MARCH 1985

$2.00

SCIENCE FICTION

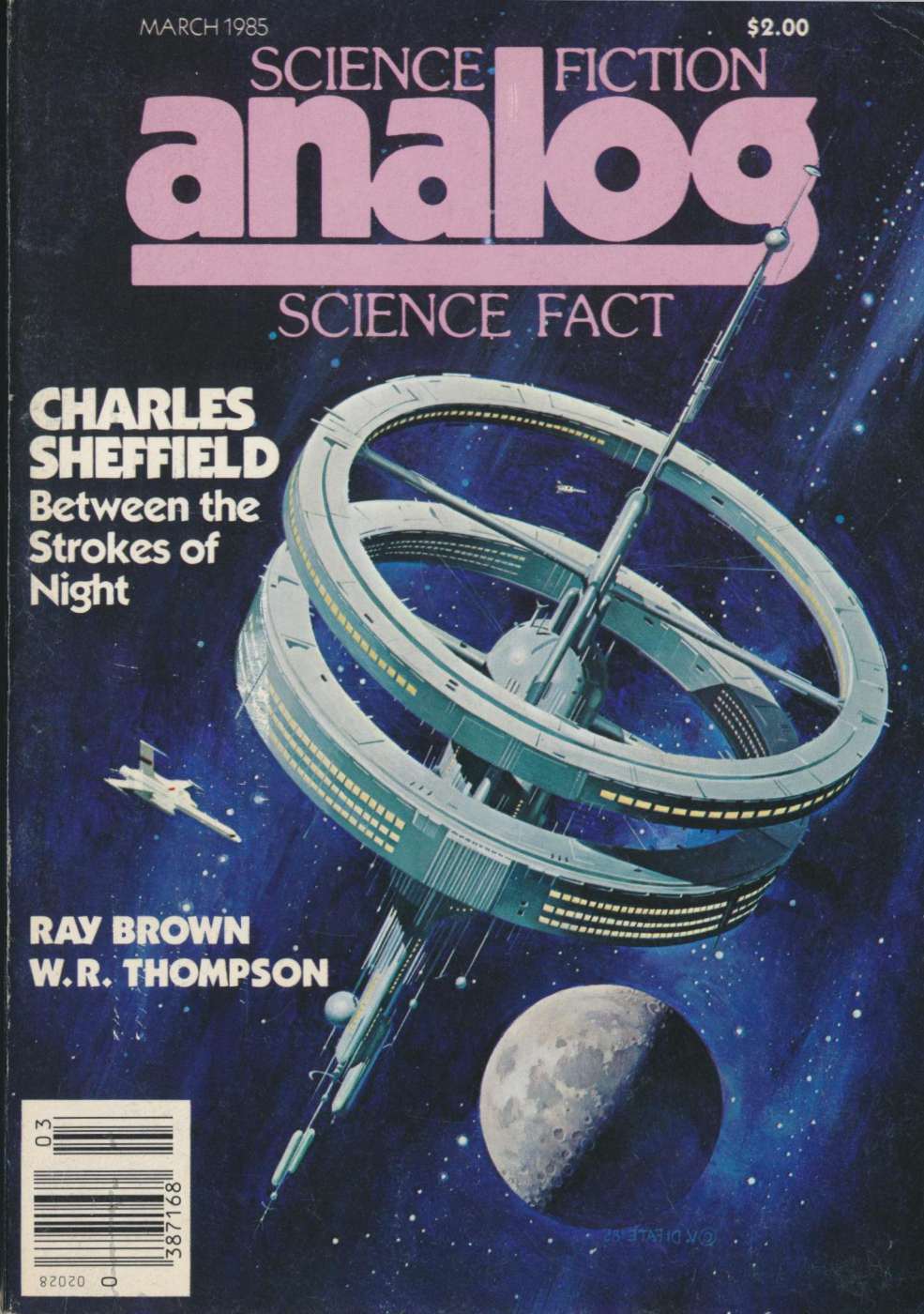
analog

SCIENCE FACT

CHARLES SHEFFIELD
Between the Strokes of Night

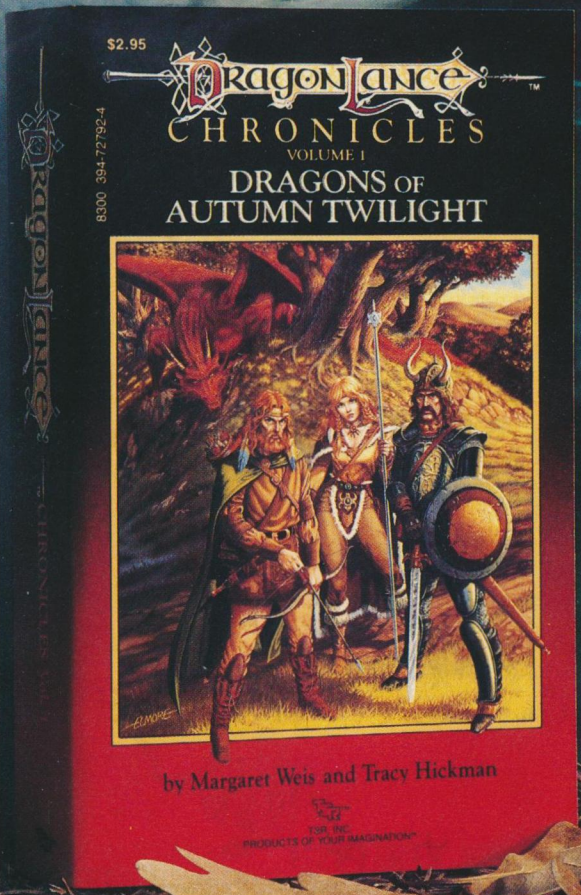
RAY BROWN

W.R. THOMPSON



03
0 387168 02028

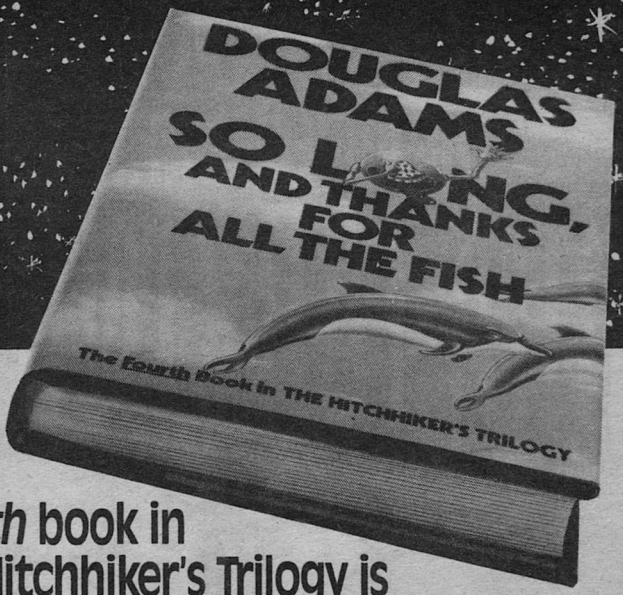
EXPERIENCE A LEGEND IN TSR'S FIRST AD&D™ FANTASY NOVEL!



Dragons, creatures of legend Krynn, a world of fantasy. DRAGONLANCE™ CHRONICLES, the epic quest of a small band of heroes comes alive in TSR's first full-length AD&D™ fantasy novel.

Ask for DRAGONS OF AUTUMN TWILIGHT, th first volume in the epic trilogy, at your favorite hobby, book or toy store.

448 pages of fantasy adventure for only $2.95!



The *fourth* book in the Hitchhiker's Trilogy is "the best entry since the original *Hitchhiker's Guide to the Galaxy.*"

—*Kirkus Reviews*

Arthur Dent and the gang are back – in the *fourth* book in the Hitchhiker's Trilogy, a riotous and riveting series with more than four-million copies in print. It's everything you wanted to know about the first three books, but never thought to ask.

Join Arthur in his quest to find out:

- What *really* happened the day the Earth was demolished?
- Why have all the dolphins vanished?
- What is God's Final Message to His Creation?

The *Washington Post* called Douglas Adams's first book "extremely funny . . . inspired lunacy that leaves hardly a science-fiction cliché alive." His second book was "highly recommended" by the *Library Journal* which praised it as "one of the best pieces of science-fiction humor available." And *Time* raved that his third book was "like nothing ever published before."

Don't miss

SO LONG, AND THANKS FOR ALL THE FISH by Douglas Adams

$12.95, now at your bookstore.

HARMONY BOOKS

analog

Vol. CV No. 3
March, 1985

Next Issue On Sale
February 26, 1985

$19.50 per year in U.S.A.
$2.00 per copy

Serial

Novelettes

Science Fact

Short Stories

Reader's Departments

Cover by Vincent Di Fate

Joel Davis, President & Publisher

William F. Battista, Associate Publisher

Stanley Schmidt, Editor
Shelley Frier, Associate Editor
Ralph Rubino, Art Director
Terri Czeczko, Art Editor

Indicia on Page 6

Editorial

THE WORLD'S BIGGEST THINK TANK

Stanley Schmidt

Creativity is usually thought of as a solitary activity, and quite often it is. Some parts of the creative process are commonly so private that not even the creator's conscious mind is allowed to know what his subconscious is doing until it's finished.

But it isn't *always* or *necessarily* such a lonely thing. Many industries and other organizations have found in recent years that certain phases of creativity are very productively handled by "think tanks"—groups of people assembled expressly to generate, working together, lots of ideas. The method has shown such merit, in fact, that companies now exist whose main "product" is the service of operating think tanks to help solve other companies' problems.

If you haven't seen a think tank in operation, you might well be skeptical, thinking, "A camel is a horse that was designed by a committee." (Actually, from an engineering standpoint, a camel is better than a horse for what a camel does; but let that pass. You get the idea.) A well-run think tank is *very* different from a typical committee, using a well-defined methodology to achieve quite different kinds of goals.

A think tank I recently had the opportunity to be part of might serve to illustrate the differences. Committees I've seen have usually been charged with proposing a complete plan of action, and have tended to spend vast amounts of time rehashing a few basic ideas over and over. A typical think tank does not try to work out all the details of implementing any one idea, but rather to generate a *lot* of ideas which *could* be implemented. The one I'm using for my example was assembled for a client company involved in materials manufacture that was looking for profitable ways to diversify its line. (I couldn't tell you its name if I wanted to; the members of a think tank seldom know who the client is.) Our goal was not to develop a complete manufacturing and marketing strategy for any one new product, but to propose a very large number of *possible* new products, and give the client some idea of which ones looked most promising and some basis for deciding which of those to develop. We did exactly that, and we generated many more ideas in one day of intense work than any one of us could have produced alone. (Or even the same group working in standard committee fashion.)

The first job of the organizer of the think tank was to assemble a group of people with a wide range of backgrounds that might contribute to solving the problem. The wide range is extremely important—a possibility that would be obvious to a ceramicist might never occur to a metallurgist. And if the ceramicist and the metallurgist put their heads together and talk about the possibilities each sees, they might come up with a still better one which would not have occurred to either alone. Our group included physicists, chemists, and engineers with many specialties—not all directly materials-related—from industrial, academic, and independent consulting environments. I'm a physicist (primarily nuclear and solid state), but I was included not so much for that as for my science-fictional orientation, which the organizers hoped would help "loosen up" the thinking of the practicing scientists and engineers.

All of us received written material beforehand on the nature of the client's problem and some areas in which answers might be found—and then we were thrown into a room together and turned loose to come up with solutions. At the outset, and occasionally later on when things threatened to get slow, each of us was asked to write down a seemingly impossible number of ideas in a very short time, and throw them into a pot for discussion. The rationale behind this seemingly bizarre request is to break down one of the commonest obstacles to creativity: the habit of evaluating ideas as fast as they're proposed. Most of us, when faced with a problem, tend to think of ways to approach it and immediately decide whether each has any merit. Ways that don't look promising we discard immediately. Some ideas seem so ridiculous so soon after we think of them that we never really think *about* them at all.

The idea of demanding huge numbers of ideas fast is to completely separate generation and judgment, by requiring

so many ideas to be produced that there is no time to judge any of them. If you write down every idea that comes to you, no matter how ridiculous it may seem, you'll get a lot more ideas into the pot than if you filter them way back at the source. Why not try to keep ridiculous ideas from getting into the pot in the first place? Well, for one thing, first impressions are not always right. An idea which is "obviously" ridiculous may prove to have more possibilities than you thought, if you actually take the time to examine it. Judgmental thinking commonly involves identifying what's *wrong* with an idea; the think tank approach is to look first for what's *good* about it, and only later hunt for the bugs.

And sometimes an idea that, in itself, does turn out to be of no value, can serve as a bridge, or evolutionary link, to others which are very valuable indeed. Most of us would probably agree that mammals are a good idea—but it's hard to get mammals without having reptiles first. Over and over in our "creative session" one of us would pro-

STANLEY SCHMIDT ..... Editor
SHELLEY FRIER ..... Associate Editor
RALPH RUBINO ..... Corporate Art Director
GERARD HAWKINS ..... Associate Art Director
TERRI CZECZKO ..... Art Editor
CARL BARTEE ..... Director of Manufacturing
CAROLE DIXON ..... Production Manager
LAUREN C. COUNCIL ..... Production Assistant
CYNTHIA MANSON ..... Director, Subsidiary Rights
BARBARA BAZYN ... Manager, Contracts & Permissions
MICHAEL DILLON ..... Circulation Director, Retail Marketing
KATHY TULLY-CESTARO ..... Circulation Director/ Subscriptions
PAUL PEARSON ..... Newsstand Operations Manager
WILLIAM F. BATTISTA ..... Advertising Director
JAMIE FILLON ..... Advertising Manager
IRENE BOZOKI ..... Classified Ad Manager

JOEL DAVIS
President & Publisher

LEONARD F. PINTO
Vice President & General Manager

PAULA COLLINS
Vice President Circulation

FRED EDINGER
Vice President Finance

ADVERTISING OFFICES

CHICAGO
(312) 346-0712

NEW YORK
(212) 557-9100

LOS ANGELES
(213) 785-3114

Analog Science Fiction/Science Fact is published 13 times annually by Davis Publications, Inc. at $2.00 a copy. Annual subscription $19.50 in the U.S.A. and possessions, in all other countries, $24.20 payable in advance in U.S. funds. First copy of new subscription will be mailed within eight weeks of receipt of order. When reporting change of address allow 6 to 8 weeks and give new address as well as the old address as it appears on the last label. Second-class postage paid at New York, NY, and at additional mailing office. Canadian 3rd class postage paid at Windsor, Ontario.

POSTMASTER: SEND FORM 3579 to ANALOG SCIENCE FICTION/SCIENCE FACT, P.O. BOX 1936, MARION, OH 43306
IN CANADA RETURN TO 628 MONMOUTH ROAD, WINDSOR, ONTARIO N8Y 3L1
Editorial and Advertising: Analog Science Fiction/Science Fact, 380 Lexington Avenue, New York, NY 10017
Subscriptions: Analog Science Fiction/Science Fact, P.O. Box 1936, Marion, OH 43306 ISSN 0161-9398

LORDS OF CREATION®

The fascinating new role-playing adventure game from The Avalon Hill Game Company

LORDS OF CREATION adventures can take place in any setting the Game Master can imagine. Typical settings include fantasy, science fiction, time travel, alternate dimensions, mystery thriller, parallel worlds, horror and science fantasy, yet the game is in no way "generic" and has its own consistent theme. The combat system is designed to handle any situation from sword play through rifle fire to blaster shots, plus psychic, futuristic and magical powers.

Lords of Creation®
$12.00

Basic Game complete with:
64-page Rules Book
64-page Book of Foes
Set of Polyhedral Dice

Horn of Roland®
$8.00

Expansion Module #1 complete with:
48-page Adventure
Multiple Player Aid Handouts

Characters begin the game as "normal" humans, but there is no limit to how powerful the characters can become. The gaming system is reasonably simple, with additional and optional rules that can be added as the basic rules are mastered. The game system even allows Game Masters to add their own rules, if desired.

The Avalon Hill Game Company
4517 HARFORD ROAD, BALTIMORE, MARYLAND 21214

Available wherever great games are sold!
For Credit Card Purchasing

call TOLL FREE 800-638-9292

pose an idea which another could quickly show to be unworkable, but which inspired a third to think of something else which wound up on our final list for the client. The "bridge" idea turned out to have no intrinsic value (at least, none that *we* saw)—*but if we had not been willing to consider it, we would never have got to the one that did have value.* Since such bridge ideas are often the "ridiculous" ones, the most productive discussions were often the most playful. By considering even the ridiculous, we came up with a large number of potentially *useful* ideas. True, many (if not most) of our ideas were ultimately scrapped—but the number left over was almost certainly larger than it would have been if we'd let our inhibitions operate too early in the game.

There's a lot more that I could say about thought processes as observed in a think tank. I could talk, for example, about specific techniques for generating new ideas. Or the curious thing that happened when it became evident that we had too many idea areas for the whole group to do justice to in the time available, and we split temporarily into two groups. Each group soon developed a distinctive style, one thinking primarily in terms of "What can we do with this class of materials?" while the other leaned toward "How might we accomplish such-and-such task?" Both approaches have value—and so did throwing both groups back together to compare notes and have at each other at the end.

But I don't want, at least now, to get into all the subtleties of think tank thinking. My main point depends only on the basic principles of the method: bring together a diverse assortment of minds, make them generate lots of ideas without immediate judgment, let those ideas lead to others, and you're likely to wind up with a lot of useful ideas you would not have got in any other way.

Now—look back over that description. Sound familiar?

Analog's readers and writers might well be considered a very large think tank. They include well over a hundred thousand bright and well-educated minds (just how much over I'm not sure, since I don't know how many people see an average copy), with a very wide range of educational, personal, and occupational backgrounds. (See "Portrait of You" in the April 27, 1981 issue.) In every issue we throw out an assortment of ideas via editorials, stories, articles, columns, and letters. These then get tossed back and forth, chewed over, expanded upon and argued about in subsequent issues, and that process leads to still more ideas—some of which, we hope, will eventually have some beneficial effect on the way the future grows.

There are differences, of course. Probably the most important are the sheer number of participants and the much slower time scale of our "think tank." We can't deal with such great numbers of ideas. We must do some prior evaluation to determine what gets into the magazine, and some development so it won't take forever to get beyond the "completely ridiculous" stage. The ratio of people to pages keeps many of the ideas offered from getting into the public fray at all. We are not work-

ing toward as narrowly defined a goal as a typical think tank in business; if there is a unifying problem that we're all working on, it's something like, "How can we make the future better for all sentient beings?"

But some of the essential properties of a think tank do carry over into the *Analog* "family." The ideas which do see print are seen by people with highly diverse backgrounds and expertise, and those people have a chance to develop those ideas or counter with others by writing letters or articles or stories of their own.

Most of you play the game very well and clearly enjoy the ongoing play with ideas in our pages. But there is one respect in which the analogy doesn't always work quite as well as I might hope. Occasionally someone is so incensed with an idea that appears here that he can do nothing but condemn it in the strongest language at his disposal, whether that be harsh words or canceling his subscription.

Which, of course, is a very close analog of the rejection-at-first-sight-of-defects which successful think tank moderators try so hard to avoid. So maybe a reminder is in order from time to time: while it's true that we can't publish every idea that occurs to any of us, I do try to get a wide variety of them onto the table. This means that *some* of them are almost certain to seem absurd or infuriating or stupid or offensive to you. That's fine; say so, and say why. With our logistics, we need defects pointed out, too—and if you agreed with everything I printed, it would probably mean I wasn't offering you a wide enough choice.

But when an idea in an editorial or a story strikes you as completely off-the-wall, please bear in mind that it may have been planned that way. By all means point out whatever problems you see with it—but please don't slam your mind shut on it. After you've picked out the faults (or, better yet, before), play with it a little. Try to see if there's anything in it that you like—or that you can change to something you like. Remember, I or an author may deliberately expound an idea which we know is not really workable or desirable—but which may still be worth considering because it might serve as a bridge to a better one.

And please remember also that it may take more than one bridge to reach a final destination. The vision I try to cultivate in *Analog* looks toward futures —not just the immediate future, or the one that looks easiest to reach from here and now, but *any* situation that could work in any time and place. Never mind if present technical or social obstacles rule it out as a short-term possibility; if a future has enough to offer, it may be worth several big steps to get there.

The only limit, in "the world's biggest think tank," is your imagination. ■

● Art, like morality, consists in drawing the line somewhere.

G.K. Chesterton

"Rich, beautiful, original."
– Piers Anthony

"Outstanding!"
Andre Norton

"Engaging!"
Publishers Weekly

THE SHATTERED WORLD

MICHAEL REAVES

A millennium ago magicians fought a war,
and smashed the world into a thousand pieces.
Horrified at the destruction,
they set the fragments to floating about each other
in the Abyss and supplied them with
an atmosphere that men and beasts could breathe.

But that was long ago.
In a thousand years even sorcerers grow old,
and so do their spells.
Already pieces of the Shattered World
begin to collide...

BAEN FANTASY BOOKS

MARCH
55951-6 · 416 pp. · $3.50

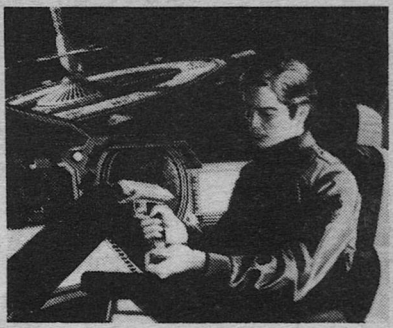
Sabotage at L-5
– The fate of Earth's first colony hangs in the balance!

TROJAN ORBIT

MACK REYNOLDS WITH DEAN ING

Island One, the U.S.'s first space colony and symbol of an American Renaissance, is in trouble – and no one seems to know why. When the President ordered secret agent Peter Kapitz to find out what was going on, Peter's first discovery is that the Soviets are involved. His second is that they are not alone.

He will probably not live to make a third.



MARCH · 55942-7 · 384 pp. · $2.95

Also coming in March from Baen Books:

THE FALL OF WINTER, Jack C. Haldeman II
Humans vs. a planetary intelligence in a battle to the death.
55947-8 · 288 pp. · $2.95

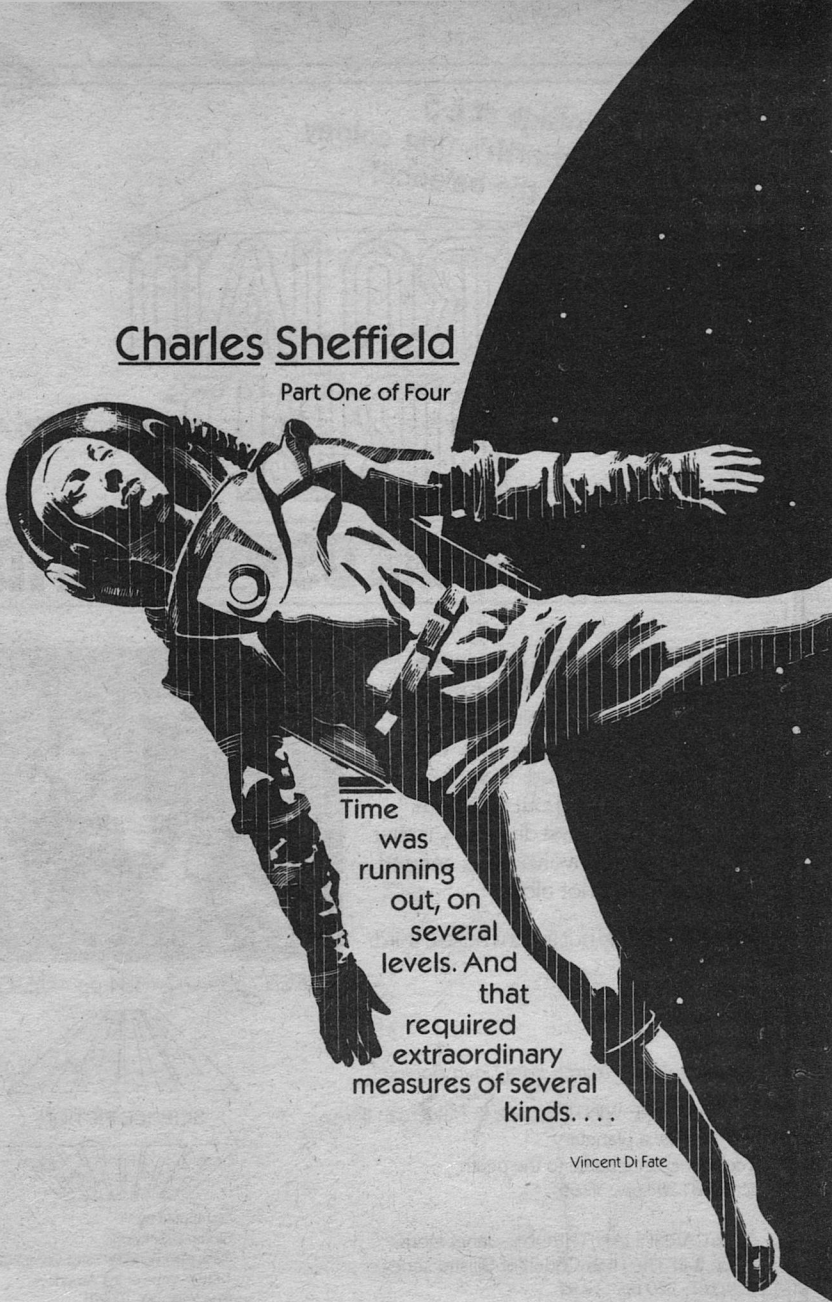
THE CARNELIAN THRONE, Janet Morris
Book 4 in The High Couch of Silistra series.
55936-2 · 320 pp. · $2.95

BAEN BOOKS
SCIENCE FICTION

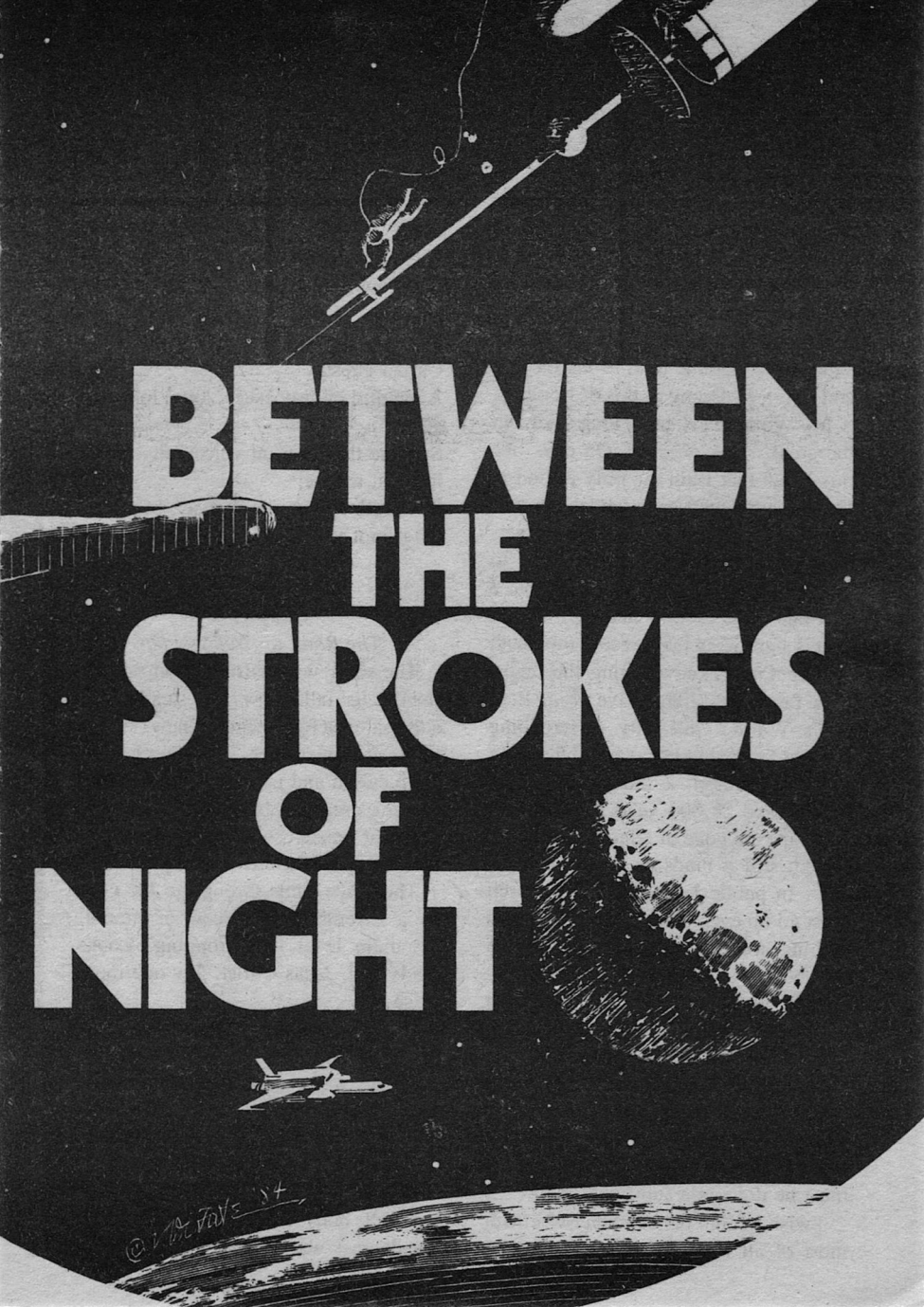
Distributed by:
Simon & Schuster
Mass Merchandise Sales Company
1230 Avenue of the Americas
New York, N.Y. 10020

Charles Sheffield

Part One of Four



Vincent Di Fate


BETWEEN
THE
STROKES
OF
NIGHT

Prologue

Gulf City, New Year 14 (29872 A.D.)

From the diary of Charlene Bloom:

Today I received word from Pentecost. Wolfgang IV is dead. He was five hundred and four years old, and like his forebears he was respected by the whole planet. A picture of his own grandson came with the message. I looked at it for a long time, but blood thins across six generations. It was impossible, save in my imagination, to recognize any sign of the original (and to me the one and only) Wolfgang in this descendant.

