dhrill, misunderstanding me. "There are no sharks around."

Sharks, I think; sharks . . .

It is very quiet. The stars are high and as yet no sign of dawn. Drugs are wearing off, pain returning, difficult to breathe. The water-splint heavy on my arm.

The whisper of the sea is wrong, ambience is wrong, something I sense but can't identify.

Something about cities . . . she became a dolphin and the city was sinking into the sea. And the people . . .

I fumble with my left hand in the med-pack and give myself another injection. Seachange. But it's not the right word. Seachange . . .

The sea is smooth, gleaming black, and the stars overhead are bright. A light mist hangs over the water, here and there lying in desolate tatters like the fading remnants of smoke from an autumn fire.

Ka-dhrill seems anxious; he bobs nervously above the surface and spouts rapidly, anxious to duck his head underwater again. I think: he feels that he should be doing something, but is forcing himself to be still. But that isn't it; he senses something. Sharks? I look for the dolphins, twisting around with difficulty, but cannot see them. Feeding again? Bottom-dwellers come up at night and feeding is usually good. But the surface seems too calm for that. Something is wrong. About to happen. Alice in Wonderland; something to happen.

On the horizon; hard to see at first, a glow, faint but growing stronger. Ka-dhrill is facing it, waiting. The whales are active now also, spouting and thrashing around, and I can sense their excitement even from here. The glow

comes closer, miles wide, the mists lighting up with it and reflecting it back onto the sea. Then the first silver bodies begin to dart by, quick slashes that set the dark water on fire, and thousands follow.

They are Pacific albacore, a species of tuna running around thirty-five pounds each, moving in a vast, oval school that we are going to pass through the middle of. The pressure wave in front of each long body excites a cool phosphorescence out of the sea, and the wake they leave behind them bleeds with luminous purples and greens.

Ka-dhrill becomes frantic with excitement. He lunges forward sending a glowing wake far out on either side and sending a sheet of water up over me, twisting my arm back painfully. He moves to intercept one of the tuna, positioning himself to be directly in its path. The fish feels the pressure wave he sets up and moves to dart aside, but Ka-dhrill has anticipated him, and with a sudden burst of speed he grabs the fish, a loud crunch, and the silver body has disappeared, swallowed whole. Ka-dhrill grunts with satisfaction.

I in the meanwhile dangle on his back, thrown about in the harness like a rag doll by the force of his lunge, my mind dazed by the wild colorplay that lights up the night all around us, every drop of water or flash of silvered body feverbright.

"One more," says Ka-dhrill in his quaking flasetto, "one more to take the edge off."

"Veto!" I shout, rousing myself. "No way! Starve! When I'm dead you can eat me!" But he is already tracking another streaking body.

VI

The school has passed and the sea is calm again, but still tingling with barely-suppressed light, so that every movement brings forth its own tiny glow of color. Ka-dhrill has returned to his old stance on the surface, forcing himself to act relaxed, but he is still terribly excited. The whales are nowhere in sight, probably off chasing the tuna, gorging themselves on the rich, sweet meat, but the dolphins have returned and move cautiously around us, aware of Ka-dhrill's excitement and not wanting to take any chances.

My head is cleared somewhat, and I begin to consider the strange dream. Part of it was mine, the things about Estee, but another part of it, the setting and what was happening, that came from somewhere else. I'm certain that it came from what the whales were singing.

Translating the whale languages is not difficult if you have the proper equipment; understanding them is. The orientation is all wrong. Touch, for example, has social, sexual and communicative overtones that simply don't exist in land creatures, and for another thing, much of what one whale

says to another is in the form of altering the condition of the air cavities in their heads, synonymous with the way we read each other's facial expressions; but of course such sonic interplay has no meaning to a human, who lacks the physical equipment to join in. And since the messages almost always deal with present activities, the subtleties and shades of meaning can be almost limitless.

Yet these whales were not discussing the shade of the water but were recounting something, reciting as Ka-dhrill said . . .

"You know!" I say aloud. "You understood what they were saying, the whales before the albacore came." He does not answer, but his anxiety is readily apparent, and the dolphins, sensing it, quietly back away, leaving us alone to settle whatever it is that has come up between us.

Still he does not reply.

"You know," I say in a quieter voice, "you could understand what they were saying, the city sinking into the sea, the people becoming dolphins; I could understand it too, parts of it, a word here and there, not consciously, but in my dream. But what was it? Do they tell stories to each other? All the human cities will be swallowed by the ocean and men will join them, become cetaceans? A reaction against the harm that man has done them? Do they have any such stories? Tell me, damn it! Why didn't you tell me you could understand their language?"

"I?" he says, giving a thrash with his tail that brings us well up out of the water, to sink back under the surface a moment later with battering force. "What am I? A bribe to satisfy the UN, a freak, neither whale nor man, unable to assimilate with either. While with you I have to adhere to your ridiculous morality, and when I want a female I usually have to fight the pod bull and probably half of the other males as well. You at least can go back to your own world for your week-long orgies, but what can I do?"

But I recognize this tactic; he is stalling, dragging out self-pity as a shield against my questions. "So cry all over yourself later," I say. "But first tell me about these stories."

"They're not stories," he says, sounding like an angry Donald Duck. "They're . . . songs, I suppose." He pauses for several seconds, as if making up his mind about things, then calms down again, and returns to cruising just under the surface so that I ride just above it. "They're old songs," he says. "Only the big ones keep them. The language is old too; it's not the one they usually use. Sometimes they drag it out and repeat the old songs. I don't know why. They don't mean anything . . ."

Old songs. Old? My arm and chest hurt, but I ignore them. How

old? But then Ka-dhrill says, "It's nothing so unusual, you know; it's been known for a long time that we were once land animals who took to the sea. It's an old story anyway; nobody cares now . . ."

But I am no longer listening.

The implications are stunning. Thirty to fifty million years ago the cetaceans were land animals. We know this, despite the fact that no fossils have ever been found of their land form, nothing except a small mammal that may have been a very remote ancestor. What Ka-dhrill is saying is that the cetaceans were sentient thirty million years ago, that they built cities, and that they still keep chronicles of those times, songs kept and repeated for thirty million years. "Impossible!" I say aloud. "It just can't be! The song was about land creatures changing themselves into sea mammals. Changemasters. That's genetic surgery on a vast scale, and thirty million years ago, perhaps even longer. It's ridiculous!"

He does not reply.

We drift in silence for a while. The eastern sky has begun to gray slightly, and a slight wind is rising. A new dawn rising; but symbolism always annoys me so I shrug off the idea and wait.

"They had to make a choice," he says at length. "Either to live your way, struggling, fighting, never enough food, always having to change, to adapt, never any rest, build and destroy, create and tear down; or to move into the warm, rich seas, where food is plentiful, and there is time to rest and play and enjoy the many sensations of existence. They were probably living half in the water anyway, the songs only tell about cities by the sea, so the final choice was easy."

"Thirty million years. And in all that time you never changed."

"Of course we changed: All things change. We adapted, we specialized, we became even better at living in the sea. But not much; once the major changes had been made, the rest was simply a matter of enjoying it. And we did; generation followed generation, and always the sea provided, the sea cared for us."

Small monkey-like creatures dance in front of us . . . "Until we came along," I say.

"Yes," he says. "You came along. You evolved, you became too plentiful, too powerful, too efficient. Yet even faced with extinction, it's still terribly difficult for us to organize, to rouse ourselves to group action. The big ones don't seem to be able to do it at all. We "killer whales" are luckier; we have always liked men, cooperating with them was easier for us. That is why we work so well together, you and I."

"Why do you like men?" I ask.

He does not answer, so I go on: "They were semiaquatic even then, shore-dwelling, sentient land mammals, not primates, but a different

racial group altogether, a species without the physical equipment to do complex construction. They had the intelligence to, but they needed hands to carry out the actual operations. Small, hairy hands, protomen who could be trained to do complex manipulation, like trained dogs . . ."

"No, not dogs," Ka-dhrill interrupts. "Your trouble is that you destroyed all of the slightly less intelligent creatures on the land; you still have trouble conceiving of races with just slightly less intelligence than your own. Besides which, they weren't men. Perhaps you evolved from them, but . . ."

"But we look like them and you remember."

"Not remember. A racial memory perhaps, like your Garden of Eden. Sometimes the big ones tell stories, sometimes we can understand them; we have little else in common with them, you know. They're one of our food sources. Perhaps our ancestors were enemies before the change. But we both feel kindly disposed toward men. You remind us of something. Perhaps the way that you like small, furry things. It was a long time ago, even for us. What difference does it make now?"

But I am no longer listening. I am in the streets of a drowning city, watching small nimble monkeys performing complex surgical operations under the eyes and instructions of larger, clumsier, but more intelligent beings. Change-masters.

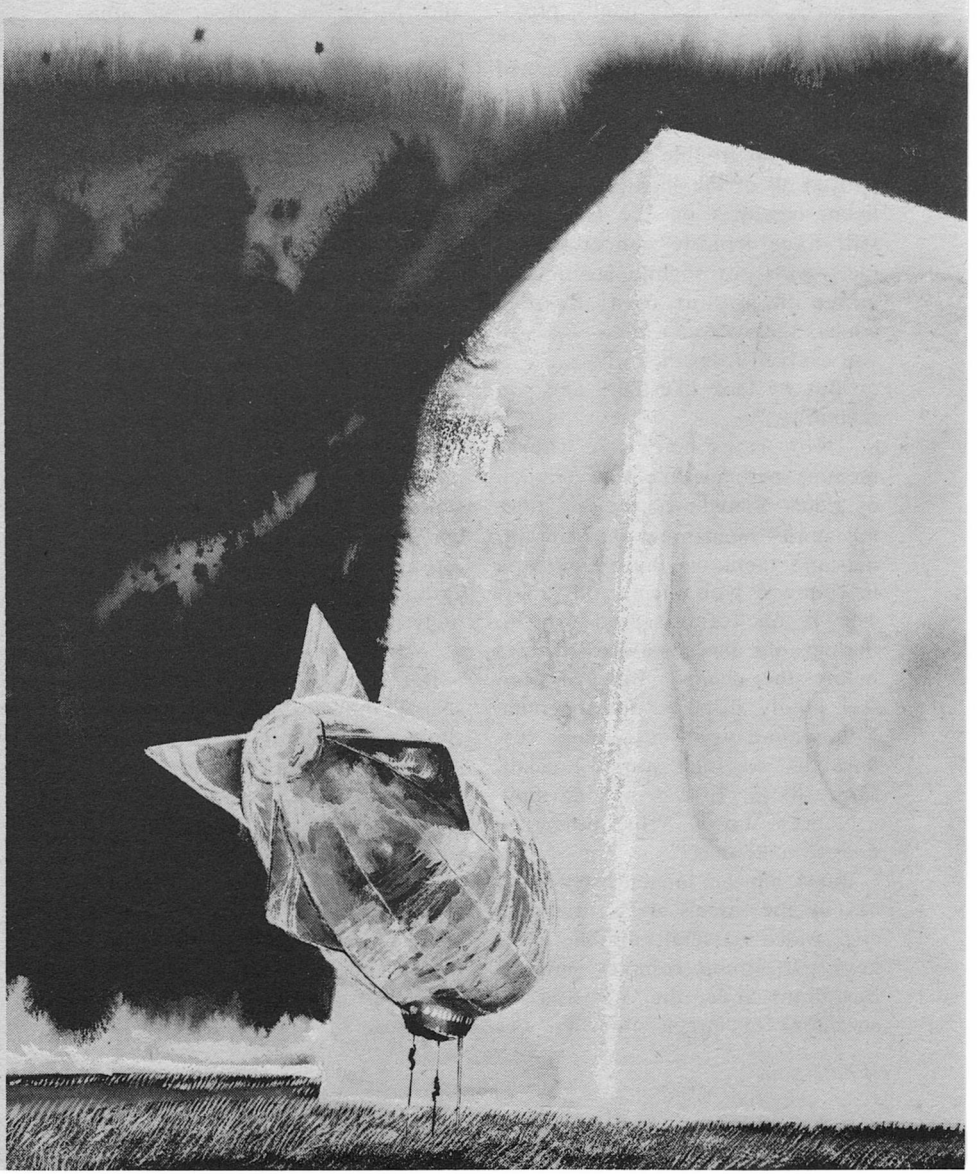
The morning sun is hot on the water, for we are near the equator, and the whales, bloated with albacore, are moving very sluggishly through the warm currents, leisurely making their way south. We unhurriedly follow. Turrel is constantly bobbing up out of the water with reports of sharks, coming to clean up after the feast, and the dolphins stay close just in case, but I am not really concerned. No shark in his right mind would attack a full-grown killer whale, even one saddled with an injured man.

My chest is beginning to bother me quite a bit, and I am beginning to worry about internal injuries; I have coughed up blood several times this morning. I feel sick and very tired. Ka-dhrill has been moving nervously back and forth, as if getting ready to say something. Finally he says, "Olaf?"

"Yes?"

But he does not ask. Damn the sea, I think; damn the stinking, slimy sea and all the things that slither through it. I yearn for the firmness of dry land, the smell of salt-free air. Racial pride is a terrible thing. A dream of Estee.

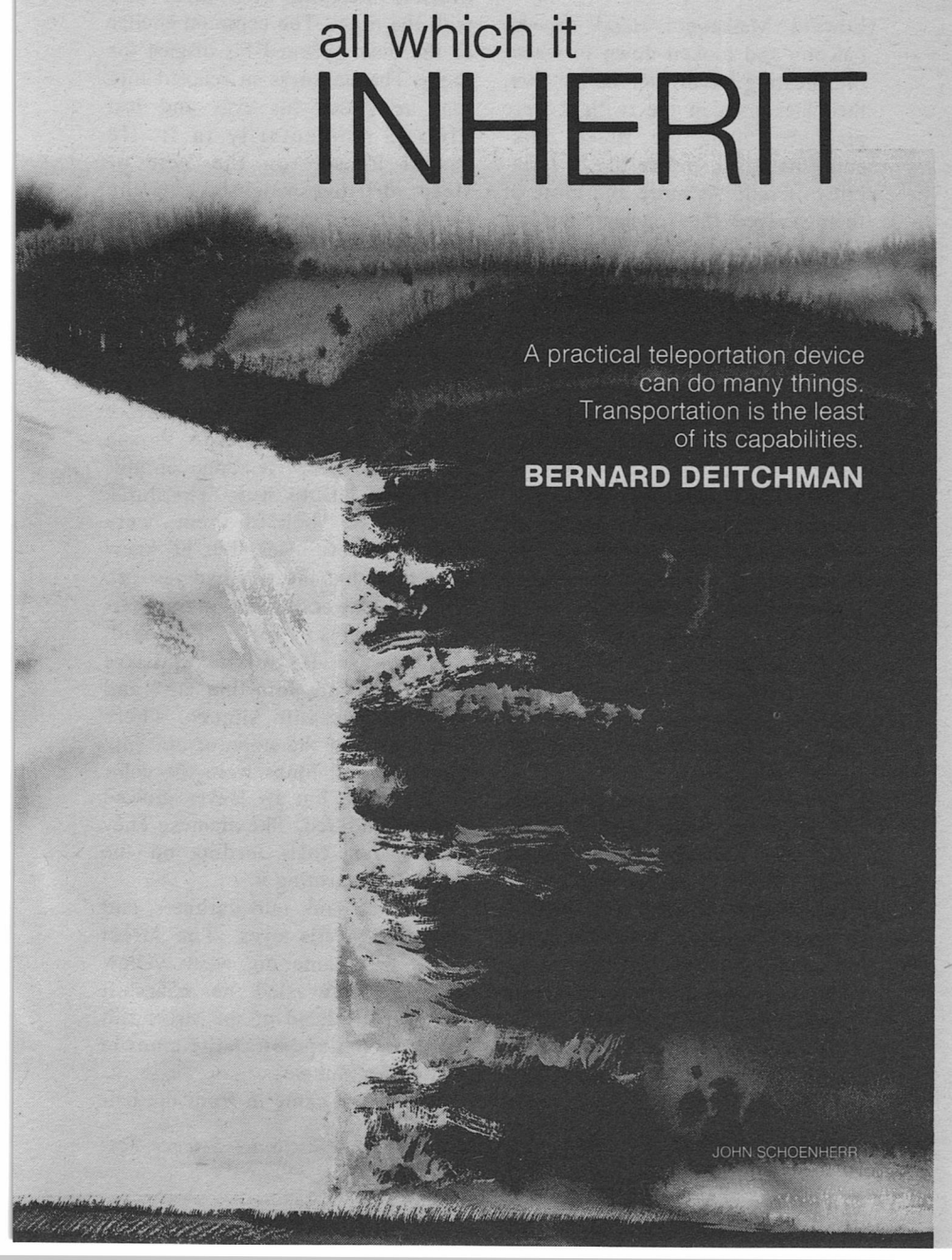
"I won't tell anyone," I hear myself saying. "We'll talk about it when I get back." But his reply is lost in the swirl and whine of the hovercraft engine as it settles down beside us. ■



all which it INHERIT

A practical teleportation device can do many things. Transportation is the least of its capabilities.