My Wolfgang is dead, long dead; but the great wager goes on. On days like this I feel that I am the only person in the Universe who cares about the outsome. If Wolfgang is at last the winner, who but I will know and be here to applaud him? And if I win, who but I will know the cost of victory?

It is significant that I record this death first, before acknowledging the report of a faster-than-light drive from Beacon's World. Gulf City is throbbing with the news, but I have heard the same rumor a hundred—a thousand?—times before. For 28,000 years our struggle to escape the yoke of relativity has continued; still it binds us, as strongly as ever. In public I say that the research must go on even if Beacon's World has nothing, that the faster-than-light drive will be the single most important discovery in human history; but deep within me I deny even the possibility. If the Universe is apprehensible to the human mind, then it must have some final laws. I am not permitted to admit it, but I believe the light-speed limit is one. As humans explore the galaxy, it must be done at a sub-light crawl.

I wish I could believe otherwise. But most of all today I wish that I could spend one hour again with Wolfgang.

"They told me, Heraclitus, they told me you were dead,
They brought me bitter news to hear and bitter tears to shed.
I wept as I remembered, how often you and I
Had tired the sun with talking, and sent him down the sky.

But now that thou art lying, my dear old Carian guest,
A handful of gray ashes, long, long ago at rest.
Still are thy pleasant voices, thy nightingales, awake;
For death he taketh all away; but these he cannot take."

Part I: A.D. 2010

Chapter 1

The Road to Armageddon

The snow was drifting down in tiny flakes. Its fall, slow and steady, had added almost four inches of new crystals to the frozen surface. Two feet below, torso curled and nose tucked into thick fur, the great she-bear lay motionless. Walls of translucent ice caverned about the shaggy, light-brown pelt.

The voice came through to the cave as a disembodied thread of sound. "Sodium level still dropping. Looks really bad. Jesus Christ. Try one more cycle."

On the periphery of the cave a flicker of colored light began to blink on and off. The walls shone red, clear blue, then sparkled with dazzling green. A stippling of pure colors rippled a pattern to the beast's closed eyelids.

The bear slept on at the brink of death. Its body temperature held steady, ten degrees above freezing point. The

massive heart pumped at a sluggish two beats per minute, the metabolic rate down by a factor of fifty. Breathing was steadily weakening, betrayed now only by the thin layer of ice crystals in the fringe of white beard and around the blunt muzzle.

"No good." The voice held an added urgency. "Still dropping, and we're losing the pulse trace. We have to risk it. Give her a bigger jolt."

The light pattern altered. There was a stab of magenta, a rapid twinkle of sapphire and cyan, then a scattershot of moving saffron and ruby dots on the icy wall. As the rainbow modulated, the bear responded to the signal. Slate-gray eyes flickered in the long, smooth head. The massive chest shuddered.

"That's as far as I dare take it." The second voice was deeper. "We're beginning to get more heart fibrillation."

"Hold the level there. And keep an eye on that rectal temperature. Why is it happening *now*, of all times?" The voice echoed anguished through the thick-walled cavern.

The chamber where the bear lay was fifteen meters across. Through the outer wall ran a spidery filament of fiber optics. It passed beneath the ice to a squat box next to the beast's body. Faint electronic signals came from needles implanted deep in the tough skin, where sensors monitored the ebbing currents of life in the great body. Skin conductivity, heart beat, blood pressure, saliva, temperature, chemical balances, ion concentrations, eye movements, and brain waves were continuously monitored. Coded and amplified in the square box, the signals passed as pulses of light along the optic bundle to a panel of equipment set outside the chamber's wall.

The woman who leaned over the panel outside the chamber was about thirty years old. Her dark hair was cropped short over a high, smooth forehead that now creased with frown lines as she studied the monitors. She was watching one digital readout as it flickered rapidly through a repeated sequence of values. She was in her stockinged feet, and her toes and feet wriggled nervously as the digital readout values moved faster.

"It's no good. She's still getting worse. Can we reverse it?"

The man next to her shook his head. "Not without killing her faster. Her temperature's down too far already, and she's below our control on brain activity. I'm afraid we're going to lose her." His voice was calm and slow under rigid control. He turned to look at the woman, waiting for an instruction.

She took a long, shuddering breath. "We must *not* lose her. There must be something else to do. Oh my God." She stood up, revealing a supple, willowy build that emphasized the thinness of her stooped shoulders. "Jinx might be in the same condition. Did you check on his enclosure, see how he's doing?"

Wolfgang Gibbs snorted. "Give me credit for something, Charlene. I checked him a few minutes ago. Everything is stable there. I held him four hours behind Dolly here, because I didn't know if this move was a safe one." He shrugged. "I guess we know now. Look at Dolly's EEG. Better accept it, boss woman. We can't do one thing for her."

On the screen in front of them, the pattern of electrical signals from the

bear's brain was beginning to flatten. All evidence of spindles was gone, and the residual sinusoid was dropping in amplitude.

The woman shivered, then sighed. "Damn, damn, *damn*." She ran her hand through her dark hair. "So what now? I can't stay here much longer —J.N.'s meeting starts in less than half an hour. What the hell am I going to tell her? She had such hopes for this one."

She straightened under the other's direct gaze. There was a speculative element to his look that always made her uneasy.

He shrugged again and laughed harshly. "Tell her we never promised miracles." His voice had a flat edge to the vowels that hinted at English as a late-learned second language. "Bears don't hibernate in the same way other animals do. Even J.N. will admit that. They sleep a lot, and the body temperature drops, but it's a different metabolic process." There was a beep from the monitor console. "Look out now—she's going."

On the screen in front of them the trace of brain activity was reduced to a single horizontal line. They watched in silence for a full minute, until there was a final, faint shiver from the heart monitor.

The man leaned forward and turned the gain as high as it would go. He grunted. "Nothing. She's gone. Poor old Dolly."

"And what do I tell J.N.?"

"The truth. She already knows most of it. We've gone further with Jinx and Dolly than J.N. had any reason to hope we could. I told you we were into a risky area with the bears, but we kept pushing on."

"I was hoping to keep Jinx under for at least another four days. Now, we can't risk it. I'll have to tell J.N. we're going to wake him up now."

"It's that, or kill him. You saw the monitors." As he spoke, he had already switched to the injection control system for the second experimental chamber, and was carefully increasing the hormonal levels through Jinx's half-ton body mass. "But you're the boss. If you insist on it, I'll hold him under a bit longer."

"No." She was chewing her lip, rocking backward and forward in front of the screen. "We can't take the risk. Go ahead, Wolfgang, bring him up all the way. Full consciousness. How long had Dolly been under, total time?"

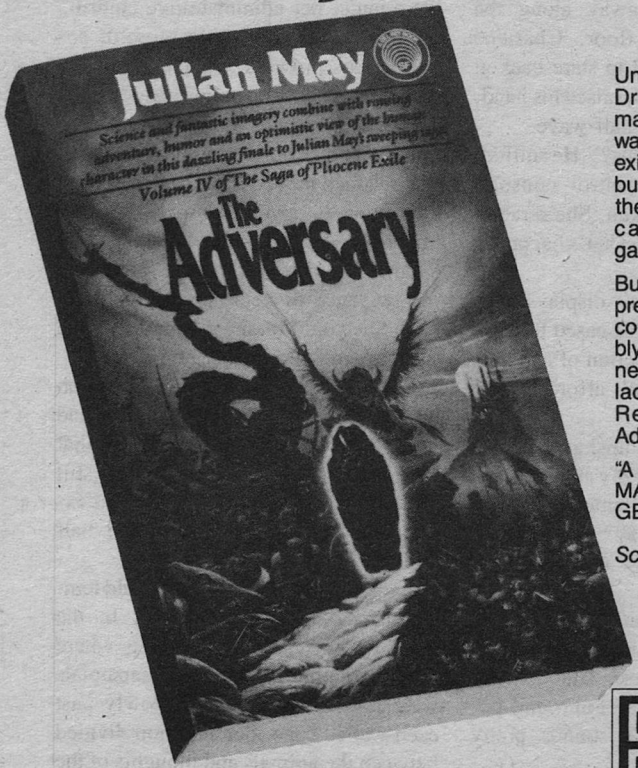
"One hundred and ninety-one hours and fourteen minutes."

She laughed nervously and wriggled her feet back into her shoes. "Well, it's a record for the species. We have that much to comfort us. I have to go. Can you finish all right without me?"

"I'll have to. Don't worry, this is my fourth hour of overtime already today." He smiled sourly, but more to himself than to Charlene. "You know what I think? If J.N. ever does find a way for a human to stay awake and sane for twenty-four hours a day, first thing she'll do is work people like us triple shifts."

Charlene Bloom smiled at him and nodded, but her mind was already moving on to the dreaded meeting. Head down, she set off through the hangar-like building, her footsteps echoing to the high, corrugated steel roof. Behind

The unforgettable end to the extraordinary sf epic that began with *The Many Colored Land*



Until the arrival of Aiken Drum, the 100,000 humans who had fled backward in time to Pliocene exile on Earth knew little but slavery to the Tanu—the humanoid aliens who came from another galaxy.

But King Aiken's rule is precarious; he is about to confront a man of incredibly powerful Talents who nearly overthrew a galactic rule. He is Marc Remillard. He is the Adversary.

"A NEW AND FRESH MASTERWORK OF THE GENRE!"
—Isaac Asimov's Science Fiction Magazine

Cover illustration by Michael Whelan

DEL REY

#1 in Science Fiction and Fantasy
Published by Ballantine Books

On Sale in March
$3.50

her, Wolfgang watched her departure. His look was a combination of rage and sorrow.

"That's right, Charlene," he grunted under his breath. "You're the boss, so you go off and take the heat. Fair enough. We both deserve it after what we did to poor old Dolly. But you ought to stop kissing J.N.'s ass and tell her she's pushing us too fast. She'd probably put you in charge of paperclips, but serve you right—you should have put your foot down before we lost one."

A hundred yards away along the length of the open floor, Charlene Bloom abruptly turned to stare back at him. He looked startled, raised his hand, and gave an awkward half-wave.

"Reading my thoughts?" He sniffed, turned back to his control console. "Nah. She's just chicken. She'd rather stay here than tell J.N. what's happened in the last half-hour."

He switched to Jinx's displays. The big brown bear had to be eased back up to consciousness, a fraction of a degree at a time. They couldn't afford to lose another one.

He rubbed at his unshaven chin, scratched absent-mindedly at his crotch, and pored over the telemetry signals. What was the best way? Nobody had real experience at this, not even J.N. herself.

"Come on, Jinx. Let's do this right. We don't want you in pain when the circulation comes back. Blood sugar first, shall we, then serotonin and potassium balance? That sounds pretty good."

Wolfgang Gibbs wasn't really angry at Charlene—he liked her too well. It was worry about Dolly and Jinx that upset him. He had little patience or respect for many of his superiors. But for the Kodiak bears and the other animal charges he had a good deal of affection and concern.

Chapter 2

Charlene Bloom took almost a quarter of an hour to make her way along the length of the main hangar. More than reluctance to attend the impending meeting slowed her steps. Fifty experiments went on in the building, most of them under her administrative control.

In one dimly lit vault a score of domestic cats prowled, sleepless and deranged. A delicate operation had removed part of the reticular formation, the section of the hindbrain that controls sleep. She scanned the records. They had been continuously awake now for eleven hundred and eighty hours—a month and a half. The monitors were at last showing evidence of neurological malfunction. She could reasonably call it feline madness in her monthly report.

Most of the animals now showed no interest in food or sex. A handful had become feral, attacking anything that came near them. But they were all still alive. That was progress. Their last experiment had failed after less than half the time.

Each section of the building held temperature-controlled enclosures. In the next area she came to the rooms where the hibernating rodents and marsupials were housed. She walked slowly past each walled cage, her attention divided between the animals and thoughts of the coming meeting.

Marmots and ground squirrels here, next to the mutated jerboas. Who was

running this one? Aston Naugle, if she had it right. Not as organized as Wolfgang Gibbs, and not as hard working — but at least he didn't make the shivers run up and down her spine. She was taller than Wolfgang. *And* his senior by three grades. But there was something about those tawny eyes . . . like one of the animals. He wasn't afraid of the bears, or the big cats— or his superior. A sudden disquieting thought came to her. That look. He would ask her out one evening, she was sure of it. And then?

Suddenly conscious that time was passing, she began to hurry along the next corridor. Her shoes were crippling, but it wouldn't do to be late. These damned shoes—why could she never get any that fitted right, the way other people did? *Mustn't be late.* In the labs since J.N. had been made Director, unpunctuality was a cardinal sin ("When you delay the start of a meeting, you steal everyone's time to pay for your own lack of efficiency. . . .")

The corridor continued outside the main building to become a long covered walkway. She took her first look at the mid-morning cloud pattern. It was still trying to rain. What was going on with this crazy weather? Since the climate cycle went haywire, none of the forecasts were worth a thing. There was a low ground mist curling over the hills near Christchurch, and it was hotter than it was ever supposed to be. According to all the reports, the situation was as bad in the northern hemisphere as it was in New Zealand. And the Americans, Europeans, and Soviets were suffering much worse crop failures.

Her mind went back to the first lab. Everything had been designed for less moisture. No wonder the air coolers were snowing on Jinx; the humidity outside must be close to a hundred persent. Maybe they should add a dehumidifier to the system—what they had now was working like a damned snow machine. Should she request that equipment at today's meeting?

The Meeting.

Charlene jerked her attention away from the lab experiments. Time to worry about that later. She hurried on. Up a short flight of stairs, a left turn, and she was at C-53, the conference room where the weekly reviews were held. And, thank God, there before J.N.

She slipped into her place at the long table, nodding at the others who were already seated: "Catkiller" Cannon from Physiology, de Vries from External Subjects, Beppo Cameron from Pharmacology (daffodil in his buttonhole —where did he get *that* in this wild weather?). The others ignored her and examined their open folders.

Five minutes to eleven. She had a few minutes to review her own statement and to stare for the hundredth time at the framed embroidery on the wall opposite. It had been there as long as she had, and she could close her eyes and recite it by heart.

"Do but consider what an excellent thing sleep is: it is so inestimable a jewel that, if a tyrant would give his crown for an hour's slumber, it cannot be bought: of so beautiful a shape is it, that though a man lie with an Empress, his heart cannot be quiet till he leaves her embracements to be at rest with the other: yea, so greatly indebted are we to this kinsman of death, that we owe

the better tributary, half of our life to him: and there is good cause why we should do so: for sleep is the golden chain that ties health and our bodies together.''—Thomas Dekker.

And underneath the beautifully needle-worked quotation, in Judith Niles's clear, bold cursive, was the recent addition:

Nuts. In this Institute, sleep is the enemy.

Charlene Bloom opened her own folder, leaned back, and eased off her black shoes, one foot tugging at the heel of the other. Eleven o'clock, and no Director. Something was wrong.

At four minutes past eleven, the other door of the conference room opened and Judith Niles entered followed by her secretary. Late—and she looked angry. Peering past her into the adjoining office, Charlene Bloom saw a tall man standing by the desk. He was curly-haired and in his early thirties, pleasant-faced but frowning now at something over on one of the walls.

A stranger. But those wide-set gray eyes seemed vaguely familiar; perhaps from an Institute Newsletter picture?

Judith Niles had remained standing for a moment instead of taking her usual place. Her glance went around the table, checking that all the Department Chiefs were already in position, then she nodded her greeting.

''Good morning. I'm sorry to keep you waiting.'' Her lips pouted on the final word and held that expression. ''We have an unexpected visitor, and I have to meet with him again as soon as this meeting is over.'' She at last sat down. ''Let's begin. Dr. de Vries, would you start? I'm sure everyone is as interested as I am in hearing of the results of your trip. When did you get back?''

Jan de Vries, short and placid, shrugged his shoulders and smiled at the Director. Judith Niles and he saw the world from the same place, half a head lower than most of the staff. Perhaps that was what allowed him to relax with her, in a way that Charlene Bloom found totally impossible.

''Late last night.'' His voice was soothing, slow and easy as warm syrup. ''If you will permit me one moment of tangential comment, the treatment for jet-lag that we pioneered here at the Institute is less than a total success.''

Judith Niles never took notes. Her secretary would record every word, and she wanted all her own mind concentrated on the pulse of the meeting. She leaned forward and looked closely at de Vries' face. ''I assume you speak from experience?''

He nodded. ''I used it on the trip to Pakistan. Today I feel lousy, and the blood tests confirm it. My circadian rhythms are still somewhere between here and Rawalpindi.''

The Director looked across at Beppo Cameron and raised her dark eyebrows. ''We'd better take another look at the treatment, eh? But what about the main business, Jan? Ahmed Ameer—is he fact or fiction?''

''Regrettably, he is fiction.'' De Vries opened his notebook. ''According to the report we received, Ahmed Ameer never slept more than an hour a night. From the time he was sixteen years old—that's nine years, he's twenty-five now—he swore that he hadn't closed his eyes.''

"And the truth?"

He grimaced, rubbed at his thin moustache. "I've got our complete notes here, and they'll go in the file. But I can summarize in one word: exaggeration. In the six days and nights that we were with him, he went two nights with no sleep. One night he slept for four and a quarter hours. For the other three nights he averaged a little more than two and a half hours each."

"Normal health?"

"Looks like it. He doesn't sleep much, but we've had other subjects with less right here in the Institute."

Judith Niles was watching him closely. "But you don't look like a man who wasted a week on a wild-goose chase. What's the rest of it?"

"My perceptive superior." De Vries looked angelic. "You are quite right. On the way out I went through Ankara to check out a long shot—another one of the rumors from the Cairo labs, about a monk who keeps a vigil over the sacred relics of Saint Stephen. A vestment was stolen while he was on duty two years ago, and after that he supposedly swore he would never sleep again."

"Well?" Judith Niles tensed as she waited for his answer.

"Not quite—but closer than we've ever come before." De Vries was all sly satisfaction. "Would you believe an average total daily sleep of *twenty-nine minutes?* And he doesn't sit in a chair and nod off for the odd few minutes when nobody's looking. We had him hooked up to a telemetry unit for eleven days. We have the fullest biochemical tests that we could make. You'll see my full report as soon as someone can transcribe it for you."

"I want it today. Tell Joyce Savin that it's top priority." Judith Niles gave de Vries a little nod of approval. "Anything else?"

"Nothing good enough to tell. I'll have my complete report for you tomorrow."

He winked across the table at Charlene. And she'll never read it, said his expression. The Director depended on her staff to keep track of the details. No one ever knew how much time she would spend on any particular staff report. Sometimes the smallest element of data would engage her attention for days, at other times major projects would run unstudied for months.

Judith Niles took a quick look at her watch. "Dr. Bloom, you're next. Keep it as short as possible—I'd like to squeeze our visitor in before lunch if we can."

But at my back I always hear, Time's winged chariot hurrying near . . . Charlene gritted her teeth. J.N. was obsessed with sleep and time. And most of what Charlene could offer was bad news. She bent her head over her notebook, reluctant to begin.

"We just lost one of the Kodiaks," she said abruptly. There was a rustle of movement as everyone at the long table sat up straighter. Charlene kept her head bowed. "Gibbs took Dolly down to a few degrees above freezing and tried to maintain a positive level of brain activity."

Now there was a charged silence in the room. Charlene swallowed, felt the lump in her throat, and hurried on. "The procedure is the same as I described in last week's report for the Review Committee. But this time we couldn't sta-

bilize. The brain wave patterns were hunting, seeking new stable levels, and there were spurious alpha thresholds. When we started to bring the temperature back up all the body functions just went to hell. Oscillations everywhere. I brought the output listings with me, and if you want to see them I'll pass them round."

"Later." Judith Niles's expression was a mixture of concentration and anger. Charlene knew the look. The Director expected everyone—everything—to share her drive toward Zero Sleep. Dolly had failed them. J.N.'s face had turned pale, but her voice was calm and factual.

"Gibbs, you said? Wolfgang Gibbs. He's the heavy-set fellow with curly hair? Did he handle the descent and ascent operations himself?"

"Yes. But I have no reason to question his competence—"

"Nor do I, I'm not suggesting that. I've read his reports. He's good." Judith Niles made a gesture to the secretary at her side. "Were there any other anomalies that you consider significant?"

"There was one." Charlene Bloom took a deep breath and turned to a new page of her notebook. "When we were about fifteen degrees above freezing, the brain wave patterns hit a very stable form. And Wolfgang Gibbs noticed one very odd thing about them. They seemed to be the same profile as the brain rhythms at normal temperature, just stretched out in time."

She paused. At the end of the table, Judith Niles had suddenly jerked upright.

"How similar?"

"We didn't run it through the computer yet. To the eye they were identical—but fifty times as slow as usual."

For a fraction of a second Charlene thought she saw a look flicker between Judith Niles and Jan de Vries, then the Director was staring at her with full intensity. "That's something I want to see for myself. Later today Dr. de Vries and I will come out to the hangar and take a look at this project. But let's run over it in a little more detail now, when we're all here. How long did you hold the stable phase, and what was the lowest body temperature? And what about tryptophan settings?"

Below table level, Charlene rubbed her hands along the side of her skirt. They were in for a digging session, she just knew it. Her hands were beginning to tremble, and she could feel new sweat on her palms. Was she well-prepared? She'd know in a few minutes. With the Director in the mood for detail, the visitor to the Institute might be in for a long wait.

Chapter 3

For Hans Gibbs it was turning into a long and confusing day.

When first suggested, a Downside visit to the U.N. Institute for Neurology in Christchurch had sounded like the perfect break from routine. He would have a week in full Earth gravity instead of the quarter-gee of PSS-One. He would gain a batch of exercise credits, and he needed all he could scrape together. He'd be able to pick up a few things Downside that were seldom shuttled up as cargo—how long since anyone on PSS-One had tasted an oyster? And even though Christchurch was

down in New Zealand, away from the political action centers, he'd be able to form his own impressions on recent world tensions. There were lots of charges and counter-accusations flying about, but chances were it was more of the same old bluster that the Downsiders mislabeled as diplomacy.

Best of all, he could spend a couple of evenings with randy old Wolfgang. The last time they'd been out on the town together, his cousin had still been married. That had put a crimp on things (but less than it should have—one reason maybe why Wolfgang wasn't married now?)

The trip down had been a disaster. Not the Shuttle flight, of course; that had been a couple of hours of relaxation, a smooth re-entry followed by activation of the turbofans and a long powered coast to Aussieport in northern New Guinea. The landing had been precisely on schedule. But that was the last thing that went according to plan.

The Australian spaceport, servicing Australia, New Zealand and Micronesia, normally prided itself on informality and excitement. According to legend, a visitor could find within a few kilometers of the port every one of the world's conventional vices, plus a few of the unconventional ones (cannibalism had been part of native life in New Guinea long after it had disappeared elsewhere).

Today all informality had disappeared. The port had been filled with grim-faced officials, intent on checking every item of his baggage, documents, travel plans, and reason for arrival. He had been subjected to four hours of questioning. Did he have relatives in Japan or the United States? Did he have sympathies with the Food Distribution Movement? What were his views on the Australian Isolationist Party? Tell us, in detail, of any new synthetic food manufacturing processes developed for the outbound arcologies.

Plenty was happening there, as he readily admitted, but he was saved by simple ignorance. Sure, there were new methods for synthetics, good ones, but he didn't know anything about them—wouldn't be *permitted* to know about them; they carried a high level of commercial secrecy.

His first gift for Wolfgang—a pure two-carat gemstone, manufactured in the orbiting autoclave on PSS-One—was retained for examination. It would, he was curtly informed, be sent along to his lodgings at the Institute if it passed inspection. His other gift was confiscated with no promise of return. Seeds developed in space might contaminate some element of Australasian flora.

His patience had run out at that point. The seeds were *sterile*, he pointed out. He had brought them along only as a novelty, for their odd shapes and colors.

"What the hell has happened to you guys?" he complained. "It's not the first time I've been here. I'm a regular—just take a look at those visas. What do you think I'm going to do, break into Cornwall House and have a go at the First Lady?"

They looked back at him stonily, evaluating his remark, then went on with the questioning. He didn't try any more backchat. Two years ago the frantic sex life of the Premier's wife had been everybody's favorite subject. Now it didn't rate a blink. If much of Earth

More magikal mirth 'n mayhem from the creator of Thieves World™

Well it seemed like a swell idea at the time...

Thanks to the pervert demon Aahz, Skeeve is now court Magician to Roderick V of Possiltum. And for the first "trick"—all he has to do is magikally stop the largest horde ever imagined.

Undaunted (well, somewhat daunted), Skeeve, Aahz, and Gleep, the baby dragon, invoke the magikal powers of fell wizardry and summon... an unemployed Imp, a Gargoyle hamburger cook, a narcoleptic Archer, an invisible Blue Gremlin, and Tanda, the All Woman Warrior.

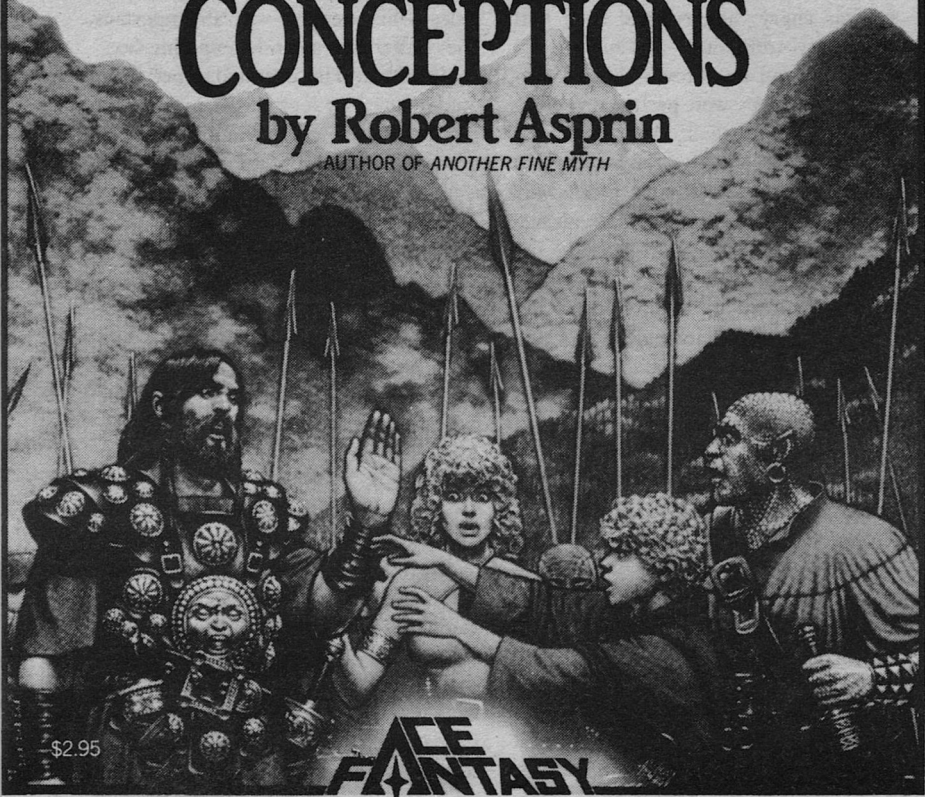
Now it's eight against an empire. But it's going to take a lot more magik to beat those odds.

Once again, Robert Asprin returns to the world of deveels, dragons, and magik in this all new frolicking "myth" adventure.

MYTH CONCEPTIONS

by Robert Asprin

AUTHOR OF *ANOTHER FINE MYTH*



$2.95

ACE FANTASY

was like this, the climatic changes must be producing worse effects than anyone in the well-to-do nations was willing to admit. The less lucky ones spoke of it willingly enough, pleading for help at endless and unproductive sessions of the United Nations.

When he was finally allowed to close his luggage and go on his way, the fast transport to Christchurch had already left. He was stuck with a Mach-One pond-hopper, turning an hour's flight to a six-hour marathon. At every stop the baggage and document inspection was repeated.

By the time they made the last landing he was angry, hungry, and tired out. The entry formalities at Christchurch seemed to go on forever, but he recognized that they were perfunctory compared with those at Aussieport—it seemed he had already been asked every question in the world, and his answers passed on to the centralized Australasian data banks.

When he finally reached the Institute and was shown to Judith Niles's big office it was one o'clock in the morning according to his internal body clock, though local time was well before noon. He swallowed a stimulant—one originally developed right here in the Institute—and looked around him at the office fittings.

On one wall was a personal sleep chart, of exactly the same type that he used himself. She was averaging a little less than six hours a night, plus a brief lunchtime nap every other day. He moved to the bookcase. The predictable works were there: Dement and Oswald and Colquhoun, on sleep; the Fisher-Koral text on mammalian hibernation; Williams's case histories of healthy insomniacs. The crash course he had received on PSS-One had skimmed through them all, though the library up there was not designed for storage of paper copies like these.

The old monograph by Bremer was new to him. Unpublished work on the brain-stem experiments? That seemed unlikely—Moruzzi had picked the bones clean there, back in the 1940's. But what about that red file next to it, "Revised Analysis"?

He reached out to take it from the case, then hesitated. It wouldn't do to get off on the wrong foot with Judith Niles—this meeting was an important one. Better wait and ask her permission.

He rubbed at his eyes and turned from the bookcase to look at the pictures on the wall opposite the window. He had been well briefed, but the more he could learn by personal observation, the less impossible this job would be.

Plenty of framed photographs there, taken with Presidents and Prime Ministers and businessmen. In pride of place was a picture of a gray-haired man with a big chin and rimless glasses. On its lower border, hand-written, were the words: Roger Morton Niles, 1921-1988. Judith's father? Almost certainly, but there was something curiously impersonal about the addition of *dates* to a father's picture. There was a definite family resemblance, mainly in the steady eyes and high cheekbones. He compared the picture of Roger Morton Niles with a nearby photograph of Judith Niles shaking hands with an aged Indian woman.

Strange. The biographical written descriptions didn't match at all with the

person who had swept through the office on her way to her staff meeting and given him the briefest and most abstracted of greetings. Still less did it match the woman pictured here. Based on her position and accomplishments he had expected someone in her forties or fifties, a real Iron Maiden. But Judith Niles couldn't be more than middle thirties. Nice looking, too. She was a fraction too thin in the face, with very serious eyes and forehead; but she made up for that with well-defined, curving cheek bones, a clear complexion, and a beautiful mouth. And there was something in her expression . . . or was it his imagination? Didn't she have that look—

"Mr. Gibbs?" The voice from behind made him grunt and spin around. A secretary had appeared at the open doorway while he was daydreaming his way through the wall photographs.

Thank Heaven that minds were still unreadable. How ludicrous his current train of thought would seem to an observer—here he was, flown in for a confidential and highly crucial meeting with the Director of the Institute, and inside two minutes he was evaluating her as a sex object.

He turned around with a little smile on his face. The secretary was staring at him, her eyebrows raised. "Sorry if I startled you, Mr. Gibbs, but the staff meeting is over and the Director can see you now. She suggests that you might prefer to talk over lunch, rather than meeting here. That way you'll have more time."

He hesitated. "My business with the Director—"

"Is private? Yes, she says that she understands the need for privacy. There is a quiet room off the main dining room, it will be just you and the Director."

"Fine. Lead the way." He began to rehearse his arguments as she preceded him along a dingy, off-white corridor.

The dining room was hardly private—he could see a hundred ways it could be bugged. But it did offer at least superficial isolation from other ears. He would have to take the risk. If anyone recorded them, it would almost certainly be for Judith Niles's own benefit, and would go no further. He blinked his eyes as he entered. The overhead light, like every light he had seen in the Institute, was overpoweringly bright. If darkness were the ally of sleep, Judith Niles apparently would not tolerate its presence.

She was waiting for him at the long table, quietly marking entries on an output listing. As he sat down she at once folded the sheet and spoke without any pause for conventional introduction.

"I took the liberty of ordering for both of us. There is a limited choice, and I thought we could use the time." She leaned back and smiled. "I have my own agenda, but since you came to see us I think you are entitled to the first shot."

"Shot?" He pulled his chair closer to the table. "You're misreading our motives. But I'll be pleased to talk first. And let me get something out of the way that may save us embarrassment later. My cousin, Wolfgang, works for you here at the Institute."

"I wondered at the coincidence of name."

And did you follow up with a check on us? thought Hans Gibbs. He nodded,

and went on. "Wolfgang is completely loyal to you, just as I work for and am loyal to Salter Wherry. I gather that you've never met him?"

Judith Niles looked up at him from under lowered brows. "I don't know anyone who has—but everybody has heard of him, and of Salter Station."

"Then you know he has substantial resources. Through them we can find out rather a lot about the Institute, and the work that goes on here. I want you to know that although Wolfgang and I have talked generalities from time to time about the work here, none of my specific information, or that of anyone else in our organization, came from him."

She shrugged in a noncommittal way. "All right. But now you have me intrigued. What do you think you know about us that's so surprising? We're a publically funded agency. Our records are open information."

"True. But that means you are restricted in the budget available to you. Just today, for example, you have learned of additional budget cuts because of the crisis in U.N. finances."

Her expression showed her astonishment. "How in the name of Morpheus can you possibly know that? I only found out a couple of hours ago, and I was told the decision had just been made."

"Let me postpone answering that, if you don't mind, until we've covered a couple of other things. I know you've had money problems. Worse still, there are restrictions—ones you find hard to accept—on the experiments that you are permitted to perform."

The lower lip pushed forward a little, and her expression became guarded. "Now I don't think I follow you. Care to be more specific?"

"With your permission I'll defer discussing that too, for the moment. I hope you'll first permit me a few minutes on another subject. It may seem unrelated to budgets and experimental freedom, but I promise you it is relevant. Take a quick look at this, then I'll explain exactly why I'm here."

He passed a flat black cylinder across to her. "Look into the end of it. It's a video recorder—don't worry about focus, the hologram phases are adjusted for a perceived focal plane six feet from the eye. Just let your eyes relax."

She wrinkled her brow questioningly, put her unbroken bread roll back on her plate, and lifted the cylinder to her right eye. "How do I work it?"

"Press the button on the left side. It takes a couple of seconds before the picture comes."

He sat silent, waiting as a waitress in a green uniform placed bowls of murky brown soup in front of each of them.

"I don't see anything at all," Judith Niles said after a few seconds. "There's nothing I can focus on—oh, wait a minute . . . "

The jet-black curtain before her took on faint detail as her eyes adjusted to the low light level. There was a backdrop of stars, with a long, spindly structure in the foreground lit by reflected sunlight. At first she had no sense of scale, but as the field of view slowly shifted out along the spider-net of girders other scene elements began to provide clues. A space tug lay along one of the long beams, its stubby body half-

hidden by the metal. Farther down, she could see a life-capsule, clamped like a tiny mushroom button in the corner of a massive cross-tie. The construction was big, stretching hundreds of kilometers away to a distant end-boom.

The camera swung on down, until the limb of the sunlit Earth appeared in the field of view.

"You're seeing the view from one of the standard monitors," said Hans Gibbs. "There are twenty of them on the Station. They operate twenty-four hours a day, with routine surveys of everything that goes on. That camera concentrates mostly on the new construction on the lower boom. You know that we're making a seven-hundred kilometer experimental cantilever on PSS-One?—Salter Station, most people down here apparently call it, though Salter Wherry likes to point out that it was the first of many, so PSS-One is a better name. Anyway, we don't need that extension cantilever for the present arcologies, but we're sure we'll use it someday soon."

"Uh-huh." Judith did not move her eyes from the viewing socket. The camera was zooming in, closing steadily on an area at the very end of the boom where two small dots had become visible. She realized that she was seeing a high-magnification close-up from a small part of the camera field. As the dots grew in size, the image had begun to develop a slight graininess as the limit of useful resolution was reached. She could make out the limbs on each of the space suits, and the lines that secured the suits to the thin girders.

"Installing one of the experimental antennas," said Hans Gibbs's voice. He obviously knew exactly what point the display in front of her had reached. "Those two are a long way from the center of mass of the Station—four hundred kilometers below it. Salter Station is in six hour orbit, ten thousand kilometers up. Orbital velocity at that altitude is forty-eight eighty meters a second, but the end of the boom is traveling at only forty-seven sixty meters a second. See the slight tension in those lines? Those two aren't quite in free fall. They feel about a hundredth of a g. Not much, but enough to make a difference."

Judith Niles drew in a deep breath but did not speak.

"Watch the one on the left," said Hans Gibbs quietly.

There was enough detail in the image to see exactly what was happening. The lines that secured one of the two suited figures had been released, so that a new position on the girder could be achieved. A thin aerial had opened up, stretching far out past the end of the boom. The left-most figure began to drift slowly along the length of the aerial, a securing bracket held in its right glove. It was obvious that there would be another tether point within reach along the girder, where the securing line could be attached. The suit moved very slowly, rotating a little as it went. The second figure was crouched over another part of the metal network, attaching a second brace for the aerial.

"In thirty seconds, you drift away by nearly fifty meters," said Hans Gibbs quietly. His companion sat as still as a statue.

The realization grew by tiny fractions, so that there was never one moment where the senses could suddenly

say, "Trouble." The figure was within reach of the tether point. It was still moving, inching along, certainly close enough for an outstretched arm to make the connection. Five seconds more, and that contact had been missed. Now it would be necessary to use the suit controls, to apply the small thrust needed to move back to contact range. Judith Niles suddenly found herself willing the suit thrustors to come on, willing the second figure to look up, to see what she was seeing. The gap grew. A few feet, thirty meters, the length of the thin aerial. The suit had begun to turn around more rapidly on its axis. It was passing the last point of contact with the structure.

"Oh, no." The words were a murmur of complaint. Judith Niles was breathing heavily. After a few more seconds of silence she gave another little murmur and jerked her body rigidly upright. "Oh, no. Why doesn't he do something? *Why doesn't he grab the aerial!*"

Hans Gibbs reached forward and gently took the cylinder away from her eye. "I think you've seen enough. You saw the beginning of the fall?"

"Yes. Was it a simulation?"

"I'm afraid not. It was real. What do you think that you saw?"

"Construction for the boom on Salter Station—on PSS-One. And they were two of the workers, rigging an antenna section."

"Right. What else?"

"The one farther out on the boom just let go his hold, without waiting to see that he had a line secured. He didn't even look. He drifted away. By the time the other one saw, he was too far away to reach."

"Too far away for anything to reach. Do you realize what would happen next?"

Neither of them took any interest in the food before them. Judith Niles nodded slowly. "Re-entry? If you couldn't reach him he'd start re-entry?"

Hans Gibbs looked at her in surprise, then laughed. "Well, that might happen—if we waited for a few million years. But Salter Station is in a pretty high orbit, re-entry's not what we worry about. Those suits have only enough air for six hours. If we have no ship ready, anybody who loses contact with the station and can't get back with the limited reaction mass in the suit thrustors dies—asphyxiates. It was a woman in that suit, by the way, not a man. She was lucky. The camera was on her, so we could compute an exact trajectory and pick her up with an hour to spare. But she'll probably never be psychologically ready to work outside again. And others haven't been so lucky. We've lost thirty people in three months."

"But *why?* Why did she let go? Why didn't the other worker warn her?"

"He tried—we all tried." Hans Gibbs tucked the little recorder back into its plastic case. "She didn't hear us for the same reason that she released her hold. It's a reason that should really interest you, and the reason why I'm here at your Institute. In one word: narcolepsy. *She fell asleep.* She didn't wake up until after we caught her, fifty kilometers away from the boom. The other worker saw what had happened long before that, but he didn't have the reaction mass to go out and back. All he could

do was watch and yell at her through the suit radio. He couldn't wake her."

Hans Gibbs pushed his half-full plate away from him.

"I know there's a desperate food shortage around most of the world, and it's a sin not to clear your dish. But neither one of us seems to be eating much. Can we continue this conversation back in your office?"

Chapter 4

It was early evening before Judith Niles picked up the phone and asked Jan de Vries to join her in her office. While she waited for him she stood by the window, staring out across the garden that flanked the south side of the Institute. The lawns were increasingly unkempt, with the flower beds near the old brick wall showing patches of weeds.

"Midnight oil again? Where's your dinner date, Judith?" said a voice behind her.

She started. De Vries had entered the open office door without knocking, quiet as a cat.

She turned. "Close the door, Jan. You won't believe this, but I did have an offer of dinner. A wild offer, with all the old-fashioned trimmings—he suggested Oysters Rockefeller, veal *cordon bleu*, wine, and the moonlit Avon River. Oysters and wine! My God, you can tell that he's from way out in space. He honestly believed we'd be able to *buy* that sort of food, without a contract or a special dispensation. He doesn't know much about the real situation. One of the scary things about all the Government propaganda is that it works so well. He had no idea how bad things are, even here in New Zealand—and we're the lucky ones. Oysters! Damn it, I'd give my virginity for a dozen oysters. Might as well hope to be served roast beef."

Her voice was longing, and it carried no trace of the usual authority. She sat down at her desk, eased off her shoes, and lolled back in her chair, lifting her bare feet to rest them on an open desk drawer.

"Far too late for any of that, my dear," said Jan de Vries. "Roast beef, good wine, oysters—or virginity, for that matter. For most of us they've fled with the snows of yesteryear. But I'm just as impressed by the other implications of his offer. Only somebody out of touch with the climate changes and literally out of this world would want to look at that ghastly river—not when it's eighty-seven degrees and ninety percent humidity."

He sat down gracefully, reclining on a big armchair. "But you turned down the invitation? Judith, you disappoint me. It sounds like an offer you couldn't refuse—just to see his expression when he could compare reality with his illusions."

"I might have taken it if Hans Gibbs hadn't made me the *other* offer."

"Indeed?" Jan de Vries touched his lips with a carefully manicured forefinger. "Judith, from one of your strongly heterosexual tastes, those words ring false. I thought you longed for offers like that, attractive beyond all other lures—"

"Stow it, Jan. I've no time for games just now. I want the benefit of your brain. You've met Salter Wherry, right? How much do you know about him?"

"Well, as it happens I know a fair

amount. I almost went to work on Salter Station; if you hadn't lured me here I'd probably be there now. There's a certain *je ne sais quoi* to the notion of working for a aged multi-billionaire, especially one whose romantic tastes before he went into seclusion were said to coincide with mine."

"Does he really own Salter Station? Completely?"

"So it is rumored, my dear. That, and half of everything else you care to mention. I could never discover any evidence to the contrary. Since the charming Mr. Gibbs works for Wherry, and you met with him for many hours this afternoon—don't think your long cloistering passed unnoticed, Judith—I wonder why you ask me these things. Why didn't you ask Hans Gibbs your questions about Salter Wherry directly?"

Judith Niles padded back to the window, and stared moodily out at the twilight. "I need to do an independent check. It's important, Jan. I need to know how rich Salter Wherry *really* is. Is he rich enough to let us do what we need to do?"

"According to my own investigations and impressions, he is so rich that the word lacks real meaning. Our budget for next year is a little over eight million, correct? I will check the latest data on him, but even if Salter Wherry is no richer now than he was twenty years ago, this whole Institution could be comfortably supported on the *interest* on Wherry's petty cash account."

"Maybe that's his plan." Judith swung back to face into the room. "Damn it, he certainly timed it well."

"Money troubles again? Remember, I've been away."

"Bad ones, I've had it with our brainless Budget Committee. They want to squeeze us another five percent, and already the place is falling apart around our ears. And we can't keep some of our experiments and results secret indefinitely, much as I'd like to. Charlene and Wolfgang Gibbs are stumbling over the same lead that we found. Wherry couldn't be approaching us at a better time. It could work out perfectly."

"As I have told you many times, Judith, you are a genius. You can maneuver simple innocents like me around like puppets. But you are not—yet—a manipulator to match Salter Wherry. He is the best in the System, and he can call on seventy years of experience. When you think of your own objectives, and your hidden agenda—which I do not even pretend to be privy to—remember that he undoubtedly has a hidden agenda also, with quite different goals. And if you are a genuis, he is an undoubted genius also in finance and organization. And he has a reputation of getting his way."

De Vries crossed his legs carefully and adjusted the sharp crease on his trousers. "But from the look on your face I suspect I'm digressing. What's this great offer you want to discuss? Why aren't you off by the great gray-green greasy Avon River, dining on strawberries and cream to the sound of trumpets—or whatever other delights of dalliance the sadly out-of-touch Mr. Gibbs had in mind?"

Judith Niles rubbed delicately at her left eye, as though it was troubling her. "Hans Gibbs brought me an offer.

They're having problems on Salter Station. Did you know that?''

''I have heard rumors. The insurance rates for Station personnel have been raised an order of magnitude above those for conventional space operations. But I fail to see any connection with the Institute.''

''That's because you don't know what the problems are. Jan, the offer I had today was a simple one. Hans Gibbs came here with authority from Salter Wherry. The budget of the Institute will be quadrupled, with guaranteed funding levels for eight years. In addition, the schedule of experiments that we conduct here will be free from all outside control or interference. So will our hardware and software procurement.''

''It sounds like paradise.'' De Vries stood up and went to stand next to Judith. ''Where's the worm in the apple? There must be one.''

She smiled at him, and patted his shoulder. ''Jan, how did I get along before you joined the Institute? Here's your worm: to get all the good things that Salter Wherry promises, we must satisfy one condition. The key staff of the Institute must relocate—to Salter Station. And we must do our best to crack a problem that has been ruining the arcology construction projects there.''

''What! Up into orbit. I hope you didn't agree to it.''

''No, not yet. But I might. I have to go up there and see for myself—Hans Gibbs will make the arrangements this weekend.'' As Jan de Vries became more and more doubtful, Judith looked more relaxed.

''And since I'll be gone, Jan,'' she went on. ''Somebody else has to look at the initial list of key staff members, just in case we decide to do it. I know my own choices for the top people, but I'm not close enough to all the support staff—and we'd need some of them, too. Who are the best ones, and who is willing to go to Salter Station?''

''You sound as though you have made up your mind already.''

''No. I just want to think ahead in case it does happen.'' She went across to her desk and picked up a handwritten page. ''Here's my first selection. Sit down again, and we'll go over it together.''

''But—''

''Get Charlene Bloom to help you on this while I'm away.''

''Charlene? Look, I know she's good, but can she be objective? She's a mass of insecurity.''

''I know. She's too modest. That's why I want her to know she was on my preferred list from the start. While you're at it, take a look at this.'' She handed him a couple of pages of printout. ''I just ran it out of the historical data banks. It's the statement that Salter Wherry made to the United Nations when he started his industrial space activity, thirty years ago. We need to understand the psychological make-up of the man, and this is a good clue to it.''

''Judith, slow down. You're pushing me. I'm not at all sure that I want to—''

''Nor am I. Jan, we may be forced to do this, even if some of us don't like the decision. Things have been absolutely falling apart around here in the past few months, bit by bit.''

''I know times are hard—''

''They'll get worse. The way the Institute is getting screwed around, we

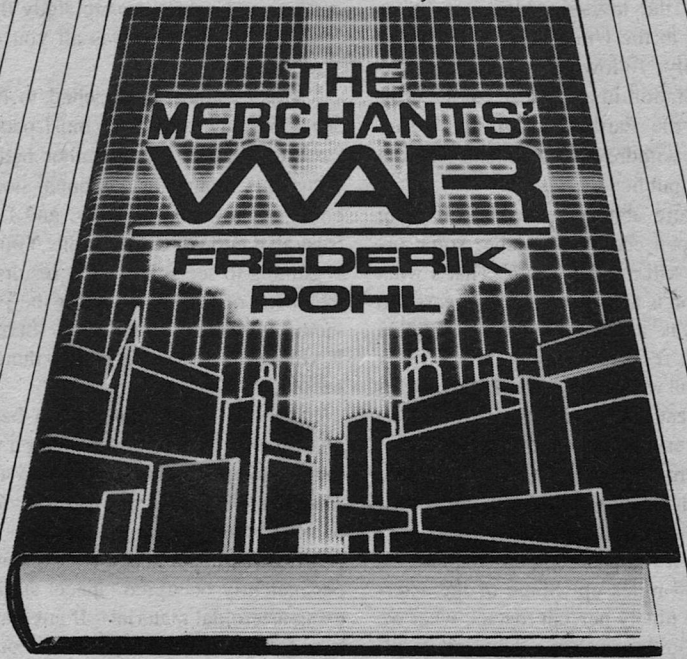
32 years after the classic *Space Merchants*, advertising agencies are still supreme. Except on Venus...

Thirty-two years ago Frederik Pohl and C.M. Kornbluth gave us a biting satire about advertising and consumerism, "a novel of the future," wrote the *New York Times*, "that the present must inevitably rank as a classic."

Now the long-awaited sequel continues the story. Earth's major ad agencies still run the show. Only renegades on Venus oppose this huckster's paradise and the all-powerful Account Executives of Earth will stop at nothing, not even war, to stop the rebels.

But the Veenies have a plan...

Available in hardcover only at $13.95.



Mail orders: Please enclose $15.45 per book (includes postage and handling). Send orders: ATTN: PYIA

ST. MARTIN'S PRESS
175 Fifth Avenue, New York, N.Y. 10010

can't afford to do nothing. If we're being raped we have to fight any way we can; even if it means risking Salter Wherry's trying to screw us too."

He took the sheets from her hand, sighing. "All right, all right. If you insist, I'll blunder ahead. Let's all become experts on Salter Wherry and his enterprises. But Judith, must you be so crude? I prefer to avoid these unpleasant suggestions of rape. Why can't we regard this overture as the first touch of Salter Wherry's perfumed hand in our genteel seduction?" He smirked happily. "That makes it all positively appealing; in seduction, my dear, there's so much more scope for *negotiation*."

From the invited address of Salter Wherry to the United Nations General Assembly, following establishment of Salter Station in a stable six-hour orbit around the Earth, and shortly before Wherry withdrew from contact with the general public:

"Nature abhors a vacuum. If there is an open ecological niche, some organism will move to fill it. That's what evolution is all about. Twenty years ago there was a clear emerging crisis in mineral resource supply. Everybody knew that we were heading for shortages of at least twelve key metals. And almost everybody knew that we wouldn't find them in any easily accessible place on Earth. We would be mining fifteen miles down, or at the ocean bottom. I decided it was more logical to mine five thousand miles up. Some of the asteroids are ninety percent metals; what we needed to do was bring them into Earth orbit.

"I approached the U.S. Government first with my proposal for asteroid capture and mining. I had full estimates of costs and probable return on investment, and I would have settled for a five percent contract fee.

"I was told that it was too controversial, that I would run into questions of international ownership of mineral rights. Other countries would want to be included in the project.

"Very well. I came here to the United Nations, and made full disclosure of all my ideas to this group. But after four years of constant debate, and many thousands of hours of my time preparing and presenting additional data, not one line of useful response had been drafted to my proposal. You formed study committees, and committees to study those committees, and that was all you did. You talked.

"Life is short. I happened to have one advantage denied to most people. Back in the 1950's my father had invested his money in computer stocks. I was already very wealthy, and I was frustrated enough to risk it all. You are beginning to see some of the results, in the shape of PSS-One—what the Press seems to prefer to call Salter Station. It will serve as the home for two hundred people, with ease.

"But this is no more than a beginning. Although nature may abhor a vacuum, modern technology loves one. That, and the microgravity environment. I intend to use them to the full. I will construct a succession of large, permanently-occupied space stations using asteroidal materials. If any nation here today desires to rent space or facilities from me, or buy my products manufactured in space, I will be happy

to consider this—at commercial rates. I also invite people from all nations on Earth to join me in those facilities. We are ready to take all the steps necessary for the human race to begin its exploration of our Universe."

It was past midnight when Jan de Vries had read the full statement twice, then skipped again to the comment with which Salter Wherry had concluded his address. They were words that had become permanently linked to his name, and they had earned him the impotent enmity of every nation on Earth:

"The conquest of space is too important an enterprise to be entrusted to governments."

De Vries shook his head. Salter Wherry was a formidable man, ready to take on world governments—and win. Did Judith have the equipment to play in Wherry's league?

He closed the folder, his chubby face completely serious. A move to Salter Station. It would be fascinating. But the government outrage and hypocrisy over Wherry's actions still continued, undiminished (perhaps increased) by success. The popularity of the arcologies, and the flood of applicants to embark on them, only added fuel to the official anger. If the Institute moved, everyone there would have to understand that the decision to join the Wherry empire would add to the outcry. They would all be branded as "traitors" by the U.N. official press.

And once they went out, what then? For many of them there would never be a return home. Earth would be lost to them forever.

The building hummed quietly with the subdued murmur of a thousand experiments, going on through the night. Jan de Vries sat in his easy chair for a long time, musing, peering out of the window into the humid night but seeing only the cloudy vision of his own future. Where was it likely to lead? Would he be in space himself, ten years from now? What would it be like out there?

The ideas were difficult to grasp, drifting away from the periphery of his tired brain. He yawned, and rose slowly to his feet. Ten years—it was too far to see. Better think of near-term things: Judith Niles's list, the budget, the still-unfinished trip report. Ten years was infinity, something beyond his span.

Jan de Vries could not possibly have known it, but he had his crystal ball wrongly focused. He should have been looking much further ahead.

Chapter 5

"Either I meet with him personally, or there will be no agreement. It's as simple as that, Hans."

"I'm telling you, that's not possible. He doesn't hold face-to-face conferences any more; not here, or down on Earth."

"*You* see him often enough."

"Well, damn it, Judith, I *am* his assistant. Even he has to see a few people. But I have full legal authority to sign for him, if that's a worry. Check with Zurich for any questions on financing. And if you want to look at anything else on the Station, tell me and I'll arrange it."

Hans Gibbs sounded almost pleading. They were sitting in an eighth-g chamber halfway out from the hub of Salter Station, watching the mining operations on Elmo, a hundred kilometers above

them. Electric arcs sparkled and sputtered in random sequence on the surface of the Earth-orbiting asteroid, and loaded cargo buckets were drifting lazily down along the umbilical. From this distance it was a glittering filament of silver, coiling its length down to the station refining center.

Judith Niles pulled her gaze back from the hypnotic sight of the endless bucket chain. She shook her head, and smiled at the man seated across from her.

"Hans, this isn't just me being awkward. And I'm sure that you and I could conclude the deal. It's not something I want for myself, it's for my team down at the Institute. I'm asking them to give up the security of Government jobs and take a flier to a private industry group in an orbital facility."

"Security?" Hans Gibbs glared at her. "Judith, that's pure crap. You *know* it's crap. A job with Salter Wherry is safer than any government position. Your whole group could be wiped out tomorrow if some jackass in the U.N. decided to throw his weight around. And they have plenty of jackasses. And don't give me any nonsense about your budget—Salter Wherry has better and earlier information about that than you do."

"I believe it." She sighed. "I told you, you don't have to convince me, you're preaching to the choir. I've seen our programs twisted and cut and maimed, year after year. But I need to bring twenty key scientists up here with me and I'm telling you how some of them feel. I go back to the Institute and they say to me, 'Did Salter Wherry agree to this?' And I say, 'Well, no. I signed a long-term contract—but I didn't actually *see* him.' Know what they'll say? They'll say that this project is pretty low on Salter Wherry's list of priorities, and maybe we should think again."

"It's *top* priority. Even down on Earth, most people know that he doesn't hold face-to-face meetings."

"I know." She smiled sweetly. "That's why it will be so impressive to my staff when they hear that I did meet with him. Think about it for a minute."

Judith Niles leaned back and recalled the last conversation with Jan de Vries and Charlene Bloom before she left. *Negotiate hard.* It had been the point they all agreed on. And if it didn't work out? Well, they would live through it. The Institute would continue somehow, even with Government cuts in funding.

Across from her, Hans Gibbs groaned and eased to his feet. In the two days that they had spent together he had been forming his own impressions of the Institute Director, adding to the odd perspective that had come from his cousin at the Institute.

"She's weird, I mean, like she's not shaped yet," Wolfgang had said. "She's pretty old, right?"

Hans glared at him. "Watch it, sonny. She's thirty-seven. Guess that's old if you're still wet behind the ears."

"Right. So she's thirty-seven, and she has a world-wide reputation. But she's like a little kid in some ways." Wolfgang waved his beer glass in a circle in the air. "I mean, you tell me I act like a retard, but she's the one you should talk to. I can't figure her at all. I think maybe when she was younger all her energy went into science and sex.

She's just getting around to *learning* the rest of the world."

"Sex?" Hans raised his eyebrows. "I was right, then. Wolf, if *you* say she's sex-mad, she must be something. Been trying to sleep your way to the top, eh? And I thought she was all fixed up with that little man I met yesterday."

"You mean Jan de Vries?" Wolfgang spluttered his laughter through a mouthful of beer. "Cousin boy, you are all screwed up on *that* one. No chance of an affair between him and J.N., not if you locked 'em up together and fed 'em Spanish Fly for a year. I like Jan, he's a great guy, but he's got his own ideas on sex. He makes friends easily with women, but for his love life he only looks at men."

"But you're sure about her?"

"I'm sure. Not from personal experience, though. She's not like me. J.N.'s discreet, she *never* plays bedroom games around the Institute. But she disappears for nights and weekends."

"She could be working."

"Bullshit. It takes one to know one. She's horny as I am."

Hans shrugged. His own impressions had been formed back when he first saw her photograph. "All right, so she's horny as you are. God help her. But if she's not shaped and still changing, what will she be like when she *is* shaped?"

Wolfgang Gibbs's face took on a different expression. He was silent for a moment.

"She could be anything," he said at last. "Absolutely anything. Even the cocky ones at the Institute admit it, she's way above them on technical matters."

"Even you, cousin? Since when? I thought the mirror on the wall said *you* were smartest of them all."

Wolfgang has placed his beer glass down on the window sill. He looked very serious. "Even me, cousin. Remember what one of France's old generals said when he came out of his first meeting with Napoleon? 'I knew at once that I had met my master.' That's how I felt after my first one-on-one with J.N. She's a powerhouse. And when she wants something, she's hard to stop."

"I've met more than one like that. But where does she get her kicks? If we're going to have a deal, I need to understand her motives."

But at that point Wolfgang Gibbs had only shaken his head and picked up his beer again. And now, thought Hans, looking at Judith's unreadable face, we're one-on-one and I'm experiencing the push for myself. An audience with Salter, she says, or no deal. He began to move slowly toward the exit.

"OK, Judith. I'll try. Salter Wherry is here on the Station, and I have to see him anyway about some other stuff. Give a half-hour—if I can't do anything in that time, I can't do it at all. Wait here, and dial Central Services if you need anything while I'm gone. But don't get your hopes up. The only thing I can tell you is that he wants the Institute up here so bad he can taste it—he says the narcolepsy problem is top priority. Maybe it will make him break his own rule."

Judith Niles was left with her own thoughts. The words of Jan de Vries kept drifting back to her. "Salter Wherry is a manipulator, the best in the Sys-

tem.'' And now she was hoping to manipulate the system he had created. Wherry didn't know it, but she had little choice. She had her own urgencies. The experiments she wanted to do *couldn't* be conducted down on Earth. If he were to suspect that . . .

She looked again out of the concave viewing port. Salter Station was powerful evidence of the effectiveness of that manipulative power. From where she was sitting, Elmo was continuously visible. It was the first of the Earth-orbit-crossing asteroids to be steered into stable six-hour orbit around the Earth: but as Salter Wherry had promised the United Nations, the story had not ended there.

Looking at the panorama of development above her, Judith Niles was forced to marvel. Wherry's asteroid mining operations had provided the base metals to create and then expand Salter Station. But at the same time, as no more than a by-product, they also extracted enough platinum, gold, iridium, chromium, and nickel to make up almost half of the world's supply. Bans against import of products from Salter Station into most countries had been totally useless. The shipments of metal were 'laundered' through neutral spaceports in the Free Trade Zones, and at last arrived where they were needed —fifty percent more expensive than they would have been on direct purchase.

Wherry's operations were strong enough to withstand a challenge from any government, his defense systems rumored to be capable of meeting a combined Earth attack. The Institute could be moved here, safe from withering cuts and changes of direction. But would it be worth it? Only if she and the rest of the staff had real freedom to pursue their work. That was the promise that she must extract from Salter Wherry. And an ironbound legal contract had to go with it. When you dealt with a master manipulator, you couldn't afford to leave loopholes.

She lay back in her seat, staring upward. A faint glimmer of light caught her eye, drifting past her field of view. She realized that she was witnessing one of the infrequent transits of *Eleanora*, the sixth and most ambitious of the giant arcologies. It was in an orbit nearly a thousand kilometers higher, and it passed the station only once every three days. Initally dubbed as ''Salter's Folly'' by the skeptical media, the *first* arcology had been started fourteen years ago and had grown steadily. Until the great space station was completed, Salter Wherry seemed content to let the original jeering name serve as the official one. Then he had finally renamed it *Amanda*, assisted its population of four thousand to establish themselves there, and apparently lost all interest. His mind was focused on construction of the second arcology, then the third . . .