BERNARD DEITCHMAN



JOHN SCHOENHERR

I

Edward Massaquoi stood on the balcony and looked down to where the meeting would be. Below him, the black men in the twilight were gradually filling the street, darkening its dusty surface like a sprinkling of rain. As more and more of them arrived they pushed together and overwhelmed the brown street with black.

A politician, Massaquoi was a crowd-watcher of long experience. But this crowd defied simple watching. It needed to be heard to be fully appreciated. It was not enough that its members carried fetishes—shells, bones, stones, or other common objects—but that nearly every person in the crowd was in steady consultation with his charm. The sound of whispering lapped around the balcony, and the politician in Massaquoi observed the scene with envy. These people never paid such attention to their leaders, he thought, and below his envy he was disgusted with the crowd.

To his left the street pointed toward jungle. The smell of damp vegetation rode the wind over the Capital down from the green tableland behind the city, bringing with it memories of a boyhood in the rain forest beyond the dark heights. The memories were comforting. While the men gathered in the street and melted into the falling night, Massaquoi was reminded of his own blackness, and he sensed himself merging with them and with the night. The common shelter of the dusk lessened his disgust for them. The darkness so relaxed him that he closed his eyes and lost himself momentarily in it. He caught himself on the edge of sleep, drifting weightless in the warm air. He opened his eyes, his legs swaying against the balcony rail.

Tired. Fall asleep and drop like a stone into the crowd, he told himself. No way to end a promising career. But he closed his eyes again anyway, and a dreamlike feeling touched him even though he did not sleep. A range of hills appeared before him. The hills, and the sky behind them, were purple, almost black, but he knew somehow that the sun had just set. There was a rumbling in his ears that became a voice that said, ". . . were all spirits and are melted into air, into thin air," and then gargled into silence. There was a tree on the slope of one hill. Its trunk and limbs were the color of the hills, but its leaves glowed orange and red, like flames. They blazed, hot coals feeding on the wind and warming it.

The tree sank into darkness, and he opened his eyes. The street lights had come on, weak yellow globes that revealed the makeshift stage at the head of the street still empty. Whispering, the people waited for Bukele.

Massaquoi came in from the bal-

cony to the gloomy office behind him. The President of Liberia sat at his desk, and before him was a chunk of granite the size of a pineapple. His right hand rested on it, and from time to time he murmured to it. His desk lamp made a sphere of light around him and his fetish.

Massaquoi went to the bookshelves and switched on a floor lamp. President Grimes looked up from his rock. "Need something, Edward?"

"Shakespeare."

"Second shelf from the top. My own from school, one of the few I was able to save."

Massaquoi reached up for *The Complete Works.* He set a chair by the lamp and sat down and opened the book. On the inside front cover was written, "G. A. Grimes, 1942." Forty-nine years ago, a world away.

But *The Tempest* lay safe between the covers, its island universe undamaged by time and real tempest. In the lines he sought, the wizard's vision had the ring of prophecy:

Our revels now are ended. These our actors,
As I foretold you, were all spirits and
Are melted into air, into thin air:
And, like the baseless fabric of this vision,
The cloud-capp'd towers, the gorgeous palaces,
The solemn temples, the great globe itself,
Yea, all which it inherit, shall dissolve
And, like this insubstantial pageant faded,
Leave not a rack behind.

Prospero, the man for our season, Massaquoi thought. His island was no more enchanted than our country. But the spirits in the *piomdos,* in the fetishes, showed no inclination to melt into thin air. Was there meaning to the dream, the poetry and the tree, nonetheless?

Massaquoi glanced at Grimes, who was once more giving rapt attention to his rock. Dreams and *piomdos,* Massaquoi remembered, were linked in the old tradition, before Godsoul. Before Godsoul. How many times do we say that every day? We should change our calendars, from AD to AG.

Godsoul: its appearance coincided with the arrival of spirits in Liberia, multitudes of gods who were not shy about communicating with mortals. Among the Gola tribesmen there had long existed the tradition of the *piomdo,* a material object inhabited by the soul of a dead man. With this sudden infestation of everyday objects by beings of unknown origin, the Gola tradition was dusted off as a convenient—though certainly inaccurate—explanation, and the name stuck. And with these beings came the flood waters that covered the West

African coast and washed over the old Capital of Monrovia, driving the coastal Liberians–for the most part descendants of the freed American slaves who founded the nation in 1847–east into the rain forest that separated them from the tribes of the interior, the people whose land the Republic had been grafted to. There they renamed a hamlet "Monrovia" and worked to rebuild what they had lost.

Godsoul: heat that freed water from the ice caps, and earthquakes that wrinkled and split the skins of continents; Europe sent to a watery grave unmarked except for the tips of a few mountains; new land raised in the re-formed Atlantic, freshly exposed seabed scattered with the remains of Godsoul itself.

Godsoul: the comet that blossomed out of Jupiter; many times the size of Earth, it trailed its guts across the sky and shrank to a whisper of itself before exploding across the North Atlantic. But even then it was an enormous whisper, one that spread twenty billion tons of debris over an area of fifty million square miles.

Godsoul: a curse, a wedge driven between the two parts of Liberia. Massaquoi was a tribesman, and the tribes were godless. Only the descendants of slaves were visited by *piomdos.*

Grimes was finished with his rock. He put it on the shelf behind his desk, and before he could start in on the paperwork before him, Massaquoi said, "Before Godsoul–"

"Yes, Edward?"

"According to the Golas, a man's *piomdo* was identified to him in a dream, wasn't it?"

Grimes nodded. "In the original tradition. The person then was expected to go out in waking life and find the object he had dreamed about. But just between the two of us, I doubt there were any actual spirit contacts before Godsoul. The Golas were superstitious about the dead, and this business of the *piomdo* was just a bit of hocus-pocus for them."

"Aren't all cultures superstitious about the dead?"

"Maybe. What are you getting at?"

Massaquoi described his dream of the tree. Grimes listened with interest, and said, "Dreams can have meaning, but I doubt that yours had anything to do with a *piomdo.* True, trees can become *piomdos,* but where would you find a tree like the one in your dream?"

Massaquoi shrugged. "There's more," he said, and he read the passage from Shakespeare.

"Wonderful poetry," Grimes said, puzzled.

"The lines '. . . were all spirits and are melted into air, into thin air,' came to me in the dream, just before I saw the tree."

"They did?" Grimes was cautious. "Just those lines?"

"Yes."

Grimes had a good idea what meaning Massaquoi would give the dream, but he said nothing. He took down his rock and consulted with it for several minutes. When he was done he said, "Nothing. I can't learn anything about your dream."

"I think one possible meaning is obvious."

"That our spirits are nothing but thin air? That they are imaginary? But they aren't."

"They may end up that way," Massaquoi said.

"But how?"

Massaquoi considered. "Maybe as a result of the expedition. The dream came at the right time."

Grimes moved the rock aside. He leaned across the desk on his elbows. His brown face was thin, and its deep shadows revealed not so much old age as hard times. President once before, years before, he had taken over the remains of government after the flood; called from a peaceful retirement, he looked forward to turning the government over to Massaquoi, his Vice-President, before much longer.

"You've never felt the *piomdo,* Edward, and that may lie behind your dream. You really don't want to believe that there are spirits in the world, that there have been for six years."

"Perhaps I have difficulty accepting a thing that may destroy the country," Massaquoi said. "We got through the heat and the floods, but I don't know if Liberia will survive these spirits."

"You honestly believe that? You aren't willing to tolerate the *piomdos?*"

"I didn't say that. Do you know that the tribes are being called savages, ignorant heathens, again?"

"What, here?"

"Never in front of you, but they are, here and in the other new settlements."

"And you never thought to bring this up before?"

"Until this morning I thought that raising hell over it would only make things worse, and that as long as the government stayed neutral toward this spiritualism the name-calling might die down in time. But now the whole country thinks that rock runs the government."

"You mean the *Liberia,* don't you?"

"Yes. It wasn't built to ferry Bukele anywhere his heart desires. Until today I thought you were still sending us east, no matter what the spirits said."

"You've got this wrong, Edward. No one, myself, Bukele, or the *piomdos,* gives such orders about the *Liberia.* The people built her. If I hear them right, they want her sent to America."

"If it's still there. And what do you hear, people or spirits?"

"I—"

"And can you call this a decision of all the people, even if we forget

the spirits for the moment?''

"No, I admit that I can't."

"Because it's really the decision of spirits, and spirits that speak only English at that."

Grimes tried to distract him. "When they speak at all, which is rarely. Mostly, you know, they just give us pictures, feelings of companionship, warmth. Anyway,'' Grimes said, trying to be humorous but sounding defensive, "English is the official language of Liberia."

Only because slaves brought it here, Massaquoi said to himself. It is not the language of free men. And then he stopped himself angrily. I sound like a whining child, he thought. Grimes is a good man, don't take it out on him.

"But would you keep the spirits if they threatened the unity of the country?" Massaquoi asked.

"No, of course not. The nation must include the tribes. Making them part of it has been the burden of this government since President Tubman. Anything going counter to that can never be a blessing, spirits or no spirits."

Grimes paused to listen to the sounds of the crowd. "And we will do something about this slander of the tribes, most definitely. But I can still hope that your fears are exaggerated, can't I?"

"Yes, but if I could I'd rid the country of spirits today. I wouldn't hesitate even for your sake. They are more of a danger every day."

Grimes sighed. "Perhaps. Certainly you are on the right side if you would destroy them because they threaten the unity of the nation. Forgive me if the benefits I get from the spirits have made it seem that I take President Tubman's legacy lightly. You have a feeling for the unity of the nation that I haven't seen in far too long. If you are right. . ."

Grimes stopped, and listened again. The crowd was becoming louder. He stood up and turned off his desk lamp. "The history of this nation is, I think, unique, Edward. We matured while we were losing territory to imperialism, we did not grow up by feeding on the land of others. I believe that has prevented us from being fools as often as other peoples. I think we have a more reasonable view of the world as it is. If some of us have become fools about these spirits, well, we are still human. Don't be too harsh with us."

Grimes walked out on the balcony, and Massaquoi followed him. The crowd was parting to let Bukele through. Massaquoi looked at them again. Yes, they were a sensible people. Even a man who touched a deep vein of feeling in them, as Bukele did, could not rouse them to hysteria. This was a characteristic of the tribes, this equanimity, and Massaquoi liked to think the others had learned it from them. In any event, Liberia was a trying place for an enterprising fascist.

Bukele was nearing the stage. "There's the man to talk to about spirits, or dreams," Grimes said.

"I've tried. He talks a lot, but he doesn't make much sense."

"The impossibility of putting experience into words. I think that his ability to interpret the *piomdos* is real, though."

"But why is it so much greater than anyone else's?"

"It seems to me that he asks them better questions and knows how to get more out of the answers they give."

"That's the sort of thing I got from Bukele."

"Then you know as much about his powers as I do."

Bukele climbed onto the stage. He was tall, lean and light brown; the muscles of his face, neck, and arms stood out under the skin.

Bukele, born Aaron Roye, was the great-great-grandson of a Baltimore slave who had been a pioneer in what became Maryland County in Liberia. Aaron Roye took the calling of *piomdo* evangelist after a career in physics was ended by the arrival of Godsoul. It had been a career on the verge of eminence.

Three years before Godsoul, the United States had opened a public teleportation system. The teleport revolutionized travel within North America overnight, and brought requests from the rest of the world for access to it. No request was made more strongly than Liberia's.

Teleportation would be expensive for Liberia, but necessary regardless. Transportation in the interior was still often limited to short river routes and jungle paths. Farming was not much better than subsistence, and economics based on barter and a crude system of currency involving heavy iron tokens beat into flat T-shapes. Teleportation offered to bring the interior tribes into the economic and political life of the rest of the country within a generation. With the advantage of long-standing friendly relations with Washington, Liberia lobbied heroically for the first terminus outside North America. And, perhaps surprisingly, won it.

Aaron Roye was selected to head the team of scientists and technicians who would set up the terminus with American help. He and his group spent a year in schools in the United States, then returned home to prepare the groundwork for the advisers who would follow. But Godsoul intervened, and the Americans never arrived. Aaron Roye went with the project to oblivion, and Bukele was born alongside the *piomdos.*

Many of the people with fetishes had difficulty grasping the impressions, ideas, rare words, that came from their *piomdos;* often only the genuine warmth and friendliness of the fetish came through. But Aaron Roye showed a great knack for interpreting what came from the spirits, much as early Freudians showed an equally great knack for

divining dreams. Roye took the name of a legendary tribesman who had developed the only alphabet native to Liberia, and hit the hallelujah trail.

As Bukele came to the front of the stage, he set his own *piomdo* against the railing. His fetish was a ritual mask many times life size. Black, with white slashes to accentuate its features, it was of the sort used by tribal dancers. Like its owner, it frowned sternly.

Unamplified, Bukele's voice carried crisply down the street. He was a fussy man in front of a crowd, and impressed with himself.

"My friends: I bid you congratulations. I bid you good-bye. Congratulations for your victory today, and good-bye because of it. We have accomplished what the spirits desired. I shall be going to America."

Grimes said to Massaquoi, "He talks like a general. I'm sorry I had to let him go along."

"He won't bother me, and I doubt he'll bother Dahn."

"I know there are doubters among you," Bukele continued, "therefore let me tell you, this journey was demanded by the One who sent you spirits, that I might prove my power to you, the power given me by God. I have been called a charlatan, and worse, but those days are dead, for when I return, you will know my power. Unbelievers, I know you are there. You cherish the spirits, yet you will not admit that they value me. You use my knowledge of them, but accuse me of self-seeking. My power is real. Look!"

Bukele pointed melodramatically at the western sky, and at that moment the street lights went out. Their eyes adjusting to the dark, the people in the street could see Jupiter dropping brilliant on his course.

"He has the very utilities in his pocket," Grimes complained.

"Godhome," Bukele said. "Note it well. Before I return it will burn a thousand times brighter, by its own light, and become a second sun and be seen in the day. It will be God's proof of the power He has given me, and you will believe."

Someone cleared his throat, loudly and carefully, with outraged skepticism. Several others tried to cover laughter.