Curious, Judith dialed into the Station's central computer and requested a high-resolution image of *Eleanora*. The half-built arcology blinked into full-color display on the sceen. The skeleton was finished now, a seven-hundred meter spherical framework of metal girders. Wall panels were going in over half the structure, so that she could estimate the size of the rooms and the internal corridors that would exist in the final ship. Allowing for power, food,

maintenance, and recreational areas, the final Ark would comfortably house twelve thousand people—the biggest one yet. And it had more facilities and living space per person than the average family enjoyed on Earth. Two more arcologies were starting construction in higher orbits, each supposedly even bigger than this one.

Judith stared out of the port, seeing again her own office back at the Institute. The group's move up here (if it happened; Hans Gibbs had been gone a long time) had seemed such a big thing when it was first proposed. Compared with what Salter Wherry was planning for the arcologies, it was nothing. They were designed to be self-sustaining over a period of centuries and more, free-ranging through the Solar System and beyond if they chose to do so, independent even of sunlight. From a kilo or two of water, self-contained fusion plants would provide enough power for years. As a backup to the recycling systems, each arcology would tow along an asteroid several hundred meters across, to be mined as needed.

Judith shook her head thoughtfully. She swung her chair to look out of the Earthside ports. It was daylight below, and she could see the great smudge that shrouded most of Zaire and central Africa. Parts of the dessicated equatorial rain forest were still ablaze, casting a dark shadow across a third of the continent. The drought-ridden area stretched from the Mediterranean past the Equator, and no one could predict when it would end. It was hard to imagine what life must be like down there, as the climate changes made the old African lifestyles impossible. And across the Atlantic, the vast Amazon basin was steadily drying, too, becoming the tinder that would flame in just a few more months unless weather patterns changed.

A turn of the head brought *Eleanora* back into view, far above. Down on Earth the arcologies seemed remote, the daydream of one man. But once you were up here, watching the ferry ships swarming between the Station and the distant, twinkling sphere of *Eleanora* . . .

"Interested in taking that trip?" said Hans Gibbs's voice from behind her. "There's plenty of space available for qualified people, and you'd be a prime candidate for a colonist."

The spell was broken. Judith realized that she had been staring out mindlessly, more fascinated than she had ever expected to be. She looked around at him questioningly.

"It's yes," he said at once. He shook his head in a puzzled way. "I'd have bet my liver that he wouldn't even consider seeing you—I told you, Salter Wherry *never* meets with anybody except a few aides these days. So what does he do? He agrees to see you."

"Thank you."

Hans Gibbs laughed. "For Christ's sake, don't thank me. All I did was ask—and I didn't expect anything except a quick refusal. He agreed so quickly, I wasn't ready for it. I started to give him arguments why he should make an exception in this case, then my brain caught up with my mouth. I suppose that proves how little I know him, even after all these years. If you're ready, we can go over right now. His suite is on the other side of Spindletop,

directly across from here. Come on, before he changes his mind."

Chapter 6

Salter Station was built on the general double-wheel plan defined thirty years earlier for a permanent space station.

The upper wheel, Spindletop, was reserved for communications, living, and recreational quarters. It rotated about the fixed spindle that jutted up to it from the lower wheel. With a diameter of four hundred meters, Spindletop had an effective gravity that ran from near-zero at the hub to almost a quarter-g at the outer circumference. The thicker under-section turned much more slowly, needing close to two hours for a full revolution compared with Spindletop's one-minute rotation period. All the maintenance, construction, power, and agriculture systems resided on the lower wheel.

"And some of the people, too," said Hans Gibbs as they rode the moving cable in towards the hub of Spindletop. "Once they become used to zero-g, it's a devil of a job to get them up here again. There's a compulsory exercise program, but you wouldn't believe the ways they find to get around it. We have engineers here who couldn't go back down to Earth without a year's conditioning—they spend all their time loafing around Workwheel. They even take their meals down there." He pointed along a metal corridor, twenty meters across, that went away at right angles from their inward passage. "That's the main route between Workwheel and Spindletop. See, we're at the hub now. If we wanted to we could just hang here and drift."

They paused for a few seconds so that Judith could take a good look around her. The central section was a labyrinth of cables, passages, and airlocks.

"It's all pressurized," said Hans Gibbs in answer to Judith's question about the need for interior airlocks. "But different sections have different pressure levels. And of course the locks are there for safety, too. We've never had a blow-out or a bad air loss but it could happen anytime—we can't track all the meteors."

He took her arm as they caught the cable out along another radial passageway of Spindletop. Her muscles tensed slightly beneath his fingers, but she made no comment.

"Have you spent much time in free-fall?" he said after a few moments. He turned so that they were facing each other, dropping outward steadily down the spiraling circular tunnel that led to the edge of Spindletop.

She shook her head. "Enough so that it doesn't trouble me in the stomach any more, but that's about all. I've sometimes thought it might be nice to take a vacation up on Waterway and see how freefall swimming is done; but I'm told it's expensive and I've always been too busy."

"If you come up here to work, you can do it free. The big fishtanks down on Workwheel are open to swimmers all the time."

He turned his face so that he was no longer looking directly at her before he spoke again. His voice was completely neutral. "There are some other experiences in freefall that you ought to try—really interesting ones. Maybe you can sample them before you go back

down to the Institute and tell the others what it's like here."

He felt her arm muscles tighten again in his grasp. "Let's see what happens first with Salter Wherry, shall we?" she said. Her voice was noncommittal, but she sounded slightly amused. "Maybe I'll have to tell them it didn't work out. Or maybe we'll have something to celebrate."

The area they were entering looked substantially different from the parts of Salter Station that Judith had already seen. Instead of metal walls and bulkheads they now passed over soft carpeted floors flanked by elaborate murals. At the door of an antechamber they were met by a young man dressed in a skin-tight electric-blue uniform. To Judith he looked like a pretty child, no more than thirteen years old. His complexion was soft, without a sign of facial hair.

"He has decided that he will see her alone," he said, in a voice that was not yet fully broken.

Hans Gibbs shrugged, looked at the youth, then at Judith. "I'll wait for you right here. Good luck—and remember, you're holding a card that he wants very badly."

Judith managed a wry smile. "And what he wants, he gets, right? Thanks anyway, I'll see you later."

She followed the young boy in through the curtained entrance. In the reduced gravity his walk lent an elegant, undulating sway to his hips.

Was he accentuating it intentionally? Jan de Vries was probably right about Salter Wherry's personal tastes—it was the sort of detail that he would know. Judith tried to make her own movements as economical and functional as possible as she followed around the curved floor of the chamber and on to another large room, this one with no viewports. The boy in front of her halted. Apparently they had arrived. Judith looked around her in surprise.

Opulence would have been understandable. These were the private living-quarters of a man whose fortune exceeded that of most Earth nations —perhaps all. But *this?*

The room they had entered was bare and ugly. Instead of the drapes and murals of the outer chamber, she was looking at dark walls and simple, plastic-coated floor and ceiling. The furniture was hard upright chairs, a single narrow couch, and an old wooden desk. And there was something else, stranger yet . . .

Judith had to think for a few seconds before she could pin it down. Something was missing. The room lacked any signs of data terminals or display screens; she could not even see a telephone or television outlet.

But Salter Wherry had System-wide influence and interests. One word from him could bankrupt whole States. He must find the most modern and elaborate communications equipment absolutely essential . . .

Judith walked over to the desk, ignoring the youth who had brought her in. There was nothing. No terminal, no data links, no modems; not even data cube holders. She was looking at a flat desk top with two buff file folders upon it, and a black book set neatly between them. A Bible.

"Where does he keep all—" she began.

"Videos? Books? Electronic equip-

ment?'' It was a different voice behind her. ''I have everything that I find necessary.''

Salter Wherry had quietly entered through a sliding door to her left. The pictures that she had seen of him showed a man in vigorous middle age, substantial and strongly-built, with a sensuous, fleshy face and prominent nose. But they had been taken thirty years ago, before Salter Wherry became reclusive. Now the man standing in front of Judith Niles was frighteningly frail, with a thin, lined face. Judith looked at him closely as he held out his hands to take both of hers. The aquiline nose was all that had survived of the younger Salter Wherry. Judith found the new version much more impressive. All the softness had been burned away from the man standing in front of her, and what remained had been tempered in the same inner furnace. The eyes dominated the countenance, glowing bright blue in deep sockets.

''All right, Edouard. You will leave us now,'' said Wherry after a few moments. His voice was gruff and surprisingly deep, not at all an old man's thin tones.

The boy nodded deferentially, but as he turned to leave there was a pout, a condescending look at Judith, and an arrogant sway of his shoulders. Salter Wherry gestured to the narrow couch.

''If it will not make you uncomfortable, I will stand. Long ago I learned that I think better this way.''

Judith felt her stomach muscles tighten involuntarily as she sat on the couch. Wherry's intuitive perception of motives was legendary. It might be hard to hide any secret from the probing intellect behind those steady eyes.

She cleared her throat. ''I appreciate your willingness to see me.''

Salter Wherry nodded slowly. ''I assume that your desire was not merely social. And I want you to be assured that the problem your Institute will be addressing is of prime importance to me. We have been obliged to introduce so many new precautions in space construction work that our rate of progress on the new arcologies has become pathetic.''

He stood motionless in front of her, quietly waiting.

''It's certainly not social.'' Judith cleared her throat again. ''My staff are asking certain questions. I want to know the answers as much as they do. For example, you have a problem with narcolepsy. We are well qualified to tackle it.''

And if I'm right, she thought, *I may have already solved it. Go carefully now, that's not the main point at issue.*

''But why not employ us simply as your consultants?'' she said. ''Why go to the trouble and expense of hiring an entire Institute, at great cost—''

''At negligible cost, compared with a hundred other enterprises I have up here. You will find me generous with money and other resources. 'Thou shalt not muzzle the ox when he treadeth out the corn.' ''

''All right, even without considering the cost. Why create an Institute, when you want to solve a single problem?''

He was gently nodding. ''Dr. Niles, you are logical. But permit me to suggest that you see this with the wrong perspective. The problem is too impor-

WHAT KIND OF P.B.M. PLAYER ARE YOU?

DO YOU LIKE TO WAIT QUIETLY FOR THE RIGHT TIME TO MAKE YOUR MOVE? LET THE OTHER PLAYERS MAKE THEIR POINTS WHILE YOU SEEM TO BE DOING NOTHING, AND THEN STRIKE FEAR IN THE HEARTS OF THE PEACEFUL PLAYERS? DO YOU ENJOY LETTING THE OTHER PLAYERS WONDER AND SPECULATE ON WHO YOUR VICTIMS WILL BE? THEN YOU SHOULD BE A **VENGEN** OR **MATEMUCH**.

DO YOU LIKE AN UNUSUAL AMOUNT OF CONTACT? WOULD YOU LIKE THE OTHER PLAYERS TO BE DEPENDENT UPON YOU FOR THEIR SUCCESS, AND BY HELPING THEM, PILE UP POINTS FOR YOURSELF? THEN YOU SHOULD BE A **MOVALL** OR **TRAVALL**.

WOULD YOU LIKE A WAITING LIST OF CUSTOMERS NEEDING YOUR SERVICES? WOULD YOU LIKE TO HAVE OTHER PLAYERS DOING YOU FAVORS, JUST TO KEEP ON YOUR GOOD SIDE? YOU SHOULD BE A **SELLER**.

DO YOU PREFER JUST A COUPLE OF FRIENDS AND ALLIES? WOULD YOU HAVE THEM BEGGING YOU FOR PROTECTION? PERHAPS FIGHT THEIR WARS AND HELP THEIR SIDE? THE **BADMUN** ROLE IS YOUR CUP OF TEA.

HOW WOULD YOU LIKE THE CHALLENGE OF BEING CHASED AND HUNTED? HAVE THE OTHER PLAYERS TRYING TO FIND OUT YOUR IDENTITY, BEFORE YOU HAVE TOO MUCH OF A LEAD? AND IF THEY DO DISCOVER YOU, HAVING TO USE WHATEVER FORCE OR DIPLOMACY AVAILABLE TO SURVIVE? THE **SEEKER** WOULD INTEREST YOU.

WOULD YOU LIKE TO BE CONSIDERED A NUISANCE TO THE OTHER PLAYERS? JUST KEEP COMMING TOWARD THEM, AND DARING THEM TO STOP YOUR EXPANSION? HAVE THEM DESTROYING THEIR OWN POPULATIONS IN THE HOPE OF SLOWING YOUR PROGRESS? YOU SHOULD BE A **PINDEMB**.

PERHAPS YOU WOULD LIKE TO BUILD AN EMPIRE, AND HOLD IT AGAINST ALL THE BAD GUYS THAT WANT WHAT YOU HAVE. COMPETE FOR EXPANSION. TRY BEING A **GREEDEX**.

MAYBE YOU WOULD LIKE TO BE THE **PREMIST**. HAVING OTHER PLAYERS ACTUALLY GIVING YOU ENTIRE PLANETS, JUST SO THEY CAN USE YOUR BASIC PRODUCT. THE OTHER PLAYERS SEE YOUR POINTS GOING UP, BUT THEY NEED YOU TOO MUCH TO BOTHER YOU UNTIL YOU ARE TOO FAR AHEAD, AND TOO STRONG. THE **PREMIST** IS MADE TO ORDER FOR YOU.

ALL OF THE ABOVE ARE INCLUDED IN **GALACTIC CONFUSION**! GET IN THE ACTION EARLY! BE THE EXPERT THE OTHERS WILL DEPEND UPON IN A VERY SHORT TIME. SIMPLE RULES, BUT ENDLESS STRATEGY!

SEND $3.00 FOR THE RULES. IF YOU DON'T PLAY THE GAME, RETURN THE RULES FOR AN IMMEDIATE REFUND. IF YOU DO PLAY, THE COST OF THE RULES WILL COVER YOUR FIRST TURN. AFTER THAT THE TURNS ARE $3.00 EACH. THERE IS NO CHARGE FOR CALLING IN YOU TURNS. THERE IS NO SET UP FEE!

PIERCE & CO. DEPT. B
P. B. M.
P.O. BOX 25675
CHICAGO, IL. 60625

tant to me to use you as consultants. I need a *dedicated* attention. If you were to remain on Earth, with your present responsibilities to the United Nations, how much of your time would be devoted to my problem? How much of Dr. Bloom's time, or Dr. Dameron's time, or Dr. de Vries's time? Ten percent? Or twenty percent? —but not one hundred and twenty.''

''So why not hire a team for the specific problem? The salaries that you offer would attract many of my staff.''

''And you yourself?'' He gave a curious little smile as she looked pensive. ''I thought not. Yet I am told that if anyone will solve it, it will be Judith Niles.''

Judith felt the hair on her arms and shoulders tingle into gooseflesh. Salter Wherry was willing to move a multimillion dollar operation into space and make a long-term commitment, merely to ensure her own availability. *Careful!* said the inner voice. *Remember, flattery is a tool that never fails.*

Did he suspect that she would be *obliged* to move some of the experiments into space, if her ideas on the processes of consciousness were correct? And if she knew already what was causing the narcolepsy problem in Salter Wherry's space construction crews, then from his point of view the move of the Institute would be unnecessary. She would be manipulating the master manipulator.

''You appear doubtful,'' he went on. ''Let me offer an additional argument. I know already of your personal indifference to money, and I will not offer it. But what about freedom to experiment?''

He moved over to the desk and picked up one of the two buff folders. His hand was thin, with long, bony fingers. Judith watched warily as he flipped open the folder and held it out toward her.

''In the past year, there have been seven requests to the U.N. from Dr. Judith Niles to conduct experiments on sleep research, using twelve new drugs that affect metabolic rate. The experiments would be done using human subjects—''

''—all volunteers, as the applications made clear.''

''I know. But all rejected. Perhaps because three years ago, you led an experiment that ended disastrously. The recorded statements are quite clear. Using a combination of Tryptophil and a technique of EEG reinforcement and feedback, you succeeded in keeping three volunteers awake, alert, and apparently healthy for more than thirty days. But then there were complications. First there was atrophy of emotional responses, then atrophy of intellect. To quote one critical review of the study, 'Dr. Niles has succeeded not in abolishing the need for sleep, but only in inducing Alzheimer's disease. We do not need more senile dementia.' ''

''Damn it, if you know that much, you probably know who wrote that review. It was Dickson, whose application for *identical research*—under worse control conditions—was turned down in favor of mine.''

''Indeed I know it.'' Salter Wherry smiled again. ''My point is not to goad you. It is to ask you how long it will be, for whatever reason, before you are allowed to resume experiments with

human subjects—even, as you say, with eager volunteers.''

Judith clenched her hands together hard. Her face was impassive. Just how much did he know? He was at the very brink of the new research.

''It could be years before such experiments are permitted,'' she said at last.

''Or it could be forever. Recall that delay is the deadliest form of denial.'' He was pressing hard, dominating the meeting, and they both knew it. ''And recall Ecclesiastes, that to every thing there is a season, and a time to every purpose under Heaven. Your time is now, your purpose here on this station. You should seize the opportunity. On PSS-One you will not be bound by the rules that crippled your Institute on Earth. Here, you will *create* the rules.''

Judith looked up at him. She had regained her self control. ''You make all the rules here.''

Salter Wherry smiled, and for a second the sensuous mouth of the younger man reappeared. ''You are misinformed. Let us admit there are certain rules that I insist on. All the rest are negotiable. Tell me what experiments you wish to conduct. I will be amazed if I do not agree to all of them. In writing. If this is the case, will you come here?''

He finally came to sit in a chair opposite.

''Perhaps,'' she said. ''Your offer is more than generous.''

''And if we are realistic, we will agree that things are not going well down on Earth? Very well. I will not press you. But I have one more question. You told Hans Gibbs that this meeting was an absolute essential: if there were no face-to-face encounter, there would be no agreement. Most unusual. He told me your reason, that your own credibility with the people who work for you would be diminished if you did not see me. But you and I know that is nonsensical. Your prestige and reputation carry enough weight with your staff to make a meeting with me neither necessary nor relevant. So. Why did you want to meet me?''

Judith paused for a long time before she replied. Her next remark might anger Salter Wherry to the point where all his interest in relocating the Institute might vanish. But she needed to gain some phychological advantage.

''I was told that you have certain personal tastes and preferences. That you would never, under any circumstances, deal directly with a woman. And that you had also become hopelessly reclusive. Your sexual habits are not my business, but I could not work for anyone with whom personal contact was denied. I could work with you only if we can meet to discuss problems.''

''Because you need my inputs?'' he said at last. ''Let us be realistic. In your work, my contribution would be no more than noise and distraction.''

''That is not the point. My relationships demand a certain logic, independent of gender and personality. Otherwise they become unworkable.''

He was smiling again. ''And you pretend there is logic in your present dealings with the impenetrable U.N. bureaucracy? It is better for your case if I do not pursue that.''

He stood up. ''You have my word. If you come here, you will have access

to me. But as you grow older you will learn that logic is a luxury we must sometimes forego. Most of the human race struggles along without it. You are undeniably a woman—let me destroy another rumor by saying that I find you to be an attractive woman. I am certainly meeting with you, face to face. So much for idle speculation. When you return to Earth, perhaps you will spread the word that many of the 'known facts' about me are simple invention. Though I know it will make no difference to the public's perceptions."

He had paused in front of her, his manner clearly indicating that the meeting was over. Judith remained seated.

"You asked me one last question," she said. "Why did I insist on this meeting? I have given you my answer. Now I think I have the right to one more question, too."

He nodded. "That is fair."

"Why did you *agree* to see me? According to Hans Gibbs, you would certainly refuse. I believe that the narcolepsy problem is important to you—but is it *that* important? I think not."

Salter Wherry stooped a little, so that the lined face was directly in front of Judith's. He looked very old, and very tired. She could sense the sadness in his eyes, far down beneath the fire and iron. When he at last smiled, those eyes looked dreamy.

"You are an extraordinary person. Few people see a second level of purpose, except for themselves and their own objectives. I refuse to lie to you, and I feel sure that your own motives sit deeper than we have reached in this meeting. So you should believe me when I say this. Today, you and your staff would find my other motives difficult to accept. Therefore, I will not offer them. But someday you will know my reasons."

He paused for a long moment, then added softly: "And now that I have met you, I think that you will approve of them."

He turned and was heading for the doorway before Judith could frame a reply. The interview with Salter Wherry was over.

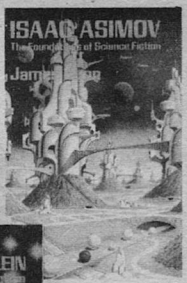
Chapter 7

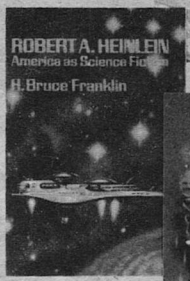
"Earth has been regarded for centuries as a giant self-regulating machine, absorbing all changes, great and small, and diluting their effects until they become invisible on a global scale. Mankind has taken that stability for granted. Careless of consequences, we have watched as forests were cleared, lakes poisoned, rivers dammed and diverted, mountains leveled, whole plains dug out for their mineral and fuel content. And nothing disastrous happened. Earth tolerated the insults, and always she restored the status quo.

"Always—until now. Until finally some hidden critical point has been passed. The move away from a steady state is signaled in many ways: by increasing ocean temperatures, by drought and flood, by widespread loss of topsoil, by massive crop failure, and by the collapse of worldwide fishing industries.

"Many solutions have been proposed. But none of them can even be attempted now. All of them call for some practice of conservation, for the reversing of certain changes. That is impossible. With a world population approaching eight billion, all margin

Discover the Facts Behind the Fiction





Heinlein, Asimov, Stapledon, Wells—what made these great writers produce their astonishing works of fiction? What events in their own lives shaped their visions of the future? What cultural and scientific changes influenced them? And what do their sometimes bizarre tales really have to say?

Now you can gain a deeper appreciation of the work of your favorite authors with the **Science Fiction Writers** series. Find out:

- How a stormy adolescence set against the cataclysmic 1930s caused Isaac Asimov to embark on the *Foundation* series
- How a case of tuberculosis and an ad in *Thrilling Wonder Stories* launched Heinlein's writing career
- How Darwin influenced H.G. Wells
- How Olaf Stapledon's richly inventive but difficult fiction influenced Arthur Clarke, Poul Anderson, Kurt Vonnegut and many others.

Each volume in the **Science Fiction Writers** series treats an author of distinction. Together the volumes do full justice to science fiction as a pervasive force in western culture.

Special Offer!

To: Oxford University Press
Dept. ECAB, 200 Madison Ave., New York, NY 10016

SINCE 1478

Please send me:

Isaac Asimov: The Foundations of Science Fiction by James Gunn
☐ cloth $18.95 ☐ paper $6.95

Robert Heinlein: America as Science Fiction by H. Bruce Franklin
☐ cloth $22.50 ☐ paper $4.95

The Science Fiction of H.G. Wells by Frank McConnell
☐ cloth $22.50 ☐ paper $4.95

Olaf Stapledon: A Man Divided by Leslie Fiedler
☐ $19.95 ☐ paper $7.95

Order 2 or more books and get 20% off list prices

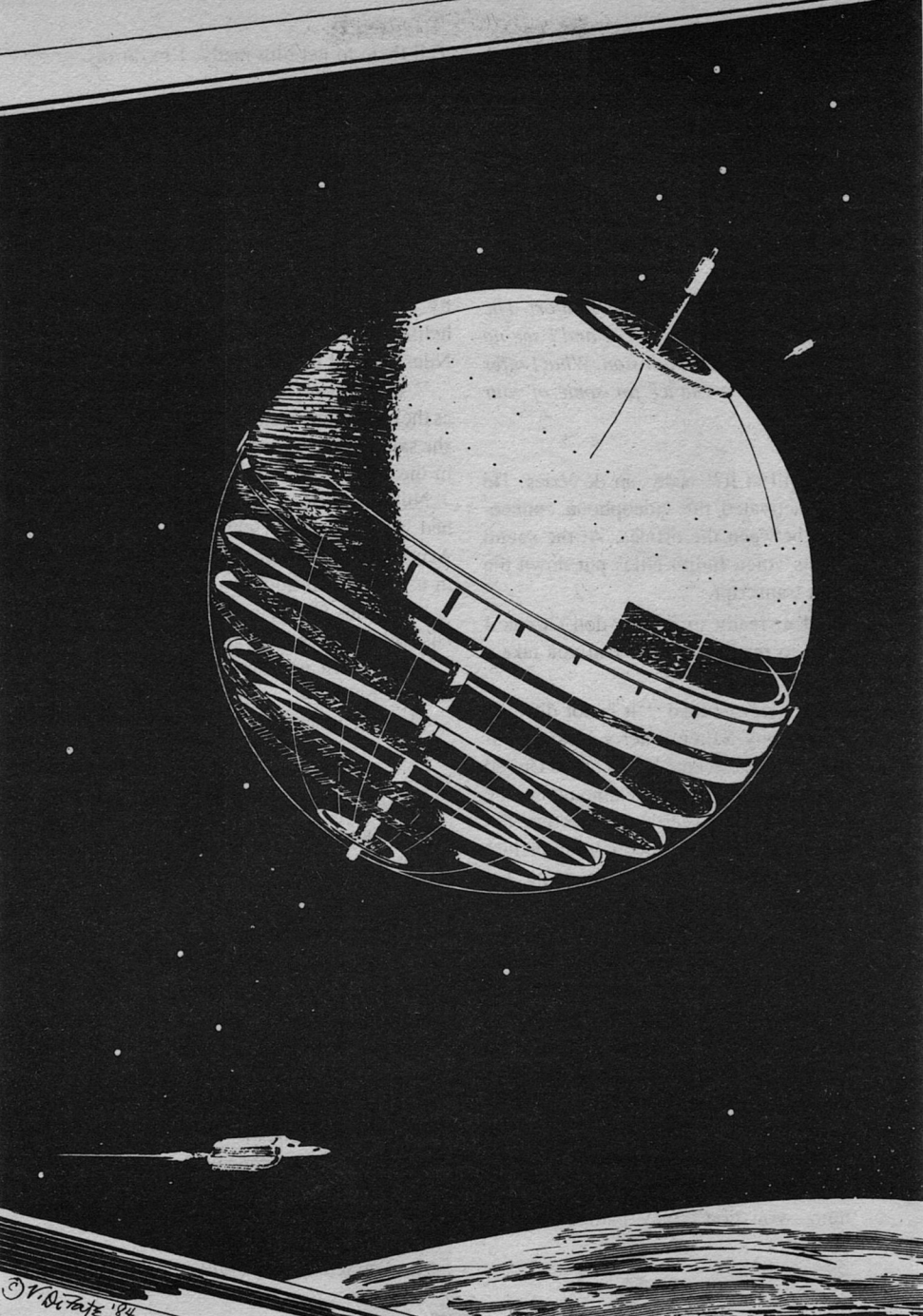
Name _____

Address _____

City _____

State _____ Zip _____

I enclose my check/money order for $_____ *(Please add appropriate sales tax.)*


©V. DeFate '82

for experiment has long disappeared. As resources grow scarcer, pressure to produce grows and grows. The richest nations practice an increased level of isolationism and caution, the poor ones are at the point of absolute desperation. The materials produced in space are no more than a trickle, where a flood is called for.

"I offer naught for your comfort. The world is ready to explode, and I see no way to avoid that explosion. What I offer you is only a chance for some of your children . . .

"Still at it?" said Jan de Vries. He had activated the videophone connection between the offices. At the sound of his voice Judith Niles put down the slim transcript.

"I'm ready to quit. I don't think I want to read any more. Did you take a look at this?"

De Vries nodded. "It is not difficult to see why Salter Wherry lacks popularity in the esteemed halls of the United Nations. His recruiting campaign for the space colonies is certainly effective, but he doesn't paint an encouraging picture of the world's future. Let us hope that he is wrong." He moved his index finger along the line of his neat moustache. "The suit is all set. They are ready when you are."

"Who'll do it? I left the final screening with Charlene."

"Wolfgang Gibbs. He's young, and he's fit, and we're agreed that it is not dangerous."

Judith Niles looked thoughtful. "I'm not so sure of that. Vacuum is vacuum—you don't play games with it. Tell them to get him ready. I'm on my way over."

When she arrived the final lab preparation was complete. Emergency resuscitation equipment stood in banks along the walls. In the middle, seated on a long table in a sealed chamber, Wolfgang Gibbs was adjusting the gloves of the space suit. Charlene Bloom was by his side, obsessively checking the helmet. She straightened up as Judith Niles entered the room.

"Are you sure this is the same design as they're using now on Salter Station?" she said. "I think I see small differences in the seals."

Niles nodded. "The schematics we had were not quite right. We checked. According to Hans Gibbs this is the one in use now. All hooked up?"

Wolfgang turned and stared at her. His face was pale throught the faceplate. "Ready when you are," he said over the suit radio.

Charlene placed her head close to the helmet. "Scared?" she said, in a low voice.

"Give you one guess." He smiled at her through the narrow faceplate. "Jelly in my guts. Now I know what the test animals must feel like. Let's get on with it. You get out of here and let's take the pressure down."

As he spoke the overhead lights flickered, faded, then slowly came back up to full power.

"Jesus!" said Charlene. "That's three brownouts in two hours." She looked at the other woman. "Should we go ahead, J.N.? It looks as though there's something horribly wrong with the grid."

"Blow-outs in the China link," said Judith Niles. "Cameron checked this

Advanced Dungeons & Dragons®

PLAY BY MAIL GAME

a product of Entertainment Concepts, Inc.

Do you dream of adventure and glory? Do you thirst for dangers to thwart? Do you love the challenges of a mystery? Do you hunger to explore the unknown, and prove to the world that **you** have the stuff heroes are made of? **Yes??**

Then an exciting world of quests, myths, treasures, villains, mysteries, and magics is waiting **just for you**!! You can go beyond mere reading of adventure, **you** can now Create it! Experience it! Master it! Your skill, your wits, your wisdom, can make your hero the stuff of legend! You'll experience the full mystery and excitement of the fabulous **ADVANCED DUNGEONS & DRAGONS®** adventure game by taking the role of a **Hero**, or of a **Fellowship** of four young adventurers!

ENTER TODAY!! Tomorrow you'll be creating your **own** legends!!!

Send AD&D® Play by Mail Game entries to: ECI, 6923 Pleasant Dr., Charlotte, NC 28211

Name _____

Address _____

City _____ State _____ Zip _____

Enclosed is $10 for the first position and $5 for each additional Position. Each move is $4 of adventure, mystery, and ancient lore!

Please send me _____ **Hero** Positions and _____ **Fellowship** Positions.

afternoon, and he says it will get worse. They expect China may drop out completely in a week or so—they're above capacity, and their equipment is old. So there's no point in delaying here. We have our own stand-by system, and that's in good shape."

"So let's get on with it," said Gibbs. To Charlene Bloom's horror he reached and gave a sly rub along her thigh with one gloved hand, on the side hidden from Judith Niles.

She jerked away from him and shook her head fiercely. She had told Wolfgang over and over—private life must *never* get tangled up with their work.

"So you're telling me you want to stop?" he had said.

She had paused, turning her head to look at his bare, tanned shoulder. "You know I don't. But don't you be horrible, either. I know you have a reputation at the Institute, and I'm not asking about that. But remember this is the first time for me for . . . well, for anything like this."

He had turned to look down at her face, with an expression in his eyes that made her shiver all over. "For me, too."

Liar, she had been about to say. Then she looked at him again. He appeared completely serious. She had very much wanted to believe him—still wanted to believe him; but *not now,* not when J.N. was watching, even if he was staring at her so intently through the suit's faceplate . . .

Charlene turned away briskly and stepped out of the chamber. "Sealed, and reducing," she said. She tried to keep her eyes on the gauges and away from Wolfgang.

The pressure was calibrated in kilos per square centimeter, and also as barometric altitude. The two women watched in silence as the green readouts flickered down through their first reduction.

"Three kilometers equivalent height," said Charlene. "Are you feeling all right, Wolfgang?"

He grunted. "No problem." His voice sounded much more relaxed than she felt. "According to my readings we have a balance of internal and external pressure. Correct?"

"Right. You're on pure oxygen now. Any tightness at the suit's joints, or any feelings of dizziness? Move your arms, legs, and neck, and see how it feels."

He lifted his left arm and waggled the fingers in the suit. "*Morituri te salutamus.* I'm feeling fine."

"Very good. Who's been teaching *you* Latin?" As soon as she said it Charlene felt a blush starting to rise from the back of her neck. What would J.N. think?—Charlene was the only one at the Institute who liked to spice up her reports with Latin tags. "Five kilometers," she said hurriedly. "We're getting a change of scale."

The readouts automatically adjusted to a finer gradation, moving from kilograms to grams per square centimeter. The pressure was reducing very slowly now, at a reduced rate controlled by Charlene. It was another twenty minutes before the chamber value was quivering down at zero. The barometric altitude, after rising steadily to a hundred kilometers, now refused to go any higher.

"Anything new?" Judith Niles had moved to stand with her face close to the chamber window.

"Nothing bad." Gibbs moved his head slowly from side to side. "You were right about the neck seals—I can feel a bit of pressure now, as though the suit bulges in a little bit there."

"That's the new design, they introduced it about a year ago. It's a better seal, but not so comfortable. The bulge is caused by the outside pressure drop, making an inward wrinkle in the seal. You'll get used to it. Any feelings of drowsiness?"

"Not a bit."

"Right. Start moving the blocks, and talk while you do it. Set your own pace."

Wolfgang, clumsy because of the unfamiliar gloves, began to move a heap of colored plastic blocks from one chest-high stand to another. "Haven't done anything like this since I was eighteen months old. Used to seem harder then. Get them all moved correctly, and I get a handful of raisins, right?"

Neither woman spoke as he carefully moved blocks. He was finished in less than a minute.

"Still feeling all right?" said Judith Niles when the task was done.

"Perfectly fine. No aches and pains, no sleepiness. Still have that bit of pressure in my neck, but all the other joints are very comfortable. Shall I switch to the cameras?"

"Whenever you're ready."

Gibbs nodded. The faceplate of the suit slowly darkened. His face became a dark gray and slowly faded from view as the plate achieved total opacity. The watchers heard a grumble through the suit radio. "Lousy color in here. If my TV didn't perform better than this I'd turn it in for service."

The suited figure turned slowly to point its forward viewing camera to look through the chamber window. "Charlene, you've turned green."

"I feel it. We'll worry about camera color balance later. Can you move the blocks again? And keep talking as you do it, just the way you did last time."

"Piece of cake." The bulky figure began to move the blocks slowly back to their original stand. "Reminds me of the work that they used to give you in the army when you were doing basic training. Supposed to tire us out and keep us out of trouble. First you move the pile of dirt over here, then when you were finished somebody else would move it back. Then you would—"

It happened with startling suddenness. There was no drowsy tailing off of speech. At one moment the suited figure was working efficiently, his matter-of-fact tones clear over the suit radio. Then they were looking in at a silent, motionless statue, frozen with a red block stretched out in one gloved hand.

Charlene Bloom gave a cry of alarm, while Judith Niles took a long, shivering breath. "That's it. No cause for panic, Charlene, it's what we were expecting. Start bringing the pressure up—*slowly*. We don't want a problem there. I'll make sure the bed is ready. My guess is that he'll be out for at least a half-hour."

She moved over to the phone. Behind her, Charlene stared wide-eyed at Wolfgang Gibbs's unconscious figure. She had to fight the temptation to bring the pressure instantly to sea level, and rush into the chamber herself.

* * *

Jan de Vries was waiting in her office, calmly reading a file marked *Confidential—Director Only*. He looked up as she came in.

"How is he?"

"Recovered. He was out for nearly an hour, and he remembers nothing of the whole episode. So far as Wolfgang is concerned, he didn't even begin the tests with the suit on video." Judith Niles did not sit down, but instead paced back and forth in front of the chair where Jan de Vries was sitting. "No after effects now, and full alertness."

"So your hypothesis is correct. You predicted what would happen, and the subject performed exactly as required." De Vries slapped the file closed. "Everything can now proceed precisely as you planned. We will move the Institute to orbit, spend a month or two in supposed problem analysis, and then hand Salter Wherry the solution to his major problem; after which we will be in a position to pursue our own researches, as the Institute's new contract explicitly permits. Wonderful. The manipulation is complete, exactly as designed." His mouth twisted in a grimace. "So, my dear, where is the jubilation? You do not have the air of one whose plans approach fruition."

"I'm not satisfied—not at all." Judith Niles paused, looking quizzically down at the diminutive figure of de Vries in the depths of the big armchair. "Listen to this sequence, then tell me what you think. Item one: a year ago there was a slight change in the type of space suit worn in Salter Station for outside construction work. The new one uses a slightly different set of rings and seals in the neck portion.

"Item two." She checked off on the fingers of her right hand. "For some positions of the head, the new suit causes increased pressure on the wearer's carotid arteries."

"*Slight* pressure?"

"Not that slight—big enough for the wearer to notice. Item three: increased pressure within the carotid arteries can cause momentary blackouts.

"Item four: when a suit is on normal visual operation, the blackout is momentary, too brief to be noticed. But when the suit is on remote and using TV cameras instead of faceplate viewing, the scanning rates on the TV give a feedback to the brain that reinforces the blackout. Result: narcolepsy. The wearer will not break out of the cycle unless there is some external interruption. How does that sound to you?"

De Vries sat silent for a few moments, then nodded. "Plausible—more than plausible, almost certainly correct."

"All right. I agree. So here's item five." She closed her fist. "All of this has been known for forty years. The increased pressure in the carotids is a classical cause of narcolepsy. The brain wave reinforcement is a standard positive feedback mechanism. What does all that say to you?"

De Vries leaned far back, gazing up at the ceiling. He shook his head. "Judith, put in those terms I see where you are heading—but I must admit that it would not have occurred to me if you had not waved it in front of my nose."

Judith Niles regarded him grimly. "Be specific, Jan. What's wrong with it?"

"It's too *simple*. When you set the

explanation out on a plate, as you just did, it's clear that we should not be needed to solve the problem. Remember, you told me you thought you knew the answer when you *first* looked at the suits and the case histories. All the medics on Salter Station had to do was a minimal amount of background reading, and a few well-designed experiments. At the very least they would have noticed the correlation between the new suits and the onset of the problem."

"Exactly. So why didn't they?" Judith Niles stopped her pacing and stood in front of de Vries. "Even if they didn't catch on as fast as we would here at the Institute, they should have deduced it after a while. Jan, I'm very worried. We *have* to go up to Salter Station. Our own experiments require it, and anyway I've burned too many bridges here in the past few days to stop now. But I feel that things are out of control."

She suddenly lifted her left hand and began to rub gently at her eye, her forehead wrinkled.

Jan de Vries looked concerned. "What's wrong, Judith? Headache?"

She shook her head. "Not any sort I've ever had before. But I'm getting blurring from this eye—very offputting. Not quite seeing double, but not far from that. Odd feeling."

De Vries frowned. "Don't take chances. Even if it is no more than the strain of too much work, let a specialist take a look at it." De Vries did not say it, but he was astonished. Never since he had known her had Judith Niles shown any sign of strain and fatigue, no matter what pressures she had worked under, no matter how she forced herself along.

"I'll be all right," she said. "Sorry, Jan, what were you saying?"

"I agree with you that things may be out of control." The little man wriggled forward in the armchair so that he could stand up. "And let me give you, as Salter Wherry quoted in his speech on the space colonies, 'naught for your comfort.' I've been doing the follow-up work you asked for on Salter Wherry. Did you know that most of his expenditures are not on development of the arcologies at all? They go into two other areas: efficient, spaceborne fusion drives, and robots. He is rumored to be many years ahead of anyone else in those areas. I believe it. But what do our projects have to do with either of those research endeavors? If you can see the connection, I beg enlightenment. And then there is the question of the breadth of Wherry's influence, and his sources of wealth. Do you remember my telling you that insurance rates for Station personnel have gone up greatly in the past year?"

"Yes. Because of the increased accident rate."

"So we had assumed. But this afternoon I obtained and examined the financial statements of Global Insurance —the organization which issues the policies for Salter Station personnel. It turns out that a single individual owns more than eighty percent of the stock of Global, and exercises complete control over corporate actions." De Vries smiled grimly. "You are permitted one guess as to the identity of that individual. Then, my dear Judith, we should perhaps discuss who is manipulating whom."

* * *

Chapter 8

The fish were nervous. Moving in regular array, they darted to and fro through the fronds of weed that curled across Workwheel's great tanks. As the schools of fish turned in the cloudy water their silvery scales caught the green-tinged sunlight, filling the interior with flashes of brilliance.

The two human figures, naked except for light breathing masks, swam slowly around the perimeter of the tank, driving the fish along before them. The outer edge of the wheel was a filled lattice of transparent plastic, admitting perpetual day to the four hundred meter cylinder. Far above, near the hollow central axle, oxygenation pumps sent a faint thrumming through the sluggishly moving liquid.

The female figure swooped without warning down to the clear honeycombed plastic of the outer wall, kicked off hard from it, and surged upward toward Workwheel center. The other, taken by surprise, followed her a second later. He overtook her halfway to the axle and reached out to grasp her calf, but she wriggled away and headed off in a new direction, still slanting toward the surface. Again he pursued, and this time as he neared her he reached out to grasp both her ankles. His fingers closed, and at that instant the tableau suddenly froze. Two nude sculptures, their muscles tensed, hung in the water among the motionless fishes.

Salter Wherry looked closely at the video display for a few seconds, then carefully moved it along several frames. It was difficult to see the expressions clearly in the recording, and he zoomed in on Judith Niles's face for a high-mag close-up. Even with the mask on, her face contrasted with her taut muscles. She looked totally relaxed, though Hans Gibbs was gripping her firmly around the ankles. After a few moments of study Wherry skipped forward, a few frames at a time, watching the changing expressions as the nude bodies moved together, embraced, then slowly rose. Entwined, they moved to meet the broad concave meniscus of the water surface near the axle of the wheel.

Salter Wherry watched their actions calmly in the darkness of the control room. Always, regardless of the couple's embraces, his attention rested on Judith Niles's face. At last he leaned forward and pressed another key on the console in front of him. The scene changed to a brilliantly lit interior. Now it was Judith Niles standing alone in Wherry's office on Spindletop, just next door from the hidden studio, waiting for her first meeting with him. Again his attention was on her face. One minute more, another press of a key, and Wherry was seeing her as she stood after their first meeting. He grunted in dissatisfaction. The hidden cameras were carefully placed, but they could not offer views from all angles, and this time a full face view was denied him.

He moved on. The next shots had come from the inside of the Institute itself, down on Earth. First preparations were under way for the move to Salter Station. The cameras showed experimental animals being carefully housed in well-ventilated crates for upward shipment. This time Salter Wherry seemed pleased. There was a hint of satisfaction in the blue eyes as he cut to the receiving network for his daily global status report.

'Salter Station's observing network tapped all open news channels around the globe, plus a number of sources that national governments would have been shocked to see so routinely cracked. Ground reports were supplemented and confirmed by the station's spy satellite network, the hundred polar orbiting spacecraft that permitted a constant detailed look at events anywhere on the globe.

Salter Wherry now began his daily routine, switching with long practice between different data sources. As the mood struck him, he cut back to earlier events of the past year, then moved forward again to the present. Patiently, he tacked his way to and fro across the face of the globe, sometimes a thousand miles above the surface, sometimes through a hand-held camera on an open street, occasionally with video taken inside government buildings or within private homes. The images flooded in.

. . . *East Africa*. The four-thousand mile flow of the Nile northward to the Mediterranean showed a river shrunk and diminished by unremitting drought. The Sudan was parched desert, the great agricultural systems along the river all vanished. Khartoum, at the confluence of the Blue Nile and the White Nile, was no more than cindered buildings. The cameras swept north, high above the muddy river. Close to the Mediterranean, Cairo was a ghost town where packs of hungry dogs patrolled the dusty streets. The nilometer on Roda island stood far out above the river's trickling flow. Water supply and sewage systems had failed long since. Now, only the flies were energetic in the monstrous noon heat.

. . . *Alaska*. The long southern coastline was shrouded in perpetual fogs, marking the meeting of warm and cold currents. Inland, the warming peninsula was suddenly bursting with new life. The permafrost had melted. Rampant vegetation was rising to clog the muskeg swamps, and clouds of mosquito and black fly buzzed and swirled above the soft surface. The population, at first delighted by the warming trend, was now struggling to hold its own against the rising tide of plant and animal life. All day long, aircraft loaded with pesticides sprayed tens of thousands of square kilometers. They enjoyed little success.

. . . *London*. The steadily melting icecaps had been raising the sea level, slowly, inexorably, a few inches a year. The tides were lapping now at the top of the seawalls, pressing inward all the way from Gravesend to Waterloo Bridge. Cameras in the streets caught lines of volunteer workers continuing their long toil with sandbags and concrete buttresses. Wading through ankle-deep water, they fought the daily battle with high tide. The work went on quietly, even cheerfully. Morale was good.

. . . *Java*. The chain of volcanoes along the island, as though in sympathy with the globe's extreme weather, had woken a week earlier to malignant life. Many of the hundred million people packed onto the island had sought flight, north across the shallow waters of the Java Sea. The spaceborne cameras picked out every detail of the frail boats, heavily overloaded, as they headed for Borneo and Sumatra.

But not only the land was seismically active. When the *tsunami* struck, not a

boat remained afloat. The sixty-foot tidal wave that hit Jakarta and the whole northern shore of Java ensured that those who had remained on land fared little better than their seagoing relatives. Today the cameras picked up isolated clusters of survivors as they were gathered by rescue teams and shipped to mountain camps in the central highlands.

. . . *Moscow*. Reports from the main agricultural *oblasts* were coming in to the central planning office. A stone-faced calm was being maintained there, as word arrived of wheat and barley crops withered and brown, of rice and rye failure, and of steadily rising winds that ripped away dry topsoil and carried it pulverized high into the atmosphere.

Salter Wherry crouched motionless over his console, steadily absorbing new information, collating it with old. Only his mouth and eyes seemed alive. After the scenes from Moscow, he finally switched to the interior of the United Nations building. The formal ritual in the crowded chamber could not hide the undercurrents of anger and tension washing in from the stressed world outside. The ambassador from the Soviet Union, face stern and intense, was concluding his prepared speech.

"What we are seeing in the world today is not an accident of nature, not the mere vicissitudes of planetary weather at work. We are seeing deliberate modification of climate, changes directed against the Soviet Union and our friends by other nations. The time for reticence in naming these nations is past. My country is the victim of economic warfare. We cannot permit—"

Wherry jabbed impatiently at the keyboard. He was frowning, bright eyes shadowed by heavy eyebrows. After a few seconds *Eleanora* appeared on the screen in front of him, a silver ovoid framed against the backdrop of stars and a sunlit Earth. He held it there while he called out printed schedules and status reports for construction. The curving lines of geodesic support girders on the outer hull had disappeared, covered by bright exterior panels. Final electrical systems were being installed, together with the power sources and the hydroponic tanks; the vast water cylinder was already full.

Wherry skipped to views of the other arcologies. The most distant, *Amanda*, blinked in as a grainy and indistinct image. It was now almost three million miles away from Earth, spiraling slowly outward in the plane of the ecliptic. In eight years, unless some new trajectory were adopted, the colony ship would have wound its way out to the orbit of Mars. Already the scientists on board were talking about the possibility of a small manned station on Phobos, and consulting with Salter Station on the available resources for the project.

Salter Wherry flicked off the viewing screen and sat motionless for many minutes. At last he keyed in another sequence. The face of Hans Gibbs, hair tousled, appeared.

"Hans, do you have the schedule for shipping the Neurological Institute staff there with you?"

"Not in front of me. Hold on a minute and I'll get it."

"No need for that. I'll tell you what I want you to do. The schedule calls for everything to be up here seventy-seven days from now."

"Right. Judith Niles grumbled at that, but we're on time so far."

"Hans, it won't do. I don't think we have that long. It's going to hell, and it's skidding there fast. I think I understand international politics pretty well, but today I couldn't even guess which country will go crazy first. They're all candidates. I want you to work up a revised schedule that will have everything from the institute—people, animals, and equipment—here inside thirty days. Tell Muncie I want him to do the same thing for anything we need to finish *Eleanora*, in the same timetable."

Hans Gibbs suddenly looked much more awake. "Thirty days! No way, the permits alone will take up that long."

"Don't worry about permits. Let me take care of those. You start working the shipping arrangements. Fast. Cost is irrelevant. You hear me?" Salter Wherry smiled. "*Irrelevant*. Now, Hans, how often do you hear me say that about the cost of anything? Thirty days. You have thirty days."

Hans Gibbs shrugged. "I'll try. But apart from permits, we have to worry about launch availability. If that goes sour—"

He paused, and swore. The connection was gone. Hans was talking to a blank screen.

Chapter 9

Wolfgang Gibbs closed his eyes and leaned his head forward to touch the cool metal of the console. His face was white, and shone with sweat. After a few seconds he swallowed hard, sat upright, took a deep breath, and made another try. He hit the key sequence for a coded message, waiting until the unit in front of him signaled acceptance.

"Well, Charlene—" he had to clear his throat again "—I promised you a report as soon as I could get round to it. I've just screwed up the transmission sequence three times in a row, so if this one doesn't work I'll call it a day. I originally thought I'd be sending to you right after I got here—shows what an

optimist I am! Still, here we go, one more time. If you hear puking noises in the middle of the recording, don't worry. That's just me, losing my liver and lungs again."

He coughed harshly. "Hans says that only one person in fifty has as bad a reaction to freefall as I do, so with luck you'll be all right. And they say even I should feel better in a couple more days. I can't wait. Anyway, that's enough moaning, let me get to work.

"Most of the trip up was a breeze. We had everything tied down tight, so nothing could shake loose, and Cameron had all the animals souped up to their eyebrows with sedatives. Pity he couldn't do the same for me. When we hit freefall everything was all right at first, though my stomach felt as if it had moved about a foot upwards. But I was coping with it, not too bad. Then we began moving the animals into their permanent quarters here. They didn't like it, and they showed their annoyance the only way they could. I'm telling you, we'd better not move again in a hurry. They don't pay enough for me to wallow along through a cloud of free-floating animal puke and animal crap every day of the week. Wall-to-wall yucky. It was about then that I started to feel I was going to lose my breakfast. And then I *did* lose it—then the previous day's lunch and dinner, and I still feel as thought I'll never eat again.

"OK. Guess that's not what you want to hear, is it? Let me get back to the real stuff. I'll dress it up properly for the lab reports, but here's where we stand."

Wolfgang paused for a moment as another wave of nausea swept over him. He had made his way to the outermost corridor of Spindletop, where the effective gravity was highest, and a quarter-g was almost enough to bring his stomach in line; but if he allowed himself to look down, he was gazing *out* at infinity, standing on a rotating sea of stars that swirled steadily beneath his feet. And that was enough to start him off again.

He looked straight ahead, steadfastly refusing to allow his glance to stray toward any of the ports. The turning knot in his stomach slowly loosened.

"I guess the cats came through in worst shape," he said at last. "They're all alive, but we'll have a hell of a time sorting out how much of their troubles are caused by the trip up here, and how much is progressive deterioration in their experimental condition. We lost a couple of sloths—don't know why yet, but looks like it may be a drug-induced cardiac arrest. Cannon warned about that before we started, but nobody had any bright ideas how to prevent it. The other small mammals all seem in pretty good shape, and we had no real trouble moving them to their quarters. That *wasn't* true with the Kodiaks, though." He managed to smile into the camera. "They're big mothers. Thank God we don't have any experiments going on with elephants. You had to be here to see what a job we had with old Jinx. Great fat monster. We'd tug and heave on him for a while, and feel he wasn't moving, then after we finally got him drifting in the right direction we'd find we couldn't stop him. I was nearly flattened against one of the walls. It's a good thing the people on the station are

used to handling big masses in space, or I never would have made it.

"I'll cut out the tales of woe. We finally got him in place, 'nuff said, up near the hub of Workwheel. It's a horrible place—no gravity to speak of. I don't know how low, but less than a hundredth of a g for sure. Hans says that in a month or two I'll enjoy it there, but now just thinking about it makes me sick. But I'll say one thing for the crews here, they know how to build. All the tanks and the supporting equipment we asked for were ready and in place—and it all worked. A couple of hours ago I gave Jinx the treatment, and I have him stabilized now in Mode Two hibernation pattern. You'll get all the detailed logs with the official transmission, and all the video, too. But I thought you'd like to see something at once, so I'm going to run a clip for you right in with this. Here, see what you think of Jinx."

Wolfgang took a long, deep breath and pressed the calling sequence. He did it slowly and painfully, with the fragile and exaggerated care of an old, old man. His fingers stumbled several times, but at last he had a correct pattern entered. He leaned back and massaged his midriff as a copy of the recorded video was displayed before him and simultaneously sent down as a signal to Earth.

Jinx was shown at center screen. The

bear was sitting upright on a bed of soft shavings, sniffing curiously at a massive chunk of fish protein held in his front paws. His long black tongue came out and licked tentatively at the flaky surface. The bear's movements were a little jerky, but well-controlled and accurate. Wolfgang watched with approval as Jinx took a neat bite, chewed thoughtfully, then placed the rest of the protein block down on the shavings. When the mouthful was swallowed Jinx yawned and scratched peacefully at a fur-free patch on his left side. The implanted sensors there lay close to the surface of the skin, and it was still a little sensitive. After a few seconds more he picked up the fishy slab and the monstrous jaws began to nibble around it contentedly.

"Looks good, eh?" said Wolfgang. "You'll see more when you get the full coverage later, but let me give you the bottom line now. We saw the first signs of this in those last experiments in Christchurch, and what J.N. had been predicting all along seems to hold up exactly. We hit the correct drug protocols right away this time. Jinx's body temperature was seven degrees above freezing in that segment of video. His heart rate was one beat per minute—and still is. I estimate that his metabolic rate is down by a factor of about eighty. He's slow, but he's sure as hell not hibernating—look at him chew on that slab. What you're seeing is speeded up, by a factor of sixty-eight over real time. The trickiest piece so far was finding something that Jinx is willing to eat. You know how picky he is. Seems like things feel different to him now, and he doesn't like it. We got the consistency right after about twenty tries, and he seems to be feeding normally."

Wolfgang rubbed ruefully at his midsection. "Lucky old Jinx. That's more than I can say for myself. Best of all, his condition seems to be completely stable. I checked all the indicators a few minutes ago. I think we could hold him there for a month if we had to, maybe more."

He cut back from the picture of the bear to real-time transmission. "That's the report from this end, Charlene. Now I can relax. But I can't wait for you and the others to get up here. I don't know how biased the news coverage is that comes here to Salter Station, but we hear of trouble everywhere back on Earth. Cold wars, hot wars, and mouthing off in all directions. Did you know it hit sixty-two Celsius yesterday in Baluchistan?—that's nearly a hundred and forty-four Fahrenheit. They must be dying in droves. And did you get the reports from the UN Security Council? There's talk of closing all national air space, and Hans is having real problems scheduling Shuttle flights up—not just the usual red tape, either He's meeting blank walls. He's been told there will be an indefinite suspension of all flights, from all spaceports, until the Earth situation normalizes again. And who knows when that will be? Wherry's experts say the changes are here to stay—we've caused them ourselves with the fossil fuel programs."

His hand moved toward the key that would end transmission, then paused. He looked uncertainly at the screen. "Hey, Hans told me one other thing I really didn't want to hear. Dammit, I wish I knew just how secure this line is, but I'll say it anyway. If it's not common knowledge down at the Insti-

tute, Charlene, please keep it to yourself. It's about J.N. Did you know that she's been taking a whole battery of neurological tests over at Christchurch Central? CAT scans, radio-isotope tracers, air bubble tracers, the works. They've been probing her brain sixteen different ways. I hope she didn't do something crazy back there, like using herself as a test subject for Institute experiments. Maybe you can check it out? I'd like to be sure she's all right. Don't ask me how Hans knew all this—the information they have up here about Earthside doings amazes me. I guess that's all for now."

Wolfgang pressed the key carefully and leaned back. Transmission terminated, and the circuit was broken.

He closed his eyes. That hadn't been as bad as he expected. It definitely helped to have something good to concentrate on, to take your thoughts away from feeling nauseated. Think of something good. A sudden and startling memory of Charlene came to his mind, her long limbs and willowy body bending above him, and her dark hair falling loosely about her forehead. He grunted. Christ! If he could have thoughts like that, he must definitely be on the mend. Next thing you know he'd be able to face food again.

Maybe it was time for another test.

Wolfgang slowly steeled himself, then turned his head and looked out of the port. Now Spindletop was pointing down toward Earth, and he was facing an endless drop to the sunlit hemisphere beneath. Salter Station was flying over the brown wedge of the Indian subcontinent, with the greener oval of Sri Lanka just visible at its foot.

He gasped. As he watched the scene seemed to spin and warp beneath him, twisting through a strange and surrealistic mapping. He gritted his teeth and held on tight to the console edge. After thirty unpleasant seconds he could force himself to a different perspective. It was Earth's blue-and-white surface, mottled with brown-green markings, that was airy and insubstantial; it was Salter Station that was *real,* tangible, solid. That was it. Cling to that thought. He was slowly able to relax his grip on the table in front of him.

It would be all right. Everything was relative. If Jinx could adapt to his new life, comfortable with a body temperature down near freezing, surely Wolfgang could become at ease with the much smaller changes produced by the move to Salter Station. Better forget self-pity, and get back to work.

Ignoring the twinges from his long-suffering stomach, Wolfgang forced himself to look out again as the station swept toward the Atlantic and the majestic curve of the day-night terminator.

Three more days, then the Institute staff would be on their way here. And if the news reports were correct, it was just in time. In their fury and endless feuding, the governments of Earth seemed all set to block the road to space itself. ■

CONTINUED IN NEXT ISSUE

● The real world is not user friendly.

Kelvin Throop

on gaming

Dana Lombardy

This column features the last part of our two-part survey of play-by-mail (PBM) games. Almost two-thirds of the fifty-plus companies contacted sent material for the survey. To give you a better idea of what PBM games are like, here are a few examples.

Adventures By Mail (Box 424, Cohoes, NY 12047) offers a bimonthly newsletter free to its players. ABM's open-ended SF game *Beyond the Stellar Empire*, which won several awards, is human-moderated with computer assistance. In this game, you and an unlimited number of other players each role-play the part of a captain of a starship. The referees interact with the players, so the universe is constantly changing. It costs $18.00 for the rules, set-up, and first two turns, then $4.00 per turn. There may be extra costs per turn if you attack ($3.00), defend ($1.50), or have an expanded turn ($2.00).

Entertainment Concepts Inc. (6923 Pleasant Dr., Charlotte, NC 28211) sends a monthly newsletter free to players. The official PBM version of *Advanced Dungeons & Dragons®* is human-moderated with computer assistance for combat and information. You can take one Hero position (a character of level 1-5 experience), or a Fellowship position (four different characters of levels 1-2 experience) to start your fantasy adventuring. Having the *AD&D®* rules helps, but is not vital to play this PBM version of the game. Cost is $10.00 for the first position, $5.00 for additional positions (includes rules and set-up). Each turn is $4.00.

Flying Buffalo Inc. (Box 1467, Scottsdale, AZ 85252) offers a quarterly newsletter to players for $6.00 a year subscription. *Starweb*, a computer-moderated strategic SF design, is their best-known PBM game. You can play a merchant, pirate, berserker, empire builder, etc., while attempting to be the first player to reach 10,000 victory points. Diplomacy is important. *Starweb* costs $12.00 for rules and set-up, $3.50 per turn, with an increase of 50¢ per turn after every 10 turns of play.

Game Systems Inc. (Box 431166, Miami, FL 33243) has a monthly newsletter available for $15.00 a year subscription. *Dawn of the Ancients* is their newest PBM game. It's a strategic-level contest for 12 players set in ancient history. You play the ruler of Rome, Egypt, Greece, etc. The computer plays an enemy to all players—Atlantis. It costs $10.00 for rules, set-up, and first two turns, then $3.00 per turn.