"Comedians! Doubters!" Bukele yelled. His voice went high, turned shrewish. "You are a nation of fools, and sometimes I believe that God has blessed you, alone of all nations, with spirits simply to cure you of your vain doubting, that you might cease to be giggling fools." A few people giggled in the dark. "Enough!" The lights came on. "Laugh if you can when I return!"

Grimes shook his head at such shrill flatulence. "Father Divine doing Mussolini."

"Father Divine?" Massaquoi asked.

Grimes did not hear him. "Bukele is a man with power, maybe even genius. But I hope we are not as simple-minded as he seems to think we are."

"Will he dare show his face here again, after that boast?"

"I imagine he would dare anything. But maybe he really does know how to make Jupiter a star. Did you think of that?"

"Are you serious?"

"Half-serious. I had thought that your career alone hung on the success of the expedition. But I forgot to consider Bukele's. He is after more than notoriety. If Bukele returns with a new star to light his way, what will he want?"

"To be proclaimed God, I suppose."

"It has probably occurred to him."

Bukele managed to control his ire. He rambled to a conclusion, and the time had come for interpretations, the time that most of the crowd had been awaiting. A long line of people formed. They needed light thrown on things their spirits had told them, and Bukele met patiently with them. When Massaquoi and Grimes left the government building hours later, the line was still formidable. The meeting lasted until dawn.

II

Roberts Field had once been miles from the sea, but now what was left of it lay within the sound of breakers. Liberia's only large airstrip was in ruins, its buildings canted and empty, surrounded by jungle. Earthquakes had buckled its tarmac and exposed the earth beneath, so that vegetation sprouted between chunks of runway. Yet in this setting of gloom and rot, air travel was to be restored to Africa.

The *Liberia*'s hangar was the only building in good repair. A steam truck arrived at its gaping entrance in a shrill cloud of vapor. Massaquoi climbed out of the truck's cab and walked into the hangar. The truck, a mongrel contraption with a huge, ancient boiler, turned back the way it had come, trailing a chorus of whistles and sighs.

It was cool in the hangar. Above Massaquoi the dirigible hung, a smooth gray shape curving up into the shadows under the roof beams. Ground crewmen worked at her mooring lines and engines, preparing her for flight.

Among the workers, overseeing them, was Segbeh Dahn, the *Liberia*'s captain. Massaquoi stopped to talk with him for a moment. Dahn, a Gio tribesman and former helicopter pilot for Firestone rubber plantations, was a solid, even regal, individual. Massaquoi had at first been uncomfortable working with him, thinking that he would,

as captain, resent another man in charge of the expedition. But Massaquoi found Dahn competent and unpretentious. Problems of protocol did not affect him.

Massaquoi moved farther into the hangar. His eyes moved over the lines of the airship, this thing that had taken so much time and labor out of their efforts to reconstruct their country. The *Liberia* had originally been part of a Firestone plan to set up rubber plantations in the interior. Whether the plan was viable, and the airship a practical means of transportation in the jungle, was never tested. Before she was completed the market in natural rubber had plummeted, and the plan was abandoned. Her frame was dismantled and left to rust in the hangar. But in the wake of the comet, the dirigible became an attractive means of re-establishing air travel. With runways in ruins all across the continent, heavier-than-air craft were impossible to get off the ground. And even if one did manage to get airborne, there was no way to know if it would find a place to land when it got where it was going. But all the *Liberia* needed was open ground. It did not even need to be especially level ground, just free of large obstacles.

The expense of her construction and operation was immense in terms of the limited resources Liberia had left after Godsoul. The rest of Africa had given up most modern forms of transportation for the time being, and Grimes, when he proposed rebuilding the dirigible, had run into strong opposition. His opponents argued that there really was no place to go with the airship, most of the continent being worse off than Liberia. Grimes conceded the point, but argued that a return of air travel would be as much a spiritual accomplishment as a technological one, a sign that the tools of civilization would not be allowed to fall into disuse. As he usually did, Grimes prevailed. And in the shade of the finished product, Massaquoi was able to appreciate his judgment. There is something in us, Massaquoi thought, that dreams of flying. To give up the dream of flight would be to deny a large part of ourselves. We cannot go backward, not even a step. And we aren't. We're moving again, and here is the proof.

Bukele arrived at the hangar as the engines were being covered. Carrying his fetish, he climbed aboard the airship with only a nod for Massaquoi. A few minutes later Dahn and Massaquoi boarded her. There was no fanfare for the *Liberia* as she was walked out of her hangar. Grimes had refused to declare a holiday for her departure, and only a few bystanders were around.

The ground crew let go the mooring lines and she drifted lazily over the useless runways as her en-

gines picked up speed. Then the lines were withdrawn inside her, and she glided off toward the sea.

It was an advantage of the *Liberia* that she flew at relatively low altitudes. The impact with Godsoul had reversed the Earth's magnetic poles and caused a weakening of the planetary magnetic field. One result of these magnetic disturbances was an increase in the level of cosmic radiation reaching the Earth. It was as yet unproved that this increase was dangerous to life, but Dahn took no chances. He flew low, where the atmosphere acted most effectively to dampen the energy of cosmic rays.

Habits of thought were stronger than the readings of a compass card. With the switch of the poles, instruments told the expedition it was headed southeast. But the men called it northwest, and left it to a younger generation to accept if they could that the sun rose in the west.

On the second day they encountered some of the new lands raised by Godsoul. Islands appeared, isolated dots of mud that gradually formed larger aggregations that made archipelagoes from the sea. Beyond these were even greater masses; some, whose size could not be determined, might have been minor continents. More than three thousand miles of these newcomers disrupted the Atlantic and reduced it to remnants, mere puddles, of its old self. The only vegetation on these lands was thin, dull green stuff. The *Liberia* weaved her way among them, all hands eagerly in search of wonders, sunken cities and buried giants, only to be disappointed.

They at last reached the open sea again, and two days more brought them to what should have been the coast of Florida. Massaquoi spent most of his time in the steering car, as did Bukele, so that both of them were there to see the unbroken ocean where North America had been.

Massaquoi expected some reaction from Bukele when Dahn told them where they were, but he took it all calmly.

"Is this what you had in mind by America?" Massaquoi asked him. "The New Atlantis?"

"America still exists," Bukele said. "Some of it, that is. The *piomdos* were not wrong."

Dahn asked Massaquoi, "What do you think? Do we go on?"

And Massaquoi asked Bukele, "I suppose you think we should?"

"Of course," Bukele said. "If we continue northwest, we will reach land before long. Would you have us turn back?"

"Maybe," Massaquoi said. "What are we going to find when we get there? Did the *piomdos* tell you that, too?"

Bukele ignored him, said to Dahn, "Northwest, Captain. America is there."

"Massaquoi?"

"All right, let's go have a look at whatever these spirits have in store for us."

The next day they reached a coast of high gray cliffs that dropped straight into the sea. There was no beach to absorb the force of the swells, and long lines of waves beat against the cliffs and hid them in clouds of cold spray. The *Liberia* circled up before the coast and floated over the crest of the continent. Grasslands, deep green in the afternoon sun, rolled west, with here and there a few trees. And the higher the *Liberia* went, the more excited her geiger counters became at the news they got from the sensors along her spine.

III

That night they carefully searched the prairie for lights. But they found none, and the occasional remains of a village or town, revealed the next morning, said that it had been a long time since there were lights here. The continent was green and silent, seemingly empty of humanity.

It was not until late the second night that they had any sign to the contrary. Massaquoi was awakened by a crewman sometime after midnight, and listened sleepily to the man telling him there was a light to be seen from the bridge, and that Dahn thought he would be interested. Massaquoi made his way forward, and found the steering car completely dark. Not even the red instrument lights were on. A weak grayness showed where the windows up forward were, and outlined against them he saw a group of men.

Dahn was among them, searching the night ahead with binoculars. Massaquoi came up and looked in the same direction. At first he saw nothing but darkness, but then found that by moving his eyes along the plane where the horizon should be, he could sense a weak glow dead ahead of them. When he tried to look straight at it, it was too dim to be seen.

"Dahn?"

"Ah, Massaquoi." The captain turned and handed him the glasses. "Do you see it?"

"A very dim light straight ahead?"

"Yes. One of the lookouts spotted it a few minutes ago and called me. I changed course for it immediately."

Massaquoi trained the glasses on it. Now he could see it without having to look out of the sides of his eyes, but it remained just a glow on the horizon.

"Impossible to tell how far off it is, or how big it is," Dahn said. "This flat land is deceptive."

By now Bukele had arrived, and he asked Massaquoi for the glasses.

"What do you think?" Massaquoi asked him. "Is it all according to Hoyle?"

"Who is Hoyle?" Dahn asked in-

nocently. "Somebody's *piomdo?*"

Bukele ignored them. He peered at the light for a few minutes in silence. Whatever that is, Massaquoi thought, it's a long way off. The *Liberia* seemed no nearer to it than when he had joined them, and all the while Bukele stared at it, it grew no brighter.

Bukele at last handed him the glasses, and turned away.

"Well?" Massaquoi asked him.

"I'm going back to sleep. It is a long way off yet." He left the bridge.

"He is not an especially good actor," Dahn said.

"No. He was expecting this, I'm sure of it." Massaquoi too had heard the partly-suppressed excitement in Bukele's voice.

It took some time to reach the light. Almost three hours. And the weak white shape, eerie against the empty night, kept changing perspective as they stared at it, so it was difficult to estimate its distance even when they knew they must be quite close to it. But as the time dragged on they came to appreciate how huge it had to be, and they were awed by it.

"How high?" Massaquoi asked Dahn. "A mile? Two?"

The glowing white cube reared up from the plain before them. Like a giant's sugar cube, Massaquoi thought. What in hell is it?

"We can find out," Dahn said. He ordered the ship down to within a few yards of the ground. In her search lights they could see the dark grass. The altimeter read 1,253 feet.

Dahn took them up. The ship cleared the edge of the cube, and the reading was 8,232. They were floating along twenty feet above the top of the cube.

Dahn said, "About a mile and a third."

"I guess that's big enough," Massaquoi said.

"Big enough for what?"

"Who knows? Shall we land on it?"

Dahn shrugged. "I suppose we could. It isn't hot. But I doubt we could moor the ship to it. Let's have a look at the other sides of it."

"All right."

They crossed the top and dropped over the far edge. Halfway down they leveled off and began a circuit of the cube. They found nothing to give them an idea what the thing was. All its faces were the same, a mystery in cool soft light. And when that light hit the *Liberia*'s skin, it turned a colder color, a kind of blue, that bounced into the car and glazed the people there. Massaquoi was relieved when the sun rose, and the strange glow of the cube faded out.

In the daylight they made another trip around it, and a lookout saw a tiny shadow on one wall at ground level. They went down, and the shadow became a depression in the wall. It was an alcove twenty or

thirty feet high, tapering up in the shape of a bullet.

"Can we land?" Massaquoi asked Dahn.

"Certainly."

The ship landed on its one wheel long enough to drop off a dozen men, and drifted away again. As she hovered over them the men pounded mooring stakes into the hard earth. When they were ready she came down again, trailing her mooring lines, and the men secured them to the stakes.

Hatches popped open. Massaquoi, Dahn, Bukele, and a score of others waded through the thick grass toward the cube. When he came up to it Massaquoi ran a careful hand over the ivory surface. There was a liquid coolness to it. It was clean. No dirt or dust stained it, and there was no sign of weathering. Massaquoi had the impression that light penetrated it for a few fractions of an inch to give it a glow like a pearl's. But he knew that must be an illusion caused by the internal glow.

The alcove was wide enough at the base for five or six men to stand side by side. Bukele, his fetish hanging off one shoulder, made straight for it. He stepped into it, and everyone else watched carefully, expecting something to happen.

But all that happened was that Bukele turned back toward them, excitement on his face, and he said, "Teleportation. Remember? The 'Quickie,' the Americans called it."

Massaquoi came up to the alcove's entrance. "Into the cube?"

"Yes," Bukele said, and he stared intently at Massaquoi. "I will return. Wait for me," he said, and he reached into the alcove behind him and touched the wall. A section of material like the surface of the cube slid down to cover the alcove and Bukele inside it. It fit so well that no seam showed. When it lifted seconds later, Bukele was gone.

Dahn came up beside Massaquoi and they looked cautiously into the alcove. On the back wall was a small metal plaque set at eye level:

THE CITY OF TOPEKA
WELCOMES
The Wayfaring Stranger.
Press button to enter. We reserve the right to refuse entry to anyone.

The rest of the alcove was the same unadorned material as the walls of the cube, except for a red button below the plaque.

"Wait for him, he said?" Dahn asked.

"Yes. If he expects to come back, he must know what's inside this thing."

"Certainly. He has known all along what to expect," Dahn said. "We've been excellent chauffeurs for him, don't you think? And I suppose loyalty demands we wait

for him, faithful retainers that we are."

"Or we could go in after him. I'd like to know what he's up to."

"Yes. But we could also leave the son-of-a-bitch here to rot."

Massaquoi nodded. "I thought of that. It has its possibilities."

"It does," Dahn said, and he looked around at the gathered crewmen, some of whom, like Bukele, carried fetishes. "He would be missed for a while, but in time it might be for the best."

Massaquoi and Dahn looked at each other, both thinking how good it would be to be rid of Bukele and his rabid glorification of the *piomdos.*

"On the other hand," Dahn said, "Grimes would have us shot if we left him here. Not because it was Bukele, but just because we left a man behind."

"Yes," Massaquoi agreed again.

Dahn stared up at the towering wall of the cube. As if to himself, he said, "Crap. Bukele has used us well. It's been his show all the way."

Massaquoi watched Dahn, and he knew they were again thinking the same thing. If they could not really leave Bukele behind, they would have to go in after him.

"I suppose there's no great danger in this thing," Massaquoi said.

Dahn sighed. "Perhaps. Who's going after him?"

"I am, right now."

"Alone?"

"Yes. It is still possible that Bukele's plain crazy and that this is some kind of booby trap."

"All right, but how long do we wait for you to come back? A day? A year?" Dahn asked. "And when the time's up, do we leave, or come in after you?"

"I wish I could tell you. If this thing really is a city, it may take time to find Bukele, and I may have problems with the natives. Give me a few days, anyway. If you decide to come after me, just don't risk so many men that you might not be able to get home."

"Of course."

The crew came up to see him off. They shook his hand and wished him luck. They were cheerful, Bukele's willingness to use the teleport having convinced them there was little danger in it. Massaquoi tried hard to believe the same as he stood in the alcove and pressed the red button. Then darkness slid down over him, his last sight their farewell faces.

IV

There haven't been civilizations without cities. But what about cities without civilizations? An inhuman thing, if possible, to have so many people together who beget nothing on one another. No, but it is not possible, and the dreary begets its own fire, and so this never happens.

—Saul Bellow

The room was small, a five-foot

cube. There was space for the chair Massaquoi found himself in and not much else. It made no difference, for there was nothing else, except a television screen set in the wall facing him. There were no doors or windows. Light, the soft white glow of the cube, came from the pearl walls.

He was there half a minute, long enough to bump his head on the ceiling several times during a crouched inspection of the place, before the screen lit up with the serious face of a white man he recognized. The man had been President of the United States when Godsoul arrived.

The picture was blurred and jumpy, with the shininess of much-used videotape—and what else could it be but a recording? Surely the man had not survived the sinking of the eastern United States, and even if he had, could he still be President? The implications of all this were unsettling. Was the cube just a machine, a massive computer, perhaps, programmed before Godsoul for some unfathomable project and still operating untended? And then the image spoke:

"My fellow American: It causes me deep regret to tell you that you are here in this room because you are black. I tell you this at the beginning so you can see I mean to pull no punches.

"Technology has often rescued this nation from serious danger. Now it has come to our aid once more. We have long suffered from problems of racial differences, problems that have threatened our very civilization, as I'm sure you know"—and he had been unable to resist a glare at the camera, as if confronting a street-corner radical. "But the Quickie can solve these problems, difficult as they have been, because it can make you, and all other black people, white.

"Understand me: we can alter the patterns of information we receive from your body when you enter the Quickie. In this way we change your physical characteristics to anything we want. We could make you purple or green when you leave, but what we offer is to make you white.

"It won't be a perfect job. We can't go too far with these alterations, but I guarantee that when we are done, you will 'pass' in white society with no difficulty.

"Further, we will give you an entirely new life, a new name, a job, in fact, a new memory. Even you won't know that you were ever black. What we propose is an unprecedented job of engineering for the common good. But you may be a person who has too much pride in being what he is to listen to my offer with anything but anger. I can understand that. But it is the consensus within this Administration that the nation cannot endure part white and part black. We are tearing ourselves to pieces. We need

racial uniformity, and the Quickie can give it to us."

Massaquoi heard the threat in the syrupy, serious words. He would be given no choice. White or else. But or else what? He felt a trickle of fear start down his bowels; rage was beating behind his eyes. Yet, he could not stop his curiosity. He wanted to roar curses at the screen, but something else told him that here was part of a mystery, a piece out of some complex puzzle that he must solve, and he knew he could not give way to rage or fear. When the image said, "Will you accept our offer?" all he could think to say was, "My God, listen to me, I'm not even an American!"

There was a pause, and the image said, "Am I to understand that you refuse our offer?"

"I don't want to be an imitation of a white man, you can understand that, brother."

The image sighed. "Then we can give you only one alternative, and that is to be placed in cold storage. You will be kept at very low temperatures indefinitely, until we feel that conditions allow for your return to society. We do not feel that we have the right to force alteration on you, yet we feel that refusal to aid the common good makes you a threat to society. You must be kept apart."

What in hell was this? Is this what Bukele had come for, with his boast of making Jupiter a star? To end up a bogus white man or a stone-cold corpse? If so, which would he have chosen, and why? Because there had to be more to the alternatives than there appeared, he felt certain of that. Bukele wasn't crazy.

"Have you decided?"

How can I decide? No, I have decided. I have decided Bukele is crazy, mad as a screaming hatter. Who could decipher such choices but a madman? Massaquoi would try another way: "I am Edward Massaquoi, a citizen of the Republic of Liberia. I have been sent by my government to re-establish relations with the United States. I have ambassadorial rank . . ."

The face on the screen froze, slightly cocked, and Massaquoi stopped speaking. Either the computer had taken this moment to break down from senility, or else his information had stumped it. Maybe there was no response programmed in to calm down waylaid ambassadors. In either event, it did not look too healthy, and a few seconds later the screen went blank again. He began to think that he was in for a long stay in the room. He had to leave the way he had come, or remain forever. If the machine was as bad off as it seemed, forever sounded likeliest. Unless, of course, there were people somewhere behind the computer, people who could take over from its aging circuits and bring him out of there.

He had a few minutes to look at

the gaping screen before the room winked out.

V

He was in another teleport alcove. He stood facing a large room with walls that glowed a variety of colors instead of the white he had come to expect, but their glow reassured him. He was still somewhere in the cube. At that moment, with the threat of oblivion still in his ears, even that knowledge was welcome.

There were men in the room. They were gathered around a long table, looking at him. Two of them he took notice of immediately. Their gray faces told a horrible story, of eyes and noses and lips no white man ever had, and no black man either, a story of a machine's tailoring one to the other's specifications. These were the finished products of the cube, men who had agreed to trade black for white—or the hope of white. Massaquoi was numbed, appalled by what he saw. No one, he thought, could be fooled by such hybrid travesties. The recording had been a joke, its promises a trick played on American blacks. The machine had made them monsters.

Automatically he hated these men. The rage he had muzzled before rose up in him. Trembling, he stepped out of the alcove. One of the gray men was approaching him, saying something that Massaquoi was not listening to. Massaquoi lunged at him and missed. The man darted behind the table.

He went after them, cursing. There was a door behind the gray men, and both of them used it. Massaquoi tried to follow them, but he could not get the door to open. He turned from the door. There had been another man in the room, but his attention had been completely on the gray men and he had forgotten the other.

There was a clicking noise across the room. In the teleport was a panel of buttons, not just a single one as in the cube's entrance. And punching madly at the buttons in an apparently random pattern, was Bukele. Having once escaped the teleport, he was trying to give it another chance at him. The teleport, however, did not seem to be interested.

Massaquoi hauled him out of the alcove. "You bastard, what have you got on your mind? You want back into that thing?"

Bukele, rattled but still blustery, said, "Calm down, Massaquoi, I know what I'm doing."

"You do?" Massaquoi stared at him. "Were we frozen?"

"Control yourself. Nobody was frozen."

"But I was threatened—"

"It was a bluff. They weren't going to freeze you."

Massaquoi tried to calm himself. Bukele's presence was a good sign. They had come into the cube together, and they had both ended

up here. Massaquoi had feared that he had been put in deep freeze after leaving the tiny cell, that perhaps years had passed since he had entered the cube. He hoped that Bukele was right, that it had been some sort of bluff.

Seeing Massaquoi relax, Bukele allowed himself some irritation. "Your hysterics have made some nice trouble."

"Hysterics. Do you know what those men were?"

"Of course. But they don't. I wouldn't tell them."

"You wouldn't? Why? What do you expect to get out of them? What were you planning on doing if you had got that teleport to work just now?"

"That's my business. Nobody asked you to come after me. And I want nothing from those men."

Massaquoi said, "Which did you choose? Cold storage or alteration? Or didn't you get the chance to choose before you ended up here?"

Bukele did not have time to answer. The door slid open and three men entered the room. Bukele pulled a chair away from the long table and sat down. His face smoothed out in a saintly expression. Massaquoi stood near the table and glared at the gray men as they approached.

All three were hybrids, and they were very much alike. Calmer now, Massaquoi noticed things about them that he had missed in his encounter with the other two. The gray men were affected. They walked like men with blisters on the soles of their feet, softly, mincingly. They had soft, pudgy bodies. With their gray skins, they might have been baby elephants walking on tip-toe. When they spoke, they gestured often, their hands never still. Had Massaquoi seen them on a stage, the fat gray men would have made grotesque clowns, but here they were simply repulsive.

"This is the one, William," one of them said, pointing to Massaquoi. "He seems to have settled down a bit, but he came out of the Quickie like a madman."

The gray man he had addressed said to Massaquoi, "You speak English?"

Massaquoi nodded.

"You two are together?" the gray man asked, looking from Massaquoi to Bukele.

The anger rose up in Massaquoi. "How does it feel to be a freak?"

"Freak? Who is a freak?" the gray man asked.

"You, and your twins here. Who else?"

All three gray men were puzzled. Bukele said, "Shut up, Massaquoi."

The spokesman said, "Maybe you'd better tell us who you are, and how you come to be here."

Massaquoi snarled at him, "I am Edward Massaquoi. This man here, Bukele, and I are part of an expedition sent by the government of the Republic of Liberia to re-estab-

lish relations with the United States."

"Is that what the other one told you, Harold?" the spokesman asked the gray man who had spoken earlier.

"Liberia, yes. Oh, I'm forgetting myself, William. This is Mr. Bukele, of course. Mr. Bukele, William Ludlow." Harold looked uneasily toward Massaquoi. "I am Harold Wildeve, Mr. Massaquoi, as I believe I tried to tell you when you arrived."

Massaquoi said nothing.

Wildeve went on, speaking to Ludlow, "Mr. Bukele was having a lovely chat with Tennyson and myself when the gate rang. But Mr. Massaquoi, like Mr. Bukele, did not arrive here immediately. It took us some time to bring him here. We will have to find out where they go when they come in the gate, William. The Quickie is shunting them someplace, and I can't figure out where. And it is quite adamant about what it is doing. I had to invoke 'I tell you three times' to bring them here.

"Of course, Mr. Bukele tells me he was unaware of any delay in coming here, so it may not be too serious."

"Bukele's lying to you," Massaquoi said. Bukele shot him a furious look and shook his head stiffly, primly. Massaquoi said, "Why not tell them the Quickie offered to make you a white man, Bukele?"

Bukele turned away as if to shield himself from an explosion.

"What are you saying?" Wildeve asked with a flutter of his hands.

"The Quickie offered to make you people white?" Ludlow asked.

"It offered to make me white, but what it really would have done was make me a freak, like you."

"Freak? What is this freak business?" Ludlow asked in a shrill voice.

"You are the freak business. Don't you remember? You used to be a black man. Your blessed machines took you apart and put you back together like this. They even wiped your memory clean, so you can't remember they gave you the choice of being white or being put away in cold storage."

The three gray men looked at each other. Their faces were uncertain. Ludlow had the air of a man trying hard to remember something. Perhaps, Massaquoi thought, somewhere in him were still the memories of another man, and Ludlow felt them stirring.

"The Quickie—you say, the Quickie made us—" Wildeve faltered.

Ludlow took a slow, deep breath. "I remember something, something about black men disappearing, before the comet. No one could figure out why. They were just disappearing."

"And here you are," Massaquoi said.

Ludlow fixed him with hot eyes.

"You smug nigger. Who the hell are you, anyway?" He paused, breathing raggedly. "If you're making all this up, we'll kill you."

"I don't think he is, William," said Wildeve.

"I don't think so either. But we'd better find out."

The three of them left, the door sliding shut behind them. Massaquoi tried to get it to open again, but failed to find whatever mechanism operated it. Smug nigger. Indeed. Maybe I was pushing too hard, Massaquoi thought. Maybe I deserved that. Maybe. We'll see.

Bukele went over to the teleport and again tried to get it to operate, but was unsuccessful. He came out of it in a rage, and Massaquoi said, "Is this how you turn planets into suns?"

"I told you to keep your mouth shut. You are quite the diplomat, aren't you? Quite the ambassador."

"Well, what were you up to here? What is this cube?"

"The city of Topeka, like the sign says."

"What's that to you?"

"None of your damned business," Bukele said, and threw himself into a chair. Hours passed, and Bukele brooded and ignored Massaquoi. Massaquoi became hungry. The lights from the walls never dimmed, and he wondered if people slept in this place.

When the gray men returned, they had Bukele's *piomdo* with them. Until he saw it in Ludlow's hands, Massaquoi had not missed it. He had seen Bukele take it into the gate, then forgotten about it. As Ludlow set the mask on the table, Massaquoi saw that there were thick electrical cables running out of it. At the ends of the cables were small black metal boxes. More boxes were fitted into the back of the mask and the cables were connected to them.

Seeing the mask, Bukele sighed, and the sigh ended in a bitter groan. Ludlow said to him, "I take it this thing is yours?"

Bukele could not answer. He stared down at the table.

"It's his," Massaquoi said. "What are all the wires for?"

"A good question. It took us a while to find out. We still aren't sure we know all about it. You know where we found it?" Ludlow's expression was no longer angry. He seemed worried, and tired.

"Where?" Massaquoi asked.

"In one of the rooms where you get the speech about being made white. You told the truth, didn't you? There are several of those rooms in the City."

"Why would he leave the mask there?"

"I don't know, exactly. I do know what all the miniaturized equipment built into it is for. It will deliver your friend outside the city from anywhere inside, without punching the combination for the gate. We don't see how it can be

triggered, or why he would want to do that in the first place. Unless he's up to something we wouldn't like if we knew about it."

"That's very possible. That thing would automatically send him outside any time he stepped into a teleport?"

"So it seems. If he could trigger it, and I assume he could. But it still wouldn't have worked." Ludlow reached into his shirt pocket and brought out a thin strip of metal foil. Bukele looked up to watch, and his face got cold as he heard Ludlow say, "We started using these things after the comet. The gate is the only teleport that will work for you if you don't have one on your person. So all this equipment is useless. No Quickie would have taken him anywhere."

Bukele stared at the metal strip. Ludlow said to him, "There is also some transmitting equipment in this mask, isn't there? Microwave, with a receiver, too. And all of it adapts perfectly to the Quickie's power input. What were you up to? You came well prepared for something."

"Nothing that would harm you," Bukele said.

"Oh? Tell me more."

"There is no more."

Ludlow looked at Massaquoi. "Do you have any idea what's on his mind?"

"He has visions of making Jupiter a star."

"Well." Ludlow shook his fat head. "He does. It has been quite a day, you know that? Are you serious?"

"As serious as Bukele is. It's his idea."

"And you think this apparatus is connected with his, uh, plans?"

"It's a good guess."

Ludlow swung his attention back to Bukele. "You are the strangest thing I've run into in quite a while. I'd sure like to know how you got so well acquainted with the Quickie."

Massaquoi said, "Bukele was a member of the delegation Liberia sent here before Godsoul—the name we have for the comet—to study the teleport. There's no telling what he learned about it, or what he may have discovered for himself."

"Liberia. Yes. There was to be a terminal there, wasn't there?"

"And thank the gods the plan failed," Massaquoi said. We can live without it. Just like you people would have been better off without the damned thing."

Bukele rasped out, "You are an envious man, Massaquoi. You tell my people to give up the *piomdos.* Now you tell the Americans to give up the Quickie. The achievements of true cultures are unbearable to a man from your benighted society."

Bukele was becoming feverish. His eyes were those of an old woman, bright points swimming in red. Whatever plans he'd had were ruined, and he was sinking into

ruin with them. Somewhere in the hours he had brooded over his failure he had begun the trip from the twilight of eccentricity into the night of unreality.

"Their damned culture has threatened me, Bukele. Excuse me if I dislike it. But you weren't threatened. You knew what to expect. So which were you going to choose, alteration or cold storage? Storage, probably, since you told me it was a bluff, right?"

"A bluff?" Ludlow asked.

"That's what he said."

Ludlow nodded to himself. "It may be. We've been trying to find out what happens to a person who refuses alteration. What does the Quickie do with him? All we have learned so far is that such people are sent to Central Terminal in Wyoming."

"And after that?" Massaquoi asked.

"Who knows? *We* haven't been able to get into Central for years. We thought the equipment there had been wrecked by the comet. But there's an open line for people who choose cold storage, so something is still going on there."

Ludlow had been toying with the teleport pass. Now he put it back in his pocket and walked over beside Bukele. "You wouldn't happen to know what happens at Central, would you?"

Bukele's glittering eyes looked up at Ludlow. He said innocently, "No. How would I?"

"How would you know everything else you do about the Quickie?"

Massaquoi watched Bukele's face. There was no sign that he was paying any attention to Ludlow. Bukele heard other voices, and it would take a strong jolt to draw his mind away from them.

Ludlow was losing his control. "What do you want here, Bukele?" he shrilled. "What do you expect to gain from us? How can you refuse to help us destroy this machine that has made us—made us—" Ludlow choked on his words. He did not know what he was anymore.

Bukele was all glittering innocence, but Ludlow had no time for further theatrics. "Answer me!"

"I can't help you," Bukele said.

"Don't lie to me. You can get silly later, but you'd better listen to me now. We can get anything we want out of you. We can put you in the Quickie and take you apart piece by piece. You probably know that already. We can play you back like a reel of tape. It takes time, but we'll do it to learn what we need to know. We don't want to take that time, but we will. Or will you help us voluntarily?"

The threat penetrated Bukele's innocence quickly. His mind, spiraling between reality and some private place where triumph had not turned to ashes, wavered in its path. The speed with which he reacted made Massaquoi realize how little he knew of the man. What

knowledge did he value too highly to let the gray men have? What was so dear that he would sacrifice some lesser information to appease Ludlow? Massaquoi could not guess, but it was plain that Bukele was going to cooperate with Ludlow, though not too willingly. His face cleared, and the fever went down in his eyes, but he was far from calm.