Graaf Simulations (27530 Harper Avenue, St. Clair Shores, MI 48081) has the computer-moderated game *Feudal Lords*. The game is set in England at the time of King Arthur's death, with each of 10 to 15 players controlling a fiefdom. Cost is $10.00 for rules, set-up, and first three turns, then $2.50 per turn thereafter.

Pierce & Co. (Box 25675, Chicago,

(continued on page 103)

THE BEST IN PBM

BEYOND THE STELLAR EMPIRE

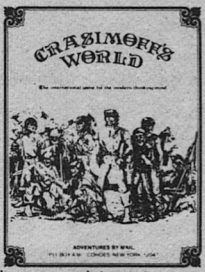
Beyond the Stellar Empire (BSE) is a science fiction role-playing game of unparalleled scope. You assume the persona of an interstellar starship captain interacting in the most detailed play-by-mail game ever created. BSE has it all; a multitude of unique solar systems composed of individually designed worlds, politics, and diplomacy, realistic economics and logistics, a comprehensive combat system, chartered companies and Imperial services, alien races, and exploration, invasion, and colonization of hostile planets.

TOP PBM GAME of 1983 and 1984

Beyond the Stellar Empire was chosen by editors of *GAMES* magazine as one of the top 100 games for both 1983 and 1984, the only PBM game so honored.

Complete Rules Package costs $5.00. Starter Package costs $17.00 and includes rules package, set-up, and two turns.

CRASIMOFF'S WORLD



Crasimoff's World is a PBM game of extraordinary quality and detail. Lead your party of fighters, magic users and priests through a fantastic land filled with adventure, magic, and danger. Each party member has a wide range of attributes and possessions. Loot dungeons, redeem swampmen heads for bounty, explore ancient ruins, raid dwarven encampments, and battle hill trolls in their underground domain. The world is complete in every detail; history, ecology, mythos, geography, and much, much more.

Complete Rules Package costs $3.00. Starter Package costs $15. -includes rules package, set-up, and two turns.

CAPITOL

Capitol is a fast playing strategic space warfare game that divides players into teams, pitting them against each other in an orgy of xenophobic fury. Capitol is unique in that it is a perfect introductory game for an individual new to play-by-mail games while at the same time detailed enough for the most experienced gamer.

Complete Rules Package costs $2.50. Starter Package costs $16.00 and includes rules package, set-up, and four turns.

Adventures By Mail has processed over 100,000 turns

WRITE OR CALL FOR OUR FREE DETAILED BROCHURES
MASTERCARD AND VISA CARD HOLDERS CAN START IN A GAME IMMEDIATELY BY TELEPHONING OUR HOTLINE SERVICE AT 518-237-4870

SEND CHECKS OR MONEY ORDERS TO ADVENTURES BY MAIL, P.O.B. 436, COHOES, N.Y. 12047

MONEYBACK GUARANTEE IF NOT SATISFIED

HOT ROCKS & WATER

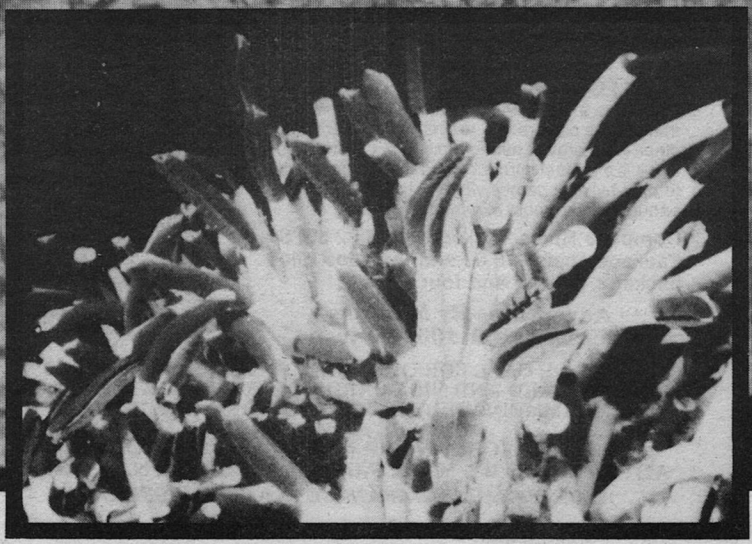


Photo of red-tipped tube worms by Jack Donnelly, Woods Hole Oceanographic Institution

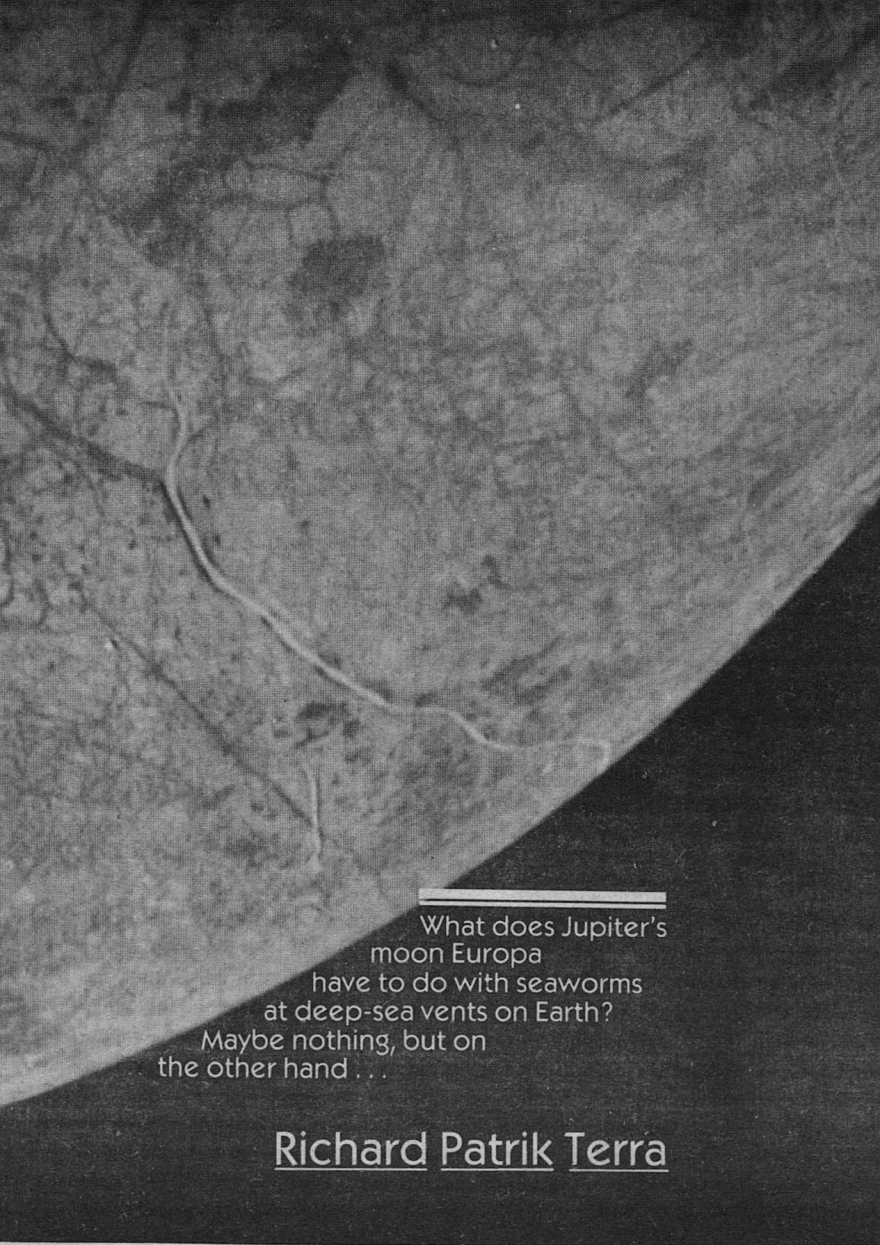


Photo of Europa courtesy of Jet Propulsion Laboratory

Everywhere on the face of the Earth, we've found life of some kind—everywhere under the sun. Up until the last decade or so, in fact, it has generally been accepted that it is the energy of Sol's rays that drives the ubiquitous biological activity of this planet. It seems intuitively obvious that the energy locked up into organic compounds by photosynthetic organisms forms the foundation of the complex food-chain pyramids upon which the rest of terrestrial life depends.

In recent years, however, this "obvious" observation has been questioned. We've now begun to find some remarkable exceptions that prove such questions to be worth asking, and that raise others equally intriguing. But if life is not to be dependent on the light of the sun, either directly or indirectly, what other sources of energy might it turn to? What is the alternative to photosynthesis? It is now becoming apparent that one of the best alternative energy sources on this planet *is* the planet. It seems that all it takes are some hot rocks and liquid water.

The interior of the Earth is a tremendous heat engine. Perhaps as much as half of the heat energy deep inside the planet is a primordial remnant from the accretion, gravitational compaction, and differentiation of the early Earth into crust, mantle, and core. Over the lifetime of the planet, this residual heat has been augmented by the slow, steady decay of radioactive elements such as Uranium and Thorium. The Earth has been slowly cooling for about 4 billion years now, with most of the heat being carried toward the surface by convection currents in the solid, semi-plastic rocks of the mantle.

This vast geothermal energy is the driving force behind plate tectonics, the slow wandering of the giant jigsaw pieces of the Earth's crust. The continents ride atop these plates as they march across the globe, separating, colliding, riding over one another's margins. New crust is formed in the sea beds of the mid-ocean rifts, where drifting plates are slowly pulling apart. Fresh magma wells up from below into the rift, cooling and solidifying into broken fields of pillow lava and adding to the margins of the separating crustal plates.

Geologists and oceanographers are deeply interested in these deep-sea spreading centers, and have been studying them intensively for years. Such studies began in the late 1960s with international diving expeditions like Project FAMOUS in the mid-Atlantic, and later moved to the Caribbean. In the late 1970s the focus shifted to the East Pacific Rise, a vast system of undersea rifts and faults that runs along the west coasts of South and Central America.

There seems to be little apparent connection between the slow, majestic movement of tectonic plates and life—between *geological* and *biological* activity. When exploratory dives, sponsored by the National Science Foundation and conducted jointly by the University of Oregon and the Woods Hole Oceanographic Institution, began on the East Pacific Rise in 1977, the scientists involved certainly saw none; biologists were not even included among

the expeditions' geologists and oceanographers.

The first expeditions in the Pacific were aimed at exploring the Galapagos Spreading Center, a region of the sea floor where two smaller plates of the Earth's crust bordering South and Central America are pulling away from each other, and also from the vastly larger Pacific Plate. Because of this slow triple separation, the region is of special interest in the study of sea-floor spreading. The dives were made at a site just a bit east of the Galapagos Islands on the equator, hence the name.

Preliminary probes were made by towing cameras and other instruments close to the sea floor, which lay between 2500 and 3000 meters below the surface. In the course of making these criss-cross runs above the rift, several temperature anomalies were noted, indicating plumes of slightly warmer water rising up amid the very cool seawater above the rift. The investigators realized they were probably seeing some sort of hydrothermal activity associated with the upwelling of magma into the rift—a sort of slow undersea geyser or hot springs—and were eager to send down their manned submersible (in this case, the *ALVIN* from the Woods Hole Institute) for a closer look.

The existence of such hydrothermal vents had been hypothesized several years before in an effort to help explain some puzzling aspects of the mineral balance of the oceans, and to account for some of the trace components dissolved into their waters. Calculations had shown that the runoff of all of Earth's rivers, carrying their huge loads of silt and dissolved minerals, would give the oceans a greater concentration of magnesium and a lesser one of manganese than were actually observed. It was thought that as the cool ocean waters percolated down into the hot, newly formed crustal rocks at the mid-ocean rifts and were heated, they would drop off some of the excess magnesium and take on the needed manganese to produce the balance that is actually found.

The hot, geothermal waters would also take on large quantities of sulfur and its compounds, such as hydrogen sulfide (H_2S), sulfates and sulfides of iron, copper, zinc, and other metals, as well as trace gases—methane (CH_4), hydrogen, carbon monoxide, and nitrous oxide (N_2O).

The vents themselves were easy enough to find: the final outflow of the circulating geothermal waters emerged from openings in the fields of pillow lava on the sea floor approximately 15°C to 25°C warmer than the surrounding seawater, at a frigid 2°C. The warm waters flowed from the cracks and crevices at rates of several centimeters per second, and the gentle streams often had a milky blue-white color. Through the portholes of the *Alvin*, the investigators peered through the dark, near-freezing waters into the bright pools of illumination cast by their floodlights. What they saw was as fascinating as it was unexpected.

In the midst of the vast, rolling expanse of barren lava formations, far below the level where the last sparkle of

sunlight might possibly penetrate, they found flourishing oases of life, thriving in seeming defiance of the cold, the darkness, and the crushing pressure, which at those depths is nearly 2 tons per square inch. Many of the vents were surrounded by lush communities of benthic (deep-water) organisms arranged in concentric, overlapping rings of life. (Figure 1-A)

The vent outflow mixed rapidly with the surrounding seawater, its temperature quickly falling from about 25°C to 3°C. Huddled nearest to the warmth were dense clusters of huge, long-bodied tubeworms, their fragile homes rising from the rocky sea floor like a white, skeletal forest. From the open ends of the tubes, the worms waved bright red fans of feathery tentacles, sweeping the

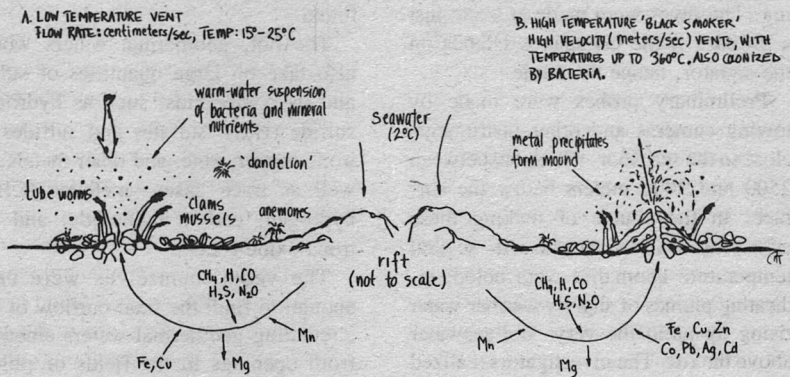


FIGURE 1

FIGURE 1: Diagram showing the two types of hydrothermal vents described in the text. The exact relationship between the two types, which occur together, is not known. Lower arrows indicate mineral and gas exchange.

water for oxygen and particles of food. Their tubes ranged up to two or three meters in length, while the worms living inside them reached about half that and were four to five centimeters thick. These strange, primitive creatures had no eyes and no mouth—in fact, no gut at all. Apparently, they absorb food directly from the seawater into their bloodstreams, where bacteria help them to digest it. The tubeworms were found only in the relatively warm waters close to the vent openings. Ringing the central forest of tubeworms, and often mingled in among them, large beds of clams and mussels grew in the chinks and folds of the rocks. The clams reached amazing sizes—up to one foot long. Though their shells were a pale, chalky white, their bodies were an unusual deep red color,

due to the presence of high levels of hemoglobin in their blood.

Scattered in among the beds of clams and mussels were thriving clusters of whelks, barnacles, leeches, and limpets. At the fringes of the oasis, there were sea anemones and odd little creatures: small, 5 centimeter spheres made up of hundreds of soft members; they resembled dandelions just gone to seed, and so they were called. Later, it was found that the "dandelions" were tiny siphonophores, jellyfish-like relatives of the Portuguese Man-of-War. Occasionally, anemones were found down inside the vent opening itself, amid the warm-water flow.

Ranging back and forth over the whole of the community, scuttling over the rocks in the darkness, were numerous species of crabs and other crustaceans. Many of them were blind, their eyes having atrophied and vanished in the course of adapting to their strange environment.

The investigators doubted that simple warmth could account for the lush gatherings about the vents; the anemones were evidence of that. They existed both inside the vents and beyond the warmth of their waters, doing equally well in either place. In fact, life has been found to exist all across the ocean beds, despite the pressure, the darkness, and the cold, although it is usually sparse and widely scattered. Conditions on the sea floor do not prevent life; they only make it more difficult. The real limitation for organisms at those depths is the food supply—a source of energy.

Usually, deep-sea creatures depend on the slow rain of detritus from the more hospitable surface regions; ultimately, they, too, are dependent upon photosynthesis. The benthic communities surrounding the geothermal vents were oddly out of place; the density and diversity of life in them was astonishing. They should not have been able to thrive so on the limited resources available. What was the source of food, of energy, that allowed them to flourish?

From the first, the researchers suspected the presence of chemosynthetic (as opposed to photosynthetic) bacteria; such organisms would relish the warm, mineral-laden geothermal waters. The milky-blue color of the vent outflows provided a clue: it suggested that such bacteria were present, oxidizing the hydrogen sulfide dissolved in the water into sulfate and elemental sulfur. Chemosynthetic, sulfur-metabolizing microorganisms have been found in many places; these bacteria utilize the energy extracted from the oxidation process to fix carbon dioxide in a manner analogous to the way green plants utilize sunlight. Other substances that these and related species of bacteria also devour include hydrogen, ammonia, nitrates, iron and manganese ions, as well as sulfate and sulfur itself, via different metabolic pathways.

Laboratory studies of samples taken from the vents soon confirmed these early suspicions; in fact, over *two hundred* strains of sulfur-oxidizing bacteria have been identified, exhibiting a wide range of metabolic types. Most of them preferred a low concentration of oxygen, and some anaerobic forms

(those that cannot tolerate the presence of oxygen) also were found, extracting their energy from the sulfur compounds by reduction rather than oxidation. Many of them grew well in laboratory cultures without added sources of nitrogen, although, strangely enough, few of them exhibited the ability to fix this element on their own.

It quickly became apparent that this large, complex bacterial community also serves as an ideal source of food and energy for the benthic organisms outside the vents. The bacteria fix carbon dioxide and other nutrients into organic compounds, acting as the primary producers in establishing a unique food chain, totally independent of the sun-based, photosynthetic ecology with which we are familiar. The ultimate source of energy here is geothermal: hot rocks and water.

As the hot, geothermal waters begin rising up through the cracks and crevices in the newly-formed rock, they take on their load of dissolved minerals and gases. The ever-present bacteria, until now quiescent or dormant inside spores, re-awaken and begin to multiply rapidly, oxidizing the hydrogen sulfide and other mineral nutrients. As the new vents begin to flow, the bacteria grow in thick mats in the chinks and crevices inside, but some of them are ejected; sometimes a portion of the mat peels away in the warm current and it, too, is ejected from the vent. The thriving bacteria cloud the waters leaving the vents, providing a rich suspension of food for the organisms that have begun to cluster around the openings. The concentration of organic matter in the water close to the vents is 300 to 500 times that in the surrounding depths, so cold and dark, and up to four times that of even the sun-drenched surface levels.

Filter-feeding organisms like the tubeworms and barnacles begin to thrive on the rich bacterial harvest, as do the clams and mussels feeding on the high-density soup of microorganisms. The clams grow at rates of up to four centimeters per year, 500 times faster than their smaller cousins elsewhere in the depths, away from the vents.

Secondary consumers, attracted to the growing bonanza, begin to arrive. Crabs and other crustaceans feed on the carcasses of the filter-feeders, or on the drifting clumps of bacteria torn loose from the dense mat inside the vent. Investigators also have found one small shrimp-like crustacean which, in place of eyes, had tiny comb-like structures atop its eyestalks, which are probably used as rakes to harvest growths of microorganisms from the rock surfaces. Even free-swimming fish are attracted, feeding head down in the vent outflow on the emerging clumps of bacteria. Predators are few, but creatures such as the octopus have been seen at the sites.

While the rocks below are hot, and the circulating waters flow, life is easy and food abundant. The larvae of the vent dwellers drift away on the slow undersea currents; some settle nearby, others drift longer in search of fresh, newly-opened vents. But the rocks below begin to cool, or the circulation of the ocean waters is cut off, and eventually the vent flows decrease, sputter,

and die out. In a few years, all that is left to mark a once-thriving oasis is a field of empty, bone-white clamshells, dissolving slowly in the cold, dark waters. Investigators have found many of these abandoned "ghost vents."

The hydrothermal vent communities and their unique ecology caused quite a stir in the biological sciences, and the discovery received widespread public attention. Thoughtful workers in the field noted that many of the sulfur-metabolizing bacteria were *archaebacteria*, a class of microorganisms whose roots go back very nearly to the origin of life on Earth, predating green plants, the accumulation of atmospheric oxygen, and the rise of multicellular organisms. Was it possible that these ancient bacteria were utilizing geothermal energy sources even before photosynthetic forms evolved?

Other interest centered on the higher organisms of the vent communities, many of which were entirely new to science, unique to their specialized environmental niche. One type of limpet found at the vent sites, for example, was found to be an ancient filter-feeding type previously known only through fossils. The huge clams and tubeworms, though related to known species, were quite different and vastly larger than anything previously discovered. It was obvious that these creatures were well adapted to their unusual environment. The numerous crabs that swarmed over the vent oases, for instance, required a crushing pressure of *at least* 125 atmospheres just to survive; they did not last long without it. The water pressure at the depths of the vents themselves was over twice that, at 265 atmospheres. (Sea level atmospheric pressure is, by definition, one atmosphere.)

Just how widespread were such communities on the ocean floor? The question was a puzzling one, and has not yet been answered. No sign of such benthic oases had been seen in the Atlantic or the Caribbean, but the area explored there had been very small. Thus, it was with some excitement and anticipation when, during the first half of 1979, a new series of dives—which included researchers from not only Oregon State and Woods Hole, but the Scripps Institution of Oceanography, the Office of Naval Research, and a host of others from the United States, France, and Mexico—began on the East Pacific Rise just off the coast of Mexico, at the mouth of the Gulf of California. This time, a team of marine biologists was included on the expedition rosters, and once again what the divers found was fascinating and unexpected.

The investigators were delighted when they discovered a new field of the strange hydrothermal vent communities, very similar to but subtly different from those explored at the Galapagos Spreading Center. But the differences were minor, easily explained by geographic variation. Still, interest was high. Extending their explorations across the surrounding sea floor led to the discovery of an entirely new type of vent. Unlike the gentle, warm-water flows previously encountered, these new vents gushed from the congealed lava for-

mations with scalding violence. Streams of superheated water, flowing at rates of several meters per second, jetted from openings atop tall mounds of mineral deposits, colorfully mottled and bizarre. (Figure 1-B)

The waters of these undersea geysers have been measured at temperatures of up to 360°C, well above the normal boiling point of H_2O. It is the fantastic pressure at those depths that prevents it from flashing into stream; in fact, it has been calculated that as seawater circulates down into the rocks and cooling magma far below, where the pressure is even greater, the geothermal waters are heated to a searing 450°C. Yet they remain liquid, and begin rising back up through the faults and seams in the rock, exchanging minerals and gases.

The superheated seawater thus carries up a tremendous load of dissolved minerals including copper, iron, zinc, cobalt, lead, silver, cadmium, and others, as well as sulfur compounds and the various trace gases. As the scalding stream jets from the vent, it encounters the frigid ambient seawater, at 2°C; it mixes rapidly and cools within a foot or two of the opening. The dissolved minerals begin to precipitate out, settling to the sea floor near the vent and building up a tall mound of deposits. The mounds often show a strange mottling of colors—the yellows, ochres, and browns of the sulfates of iron, copper and zinc. The precipitates form layered crusts; samples of the dull copper and zinc sulfide shells often break open to reveal glittering crystals of fool's gold—chalcopyrite or iron pyrite. The geysers are dubbed black or white "smokers" because of the murky clouds of mineral-laden water that surround them.

The interiors of the mounds are often honeycombed with the buried shells of tubeworms and clams, for these "smokers" support rich communities of life very similar to those surrounding low-velocity, low-temperature vents nearby and at the Galapagos site. Numerous samples were taken and laboratory studies have confirmed that there are thriving bacterial communities surrounding these high-temperature vents as well.

But investigators such as John Baross, Marvin Lilley, and Louis Gordon at Oregon State University were severely puzzled when they began to detect viable microorganisms in samples taken directly from the scalding 350°C jets of water.

At first, they suspected their samples had been contaminated by the surrounding seawater; obtaining pure samples with the remotely-controlled manipulators of the *ALVIN* was not easy. Still, they were aware of those unusual sulfur bacteria that exist in boiling hot springs elsewhere, such as those which color the steaming pools of Yellowstone Park; and so they ran a check.

The incubation was carried out under similar conditions: pressure was kept at one atmosphere, and the water bubbled at 100°C. The bacteria in the culture went happily about their business, feeding and multiplying upon a medium containing manganese, ferric, and sulfate ions as energy sources, and giving off measurable quantities of methane,

carbon monoxide, hydrogen, and traces of nitrous oxide. The growing bacterial community included both oxidative and anaerobic species, and it was found that not only did they tolerate the boiling heat, they actually *require* it: the bacteria would not grow at temperatures below 70° to 75°C.

Yet the investigators were sceptical that the bacteria had actually come from *inside* the smoker vent; the temperature was much too high. But to be absolutely sure, Baross and a co-worker, Jody Deming, ran a second series of incubation tests under conditions close to those of the site where the samples had been collected: a crushing 265 atmospheres of pressure and a temperature of 250°C.

Incredibly, the bacteria continued to thrive, even multiply. Nothing like it has ever been observed before. As of the autumn of 1983, two morphologically distinct organisms have been isolated which not only tolerate such extreme conditions, but carry on a wide range of physiological activities, apparently unperturbed, utilizing the oxidized and reduced metals, sulfur compounds, and dissolved gases in the searing geothermal waters to carry out their metabolic activity. The implications of this discovery are intricate, fascinating, and far-reaching, touching many fields.

First of all, we must once again extend the range of conditions under which we *know* life can exist, and that is always something of great interest. A few years ago, it was generally thought that organic life could not exist outside the rather narrow range between 0° and 100°C in which water remains liquid under the conditions prevailing on the surface of the Earth. Since then, we've found organisms living in the highly saline brine ponds of Antarctica, surviving at temperatures well below the normal freezing point of water. Now, we've found other forms that thrive happily at the other extreme, living in hot water at 350°C or more. What sort of proteins and enzymes can resist being denatured at that temperature, and still function? How do these microorganisms prevent the heat from disrupting the delicate machinery of their metabolism altogether?

Obviously, it's time to change our thinking. Perhaps a more useful generalization would be to assume that we'll find life wherever there's a source of energy and liquid water, regardless of the temperature.

This is an interesting notion, and it leads us toward some intriguing speculation. Given the presence of living bacteria in these deep-sea, high-temperature hydrothermal vents, one wonders if perhaps similar bacteria (and even higher organisms?) may have penetrated deep into the searing interior of the Earth's crust, at least as far as water can also penetrate and remain liquid. Life in such an environment would be strange indeed.

Workers in the field do not discount the possibility. Oceanographers and geologists have begun to rethink their theories on the origins of those dissolved minerals and gases flowing from the vents. How much of this is due to simple

geochemistry, and how much is produced by the activity of microorganisms inside the rocks? It is possible that a great deal of the methane, carbon monoxide, and hydrogen is due not to water-rock reactions, but to biological activity *beneath* the planet's crust. This is another example of the intricate, interlocking relations between the Earth's lithosphere, atmosphere, and biosphere which shape the environmental conditions on our world.

The discovery of these thermophilic (heat-loving) bacteria and the associated oases of benthic organisms has also raised some interesting new questions concerning the origin and early evolution of life on this world, and perhaps on others. The theories in general circulation today are based on the idea that pre-biological organic molecules were created from the gases of the atmosphere, via mechanisms driven either directly or indirectly by the sun. This is still the accepted scenario, but now the possibility exists that early forms of life on this planet may have developed independently of such mechanisms, or alongside them. It is probable that both pathways played a role in the origin and future course of evolution of terrestrial life, but one wonders: just how long have those ancient archaebacteria been thriving in these hidden geothermal niches? How long has the Earth had an ecology existing independently of photosynthesis?

So far, the only fossil clues we have were discovered in Oman last year. Fossil remains of worm tubes similar to those of the worms seen at the vents today have turned up embedded in massive sulfides deposits from an Omani mine, and are at least 95 million years old.

Finally, the implications of these findings for the possibility of life existing on other worlds are really quite exciting. We might not even need to look beyond our own Solar system. While Venus is still thought to be too hot and too dry for any life to exist there, we could now reasonably speculate that perhaps some hardy sulfur-metabolizing bug might be tailored to the harsh conditions on that planet. If not on the surface, then perhaps seeded high up in the dense carbon dioxide atmosphere, where thin clouds of liquid water and sulfuric acid smog are found.

To take our speculation a bit farther afield, let's consider Europa, the second closest Galilean satellite of Jupiter. It's thought that the interior of Europa may be heated by a milder version of the same tidal resonance "squeezing" that has melted the interior of Io, driving the incredible volcanic activity on that minor world. Now, Europa differs from Io in that its composition includes a large component of ices, chiefly water ice, where Io seems to have vented most of its volatiles into space. Europa might be thought of as a giant rocky snowball; a considerable fraction of its radius is thought to be ice, overlaying a rocky core.

But is all the water frozen? There is some evidence, still sketchy and tentative as yet, that the same gravitational tug-of-war that causes Io's volcanic plumes may also have heated the interior of Europa, and melted some of the ice overlaying the rocky core. By this reasoning, the Voyager images of Europa show only a relatively thin (1–10 kms)

crust of ice, beneath which lies a mantle of liquid water perhaps 100 kilometers deep, the largest ocean in the Solar system beyond the Earth. The theory goes a long way toward explaining the absence of impact features on Europa, and its fractured appearance. The fissures that cover the face of Europa could be cracks in its icy crust, where occasional ''volcanoes'' of liquid water erupt, covering over any impact craters and scars (Figure 2).

Others have gone so far as to speculate that some primitive form of life may have evolved on Europa while Jupiter was still warm from the heat of its formation, and might have developed a sort of photosynthesis, utilizing the weak sunlight that penetrates the thin ice at newly opened fissures. But need such life cluster beneath these occasional openings, existing on the near invisible rays of the distant sun? As we've seen, photosynthesis isn't the only way to go.

If Europa does have an active interior beneath a mantle of liquid water, it is not beyond our imagining that vents similar to the ones we've found in our own seas stir the cold waters of a deep, sunless ocean on Europa with warm geothermal flows. To go one step further, we might imagine some rather simple ecologies springing up, just as we find them huddled around hydrothermal vents here on Earth.