"Cowards! You were once black, and you dare threaten me with this! The guilt of this nation will be on you now, as well as on the rest. A judgment–"

Ludlow brought his right arm around in a girlish swing, and his fist hit Bukele in the face. "Shut up! I don't need lectures."

Bukele rubbed his cheek. "A judgment has been passed on this nation. You will be punished with the rest."

But Bukele seemed weaker now, running down.

"Tell me about the Quickie," Ludlow said.

"What?"

"The cold storage line to Central. What happens at the other end?"

"Cold storage?" Bukele glanced around the room. "Yes, once there was such a thing, for people who refused alteration."

"Go on. What else?"

"Too many people chose cold storage. There were too many bodies around. As both cold storage and alteration progressed, more and more black people were being taken out of circulation, and their disappearance was becoming noticeable. But it was not connected with the Quickie. Yet."

"Yes?"

"If all those bodies in storage were ever found, that *would* be evidence of what the Quickie was doing. What the government was doing. Proof was all too available. How long could the secret be kept?"

Massaquoi interrupted, "How could the secret be kept even for a day, when the Quickie was altering people to look like these three? Who would be fooled by them?"

Bukele studied the gray men. "I have been wondering about that, Massaquoi. As far as I know the Quickie did an effective job of alteration, before Godsoul, that is. I don't understand these people here. Altered people should look like fairly normal white men."

"How do you know what they looked like before Godsoul?" Massaquoi asked.

"You'll see, you'll see. Because the Americans found a solution to the problem of too many bodies. Yes." Bukele said to Ludlow, "You know of course that the Quickie operates by cable, like a telegraph, don't you? There has never been a practical method of wireless teleportation."

Ludlow was nodding agreement. All this was news to Massaquoi.

"Its inventors tried hard to make the Quickie wireless," Bukele went

on, "but failed. So they went ahead with the construction of the cable teleport system that still exists here today.

"But after the cable system was in operation, a method of wireless teleportation was developed. Or so it seemed."

Bukele shook his head slowly, remembering. "People have long speculated on the nature of the barrier presented by the speed of light," he said, "and of course if a person were to be sent through a wireless teleport as a pattern of energy, he would reach the speed of light, and he might learn the nature of that barrier, and the nature of another kind of existence perhaps. But all this did not occur to the men who worked on the Quickie, so when they developed a wireless teleport and sent volunteers through it, they were surprised that none of them ever reached their destinations. They reached the speed of light, and were gone. They went somewhere, but no one knew where. Transmission by wireless could not work. Dead matter reached its destination, but living matter, never.

"And so, someone somewhere in the government made a decision, and people who refused alteration, as well as the bodies already in storage, were transmitted. They vanished. No bodies. No evidence. And no one could actually say that they had been killed. They had just been sent somewhere."

Massaquoi began to see the implications of what Bukele was saying. The relation of Aaron Roye, physicist, to Bukele, king of the *piomdos,* was coming clear, for it was apparent what the *piomdos* must be.

"But something unexpected happened after they disposed of all these people." Bukele giggled. "Godsoul."

"What's that?" Ludlow asked. "Oh, the comet?"

"Yes. These people, existing as patterns of energy, can still establish contact with the material universe. In fact they can affect it greatly, for their position gives them a certain leverage, so to speak. They are outside of our sort of existence, bodiless, pure energy, but this gives them power over the material universe. And in their rage at what had been done to them, they used their power. They attempted to pull one planet out of its orbit and destroy another one with it."

"Jupiter," Ludlow said.

Bukele nodded. "Yes. But for all their power, they only managed to tear part of it loose. Still, that was nearly enough. Godsoul killed most of the white men on earth, and that satisfied them. Judgment. It was earned."

Massaquoi said, "And then they became the *piomdos.*"

"Of course."

Ludlow was puzzled, and Bukele had to explain the *piomdos* to him.

"And that's how you know so much about us, through this 'spirit' contact with the people who were transmitted?" Ludlow asked.

"Yes."

Massaquoi said, "Why have the *piomdos* been so secretive about what they really are? Why didn't they tell their contacts what had happened to them?"

"It is not an especially happy existence where they are, Massaquoi. It is difficult, confusing. Their senses are limited to the detection of electromagnetic waves, but not limited to the detection of the visible spectrum. They are bombarded with radiation, and it is difficult to maintain a coherent picture of the universe this way. Contact with someone in our plane allows them a sense of reality, let's call it, that is absolutely necessary for beings accustomed to material existence. In a sense, they can experience the material universe through the *piomdo* contact.

"But this contact depends on the willingness of another person, someone on Earth, someone in fact who most likely suffered a great deal because of Godsoul. Would such a person, if he knew the nature of the *piomdos,* and that they were responsible for Godsoul, want to continue the contact? In some cases, perhaps, yes. But in how many other cases would such people gladly consign the *piomdos* to despair? So the spirits could not reveal what they really were, or how they came to be where they were. They chose to remain mysterious."

"But why choose Liberia to be mysterious in?"

"Because we had people who were likely to retain some sympathy for the *piomdos* if their true nature were revealed, people least likely to desert them."

"We did?" Massaquoi said. "Who?"

"Why, the people they contacted. The descendants of slaves. Who else would understand why they had set Godsoul loose, if not people with the common heritage of slavery? Because in the end it is slavery that must be held responsible for everything that has happened since Godsoul. Only the descendants of slaves could understand where responsibility lay. What need had the *piomdos* of happy savages like yourself?"

Massaquoi was anything but happy at the moment, but let the question of who was a savage and who was not, pass. "How long can these people last as *piomdos?* Won't their energy eventually just dissipate?"

"Oh, they can probably go on as they are for a few years more," Bukele said. "But finally they will cease to exist as coherent patterns of energy, yes. They will die. But there is a way to forestall death, and I have been trying to convince them to take it."

"What is that?"

"They must use living plants as the basis for contact. They must attach themselves to the life force of plants, and in this way they will be able to live as long as the plants do. Some have already done this. Others are reluctant to leave the objects through which they maintain contact for fear that they will not be able to regain it once they have moved. But in the end, they will have to shift themselves, or die."

Ludlow's interest was flagging. He said, "But what is all this for?" He pointed at Bukele's mask.

"I wanted to confirm their experience, but I hoped to return. That is what the transmitter and receiver are for, to track me and bring me back."

But only after somehow incinerating Jupiter and making yourself a demigod in the process, Massaquoi said to himself.

"And the Quickie's transmitters—are they at Central?"

"I'm not certain. Possibly they are."

Ludlow considered that. "We can find out. We will find out. We'll do something about all this."

Massaquoi was tempted to ask him what it was he was going to do something about, and how, but he kept quiet. Bukele said, "It is much too late. The judgment is on you, now."

Ludlow smiled a cold smile. "We'll worry about that when we have to." He started for the door, and the other two followed him.

"Ludlow," Massaquoi said. Ludlow stopped and looked back. "Are we prisoners? Don't we even get bread and water?"

Ludlow said, "Pardon me, Massaquoi, I wasn't thinking. In a manner of speaking, though, you are prisoners. I'm not sure we could get you out the gate without the Quickie interfering, and the gate is the only way out of the city. But while you're here, we can do much better than bread and water for you. I'll see to that. You've helped us a great deal, both of you." And then the gray men left.

Wildeve was back in a few minutes with food, and he showed them how to operate the door and told them Ludlow was arranging quarters for them. Then he left them.

They were alone for several hours. At first Bukele was quiet, and refused food. But as time passed he became agitated, mumbling to himself until he worked himself into a rage. He ranted at Massaquoi, at the glowing walls; he bragged and threatened and crowed of his powers. And somewhere along the way he got caught up in the Shadow World and became obsessed with it.

The term meant little to Massaquoi, aside from a few references he had heard in discussions about the *piomdos;* but it obviously meant a great deal to Bukele. He spun

madcap dreams around it, and Massaquoi had the feeling that beneath the ruins of Bukele's plans were being born new connivings, that Bukele's mind worked on with its usual surrealistic disregard for the limits of possibility.

When Ludlow and his two companions returned again, Bukele was still wrapped up in the subject of the Shadow World. Ludlow listened to his rambling a moment, then asked Massaquoi, "Does he get like this often?"

"This is the first time that I know of."

Ludlow shook his head. "What is this Shadow World he's raving about?"

"I'm not too sure. The *piomdos* mention it occasionally. It sounds like something exists where they are that they dislike, or even fear. Anyway, they keep away from it. Why they call it the Shadow World is anybody's guess." But Massaquoi was ready to bet that Bukele could explain the name, and more, if he could be made to talk sense.

Ludlow turned to Bukele. "What is this thing, Bukele? Why is it so important?"

Bukele gave him an idiot smile. Ludlow bent forward, reached out to shake him. But Bukele was too quick for him, too quick for them all. He lunged out of his chair and grabbed Ludlow and there was the sound of tearing fabric. Bukele pushed Ludlow aside and dashed to the teleport with Ludlow's pass in hand. By the time Massaquoi realized what he had done, Bukele was gone.

Wildeve recovered his senses first. There were controls set in the wall beside the teleport and he worked with them to bring Bukele back. But he could not locate Bukele in time. He was able to trace him to one of the alteration cells, but by then Bukele had already been sent on to Central Terminal.

VI

Ludlow arranged living quarters for Massaquoi not far from the arrival room, and then went back to his investigation of the teleport. Massaquoi slept much of the next day, and when he woke there was food waiting for him. He ate, then sat waiting for company. But the gray man who came for the remains of his meal was a stranger, and could give him no information about either Ludlow or Bukele.

When the man had gone, Massaquoi decided to explore. The level of the city he was on was perhaps a quarter of the way up one wall of the cube, and it seemed to have been evacuated. Massaquoi never saw a soul as he walked through the glowing corridors. Had Ludlow put him in quarantine?

The level, he learned, was far from completed, as was true of most of the interior of the cube. He had access to several hallways that ended on open space, where he could watch parties of gray men

working to build their city. They had apparently taken the old city of Topeka, marked off a large square in the center of it, razed everything outside the square, and then built the cube around what was left. Remains of old buildings were being engulfed in white as the new city rose around them, using them for a skeleton. On levels like Massaquoi's, work was progressing out from the walls, eventually to meet in the center of the cube. One day the cube would be filled with hundreds of levels, a solid hive. Now it was a shell and framework over the old city.

When he returned to his quarters, Ludlow was there. Alone, the gray man sat at the table, surrounded by books, papers, diagrams, a confusion of dusty, aged information concerning the teleport.

Ludlow had no time for greetings. He said, "Do you think Bukele will go ahead with his plan to turn Jupiter into a star, Massaquoi?"

"You believe he really *can* do it?"

"Yes. Not by himself, of course, but with the help of the others who were transmitted, yes. Remember what he said about the 'leverage' these people have."

"But how would they do it?"

"Pressure. Squeeze it until it ignites."

Massaquoi gave him a dubious look. Ludlow said, "I've had people researching this—hell's bells, we've had half the city digging into what Bukele told us. Anyway, astronomers before the comet had a theory that when the Solar System was being formed, Jupiter almost became a companion star to the sun. In other words, our Solar System is an abortive binary system. But Jupiter was not quite big enough and did not possess enough gravity to produce sufficient heat and pressure to begin a hydrogen-helium fusion reaction. It was a star that never lit. You see what Bukele and the others could do?"

"I'm getting an idea."

"They could increase pressure on the planet, make up for what its own gravitational field lacks, until it does ignite. We think that this is what he has in mind, anyway."

"And there's no way to stop him?"

"No. We could attach his return equipment to the Quickie, but I have an idea that we could not learn how to trigger it in time. I believe it has to be triggered by his own *will,* so to speak. He has to want to come back. We can't bring him back.

"Of course, at this point we're not sure we want to stop him."

"What?"

"We need proof of his claims. We are not positive that these transmitters exist, even though we've found the research on them. We don't know for certain that the comet was caused in the way he

says it was. Even though our mathematicians concede that everything Bukele claimed about the Quickie is possible, we still need concrete proof. If he actually succeeded in making Jupiter a star . . ."

"But what good would that do you? You want that madman loose out there just to satisfy your curiosity?"

"No. If what he told us is all true, we plan to use some of it for ourselves. I told you we would do something about this, that we would get even for what has been done to us—alteration, cold storage, the rest of it."

"Get even? How? The men that were responsible are probably all dead."

"Perhaps. But our investigations have produced hints to the contrary. Very strong hints to the contrary. We are not free men, Massaquoi."

"You look pretty free to me."

"But we're not. But we might become free, if Bukele is right. If he is not completely insane," Ludlow finished to himself. Then a troubled expression crossed his ugly face. "It worries me how little we knew about the Quickie until you two arrived. If we are overlooking something of importance now . . . you don't think that's possible, do you?"

"How the hell would I know?"

Ludlow shrugged. "I think we know enough to make ourselves free. That should be enough."

"Then maybe you ought to give Bukele a medal."

"Maybe we should at that. But really, the help he gave us only balanced things out as far as Liberia is concerned."

"What's that?"

"I said, it's fitting that two Liberians should make it possible for us to understand the Quickie. Our research has been very instructive. Do you know who developed the theories that resulted in the building of the transmitters?"

"No. Who?"

"It was a Liberian. A man named Aaron Roye, who is ultimately responsible for those people out there in limbo, or wherever they are. You might even say that the very face of the Earth is his doing. And he—or the Liberian government—wanted a lot in return for his theories, of course. You know the price we were going to pay for them."

"The terminal. I wondered about that for a long time, why we were chosen to get it. I didn't think our countries were that friendly." and now something else bothered Massaquoi. "You don't think our government ever had any idea what Roye's theories would lead to, do you? Did we help to destroy black men?"

"No, I'm certain not. I don't think Roye himself could have foreseen that his ideas would produce what they did."

Couldn't he? Was it impossible

that Roye-Bukele had planned everything that had followed the use of the transmission system? Or could he, on his trip to the United States, have learned about the alteration of black men, and cold storage, and decided to use the teleport for his own ends? Or was any man, even a genius, capable of such long-range thinking? No matter; by now Bukele himself likely had no clear idea what he had planned, and what had fallen into his lap. But that he indeed was not free of guilt, was inescapable.

"Of course, Roye was a brilliant physicist," Ludlow said, "and he worked completely on his own. Tell me, what became of him?"

"Roye disappeared after Godsoul," Massaquoi said. Here was one of the secrets Bukele had valued enough to cooperate with Ludlow, and apparently it had been worth it, for they had not found him out on their own.

"A pity. We could use him now."

But you did, Massaquoi thought.

They sat quietly for a moment. Then Ludlow said, "We are duplicating Bukele's return equipment."

"Oh?"

"Yes. If he does destroy Jupiter, someone is going to have to go after him, convince him to come back."

"He may not want to come back."

"But still we must try."

"We?"

Ludlow smiled weakly. "Actually, Massaquoi, we were hoping you would do it."

"Why should I?"

"For one thing, he is not likely to listen to one of us. He might listen to you. For another, do you want him loose out there? He might wreck the Earth."

"That might be no great loss."

"You don't mean that. I know you don't," Ludlow said in confiding tones.

"Do I really have any choice?"

"Of course. You can always just stay here . . ."

"In other words, go get him or rot here. Just like the Quickie, aren't you? Both choices are worthless. Father and son, you and your machine. You're too scared to go after Bukele yourself."

Ludlow would not deny it. "Think about it, Massaquoi. Bukele, with the power to make stars." He gathered up his library and left.

Massaquoi had three days more to consider the problem of Bukele. It took that long for the problem to make good his prediction.