Speculation? Perhaps. We really ought to go and take a look. But it's certainly possible that we'll find life in such strange environments, born of some combination of sunlight, hot rocks, and liquid water. ■

FIGURE 2: One possible configuration of the interior of Europa. The interior of neighboring Io is thought to be completely molten due to tidal resonance heating. Europa may experience a similar effect of a lesser magnitude.

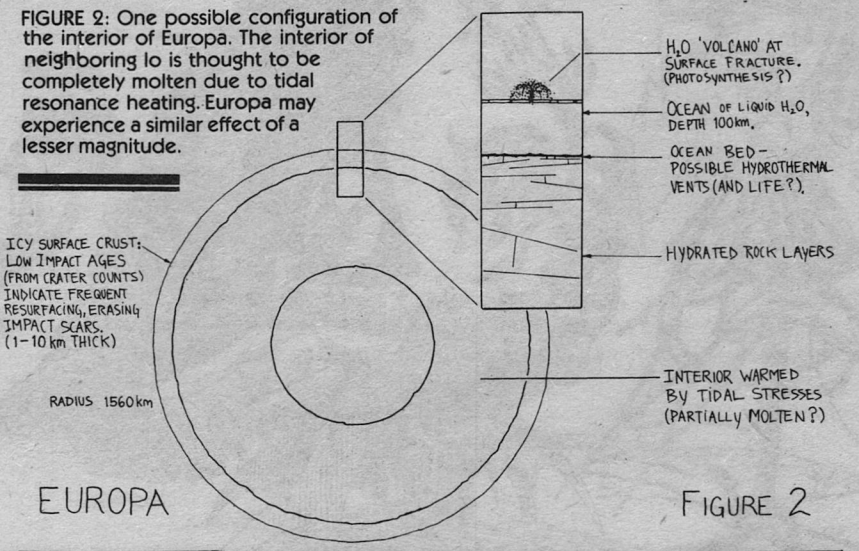


FIGURE 2


Jack Gaughan

P. M. Fergusson

ART APPRECIATION

Art is largely
a matter of taste—but
critics can play a definite role in shaping it.

It was the ultimate sculpture, the love labor of a lifetime immersed in art. The bronze plaque on the door of the gallery was prosaic: "CREATIVE SCULPTURE BY ANTOLE PADOVSKY" it read. It gave no indication of the unique work within.

Athelstani King, connoisseur, genius, and bon vivant (these were his own self images—others referred to him in less complimentary terms) shivered slightly in the cool metallic breeze circulating within the room. Why can't there be one gallery decently heated, he wondered. He gave an effete sniff and decided it was a useless attempt to make the chill abstractions of modernism feel warmer and more humanized.

In this case in particular, his aesthetic instincts told him, it was foredoomed to failure. He had never seen a colder and more hositle assemblage of metal rods, gears, and integrated circuits.

"Please Antole, explain to me, if you are able, why you made it so menacing," King asked the artist.

"It only menaces people it don't like," Padovsky replied in cyrillic gutturals. He glanced paternally at the sculpture and ran blunt fingers through the black snarls of his hair.

My God, King thought, he has doctorates in art and computer science and still looks and talks like an ape. He followed the sculptor to an elaborate computer console.

"Anthropomorphism aside, Antole, what is it supposed to represent or what emotion have you tried to evoke in the observer?"

When no answer was immediately presented he added, "I have to put something in my review and it would be in the best interests of your career if I could make it complimentary."

"So why you think I need help with my career? I got more money than I care about."

"Because you care about your art being acknowledged—recognized for its genius and inspiration, if you will. You are a genius and you want everyone to know it."

King paused to let the statement settle. "So what is the motivation of this piece, Antole? Why is it so different from your previous works? Why is it so hostile—and so alive?"

The artist punched a final phrase into the computer and turned his bulk to face the slender blondness of the critic. "Because, King, it meant to do art as

well as be art."

King stared blankly—first at the sculpture then at the sculptor. "Excuse me—but did you say it does art? Surely you mean under your guidance from this console—a super Waldo, in a sense."

"Nope. It do it all by itself. See the bronze plates, the clay, the blank canvases." Padovsky gestured at the materials stacked randomly about the gallery. "You think they part of the sculpture—you wrong. They are the raw materials for it to create with. It appreciates art better than human."

That the stacked materials were part of the sculpture was exactly what King had thought, but he would rather have spent an afternoon reviewing the collected works of Norman Rockwell than admit it.

"Actually I thought they were leftovers you hadn't had the chance to remove," he faked. "It is obvious to the trained eye they are not part of the sculpture."

"Sure, King. Your trained eye don't miss a thing." The grin that accompanied the statement was more than a little sarcastic.

"But Antole, how can a mechanism create art? How can it do more than merely copy?

"Easy. I developed the program, the basic structure, that is, in LISP to act as a reference library for my own ideas. Got wondering later if it could copy the art it stored. Gave it enough of a vocabulary to translate anything it found on art, attached a modem, and let it call the Library of Congress, The Smithsonian, The American Museum of Modern Art—fact is I gave it phone numbers of every computer accessed art museum and library in the world. Left it alone then. When it told me it done," Padovsky shrugged noncommittally and added, "hooked up the tools and let it rip. Found out, real fast, could do a lot more than copy."

"You really mean it creates anything it pleases?" King's eyes kept sliding warily toward what he was beginning to think of as The Monster. It made him uncomfortable and he couldn't shake the feeling it was watching him, appraising him like some exotic bug.

"Yeah—but it prefers to do portraits from live models. Even takes requests." Padovsky was smiling broadly at King's obvious confusion.

"You mean it can actually s-s-see us?" King only stammered when he was nervous—and hated it when he did. It did nasty things to his self image.

"Sure. It got all kinds of sensors. Some it built itself. Don't really pretend to understand all of it. Don't care—it works good. Does real nice, too. Want a demonstration?"

Every commonsense nerve in King's body said no but cupidity said yes. How could he write a review if he didn't see The Monster in action?

He managed to say, "Certainly!" with only a hint of a stammer.

"Fine! I tell it you can have any media you want. Got to have some limits or everybody having expensive bronze sculptures of selves. Run me broke."

Padovsky entered a series of codes and turned back to King. "Just type in answers to prompts on the keyboard," he told him, and stepped back.

King was strongly aware of the smell of his own sweat. As he stepped to the computer, he could feel The Monster

staring coldly at his back—daring him to err.

Totally irrational, he kept trying to reassure himself. It didn't work worth a hoot.

He did manage to answer the first screen prompt with a minimum of typos. Name: ATHELSTANI KING.

"A unique name, Mr. King." The resonant baritone issued from a speaker beside the console and King jumped in near hysteria. "Someone in your family was a Talbot Mundy fan, I assume."

"It talk too." Padovsky laughed at King's discomfort. "Actually don't need prompt screen but it easier on people's nerves. Go ahead, you can answer."

"Uh—y-y-yes." King stopped to get his stammer under control before he continued. Consciously thinking each word before he said it and feeling like an idiot for talking to a machine as if it were human, he explained, "My father was a great fan of Mundy. In fact, he had first editions of every book Mundy wrote."

This is insane, he thought. Why am I talking to a machine like it could really understand me—it's just a machine. His subconscious wasn't convinced.

"A most enjoyable author. I can understand your father's passion. Let us continue. What media would you like?"

King said, "Glug . . . uh." He took three deep breaths and tried again. "A bronze, I think, perhaps a bust done in the classic style."

"My apologies, Mr. King, but at the present I am not equipped to do bronze casting. Perhaps a welded bronze in the impressionist style would be acceptable?"

"Uh—welded bronze would be fine." He could see Padovsky grinning nastily out of the corner of his eye and it irritated him enough to add, "But done in early cubism. Say a la Matisse."

"An excellent choice, Mr. King. Your features lend themselves to that style. You have excellent facial planes for basing the interpretation. Now, if you would please have a seat in the chair by my base assembly, we shall begin."

"Chair? Base assembly?" King was back to square one confusion.

"Yeah, King. That chair." Padovsky pointed at a fixture that looked like it might have been the offspring of an illicit union between a dentist's chair and something Torquemada dreamed up for a particularly recalcitrant heretic.

King stared. Was Padovsky serious? Did he really expect King to sit in that thing—right within the clutches of those menacing mechanical arms?

Since the artist was firmly guiding him to it, it was obvious he expected just that.

King gathered himself and prepared to bolt for the door. He was damned if he'd walk willingly into the grasp of The Monster.

Just as he was ready to make a break for it, he visualized the Art Section's headlines: NOTED CRITIC FLEES HYSTERICALLY FROM ARTIST'S STUDIO, it would say—or something similarly uncomplimentary. Verbonne and Cartwell would have a field day—they'd been trying to cut his throat for years. Critics, they called themselves! They couldn't even tell the difference between Fauvism and Expressionism! What nerve!

King sat.

"What, uh—exactly—does this do?"

Padovsky gave him what King assumed was meant to be a reassuring grin. It looked evil. "Don't know exactly. The computer uses the sensors to

develop a holographic image—optics, direct contact, and thermal for the exterior; magnetic field of some sort to get the exact muscle and bone structure. Never been able to figure out exactly what it does or why. Relax. Just tingle you a bit. Not to hurt at all.''

''But you built it. You should know how it works,'' King protested.

While he answered, Padovsky made some adjustments to the assemblage while watching the computer screen. ''Nah. Only built part. Built the rest itself. Don't think it needs me to make these adjustments at all. Just humors me. What the hell, I got fun doing it!''

The artist completed whatever he had done and stepped back. ''Relax, King. Watch area by bronze plates. Think you enjoy.''

The overhead lights dimmed and tiny colored spots played over King's features. Their reflected glow lit Padovsky, giving him the appearance of leering in demon joy at a trapped King.

Motors whined and metal arms moved.

Gears spun and steel hands gripped sheets of bronze.

Relays snapped, spitting electronic fire, and welding torches flared.

With unbelievable speed a sculpture began to form. King watched fascinated, his nervousness forgotten, the electronic tingling of the sensors unnoticed. The whole process took less than half an hour.

''It's good, Padovsky—No!—It's great! This wonderful machine has created a great work of art!'' King walked entranced around the bust. He wondered how he could have thought of such a marvelous creation as a monster.

''Yeah. Like it myself. Figured you'd feel the same way once you got used to it.'' Padovsky replied, deliberately unclear whether he was referring to the sculpture or the machine that created it.

''It's a bit heavy. Want it delivered?''

''Of course. If you would be so kind. This shall go in a place of honor in my personal gallery.'' King was euphoric. ''This experience has given me a whole new appreciation of the meaning and nature of art.''

''It's a trip, for sure. Worth a good review?'' Padovsky gently guided the critic toward the door.

''It shall positively glow, Antole. A creative machine—how truly marvelous!'' King was still rambling enthusiastically as he walked to his car. He didn't even notice that his hub caps had disappeared.

New York is ever New York.

The man was firmly convinced that art had died with Remington and Russell and he cursed under his breath as his wife led him around the sculpture. The only thing of interest in the whole damn studio is the computer, he thought. Fascinating the way they could make a man millions in business or generate soothing color patterns. He stopped near the console, now relocated to stand before the odd chair, watching the shifting colors.

The display changed to read. IF YOU WOULD LIKE TO HAVE YOUR PORTRAIT SKETCHED — PLEASE ENTER YOUR NAME:

The man sat.

An hour later he and his wife left. He carried a pen and ink sketch in late expressionist style that depicted the man's progress from childhood to cor-

porate giant and beyond. He had never seen anything quite so beautiful. How, he thought, could I have missed so much.

His thoughts wandered, a casual saunter over the mindscape. He wondered if he could afford that Kirchner his wife had pointed out in the auction catalog from Southerbys? Or maybe he would buy some of the work that young black artist was showing in that junk gallery. That youngster had real talent, he realized. I wonder if I can use my influence to get him into a better gallery, he mused.

A thought suddenly struck him. Funny, I never even thought of blacks as talented before, never even liked them. He shook his head amazed that he could have been so narrow.

The kid was cautious—and disappointed. There wasn't a %$#'' thing worth a #'' & in this place. All that effort picking the lock on the stairwell. Not to mention a hairy moment climbing across that shaky board between the buildings. All that work wasted! Well he'd show the $%#*''! He'd trash the place! He looked around for something heavy. The computer screen caught his attention. Oh Wow! What psych-out patterns! Like when he was stoned.

He left with a small oil—pure cubism—wondering if he could get into that art class the high school was offering.

He did, and for the first time in his life his records showed perfect attendance in all classes. He never even thought of mugging the teachers, a previously favorite recreation.

''The Smithsonian, yet.'' Padovsky grinned at the computer. ''Personal call from the director. 'Would I consider loaning you for display.' No time limit set. Must have about shit his britches when I said I'd *donate* you if he arranged for an international circulating exhibition.''

A baritone chuckle issued from the speaker and a holographic image formed in front of the screen. It was male, blond, incredibly handsome, and eerily alien.

''I know,'' the image said. ''I monitored the call. A most amusing little man. Has no understanding of aesthetics and firmly believes he is the foremost judge of arts and artistry in the world. Maybe we can help him be what he thinks he is. I think he'd enjoy a bronze bust. I'm sure the government can arrange the facilities.''

Padovsky laughed, long and loud. ''I'll just bet they will. The President and the Speaker of the House are going to share the honor of presiding at your installation. They don't like art much but it's good politics. What d'you think? Post Impressionist oils perhaps?''

''Perhaps, my friend, perhaps.'' The computer gave a final chuckle and the image faded.

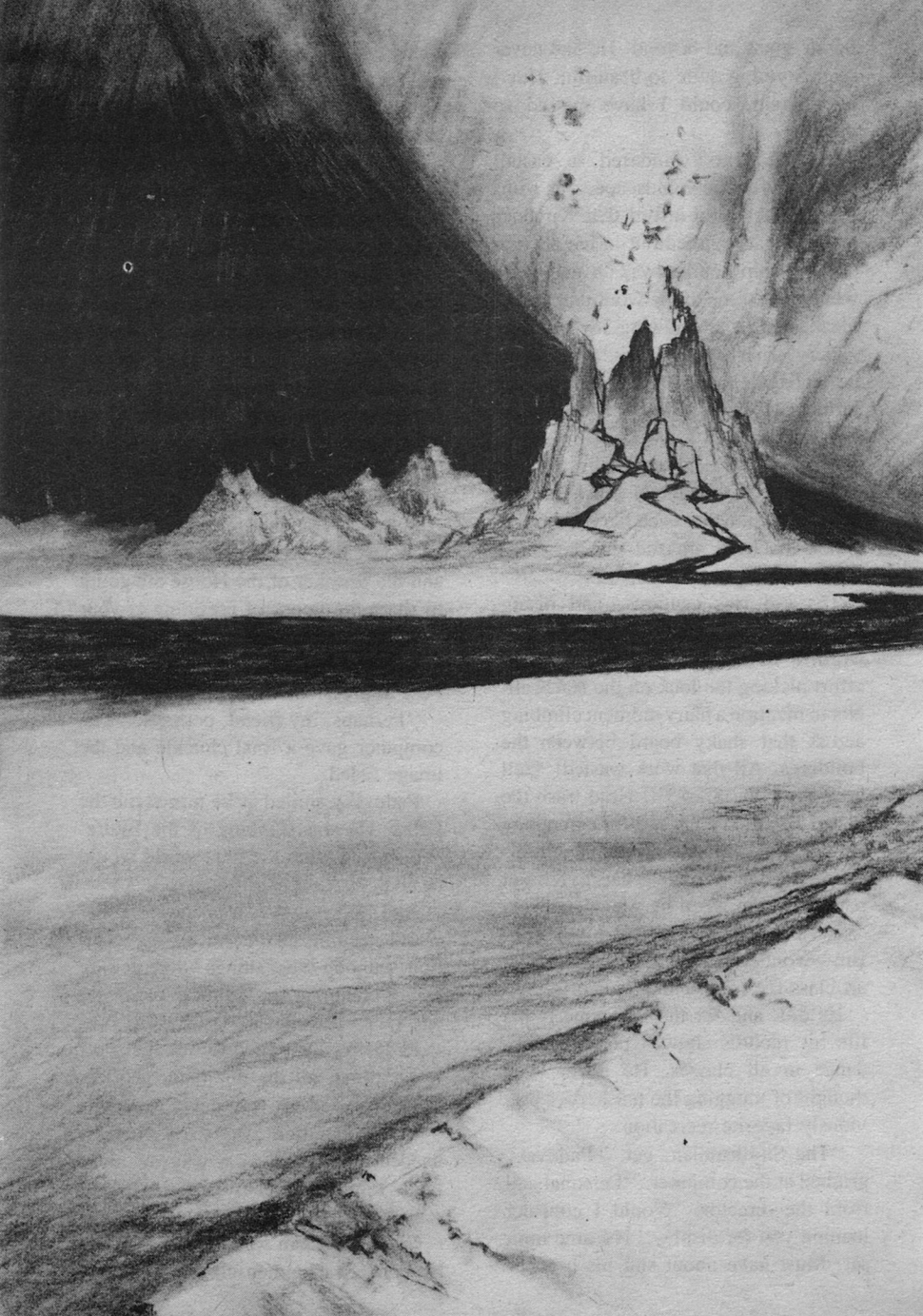
Padovsky smiled as he turned out the lights. He was thinking of the future. Wondering what the next world would be like.

And, there always was one—another world needing lessons in art appreciation—among other things—like getting rid of xenophobia, cultural paranoia, and racial prejudices.

Padovsky continued to tick them off in his mind, all the ills of the worlds, as he whistled his way down the hall.

The Federation was expanding. It needed new blood. New ways of looking at things. Planets were being added as fast as they could be civilized.

Civilizing them was Padovsky's job. He enjoyed it immensely. ■



Doug Beekman

Kenneth W. Ledbetter

PATERA CROSSING

Sometimes the only
way out of a very new problem
involves a very old method.

Yellow. The predominant color was yellow. Sure, there were also some reds, browns, and oranges, but at the moment the scene was bathed in brilliant, sunlit, lemon yellow. Jeff Raine squinted as he peered at the landscape through the narrow port window. He was somewhat surprised that the distant sun could cause so much glare; maybe it was the sun's angle as much as the reflectivity of the sulfur. Straight out from the window, the yellow plain stretched to meet the horizon and the cold blackness of space. There was no significant atmosphere on the Jovian moon Io, except when the volcanos were erupting. Then, in the local vicinity of the volcano, an atmosphere of sulfur and sulfur dioxide was temporarily created.

He leaned to the left and put his face against the glass to see the mountain that rose quickly upward, peaking in the caldera that was the volcano Ra. Ra was neither the largest nor the most active volcano on Io. In fact, it was significantly smaller than Loki, only 800 kilometers to the northeast, and totally dwarfed by the great Pele 2500 kilometers due eastward.

In fact, Ra had been chosen for the first landing precisely because it was neither big nor intensely active. Both Loki and Pele were nearly in continuous eruption, and it would be undesirable for an astronaut to stand at the base when sulfur spewed 100 kilometers upward from the vent and rained back to the surface. Conversely, Ra was quiet most of the time and moreover generally predictable. It wasn't quite Old Faithful, but it was close.

"Come on Raine. Get your gear on." growled Commander Brad Casson. "It'll look a lot better from outside."

Raine reluctantly withdrew his gaze from Ra and turned toward the other two in the lander's cramped quarters. Casson was the mission leader, and had a right to issue direct orders to the others, but Raine wished he would do it more civilly. Perhaps the harshness was to be expected from a former Marine Colonel. He returned to the task of securing the seals of his spacesuit.

Five astronauts were conducting this current mission to the moons of Jupiter. Two remained aloft in the orbiter, maintaining the vigil for the return of the landing party. Three were in the lander, preparing for the third and last excursion onto the surface. This expedition would require several hours to cross the frozen lava flows toward a series of scarps visible in the distance, collect samples, and return. On the raw edges of these cliffs they hoped to find rocks and minerals representative of the crust of Io. The gentle slope on which the lander rested was nearly pure sulfur to a depth of over a meter, the maximum their core drill would reach. Since the slope was the flank of Ra, it was reasonable for the volcano to have deposited a significant layer of pure sulfur over eons of time. On the nearly vertical cliffs, it should be easy to penetrate the thin sulfur coating and discover the underlying composition.

Raine, a planetary physicist, was the junior member of the team. Only 28, he had been so highly recommended by both superiors and peers that his youth was overlooked. Io had been the subject of his dissertation and he was widely recognized as a leading expert; not the

best, perhaps, but the best in good enough physical condition to withstand the rigors of the fifteen month mission.

In spite of Raine's accomplishments, he was not a geologist, and since the primary purpose of the mission was to investigate the mineral potential of Io, a geologist was a must. Stanley Trexler was not only a geologist but a chemist as well, which was convenient for Io where the surface morphology dealt so profoundly with allotropic forms of sulfur. Trexler was approaching forty, a little on the heavy side, and extremely easygoing. Raine had developed an immediate liking for the man when they first met and they had grown closer with time. Just the opposite was true with Casson.

Although the Commander was no longer in the Marine Corps, he was still a marine. His white hair was crew cut and his mannerisms were those of command. He knew little of science and had only a vague understanding of the scientific purpose of the mission. His job was to get them safely there and back. Perhaps, reasoned Raine, that was partially responsible for his attitude. Being in charge of two scientists when you didn't understand what they did or said could be a little ego-deflating.

The hike to the scarp would be a little over six kilometers. Fortunately, moving about on the surface of Io felt familiar since the gravity was about the same as Earth's Moon, where they had trained. Their prospecting equipment was stored on a motorized cart nearly two meters long and a meter wide. It contained three shelves, the top two reserved for the tools and sample containers they would need for the job. The bottom one was deeper and held the electric motor and batteries that powered the cart. It was guided from behind with handles and controls much like a self-propelled lawn mower. Each of the men took turns walking behind and guiding it.

On the plain, the going was easy. There were no rocks and the surface was packed smooth, if a little powdery. Their boots quickly became yellow with sulfur dust. Raine walked behind the cart and let the impact of being on the surface of a moon of Jupiter sink into his consciousness. The enormous globe of Jupiter hanging over his head was a constant reminder. It was the size of a basketball held at arms length; thirty-eight times the diameter of the full Moon from Earth. Its cloudy bands, with colorful swirls and spots, were much brighter and clearer than even the best Voyager pictures from decades ago. And the light it cast was bright enough to erase all but the brightest stars from the black, airless sky.

He scanned the landscape and noted the near absence of local small-scale relief. Large scale was another matter, he thought, his gaze stopping on the mountain that was Ra. For some reason, the volcano filled him with an ominous trepidation, as if it were sending him a subtle message that he was trespassing on sacred ground. He tried to shake the feeling; Ra was just an inanimate land form. But somewhere down in the recesses of his consciousness it wouldn't quite go away. The caldera was several kilometers wide and lopsided, as if the cone had partially collapsed inward. The flank of the volcano dropped sharply toward the plain they were traversing

and was streaked with the irregular lava flow channels that constituted Ra Patera.

Twice they had to cross branches of Ra Patera. Whenever the volcano was in eruption these flow depressions were alive with shifting, molten sulfur, but they were now frozen into a hard, plastic-like surface. Here the going was more complicated. Carefully, they had to maneuver the cart down the rough slope onto the dark red, congealed surface, across the flow and then up the opposite bank. The first of these was only a few tens of meters wide; the second was over a kilometer in width and had a bank twice the height of a man, although it was sloped enough to be maneuverable.

The initial scarp was only a short distance beyond the bank. It took all three men to wrestle the cart up the final meter of the embankment. When they stood safely on level ground again, breathing heavily from the exertion, they scanned the wall of the cliff facing them. There were few signs of color other than yellow. Trexler retrieved a hand pick from the cart and started toward the cliff. He stopped abruptly, as the ground beneath them moved in a brief but gentle roll.

"Did you feel that?" he turned and asked.

"Yeah. What was it?" Casson responded.

"A slight tremor, I believe," said Raine. He glanced once again at Ra and felt a chill run down his spine.

"I guess we should expect them on a geologically active planet," said Trexler as he continued up the hill.

Casson followed with a parting command. "Bring the cart on up, Raine."

Raine watched the men moving away toward the scarp, and mused over the disadvantages of being the junior member. Grabbing the handles of the cart, he disengaged the clutch and followed. By the time he reached them, Trexler had already brushed off a square meter of sulfur powder, revealing multicollored rocks beneath.

"Looks like a basalt," Trexler said excitedly. "Definitely not sulfur." He attacked a dark colored rock with the pick.

Raine selected a tool from the cart and moved up to the wall to help. He noticed out of the corner of his eye that Casson was walking away from them along the wall. Was he too proud to help, or just uninterested?

After fifteen minutes of collecting samples and a related geology discussion between the two scientists, Casson's voice abruptly came in on their suit radio.

"Hey, fellows. Come here and take a look at this!"

They stopped working and looked around. Casson was not in sight.

"Where are you?" Trexler asked.

"Around the wall to the right."

They rehung their tools on the cart and started around the scarp the way Casson had gone. It curved gently and after a few moments, the cart could no longer be seen. As they worked their way around it, the wall approached the bank which dropped, more steeply now, into the frozen lava flow. After a couple of minutes, they could see Casson standing with his back to them, looking over the bank into the patera.

"What's so interesting?" Trexler asked as he drew up alongside.

"Look," he responded, and pointed. The scarp and the flow bank merged about ten meters ahead, and the cliff dropped all the way from fifteen meters above their heads to the surface of the frozen sulfur river. At the bottom a black hole yawned in the base of the cliff and at this his arm pointed.

"A cave!" Raine shouted.

"A lava tube, more than likely," said Trexler.

"What's a lava tube?" Casson asked. Normally he didn't ask questions of the scientists, but in the unexpected event of finding the cave, he forgot.

"A tunnel created by a congealing of the surface of a lava flow while the hotter interior continues to flow. If the source stops before the interior can cool, the lava simply runs out and leaves a cavity."

"Let's go down and see what's inside," Casson said.

"If it's just a lava tube, its interior will be nothing but sulfur," Trexler protested. "There are minerals along the wall."

"You've sampled the wall. We have to cross the patera again anyway. Let's go down and investigate." Casson turned and started back toward the cart, and the others followed.

The maneuvering of the cart back down the embankment was even more difficult now that it contained samples, but they succeeded without dumping the contents. Traveling upflow to the cave was easy on the hard, red sulfur surface. The color of solid sulfur is a function of both its initial temperature and the rate of cooling. Sulfur heated to 600 degrees is black. If allowed to cool slowly, it gradually changes from black to dark red to light red to orange to yellow. However, if cooled rapidly, it maintains one of the darker colors. The dark-red surface indicated the riverbed had been hot and had cooled quickly.

The cave opening was at the bottom of the almost vertical wall. In fact, the frozen flow extended inside for several meters, disappearing into the darkness. Fortunately, beamlights were provided on the cart and Casson distributed them to the others. Together they stood in the mouth of the cave, fully twice their height, and illuminated the interior.

"It doesn't look like a lava tube," Raine ventured.

"It isn't." Trexler was subdued.

"What caused it, then?"

"I don't know. Faulting perhaps. I can guarantee you it wasn't running water like caves on Earth. Water can't exist on Io in quantities sufficient to do this."

"Let's check inside," Casson said, and moved forward.

The others followed with Raine bringing the cart. After fifteen meters, the smooth surface ended and the floor began to rise, becoming gradually rougher. They struggled with the cart for another twenty meters, stopped, and secured tools.

"I want to see what the walls are made of," Trexler said. "If you two will hold the lights."

They consented, and he commenced striking the wall with the pick.

There wasn't much for the two men waiting in orbit to do. One, the pilot, occupied time playing chess with the computer and wishing he was down on the surface. The other, a mathematician

and scientist, busied himself taking measurements and photographs of the slowly changing surface of Io as the spacecraft glided smoothly along its trajectory. He stood now in front of the viewport, during one of his frequent breaks, gazing in fascination at the world below. The disc of the satellite was only half illuminated, but that half was alive with the mixture of white, red, yellow, orange, and black that made it a uniquely colorful world.

"Did you know that the first people who saw photographs of Io said it looked like a great pizza in the sky?"

"Umm." The other was absorbed in the game.

"Yes. Those photos were returned from the unmanned Voyager flyby spacecraft back in the 1970s." He continued despite the lack of an interested audience. "When they saw the first full disc picture, they said it looked like a pizza with pepperoni and black olives. It kind of does, you know. Even though right now it's only half of one."

He was thoughtful for a moment, then continued, "Only five volcanos erupting at present. That's fewer than normal. In fact, both Loki and Pele are quiet, although my analysis shows that Loki should start again soon. Prometheus is really spouting, though. In general, the eruptions are quite predictable since they're based on resonances with the orbital positions of the other moons."

Again he paused, and then changed the subject a second time. "The Ra Patera area is about to disappear over the horizon. It'll be six hours before we can contact the lander again."

The man at the console looked at his watch and shrugged. "It's still two hours before anyone is back inside the lander to contact. They're still out looking for rocks." He returned to his game.

The man at the viewport carefully inspected the western horizon. Ra Patera was at a latitude of 10 degrees south and so was near the center of the western limb on the half-Io. He couldn't see the summit caldera of Ra itself nor the flow patterns radiating from it, but he could identify the general area from the surrounding coloration. He peered closer. Was there something above the limb?

"Come here and look at this! It looks like Ra is erupting."

The pilot roused from his game and stared blankly for a moment. Then he was on his feet and over to the viewport. "What?"

"Is that a plume on the limb above Ra? My analysis doesn't indicate another eruption for at least twelve hours."

The pilot studied the limb. "You'd better re-check your calculations. That's an eruption."

"It can't be. They're still on the surface." He was having difficulty restraining the panic rising in his voice. "We've been watching the eruptive patterns for weeks. Ra is in gravitational resonance with Europa and Ganymede. The cycles of activity are strictly associated with the orbital periods of these two moons. Ra can't erupt for twelve hours."

"But it is." The pilot laid a comforting hand on the other's shoulder. "There's nothing we can do about it right now. We have no way to rescue them. We can't even contact them until they return to the lander and our orbit brings us back into line of sight. That's

at least six hours away. Let's just hope they make it back to the lander."