Massaquoi did not at first believe Ludlow when the gray man told him that Jupiter was burning. But then Ludlow brought him confirmation from outside the city.

"This just came through the gate," Ludlow said. "Would you like to send some answer? It will save a lot of unpleasantness if you do."

The note was from Segbeh

Dahn. It read: "Massaquoi, I do not know if this will even reach you, but I thought I must try to let you know that Bukele has been successful, Jupiter is a star. I regret that I have not sent anyone after you before this, but now that I see what Bukele has done, I have decided that the only danger in this cube is probably from him. So if I get no answer from you within another day, we will be coming to find you."

Bukele had done it. Now someone had to stop him.

"I'll send him a message," Massaquoi said.

Ludlow gave him a pen, and Massaquoi scribbled a note on the back of Dahn's letter. He explained what had become of Bukele, and why it was necessary to go after him.

Ludlow was reading over his shoulder as he wrote. "Good, good. I knew you would help us."

"Shut up. I'm going to tell him that if he wants any more information while I'm gone, he can send messages in here to you and you will answer them. You agree?"

"Oh, yes, certainly. Anything to help."

Ludlow left with the note. He was back almost immediately, accompanied by Wildeve, and the one called Tennyson. Wildeve carried Bukele's mask. To Massaquoi's surprise, the three of them were going with him.

"What are you doing?" he asked.

"We're taking you to Central," Ludlow said. "To show you where the transmitters are."

"I thought Central was closed to you."

"Not anymore."

"But why not just put me in a Quickie, and let me go the way Bukele did?"

"Because we have suspended operation of the equipment that shunts black people to the alteration cells."

No more alteration. Massaquoi fingered the teleport pass Ludlow gave him and thought what that meant. If he could get into the teleport and set it for the gate, he would be free. But he did not know the combination for the gate, and escaping would do nothing to solve the problem of Bukele.

Ludlow punched a combination on the teleport board, and they left one by one, Massaquoi second after Ludlow.

They came to a gigantic, metal-walled corridor that stretched off to either side like some monumental subway. It was gloomy in the corridor. Light came from rows of small red bulbs mounted along the walls. The ceiling was invisible, for the rows of bulbs climbed high into the gloom until they were engulfed by it.

Wide catwalks like balconies were fixed in tiers to the walls, paralleling the rows of lights. Stairways led from the ground floor, where Massaquoi and the others

were, to the catwalks. It was perfectly quiet in that huge, shadowed room.

"Central Terminal," Ludlow whispered.

The walls at ground level were lined with teleport alcoves. Wildeve crossed the corridor and set about attaching Bukele's apparatus to a teleport set in the far wall. Tennyson was busy at the wall behind Massaquoi and Ludlow.

"What was this place for?" Massaquoi asked.

"Cold storage," Ludlow whispered, in a voice that tried to be bitter, but was only frightened.

Massaquoi looked more closely at the walls. Above the catwalks were long lines of doors set in the walls, and they, like the catwalks and the lights, climbed row after row into the darkness.

Ludlow gestured across the corridor. "The booths over there will take you into the transmitters. Just step into one. Hurry."

The gray men were frightened here. Massaquoi himself was unsettled at the sight of the vaults, but they hardly affected him as they did the others. "What are you afraid of?"

The quiet beat down on them. Ludlow would not look at him. "Please, hurry."

"Where is the equipment to bring me back?"

"In the city."

"But you want Bukele to return here. Why?"

"Please. Leave. Now." Ludlow was terrified. His eyes jerked up toward the darkness, as though he had heard something there.

Massaquoi listened. Silence. But though he heard nothing, still he sensed a kind of stirring in the quiet. There was a presence here, something living.

"Those vaults aren't empty, are they?"

Ludlow was silent. Massaquoi ran to a stairway and up to the first catwalk. The gray men stood below, too scared to call after him, unwilling to leave him alone here.

There was glass in the vault doors, and inside Massaquoi could see the sleepers. They were white men. This surprised him, but then he guessed why they were there. In the ruin of Godsoul, some men had managed to take refuge here, to sleep, to dream of a time when there was no comet. And while they dreamed, the gray men were left to make do as best they could in the ruins of the country.

Or was it that simple? Had these people really just gone to sleep, cut themselves off from the world outside the vaults? Massaquoi considered the sleepers: who would these people be? The likeliest answer was that here were the politicians responsible for alteration, the scientists who had made alteration possible, and the bureaucrats who had carried it out. In short, the people who would know about Central Terminal in the first place, and

would have access to it. Would such people give up their power, even amid the ruins of their world? Or would they try to control even those ruins? Were these then the enemies Ludlow sought to destroy, the antagonists he had hinted at to Massaquoi?

The stirring Massaquoi had felt was stronger up near the vaults, as though a mind of great power lived in them and did not sleep, a union of brains turning in the gloom to reach out and control what was left of a nation. Was it this presence that the gray men had sensed—and feared—all along? Somehow the sleepers communicated, linked their wills, and Massaquoi knew Ludlow was right, the gray men were not free while the power here lived.

A sound came down from the darkness. One of the gray men gasped when he heard it. Massaquoi looked up; what sort of watchdog might these people have created to guard their tombs? Massaquoi hurried back down the stairway.

"We can't let them find us here," Ludlow said. He led Massaquoi to the transmitter booths. There was a long sighing noise overhead. It was too much for the gray men. They bolted for the teleport they had arrived from, and were gone.

Massaquoi paused before the transmitter teleport. The stirring he sensed was stronger than ever. These people were aware of him, and they resented his presence here. He did not look up to see what might be dropping toward him. Being the last trespasser, he saw what it was that Tennyson, in a moment of bravado, had done. Scrawled on the other wall was, "God is dead."

He laughed, and stepped into the teleport.

VII

The Earth, washed in fantastic colors, swimming in the fringes of the sun, fell away from him and he was in a silent universe filled with a babel of radiation. The sun was a storm of energies, from radio through infrared and ultraviolet to X-ray. Space around him was a haze of sensations like colors, but colors he had never seen before. He could not find any of the colors of the visible spectrum here, and what he usually thought of as the sun was only the brightest heart of the storm. Massaquoi had discovered the spectrum.

Bodiless, he fell away from the Earth and sun, and the stars came out. They were in patterns he did not know, and he guessed that he was sensing radiation from gamma and X-ray stars, from radio nebulae and galaxies, along with energy from the usual stars of the visible band. The sky was crowded with lights he'd never suspected were there, all, like the sun, in colors that were new.

And far off in space, a dim twin to the sun, was Jupiter, Bukele's

star. He was falling toward it, the Earth vanishing into the sun's corona. He tried to control his fall, and found he could. He came back within the radius of the solar storm, back near the Earth, and he waited, searching for some sign of Bukele and the others out here.

But there was no sign that he could find. The others must, like himself, consist of energy of a certain frequency, but what frequency? He could detect a dizzying array of energies, the entire natural spectrum, but still he was alone. Where was everyone?

The energy around him was raucous. He tried to filter out various frequencies, to separate them and examine them for evidence of intelligence. And when he had sifted through the radiation around him, when he succeeded in blanking out all the energy bombarding him, he found there was something left, that space was not black even now. He sensed something like a green mist, within which were darker segments linked in chains. He himself was at the end of a chain. Here were the *piomdos*; he could sense them communicating through the mist.

There was an argument in progress. On one side were a number of people. On the other side, only one: Bukele. The argument concerned some plan Bukele wanted carried out. It was plain that the others did not enjoy refusing him; they had a debt to him for his avid promotion of fetishism in Liberia, and for his efforts to cement contacts between them and Liberians, and they knew it. So, of course, did Bukele. But Massaquoi could feel that the *piomdos* now desired nothing except contact with ordinary human beings. The adventure with the comet, the burning of Jupiter, had satisfied any yearnings for power they might once have had.

But not Bukele. If the nature of the *piomdos*, and the roots of his power, were now known, there was no turning back. He would attempt something more grandiose even than the destruction of Jupiter. But he needed help.

Massaquoi said-thought, "Bukele. Bukele, this is Massaquoi."

Bukele's tirade stopped. "Massaquoi? Here?"

"Yes. Listen to me. Your mask is hooked into the teleport. You understand?"

The other people were silent. Were they listening?

"Why are you here?" came from Bukele.

"Ludlow sent me after you. You can return. We can go home, to Liberia, if you do."

"You are a fool! A fool! Did they promise to bring you back from here, too?"

"Yes."

"And you believed them? Cowards like that? They will not let us back. We were the only men on Earth who knew what they had

done, and we will not get back. See for yourself. Try and get back."

"Ludlow has done nothing. He is a victim. Why would he trick me?"

"To be rid of you, you know what he is!"

Bukele had one plan, one idea that his madness had centered around, and he would not leave it, would not consider returning. It was the Shadow World.

"We must reach the Shadow World, Massaquoi. We must take the very universe and remake it in our own image."

"But what is the Shadow World, Bukele? Where is it?"

"It is behind you. See for yourself what it is."

"Behind me? Where is behind, here? How do I look behind myself?"

"Just imagine that you are looking over your shoulder, as if you had a body."

To Massaquoi this had to be like listening to the sound of one hand clapping, but he was willing to try. Behind. Look behind.

Gradually the green mist darkened. Was this the way? The mist was becoming nearly black, darker and darker until it was like a window faintly frosted with green that looked out on the blackness of space. The sun was near him, but still distant enough that he could see the Milky Way; he could find no planets. Was this the Shadow World?

Then he realized he had forgotten Jupiter. Though only a weak sister to the sun, it should have been visible as an object far brighter than any star. But Jupiter was not burning.

He wanted to move out of the last shreds of the mist, to investigate. But when he tried, he felt uneasy, not exactly frightened, but disquieted. Outward motion alarmed him, as though he were somehow being threatened. But threatened with what, and how? He tried to ignore these alarms, but he could not. At last he let himself retreat into the mist, and the sun and stars disappeared. As the mist lightened, and he could sense the *piomdos* again, he found Bukele.

"What was that supposed to prove, Bukele? Was that the Shadow World?"

"You saw it? But you don't know what you saw, do you?"

"The sun. The galaxy. What I didn't see was Jupiter. Why?"

"Because where you were, Jupiter is just a planet, it does not shine by its own light. And you did not see *the* galaxy, you saw *a* galaxy, part of another universe, a mirror universe to our own in many ways. It coexists with our universe in all the spatial dimensions but is not aligned with ours in the time dimension. It is the Shadow World. Existing here, we can overcome that time displacement, and move from one universe to another."

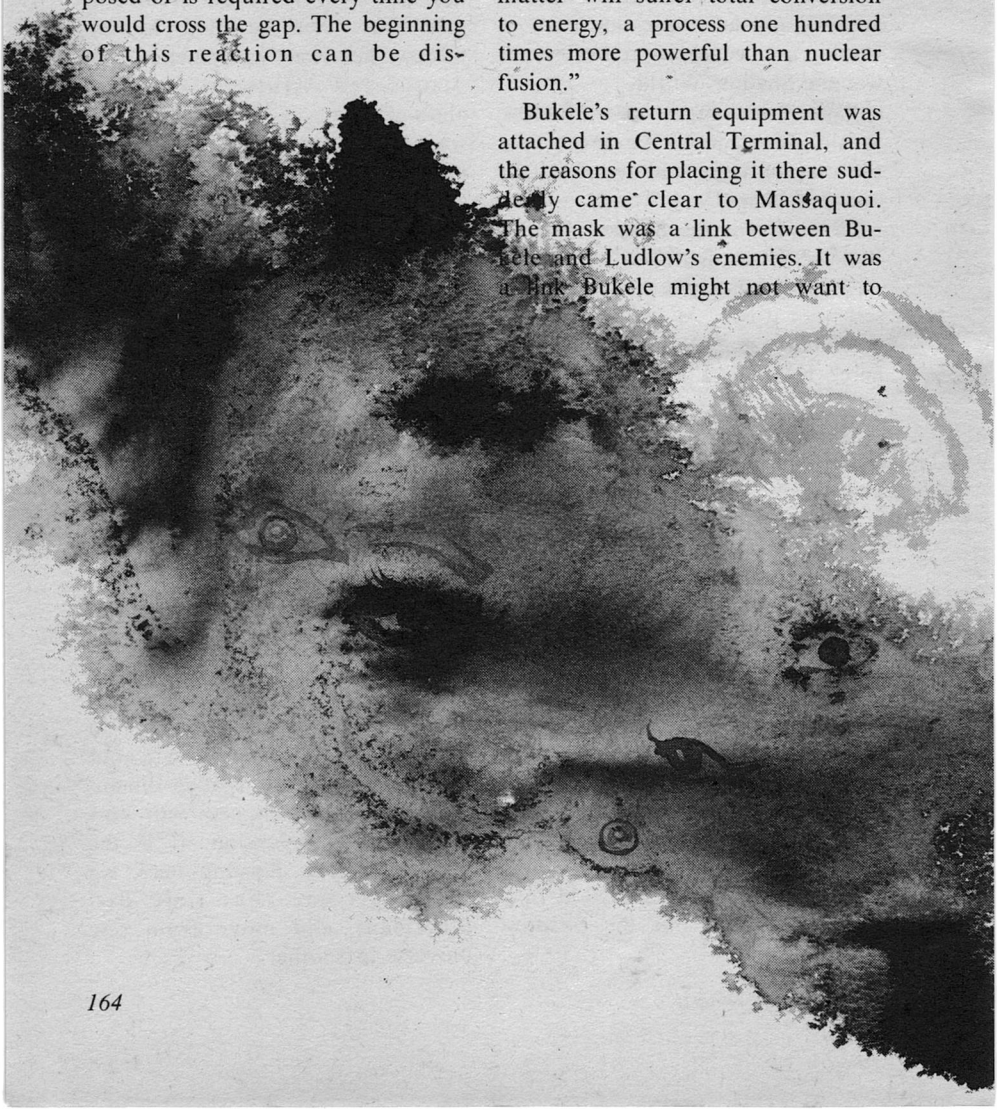
"We can? I tried it, but it didn't work."

"You let yourself be frightened off." Bukele was smug. "That other universe is made up of antimatter, and a change in the polarity within the energy patterns you are composed of is required every time you would cross the gap. The beginning of this reaction can be disconcerting, but you could have crossed over."

"Antimatter?"

"Yes. At any instant that our universe coexists with this mirror universe, both will be completely annihilated. Their matter—or antimatter—will suffer total conversion to energy, a process one hundred times more powerful than nuclear fusion."

Bukele's return equipment was attached in Central Terminal, and the reasons for placing it there suddenly came clear to Massaquoi. The mask was a link between Bukele and Ludlow's enemies. It was a link Bukele might not want to



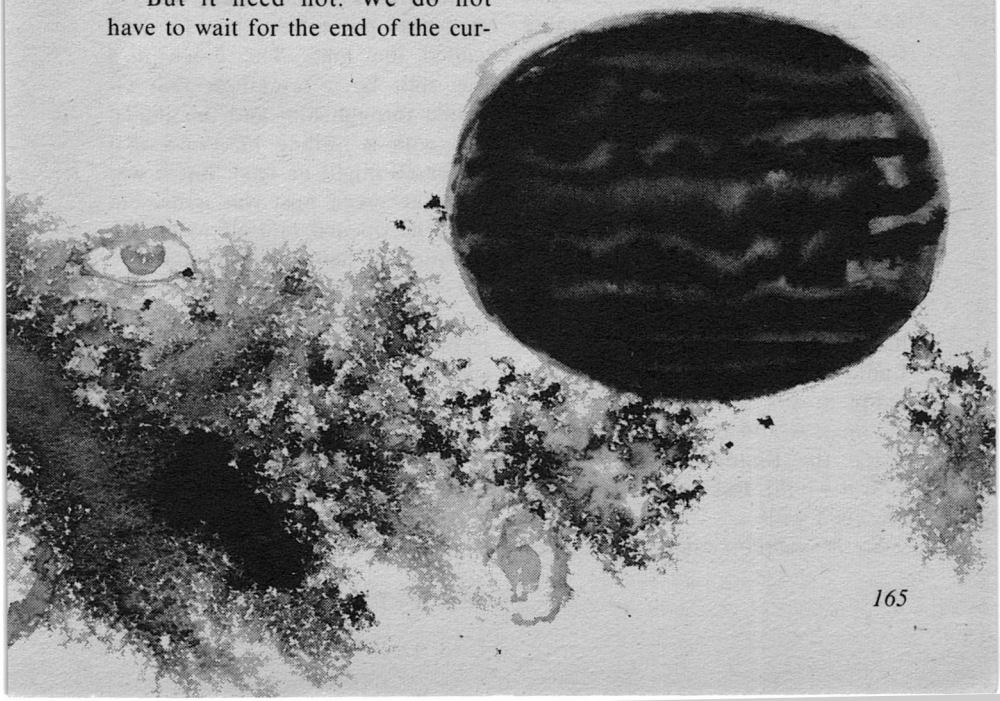
use or acknowledge, but a link nonetheless.

And if Bukele tried to reach a universe of antimatter?

Bukele went on, "Normally this meeting between the universes only occurs at the end of every cycle of expansion and contraction within each universe, when all the material in both is condensed into two giant masses. These masses are caused to explode when the universes—for an instant—meet in time. After this explosion of pure energy, both sides move away from each other again in time, to begin a new cycle of expansion and contraction that will eventually end in another explosion, and so on and on. The process, of course, covers hundreds of billions of years.

"But it need not. We do not have to wait for the end of the current cycle to begin things anew. We can bridge the gap between the two universes without harm, because we are ourselves already energy. Of course, in a new creation, without living things to enter into as *piomdos*, we will not live long after we have bridged the gap. But think: the next cycles of creation will be ours! Before we vanish, we will have begun creation in our own image!"

There was no doubt that Bukele considered his ideas sound, and gave them every probability of success. But to Massaquoi these plans only confirmed that Ludlow and his researchers had deduced what the Shadow World was and why it was important to Bukele. Having



gauged his megalomania perfectly, they had decided, as Ludlow had told Massaquoi, to use what they had learned to gain their freedom.

If Bukele did manage to reach the Shadow World, he would be a momentary short circuit in the cosmic works, a cataclysmic link between Central Terminal and the antimatter of another universe. The resulting destruction likely would include Bukele as well as the vaults of the dreamers.

And whatever genius Bukele had once possessed was shattered, the pieces useless for evaluating his plans. He knew only what he wanted, not what was possible. Ludlow was about to get the maximum use out of Aaron Roye without ever knowing it.

"These people here, the *piomdos*, are weak, Massaquoi. They value their contacts with Liberia too much to undertake this, but even just you and I—"

Massaquoi saw that it would be futile to try to convince Bukele of the danger in the Shadow World. Now he understood fully what Ludlow had done. Ludlow needed Bukele to reach the Shadow World, and he had sent Massaquoi out here to ensure that Bukele did. Ludlow was betting that any attempt to talk sense to the perverse madman would make him want to reach the Shadow World more. And it would. Bukele was not to be reasoned with.

So Massaquoi could not answer him. There was no answer to his plans. Bukele of course took this as a sign of cowardice.

"Then you are frightened, too?" Bukele would have shrieked the words if he'd had lungs. "Only one man has the courage to remake creation? Then I will."

And that was the last that Massaquoi ever knew of Bukele.

In the waiting silence, Massaquoi caught himself thinking, "And then we heard the thunder." But would he and the others here even see the lightning, or would they simply vanish along with Bukele in the instant that matter and antimatter met in this place where they were? Now, Massaquoi thought, was the time to find out how much Ludlow had lied to him.

He tried to will himself back to material existence, but he had waited too long. The green mist was split by a brightness that vibrated through him and threatened him with a trailing blackness that he feared might be final. But it was not. The green mist was gone, but when he opened himself to all the radiation he had earlier filtered out, the Earth and sun—and Bukele's star—appeared, in a universe that seemed little changed by Bukele's adventure in time. He approached the Earth, and came down over North America, searching for the *Liberia.*

There was a cloud rising where Wyoming must have been, a cloud two or three hundred miles across,

perhaps twenty miles high. The gray men had their freedom, and Massaquoi had a future as *piomdo* to look forward to.

He searched for Topeka. The prairie landscape, mystic in its new colors, rolled beneath him. He had to make contact with Dahn, inform him that there was no reason to wait for either himself or Bukele to emerge from the cube, especially because any delay in leaving would only increase the danger of being caught by any radiation in the cloud moving with the wind over America.

He could not find Topeka. When he did finally locate the *Liberia*, the cube that should have been near it was gone. The bones of the old city stood empty in the eerie sun; nothing, not a ghost of a gray man, was left of the cube. Only Dahn and his crew, beginning a search of the ruins, gave the scene any life.

The gray men had been less free than they had ever dared to imagine. They—and their city—could not exist at all without the teleport system, without Central Terminal. The men who had slept there had not, as Massaquoi had first thought, been content to rule over the ruins of a civilization, where grim survivors labored to rebuild. No, Godsoul apparently had reduced the country to a level where such recovery in the immediate future had been impossible. If the men who had taken refuge in Central Terminal were to have any sort of society at all to control, they would have to create it themselves, and they had.

But if the gray men had not been the grim survivors of Godsoul, what had become of the Americans? Had there been no survivors outside the vaults?

Massaquoi could accept that the cube had been nothing but a trick of engineered matter produced by the teleport, but not the men inside it. Massaquoi doubted that the collective mind of the men in the vaults had possessed the power to create independence. But it might have taken the remains of the general populace into Central Terminal too, to serve as jesters, to inhabit the bodies that the collective mind had made. Real people, who had slept not as part of some great common mind, but in solitary, dreaming of life in a white city, had given the animating spark to the gray men. And the creator, free to make creatures as noble or debased as it wanted, had chosen the latter, and produced the grotesque hybrids who had been neither black nor white, but a travesty of both.

Of course, independence being a risky affair, the creator would have had to expect threats from its creatures. But until Bukele's arrival there had probably been no real question of who controlled things. In Bukele the gray men had found a tool whose uses even the collec-

tive mind could not have anticipated.

Or maybe a collective consciousness was not too effective an instrument in the face of threats and difficult decisions, and had simply stalled, and been lost.

So Segbeh Dahn and his men picked through the rock bottom of a culture, and the words of his dream came back to Massaquoi: "These our actors, as I foretold you, were all spirits and are melted into air, into thin air." It had not been the end of the *piomdos* that his dream had prophesied, but of the gray men.

Massaquoi stayed near Dahn as the Liberians poked in the ruins, but he could not make contact. Possession of a material medium was more vital for contact than he had guessed. At last the growing blur to the west that was the cloud moving toward them convinced the Liberians to leave. Massaquoi stayed with the airship as it moved south out of the cloud's path. He left it when it reached the sea, and he went home.

Massaquoi did not enjoy the prospect of a lifetime as a *piomdo.* But he knew what he would do with that lifetime. He would be the first tribal *piomdo,* and not that of just one tribesman, but of any and all tribesmen. If all that the other *piomdos* had had in common with their contacts had been the dubious heritage of slavery, how much more did Massaquoi have to share with the tribesmen of Liberia. If it were at all possible, if it could be done, he would learn to communicate with all who came to him.

He was dropping toward home. He would need a tree, a young tree, and one likely to reach a ripe old age. He knew where there was a stand of ebony: he would live in black wood. And he would do more than the other *piomdos,* much more. There were abilities he had that would be useful . . .

VIII

The shrine was nothing more than a circle of bare, dusty ground. In the center of it was the tree. The human feet that had worn the circle out of the jungle had also worn the earth away around the tree, so that a tangle of root tops was exposed to the African sun.

The caretaker of the shrine, an erect, ancient man who kept the circle clean and swept, waited at the edge of the jungle with the four guests while the last patient and the last intern of the morning consulted with the tree. The caretaker glanced casually around the clearing, inspecting it for flaws, the palm frond in his right hand ready to smooth out footprints from the dust as soon as their makers had left.

One of the guests was a Nigerian doctor, who stared intently at the patient and the intern as they sat among the roots of the tree and held their hands to its trunk. He

said quietly, "I don't imagine many veterans of my profession bring their patients here, do they? Or even themselves?"

Segbeh Dahn flicked his palm frond at a few insects. He smiled. "No, not many. They don't enjoy seeing what He can do."

"No, I don't expect they would," the doctor said, implying that he was not to be found among the backward members of his profession. "It is one thing for an intern learning the trade to receive perfectly accurate . . . ah, feedback, shall we call it? The intern has no idea of himself as omniscient healer. But for an old doctor to come—"

As he trailed off, Dahn said serenely, "The old are just about gone. And with the doctors He produces, they will not be missed."

The doctor nodded. And because this was his first visit to the shrine, he asked, with only a trace of doubt, "He really can see inside a man? I mean actually *see*—"

"Yes," Dahn said. "He sees by the heat of the body itself, the infrared light it produces."

"Indeed," the doctor said. "One can't match that for diagnostic ability, can one?" He looked around at the three young men visiting the shrine this morning, one of whom was a Liberian. "I'm surprised that anyone in Liberia would want to be anything but a doctor, not even a spaceman."

The Liberian said, "He advised me to do it. The space program is very important to Him."

"Yes? Then you've come to say good-bye? Ask His blessings?" The Nigerian doctor grinned expectantly.

"No, I've come so He can examine me, make sure I'm fit for the trip." He indicated his companions, like himself dressed in the blue uniforms of the navy of the Grand African Union. "When I told them I was coming here, they asked to come too."

"But surely the doctors at the Cape examined you. I mean, they know space medicine—"

"Yes, they did. And they do. Some of them are even Liberians. But they are only doctors."

They are not Him, the Liberian's tone said, and the doctor cleared his throat awkwardly. He looked across the clearing again, and saw that the intern and patient were standing, ready to leave.

Segbeh Dahn stepped regally into the clearing, and invited the other four men to come with him to the tree.

The Nigerian doctor said, "No, no, take them first. I'll wait till they're done."

Dahn and the spacemen started across the circle of the shrine. Halfway to the tree, Dahn looked back. The Nigerian doctor was gone. Dahn nodded to himself, dismissing the man from his mind, and led his three guests to the tree where Massaquoi lived. ■

the reference library

P. SCHUYLER MILLER

QUASARS

No awards can satisfy everyone, but there should be very few objections to the Science Fiction Writers of America's Nebula awards for best science fiction of 1973. The SFWA has decided not to publicize the runners-up (at least, not until the annual anthology of best short fiction comes out with the official record), so I can be briefer than usual. As a bonus, the "newspaper of the science-fiction field," Charles and Dena Brown's *Locus No. 159,* is in with the list of John W. Campbell Memorial Awards, and with the "short list" from which the Hugo winners will be chosen.

Arthur C. Clarke's "Rendezvous with Rama" took the Nebula for best novel of 1973, and shared the Campbell Award with "Malevil" by Robert Merle, a Simon and Schuster novel that I haven't seen and haven't been able to buy. It's a "hard science" book in the classic tradition, and nobody is likely to quarrel with the choice, though it isn't in a class with books like "Dune" or "Left Hand of Darkness." These also took the Hugo in their year, and so may "Rama": it is running against Poul Anderson's "People of the Wind" (serialized here in Analog), David Gerrold's "Man Who Folded Himself," Robert A. Heinlein's massive "Time Enough for Love," and Larry Niven's "Protector."

The SFWA makes three awards for short fiction (and so will the World SF Convention in Washington: check the AnaLOG Calendar of Upcoming Events. They are all science fiction (though fantasy is eligible and has won), and all exceptionally good—real quasars, to strain a metaphor very, very slightly.

Gene Wolfe's "The Death of Dr. Island" from the anthology of original SF, "Universe 3" edited by Terry Carr, was voted best novella and is on the Hugo short list with four stories I haven't read. Wolfe, whose "Fifth Head of Cerberus" was a winner last year, is hard to categorize. This is an extraordinary story of computerized psychotherapy carried out in a man-made satellite of Jupiter—and that is saying very little.

Vonda McIntyre's "Of Mist, and Grass, and Sand" (here last October) is best novelette. Again, it is a remarkable story, reminiscent of "Dune" in its creation of an arid-world ecology and culture but, I think, going a step beyond in its creation of Snake, the healer-with-serpents. I hope the author doesn't abandon this strange world she has

made, and I guarantee to reread her story with enjoyment and new discoveries every time it is put in another anthology, which will be often.

Best short story is James Tiptree, Jr.'s "Love Is the Plan, the Plan Is Death" from a paperback anthology edited by Stephen Goldin and published by Ballantine, which I am ashamed to say I hadn't read. This maintains the Tiptree standard of unpredictability: it is a completely alien "love" story that makes Philip Jose Farmer's pioneering experiments in that genre seem naive. House rules being different in the two organizations, the World SF Convention considers it a novelette, and it and the McIntyre story are two of the five Hugo contenders in that class. Analog has another horse in the race: Jerry Pournelle's "He Fell Into a Dark Hole," and one for the short story Hugo, George R.R. Martin's "With Morning Comes Mistfall."

The SFWA made a new Nebula award this year for best dramatic presentation. It went to "Soylent Green," based on Harry Harrison's book "Make Room, Make Room"—and there was a special posthumous award to Edward G. Robinson for his standout work in the film. Some have said he made the film worth watching, but there was some nice furniture too.

There was also a tie for second place in the Campbell Award selection. (Six judges, only one an SF writer since Brian Aldiss disqualified himself, voted on books nominated by publishers.) The placers were Ian Watson's "The Embedding," thus far published only in England, and Peter Dickinson's "The Green Gene," a racial parable of the future. A special award went to astronomer Carl Sagan for his collection of very short essays, "The Cosmic Connection." (As Charlie Brown says, he's no Clarke but every bit as fertile an idea man.)

Now back to *Locus*. To No. 158, to be precise. (It comes out twice a month, when feasible and/or humanly possible.)

Every year, *Locus* makes its own awards, in slightly different categories than the "biggies." I haven't checked back to other years, but *Locus 158* was practically a tout sheet. "Rendezvous with Rama" was voted best novel by 401 readers, with the Heinlein, Anderson, Niven, and Gerrold books following, just as in the Hugo lineup. "The Death of Dr. Island" was picked as best novella, and the McIntyre and Tiptree stories were second and third in the short fiction list, beaten out by Harlan Ellison's "The Deathbird." (The Hugo short list calls 'em novelettes.)

Locus 156 has some other interesting statistics. Every year it also tries to compile a summary of the previous year's SF publishing record. Data on paperbacks come from Computer Book Service, which distributes to bookstores. Charlie Brown keeps the hardback record—English and American—himself. Howbeit, in 1973 there were 191 new SF paperbacks and 155 new hardbacks for a total of 346—almost one a day. There were

280 paperback reprints and 35 hardbacks (mainly SF Book Club selections), or 315 in all.

I can't read a book a day. If I were following the rules John Campbell originally set up, I would read everything that is "real" SF, report on the best, and leave Ben Bova to glean what he wants to publish from that. I wish I could, but I can't, and I don't. Sorry 'bout that. If I'm still hanging in there when my full-time employer retires me, maybe it will be different—or will inflation make it two books a day by then?

TRULLION: ALASTOR 2262
by Jack Vance • Ballantine Books, New York • No. 03308 • 247 pp. • $1.25

With this book, Jack Vance begins an open-ended series about the human societies on the worlds of a globular cluster, the Alastor Cluster. The cluster itself is out somewhere on the fringes of the galaxy, among the Rim Worlds that several writers have exploited. It has thirty thousand stars and three thousand inhabited worlds, of which the water-world named Trullion is No. 2262. The human worlds have a common language, presumably a common history, and a roving overlord, the Connatic, who has very little to do with the book.

It is critical gospel that you shouldn't, or shouldn't be able to, transplant a mystery, or a Western, or any other genre story to another planet and call it science fiction. What Jack Vance has done here is transplant a sport story, for the book hangs on the fortunes of a pick-up team of would-be pros, playing the planetary game of *hassade.* This is a ferocious hybrid of hockey and water polo (Trullion is, after all, a world of small continents and myriad islands), set in a gambling framework that is less bloody than the Aztec but no less vigorous than the Iroquois.

We have, of course, the intricately worked-out setting that you expect in a Vance book, let alone a Vance series. Trullion has a largely feudal aquatic society. The Alastor Cluster supports space piracy which a more dispersed star-spread couldn't; Trullion has a nasty amphibian native race that steals—and presumably eats—careless folk, and it has the thoroughly human but almost as nasty roving Trevanyi, gypsy-like wanderers who live by their wits, their knives, and on occasion their women. When young Glinnes Hulden comes back from a hitch with the Alastor space-army, the Whelm, he finds his ancestral manor falling into ruin. His eldest brother has vanished, probably eaten by the *merlings* like their sister. His mother and remaining brother seem to have "got religion"; they have sold off the manor house and given the money to the Cause. Glinnes' only hope of scraping enough money together to reclaim the manor seems to be as a star in a world-beating *hassade* team—but things aren't quite that easy. There are the Drossets, a particularly ugly tribe of Trevanyi who have settled down on his property. There is their oddly fascinating daughter. There are as-

sorted noblemen with big ideas and no money. There is a vanished ransom—a legitimate mystery to be solved legitimately.

It's quite a story—but very evidently, it's only an opener. There are 2999 more planets in the Alastor Cluster, and I am sure a lot of them are odder than Trullion.

FOR WANT OF A NAIL

by Robert Sobel • Macmillan Company, New York • 1973 • 441 pp. • $12.95

Back in 1931 J.C. Squire, one of the coauthors of that nice little time-travel play, "Berkeley Square," edited a whimsical symposium called "If, or History Rewritten." A distinguished lot of part-time scholars (G.K. Chesterton, Andre Maurois, Hilaire Belloc, Emil Ludwig among others) commented on how different the world might have been if different decisions had been made and different circumstances occurred in times past. If Napoleon had escaped to America. If Byron had become King of Greece. If Booth had missed Lincoln. If (from a minor MP named Winston Churchill) Lee had not won the battle of Gettysburg . . .

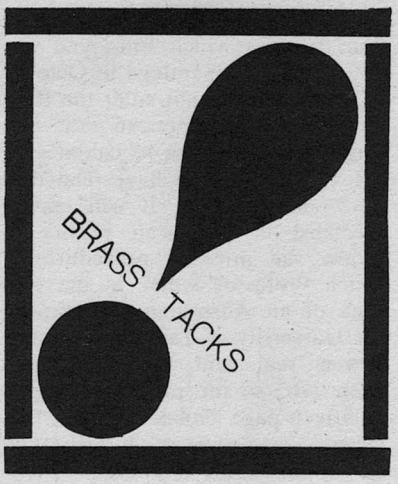
Kennikat Press reprinted "If" in 1964 at the rather exorbitant price of fifteen dollars, probably for collectors of obscure Churchilliana. The theme that he treated straightforwardly in a deadpan essay was the root of Ward Moore's memorable "Bring the Jubilee." And Robert Sobel, Professor of History at New College of Hofstra, has used the Churchill approach for a full-scale "history" of the parallel time-track in which Burgoyne was not defeated at Saratoga in October 1777, France did not enter the Revolution on the American side, and England did not lose its colonies.

I won't pretend I have read it; I have nibbled at it. It will take a specialist in American history to follow the intricate procedure by which Professor Sobel, in the persona of an Australian professor at the University of Taiwan, has interwoven real and fictional events from 1763 to the present. There is a fifteen-page index . . . a "selected" sixteen-page bibliography . . . innumerable footnotes.

In the time-track where Burgoyne held out long enough for the British to catch the Americans in the rear, George Washington lived out his life in disgrace at Mount Vernon, but John Adams, Samuel Adams, Thomas Jefferson, Patrick Henry, and five other revolutionary leaders were executed. Canada, the East, and the Midwest became a Confederation of North America. Many of the rebel leaders made a grueling march to Mexico, where they eventually formed a United States of Mexico stretching from Honduras to Alaska and east to the Mississippi in its state of Jefferson. Nathanael Greene was its first president; Madison and Hamilton wrote its constitution.

Science fiction? Of a highly unusual kind, akin in its way to Stapledon's "Last and First Men."

Sooner or later there is a place for everything in science fiction. Here it encompasses a fabulous "in" joke for historians.



George R.R. Martin's "A Song for Lya" in the June issue stirred some strong comments, on both sides of the fence.

Dear Mr. Bova:

From 1965 up to the time of the Haldeman story "Hero" in 1972, I was passing your magazine on to teenagers, thus helping you create a new generation of Analog readers. *I can't do that anymore* without being run out of town by irate parents.

I can hear you say, "The kids know more about that stuff than you do, Grandpa," and well they may, but they are not publishing 140,000 copies of the pornography they know and spreading them all over the world.

What is it you are trying to prove?

Is it a personal satisfaction to you to allow some of your authors to wade around in fornications, such as George R.R. Martin in "A Song for Lya," so Analog can compete in the sweepstakes for the most orgasms per page?

I know nothing about you personally, but in your defense of this type of story I must consider you a mentally juvenile fool.

F.L. WHITTIER
PO Box 3074
Bartlesville, Oklahoma 74003

Dear Mr. Bova:

"A Song for Lya" in the June issue was superb. It gave much food for thought. So much of science fiction seems geared only to matter, taking no cognizance of an infinite mind. The questions at the end were most provocative. I shall be looking forward to reading more of George Martin!

I also wish to commend you for some of your Guest Editorials. I was most gratified to read Robert Heinlein's speech.

It seems that your letters to the Editor run three to one on the liberal side. Could it be the writers of those letters don't work and have nothing to do but write critically of everyone not of their own ilk? I like to hear both sides represented and am happy to see you present a mixture of both. Again, hurrah for R. H.

ESTELLE DOWDY
21233 Placerita Canyon Road
Newhall, California 91321

One of the points that Martin was trying to make was that love between two human beings is more than sex, no matter how enjoyable sex may be. And the real question of the story was: How will humans re-

act to the new capabilities that our inevitable contact with alien intelligences will bring to us?

Dear Ben:

June issue purchased and noted:

I agree with every word of your Editorial . . . You should have heard the panel I was on with Clareson, Pohl, Goulart and Eisenberg at Lunacon when this came up. Very bitter, all of us, particularly Goulart who rightly depicted academia as ripping off the writers and professionals just as publishers have for thirty years. Make a buck on it by all means, get the enrollment/tuition fees . . . but don't give the writers a cent, much less let *them* teach. I know a rather famous SF writer who has been trying desperately to get an academic post, any kind of post, for a while now . . . no one will touch him. I also met a couple of thirty-year-old idiots at Lunacon who are teaching full courses. "Oh I know you," one said, "you're one of those writers I'm aware of and resolved not to buy, ever. I pass your stuff right by on the stands. Nothing personal . . . I'm just into the pre-1968 stuff . . ."

BARRY MALZBERG

. . . And we're into the post-1974 "stuff."

Dear Ben:

As one of the founders of the Science Fiction Research Association, I feel called upon to take issue with your June Editorial, "Teaching Science Fiction." I must fault you on one matter of fact, and one of opinion.

The Science Fiction Research Association is *not* "a professional society devoted to teaching science fiction." SFRA is an organization of people interested in the study and use of science fiction—by critics, historians, teachers, librarians, futurologists, and anyone else with a serious interest in SF. We quite consciously decided at the beginning to welcome into membership anyone—professional scholar or otherwise—who shared this interest. We did not want to limit the organization to that small portion of the science-fiction community whose credentials to contribute to SF scholarship are certified by university degrees, to the exclusion of the many amateurs whose pioneering contributions to the field have paved the way for the present SF boom. Could you take seriously a Science Fiction Research Association whose qualifications excluded from membership such men as Sam Moskowitz, Donald Day, or Ed Wood? What you see as a weakness in SFRA I see as its basic strength.

I don't share your view that SFRA, or any other organization, should set and demand professional qualifications among SF teachers. There are so many approaches to teaching science fiction, and so many ways in which science fiction can be used in college courses, that setting standards would be stultifying. What *is* needed is for the students, faculties, and others concerned with the various colleges at which SF courses are taught to demand that a science-fiction course be taken as seriously by the college

administration as any other course in the curriculum, and that teachers, library resources, audiovisual aids, and everything else necessary be planned and provided for as carefully as they would be for a more conventional course. Ill-considered SF courses say more about the value of the institution at which they are offered than about the value of science fiction as a field for study. A school that offers second-rate courses is a second-rate institution.

FRED LERNER
51 Berkshire Place
Hackensack, New Jersey 07601
Without recognized standards, most students (and school administrators) have a difficult time discerning first-rate from second.

Dear Mr. Bova:

Writing letters is for me something almost as rare as attending funerals, but a story in the May issue forces me to subordinate my otherwise inhibitory feelings and speak out. If the writing in "No Biz Like Show Biz" were merely execrable it would perhaps suffice to send an evaluation to the AnLab, but this nightmare masquerading as a story cavalierly jests with a subject that is still painful for many of us.

To describe a society which punishes unemployment by death while forcing unsanctioned psychopaths to perform publicly, bespeaks an illogic justifiable not even by members of that eminently logical (albeit irrational) waltz of death thirty years ago. For those of us whose friends wear tattoos acquired in Auschwitz and similar places, light treatment of the ultimate abomination is extremely distressing.

Lest it seem that this is an ill-considered diatribe against the magazine itself, please note that I have read every issue for the last dozen years and intend to continue so doing for as long as at least one good piece can be found per month, a quota met this issue by "Owe Me," which was a pleasure to read and reminds me to ask if you can recommend a good patent attorney.

Between these extremes lie the two novelettes and last month's conclusion of the serial, all of which seemed rather dull and almost entirely predictable, except for the serial, which I would have predicted could have made its plot reasonably extend only half as long.

S. DAVID EISENBERG
612 West 115th Street
New York City 10025
"No Biz Like Show Biz" was a lot of things; light *was not one of them.*

Dear Mr. Bova:

Mr. Allred's Editorial, in your May issue, made a lot of sense. Needed saying. I enjoyed it.

Now a word on Mr. Hill's letter (p. 174 of the same issue). It must have been quite some time since he looked at a defense budget, if it was in fact 73 percent of the total! The latest figures I have are for fiscal 1973, in which the appropriation for defense, space and foreign affairs combined (defense was of course much the largest of the three) was 34 percent—repeat, 34

percent—of the total. Compared with 53 percent for the same trio, ten years ago.

This 34 percent amounts, incidentally, to somewhere around seven percent of our Gross National Product. Obviously, that evil Military-Industrial Complex runs the country . . .

In connection with which, while I'm on the wire, allow me to offer the following quotation:

"At latest count, 83,457 articles, editorials and columns of comment related to Dwight Eisenhower's death had recalled that in his 1961 farewell address he urged that 'we must guard against the acquisition of unwarranted influence by the military-industrial complex.' Exactly one, so far as *NR*'s researchers have been able to locate, mentioned that General Eisenhower went on to explain that danger as being derived from and subordinate to the primary threat to 'the very structure of our society': namely, 'a hostile ideology—global in scope, atheistic in character, ruthless in purpose and insidious in method.' "

Enough said, I hope.

CHARLES H. CHANDLER
1296 Worcester Road
Framingham Centre, Massachusetts
01701

Ike was speaking against multinational oil cartels, I presume.

Dear Mr. Bova:

For many years, science-fiction writers have been seeking methods of exceeding the speed of light. Not wanting to be limited by Special Relativity to one star system, they have generally sidestepped the theoretical questions involved by invoking the convention of the space warp—a time-honored convention, and one which readers are quite willing to accept for the sake of a good story. The term "space warp" was perhaps suggested by the General Theory of Relativity, which develops a model of the gravitational attraction in terms of the warping of space by massive objects, on the analogy of the warping of a two-dimensional sheet of rubber by an object resting on it. In these terms, a black hole is so dense an object as to warp space into a closed pocket around it.

With the recent speculations of astrophysicists concerning black holes, some science-fiction writers have been led to pounce on the black hole as a means of getting around the lightspeed limit, identifying it as that good old space warp they'd been writing about for years, finally legitimatized by science. Since an object inside a black hole would be cut off from normal space, they have presumably decided it would be in a sort of hyperspace, in which it could travel to some other point in the universe without traversing the intervening distance. Some recent stories have used this idea, and you mentioned it in your February Editorial.

Well, I'm sorry to disappoint everybody, but I'm afraid it won't work. What would actually happen to an object approaching a black hole is that a relativistic time dilation effect would set in, making the time for the object to come close to

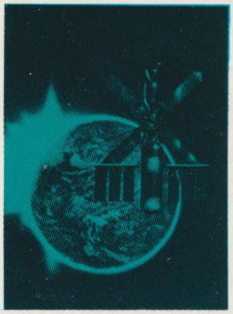
the black hole infinite to any external observer; in fact, the object could never be observed to get as close to the star as the Schwarzschild radius, equal to $2GM/c^2$ (where G is the gravitational constant, M the total energy of the star, and c the speed of light.) While to an observer on the object, the object would cross the Schwarzschild radius in a finite length of time, this doesn't help matters; since if he ever emerged from the black hole an infinite amount of time would have passed for the universe; this is equivalent to saying he could never emerge. (For the mathematics leading to these conclusions, I refer you to "Gravitation and Cosmology" by Steven Weinberg, Wiley, 1972, chapter 11, section 9.)

One could avoid this problem by not accepting the General Theory of Relativity (which, after all, has yet to be proven conclusively), but it is the General Theory of Relativity which predicts the existence of black holes in the first place, and you can't have it both ways. So it looks like we'd better just stick with space warps until something more promising than black holes comes along.

I'm interested in your comments on wormholes and alternate universes, and I'd like to know where I can read more about them . . .

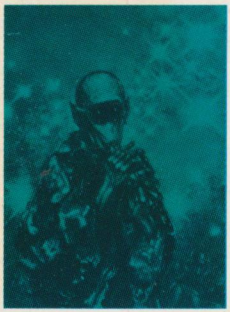
DANIEL M. KAPLAN
405 North Highland Avenue
Merion, Pennsylvania 19066

In the universe described by Einstein, all star journeys are essentially one-way trips. By flying near light-speed you can use time dilation to cut your elapsed trip time, but when you returned to Earth, eons may well have passed. One place to read about "wormholes" is (ahem!) "The New Astronomies," by Ben Bova, published by St. Martin's Press.



Analog covers available

Thanks to your great interest and demand, we now have available for sale a limited number of reprints of our June, August, October and November 1973 covers. The reprints are in the same colors as originally published, without the printed material overlaying them. The reproductions are bordered with white stock, suitable for framing. Size is 9″ x 12″. Individual covers will cost $1.75. A set of two covers will be $2.50; three-cover sets, $3.25; all four covers, $4.00. Order now! (A limited number of 1972 covers also available.)



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