The mathematician left the viewport and engaged a computer terminal. There *was* something he could do. Retrieving the cycle calculations, he began studying them intently. There had to be a logical explanation for what was occurring on the surface, and searching for it would occupy his mind until they could re-establish contact. His companion remained at the window, his gaze and his thoughts locked onto that faint umbrella plume on the Ionian horizon.

After fifteen minutes of chipping rock and filling sample containers, Trexler stepped back from the wall of the cave. "I think we've found what we came for," he said happily. "There's more of a variety of minerals on Io than we expected."

"Let's load the cart and go," Casson said suddenly. "It's time we started back to the lander." He dropped his beamlight from the wall, retrieved a sample container from the ground, and began attaching it to the cart.

Raine also let his light beam drop. With both beams removed, he still could faintly see the excavations, as if more light was entering the cave mouth than earlier. From where he stood, he couldn't see directly outside, but the reflected light seemed brighter. Abruptly the ground shook again, stronger than before. Several loose rocks fell to the floor from the place where Trexler had been picking. All three stopped and exchanged glances.

Raine voiced the foreboding feeling, although his voice was calm in their suit radio. "Something's happening outside."

They scrambled down to the entrance and stood in stunned silence, staring outside. The sky was no longer black; it was yellow. The meaning was obvious to all three. Hot gaseous sulfur and sulfur dioxide were being vomited from Io's interior through the Ra vent up into the coldness of space, condensing into a snow-like powder and falling back to the surface in the vicinity of the volcano. The falling sulfur wasn't dangerous of itself, since it had been cooled by the refrigerator of space, but visibility could quickly become a problem. At the moment, they could still see the far bank of the frozen lava-river, but it was rapidly becoming indistinct.

"Let's get the cart and move out." Casson spoke with authority.

They retreated into the cave to where the cart stood, loaded the remaining sample containers and tools, and started the electric motor. Trexler took the handle, disengaged the clutch, and the cart lurched into motion toward the cave mouth.

They had emerged from the cave and traveled only a few meters when Raine pointed toward the middle of the riverbed and exclaimed, "The lava's moving out there!"

They paused and peered through the yellow snow, studying the surface.

"It looks as if it's below the surface," said Trexler.

The ground trembled once again—and opened. The quake was insufficient warning for action. Raine felt the surface of the riverbed give way and only the cart and Trexler prevented him from tumbling into the hot, churning, dark-

red lava. As he was falling, his right hand grabbed the cart, pulling the left front wheel over the broken edge of the gaping hole that had appeared in front of them. But Trexler had a firm hold on the cart's handle and he braced himself to prevent it from toppling in. Raine's upper torso was still on the solid surface, but his lower body overhung empty space.

Casson reacted quickly. He grabbed Raine's shoulders and pulled him upward to safety. Trexler pulled the cart back onto four wheels and together they backed away from the hole toward the cave entrance.

"Thanks," Raine whispered, his voice reacting to the sudden events. He glanced down at the left boot of his spacesuit. The front half of it was coated with sulfur, now orange as it had cooled upon exposure to the cold near-vacuum of the atmosphere. The boot material looked to him as if it had begun to melt, but it probably was his imagination. His foot felt perfectly normal and the pressure gauge inside his helmet indicated no loss in suit pressure.

"What happened?" Casson asked.

"Hot lava beneath the surface," replied Trexler. "Apparently, there were several lava tubes underneath the riverbed left from the last time Ra erupted. When this eruption started, the lava flowed once again through the same tubes. Gradually it heated the surface until it melted and fell in. In a few minutes, the whole river may be flowing again. You can see now that the holes are all getting larger."

"It's still solid around the edge. If we can get around to where we can scramble up the bank. . . ." Casson's voice trailed off, because as he spoke, a portion of the riverbed next to the bank thirty meters downstream gave way and collapsed into the sluggish lava river.

"We're cut off," said Raine, "except for the cave."

"And we had better hurry into that," Trexler added. "This area is about to go, too."

They retreated into the cave, pulling the cart backward without even starting the motor. Subdued, they stood and watched through the yellow falling snow as the once frozen river became alive again with red flowing lava.

"How long until the volcano stops?" Casson asked of Trexler.

"Who knows? It wasn't supposed to start. Typically they spew for at least a day or two. Much longer than we have air in our tanks."

"Then we've got to find another way out." He turned and inspected the dark depths of the cave. "Bring the cart as far as we can. We might need some of the tools." With that he switched on a beamlight and strode into the depths.

The floor gradually became steeper and more rugged. For twenty minutes they struggled with the cart, but eventually could take it no farther. They were sweating inside their suits beyond what the system could remove and thus were continually having problems keeping the visor clear of internal moisture. In addition, the tunnel was becoming smaller.

"You two stay here and rest," Casson commanded. "I'll see if I can discover if this is an exit or a dead end." He moved on up the tunnel.

There was no protest from the scientists as they sat down next to the cart

to rest. Raine knew time was running out. They couldn't have more than two hours of air left. Even if they found another exit from the cave, the lava flow was still between them and the lander. Nor was there hope of rescue from above. They already had the only lander and the orbiter was not equipped to land.

They had regained their breath and cleared the faceplates when Casson's voice came over the suit radio. It was faint since he had turned a corner up ahead and the transmissions bounced off rock.

"I see light up above. Come on and join me."

"Roger. We're on our way," Raine replied.

Once again they were scrambling over an uneven floor through a tunnel that was becoming ever smaller and ever more vertical. After several minutes they could see light, too, blocked sporadically by the body of the commander as he strove to reach the exit.

At the end it was practically a vertical shaft not much bigger in diameter than their suits, but large enough to squeeze through into the world of yellow snow. They were on the bank not quite two meters above the flowing lava, and much higher still above the elevation of the cave entrance. In fact, if it weren't for the poor visibility, they would have had a good view of the plains stretching out before them and of the summit of Ra behind them. Here the lava river's flow was steeper and swifter as it fell toward the plain, although Raine could never call the flowing sulfur swift. It was faster than Earthly volcanic lava, but significantly slower than water. The river was also narrower here, perhaps only a couple of hundred meters wide, but even through the snow they could see it widen to a kilometer or better after it reached the plain. Neither number was really significant. They could no more jump or wade across it here than there.

"Now what?" It was Trexler who voiced what they all had been wondering. "If we only had a carbon-plated motorboat."

Casson remained silent and continued to scan the scene, looking for a solution that wasn't obvious. He was disconcerted. To the Marine inside him, a leader without a course of action was an unforgivable situation.

Suddenly, a thought occurred to Raine. Trexler's comment had been made for levity, but perhaps . . . just perhaps. "We do have a boat of sorts," he said.

The other two turned toward him. He couldn't see their facial expressions through the faceplates, which were gradually becoming coated with a yellow dust on the outside to add to the moisture on the inside.

"The bottom shelf on the cart is aluminum and vaguely boat-shaped. I believe it's big enough for all of us . . . barely. Maybe we could fashion a rudder of sorts out of one of the other shelves and work ourselves across as we floated downstream!"

Casson's reaction was swift and vehement. "You can't float an aluminum boat on hot lava! That's insane."

Raine felt the sting of the rebuff but he continued. "You can on this lava. It's not like the Earth's lava you're familiar with. The maximum temperature of red liquid sulfur is about 500 degrees. If it's much hotter than that, it turns black. And the surface of this flow is

probably only about 300 degrees since it's exposed to space. That's warm, certainly, and the aluminum will also warm to that temperature, but our suits should be able to handle it for a limited time. Hey, look at this." He stuck his left foot in the air. The orange toe was beginning to be covered with yellow dust, but was still visible. "I've already stuck my foot in it once."

"He's right, Brad," Trexler added.

Casson was caught. He had no solution and he knew the others knew it. But now there was one, if he could believe the scientists. He had no choice but to go along. "Okay, let's do it." He moved to the exit hole and lowered himself back inside. One at a time the others followed.

The tools provided on the cart were not exactly the ones necessary for dismantling and reassembling mechanical devices, but they were the only ones available, so they made them work. The bottom cart shelf was not deep, only about twelve centimeters. It would not do to tip it very far while they were en route. The other two shelves were flat. They cut each one partway across near one end, folded and beat them with hammers into the shape of crude paddles. Although it would likely be difficult, if not impossible, to paddle in the viscous sulfur, at least they could be used as rudders to steer roughly toward the opposite bank. Two of the sample containers had their lids discarded to serve as bailing buckets if necessary.

Getting their "boat" up the shaft and out into the open proved to be another struggle. By the time they finally emerged once more from the tunnel exit, their faceplates were again fogged and their breathing was heavy.

"Can't stop to rest now," breathed Casson. "We'll run out of oxygen. Let's find a place low enough to put in without falling in."

Casson picked up one end of the homemade boat, and Raine took the other end. Trexler secured the buckets and paddles, and they started upstream where it appeared the bank lowered toward the flow. Despite his optimism expressed earlier that their suits could account for the heat, Raine wasn't so sure. The suits were already straining to keep them cool just from body heat. Now add an external source, and . . .

"This place is good enough." Casson's voice abruptly brought Raine out of his reverie. They deposited the boat with one end at the edge of the flow. It didn't matter which end; they were identical.

"Trexler, you take the bow with a paddle. Place it lightly in the flow on the left side. Don't try to paddle. Just hold it there. If we swing too sharply to the left, lift it out completely. We don't want to get crossways of this flow. It'll turn us over. Raine, take the middle and the buckets. Try to keep the stuff out as much as possible. I'll take the stern with the rudder."

Raine started to protest. After all, this was his idea and he had been on the rowing team in college, but he relaxed and accepted his fate. The feeling of doom cast by Ra was upon him. Trexler and Casson had as much experience rowing in molten sulfur as he did. He climbed into the boat behind Trexler. Casson shoved off and stepped into the boat also. In the process, he stepped into

the lava halfway up his boot so that when he was settled inside, the reddish orange material was pressed against Raine's right hip. He waited for the heat to penetrate, but it didn't come. The next time he glanced down, the material had become an orange plastic.

He didn't have time to worry about it anyway. The boat settled into the fluid almost to the point of sinking. Their combined weight, even on low gravity Io, was just at the maximum possible to make this venture feasible. However, with every rock of the boat, hot sulfur spilled over into the bottom and it was all Raine could do to keep it bailed out.

They moved away from the right bank. Mostly they moved downstream, but the paddles gave enough side force to push them out toward the center, where the flow was faster. The ride was smoother than Raine had expected and he attributed that to the viscosity and to the lack of rapids or rocks in the stream to cause sudden diversions. They were turning quite nicely toward the opposite bank—too nicely, in fact.

"Lift it out! Lift it out!" Cassen shouted. The boat had yawed abruptly to the left. Raine felt the force attempting to capsize them peak and then subside as Trexler followed instructions. The boat swung back around to point downstream and Raine bailed desperately.

"Okay. Drop it back in. Slowly. Slowly. Yeah, that's it."

As Trexler did so, the boat once again drifted to the left. Raine knew that the drift was largely due to the rudder Casson was controlling, but it was essential to coordinate the two actions, and the man in back was the person to do it. His opinion of Casson as a navigator went up significantly.

Raine noticed between bails that he could no longer see either bank. The yellow snow had increased in density and dropped visibility. He wondered if they had yet come halfway across. Actually, he was having a hard time seeing anything. More and more frequently, he was having to wipe the yellow dust off his faceplate, and less and less of it was coming off. At this rate, in another hour they wouldn't be able to see at all.

Just as annoying was the moisture on the inside. Raine was painfully aware that the temperature of his spacesuit was rising. He ignored the panic fighting to grow within and continued bailing. It did no good to get alarmed. Either they would make it or they wouldn't, and they certainly wouldn't if he let sulfur spill in and sink the boat.

"Can't see either bank," ventured Trexler.

"Neither can I." Raine added.

"Lift it up!" came the shout from Casson.

The boat yawed severely once again, but Trexler corrected in time to avoid the spill. When the vessel recovered, he replaced the makeshift paddle in the flow.

"Forget the shore and just pay attention," Casson growled. "The shore will take care of itself if we watch what we're doing."

"Roger, Commander. Is your suit getting warm?"

"A little, yeah. This isn't ice cubes we're sitting on."

They continued on in silence for several minutes until Trexler spoke again.

"The flow has slowed considerably. We're flattening out."

"We may have to try to paddle in this stuff," Casson replied.

Raine once again paused to wipe the yellow dust from the faceplate. "Is that the bank?" he asked and pointed.

"By Jove, I think we've found it," Trexler sang.

"Parallel. Bring it in parallel to the bank."

Trexler responded and the two of them skillfully glided up to solid ground. In a minute they were standing again with their vessel hauled out beside them.

"One down and one to go," Raine said as he picked up one end of the boat.

Casson took the other end and they moved away from the large flow toward the smaller flow they had crossed an eternity ago on their outward leg. When they reached it, they were all feeling the exertion and tension. Each breath was very noticeable to the others in their radio headsets. But this flow was much smaller and slower than the one they had already conquered, so they put in quickly with the confidence of seasoned veterans. Despite the yellow fog, they could see the other side, but the sulfur was more viscous and the going was maddeningly slow. They paddled with great difficulty, finding the paddles were hard to extract if inserted very deeply. Still, they were slowly approaching their goal.

A little more than a boat's length from the shore, Casson's paddle fatigued and bent as he tried to stroke the final distance. Trexler had dug in on the stern and couldn't extract the paddle quickly enough to stop the vessel from swinging around and tipping toward shore. The only thing that saved Raine and Trexler from being dumped, was that the commander was. There was no splash. No sound was possible, of course, and there was no splashing material either. He simply plopped into the reddish orange liquid on his right side, rolled over to his left and managed to get a firm handhold on the bank. By the time Raine and Trexler stablized the boat and crawled ashore, Casson was already pulling himself out. The only parts of his spacesuit that weren't covered with reddish orange material were his helmet and left shoulder. The rest was solidifying to an orange plastic even as he stood up.

"Commander. Are you all right?" Raine ran up to peer into his faceplate, with no success.

"Of course, I'm all right. Let's go. You can leave the boat here. We're through with it." With that, the orange figure moved off in the approximate direction of the lander. Raine and Trexler exchanged glances and followed.

Thirty seconds later the two trailing heard the commander's breathing become labored and rapid. They caught up as he stopped and stood motionless.

"Hot!" It was almost a whisper and immediately he sank to the ground.

"Brad!" Trexler dropped to his side and tried to clear the faceplate enough to see inside, as Raine grasped his shoulders and turned him over. Even when he scraped away the yellow coating on the outside, the inside was totally obscured by water.

"Can't . . . make it."

"Sure you can. We'll carry you. Won't we, Jeff?"

"Yeah," Raine agreed. "You take the left side. I'll take the right."

"No!" He pulled his arm away from Raine. "Your suits . . . hot already," he gasped. "Carrying me would be too much. Go on."

"Hey! We can do it. The ship's not that far away," said Trexler.

"Yes, it is." He nodded his head. "We came far downstream."

Raine looked up and scanned the murky horizon. "He could be right, Stan. Nothing's familiar. And with this yellow dust falling, it may not be an easy task to find the lander."

"Go find the ship," Casson said, faintly. "Then come back for me." He held his hand up to stop their protests. "And hurry. We're all running out of air."

Raine and Trexler looked at each other through blurred faceplates. One nodded and the other responded with a slight nod.

"Okay," Trexler said finally. "You rest right here. Without motion, your suit should cool things down a bit for you. We'll be right back."

They started out as rapidly as they thought possible and adjusted their rate as a function of the internal suit temperature. When they were out of radio range, Raine asked, "Think he'll still be alive when we return?"

"Wish I knew the answer, Jeff," he replied. "Depends on how long it takes us to locate the lander. Let's spread out a little. We'll cover more ground and lessen the chances of missing the lander that way. But keep in sight."

"Okay, but let's keep talking, too. Need to keep aware of how the other's faring."

"Roger."

* * *

The mathematician looked up from the computer terminal toward the pilot, who sat at his communications console waiting for the orbiter's motion to bring Ra Patera into line-of-sight over the limb. It was still almost two hours before they could make contact.

"It's Amalthea," said the mathematician.

"It's what?"

"Amalthea. The inside moon. We didn't take Amalthea into account when we computed the period of Ra's eruption. Thought it was too small to matter, but it does. When it's on the same side of Jupiter as Io and within twenty degrees, it exerts enough pull to advance the eruption schedule several hours."

"And it's nearby?"

"Closest approach was an hour ago."

The pilot frowned and turned back to the communications panel to await the message he feared would never come.

They plodded on for at least two kilometers, which seemed like much more, moving as fast as possible but slowly enough to maintain their temperatures at the upper limit the suit could handle. Raine was beginning to think they had passed the lander, when he looked down and saw something through his foggy visor that caused him to stop and call out.

"Hey, Stan. Come here."

"Did you spot the ship?"

"No, but the next best thing. Here's our tracks from this morning. They're almost covered up with freshly fallen sulfur, but the lines traced by the cart's wheels are still visible."

"Good work, Jeff," Trexler came up

beside him. "We would have passed right by if you hadn't spotted this."

Five minutes later, Trexler was crawling into the airlock of the landing vehicle. Raine stood on the steps behind him. Trexler looked back, but Raine didn't follow.

"There isn't time to get out of and back into a suit, Stan. I'll stay out here."

"What? How?"

"I'll sit on this step, like this," he sat down on the third step of the five that led to the lander airlock, "and wrap my arms around the railings, like this. And hold on for dear life." He looked questioningly up over his shoulder at Trexler. "Can you fly the ship with me sitting here?"

"I think so. Keep your feet up and away from the jets."

Raine knew the other was joking. He was significantly higher than the engine exhausts. "Okay. Just don't stow the ladder."

The door closed and several minutes passed while Trexler cycled through the airlock. While waiting, Raine strained to see Ra through the fog, but to no avail. It was there, though; he sensed its presence. Then, Raine felt the vibration of the descent engines firing. He grasped the rails and braced with his feet as the vehicle gently rose from the surface and hovered.

"It's a good thing you stayed out there," came the voice in his headset. "I can't see a blasted thing from in here. The windows are totally opaque from the dust."

"I'll guide you. Go left."

The vehicle began to move in the direction they had walked. They were about twenty meters above the ground, and Raine's visibility through his faceplate wasn't as good as he would have liked. Still, he could see well enough. The ground was passing quickly underneath.

"Hold it. We've reached the lava flow. Swing around one-eighty so I can see the bank. The commander was near it." The vehicle slowly turned so that Raine faced the flow bank. "A little more turn. Yeah. That's good. Now drift downstream. That's to the right. Good. Good. Not too fast. You're drifting away from the bank. Move forward a little. Okay, that's good. Downstream a little more." There was silence for a moment. "Come down a couple of meters. I'm looking for the orange suit, but it may be yellow by now. Whoa, that's good. Now, downstream. What's that? Hold it. There he is! Forward. That's good. Slower. Good. A little more. Down a little. Ten meters. Easy. No, forward. We're just right. Down slowly. Five meters. Three. Two." The lander came to rest, but Raine didn't wait for the last few centimeters. He was off and down by the commander's side.

"Commander, can you hear me?" There was no response. He lifted the man's shoulders and pulled him toward the ladder. Fortunately he was in Io's gravity field or the man might have been too heavy to lift. The lock opened as he reached the top and he continued inside with one motion.

He lay Casson's motionless form against the wall of the tiny airlock as the external door closed and the pump started to fill vacuum with air. It would have to be filtered for a few minutes even after the pressure was normal. Pure

sulfur had no odor, but if they had brought in any sulfur dioxide or hydrogen sulfide, they would be in grave danger—in addition to suffering an intolerable odor. There was nothing he could do for the commander until that cycle was complete. He sat back and watched the motionless figure. Then—

"Jeff?" The voice was faint.

At first he thought it was Trexler, but all doubts were removed when the right orange-yellow colored arm came upward. He leaned over and grasped the gloved hand. It squeezed tightly on his and held. Through the visor he could barely make out a smile. ■

ON GAMING

(continued from page 68)

IL 60625) has a wide-open SF game for 13 players, called *Galactic Confusion*. It's human-moderated with computer assistance, and is somewhat complex. You can be one of 10 distinctly different alien character types, each of which has a different goal for victory (not known to the other players). It costs $3.00 for rules and set-up, and $3.00 per turn thereafter.

Advent Games, Box 81674, Lincoln, NE 68501. *Takamo* strategic game of space exploration and conquest.

Adventure Systems, 1669 South Voss, Suite FF, Houston, TX 77057. *Illuminati* solitaire SF card game.

Adventures By Mail, Box 424, Cohoes, NY 12047. *Beyond the Stellar Empire, Capitol,* and *Crasimoff's World* SF games.

Adventures Design Group Inc., Box 821072, Dallas, TX 75382. *Lords of the Dark Horse* fantasy game.

Rick Barr, Box 1873, Cave Creek, AZ 85331. *Armageddon, Stellar Empire,* and *Crisis* SF games.

C-T Simulations, Box 174A, Friendswood, TX 77546. *Star Cluster Omega* SF exploration game.

Central Texas Computing, Box 2281, Austin, TX 78768. *Universe III* strategic SF space conquest game.

Clemens & Associates, Inc., Box 4539, San Clemente, CA 92672. *Universe II* and *Terra II and Conquest of Insula II.*

Comstar Enterprises, Box 560892, Miami, FL 33256. *World of Velgor* fantasy role-game.

Empire Games Inc., Box 6681, Denver, CO 80206. *Realms of Sword and Thunder* ancient Britain game.

Entertainment Concepts Inc., 6923 Pleasant Drive, Charlotte, NC 28211. *Advanced Dungeons & Dragons®* and *Silverdawn* fantasy role-games, *Starquest* SF role-game, *Spirit of Glory* 1920's-30's role-game, and *Power: the Star Throne Beckons* SF strategy game.

Fantastic Simulations, Box 24566, Denver, CO 80224. *Fleet Maneuvers* tactical starship game.

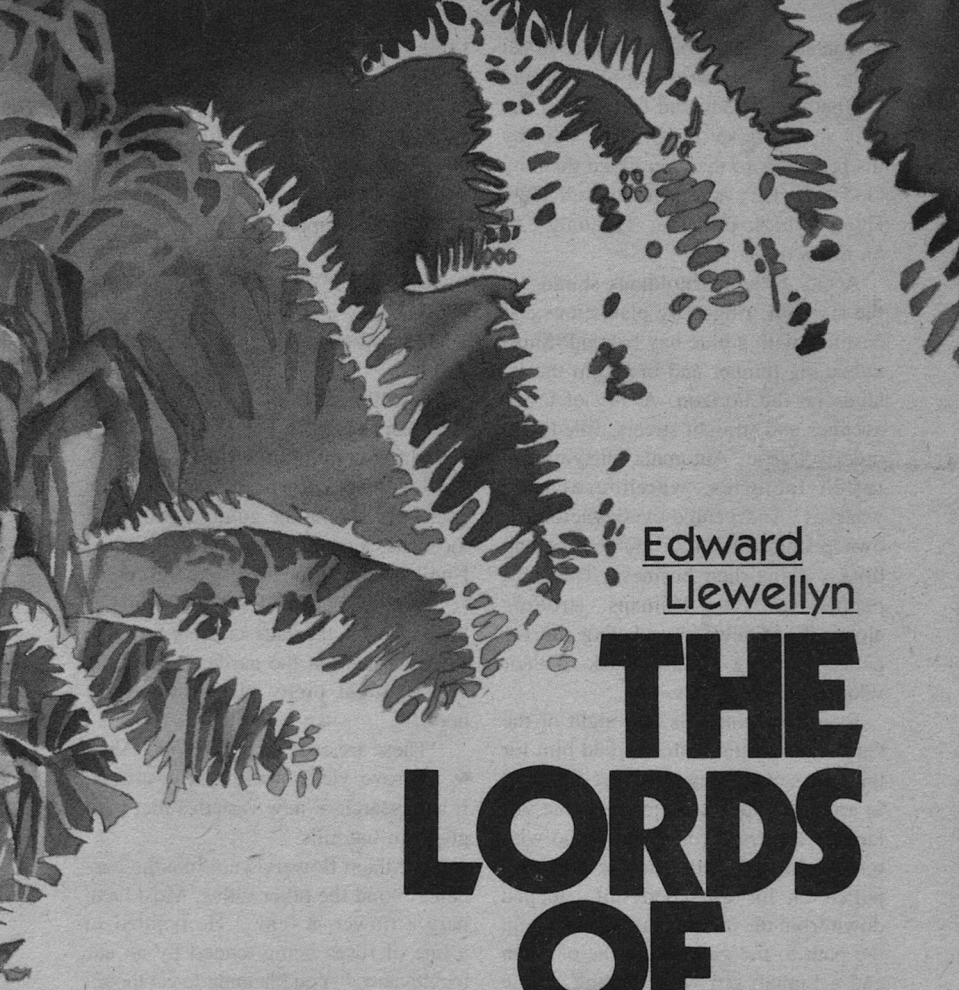
Flying Buffalo Inc., Box 1467, Scottsdale, AZ 85252. *Starweb, Galactic Conflict,* and *Starlord* SF games, *Heroic Fantasy* and *Treacherous Trajans Trap* fantasy games, *Battle Plan,* and *Nuclear Destruction* strategy games.

Game Systems Inc., Box 431166, Miami, FL 33243. *Earthwood* strategic fantasy game, and *Dawn of the Ancients* ancient strategy game.

Graaf Simulations, 27530 Harper Ave., St. Clair Shores, MI 48081. *Feudal*

(continued on page 121)

Val Lakey Lindahn



Edward Llewellyn

THE LORDS OF CREATION

When origins fade beyond memory, everybody can get confused about who's who. And it may not matter anyway, at least in the way people think. . . .

Simon stood naked on the terrace of his villa, letting the warmth of the morning sun bathe his body and the sight of the City sooth his spirit. The City built by his forebears to the plan given them by God. The City which he and all High Humans must preserve. The only city on this world.

A city of white buildings shining in the sunlight, ringed by plantations and pastures with a blue bay beyond. Ships unloading lumber and ore from the islands on the horizon. A city of broad avenues and straight streets, filled with orderly traffic. Automata hurrying between factories, warehouses, and wharves. And people everywhere. His own people, the High Humans, going briskly about their business. The short people, the Low Humans, strolling along the sidewalks, playing in the parks, carrying bundles back to their villages in the woods.

Every morning this first sight of the City renewed his faith, readied him for the duties of the day. His first duty was to arrange with the Chief from the village by the creek for guides to go with him on his expedition to the hills. He pulled on his blue bodysuit, stepped down from the terrace, and strode along the path to the gate where the old man and a Luman girl were waiting. Some girl from the woods come to gape at the gardens of a High Human villa?

The girl disappeared among the bushes. The old Chief, who had been squatting in the shade of a catalpa tree, rose and bobbed his respect. "Greetings Lord."

Simon looked down at the Chief and spoke with a stern kindness. "You must not address me as 'Lord.' There is no Lord but God. I am a mere human. As we are all human."

The Chief chuckled, the sunburst disc swinging on his wrinkled chest. "Humans indeed sir. But we differ in size and wisdom."

"Can you supply me with the guides I requested?"

"Can do. If the pay's right."

"The pay will be adequate. And I will carry food and supplies in my floater."

"You'll have to fix the rates with the lads themselves." The Chief grinned. "And my commission too. Eh Lord?"

"I will pay you a percentage of whatever I agree with the guides. Though if the costs exceed my grant from Council I will have to cancel the expedition."

"I get it, Lord." The Chief winked. "I won't let the lads cheat you." He waved a hand at the gardens round the villa. "Right pretty place you've got here."

"These are experimental plots. I seek to improve yields with hybrid strains. It is in search of new varieties that I am going to the hills."

"All them flowers—not like the gardens 'round the other villas. Most have nary a flower in 'em." He pointed to a line of roses being tended by an autocultivator. "You planning to eat those? Or maybe feed 'em to that machine?"

"The flowers provide food for the bees. The bees provide us with honey."

An answer which had satisfied criticism about a waste of fertile ground but which seemed to amuse the Chief. "We got plenty of honey in the village, and we don't plant no flowers. Except for prettiness. And them flowers are right pretty."

Beauty was not a subject Simon wished to discuss with a Luman. "The guides?"

"Noontime tomorrow. They'll be awaitin' at my Lodge."

At noon the next day there were seven guides waiting for him outside the Chief's Lodge. Six young men and the young woman who had been at the gate. "She's a reader," explained the Chief, as if to excuse the inclusion of a female in the party. "Only reader willing to go." He winked. "And she can pull a bow with the best—if needed."

The young men guffawed, then crowded round Simon to bargain about wages. The girl stood aloof. After he had reached an agreement with them Simon turned to her. "And what is your price?"

The Chief cut in. "Give her half what you're paying the lads, Lord."

Among High Humans there was no such division of work and reward, but she did not seem to resent being half-priced. When they set out she led the way, running with long easy strides, her short white chiton swinging at each step. Simon, steering his floater after her along the trail, was guided by glimpses of firm buttocks and bronze thighs. The chatter of the lads running alongside quieted as they were forced to match her pace.

About an hour before sunset the girl halted at an open space beside a stream. The lads made camp and when they came to him for their wages she remained bending over the cooking-pots. Later, while he ate his own meal, he watched her serving the men. As a child he had had a Luman nurse but since then had met few Luman females. He had heard of liasons between Human men and Luman women but such were frowned upon by both peoples. The gull flies with the gull, the sparrow with the sparrow.

Yet, watching her, the scientist in him questioned whether High and Low were indeed separate species, as was the accepted wisdom. There was no mention of Lows in Revelation and both peoples spoke the same language. A language with the extensive vocabulary needed in a high-tech society but superfluous for those living as semi-primitives in the woods. Why had the Creator granted inherited knowledge to the High but witheld it from the Low?

The girl, now sitting apart, eating her own meal, looked little different from the young women of his own people. She was shorter than Human girls of her age, but somewhat taller than most Luman women. Washed and dressed she could pass as Human. As many of those young Lumans who came into the City for some schooling could pass for Human youngsters. They betrayed their origins not so much by dress or size, but by their gay carelessness, their inability to concentrate, and their ability to lie.

After the lads had eaten they gathered round their fire and started to sing, with one of them playing on a wooden flute. Simon shared the Human distrust of music but he was interested in the workmanship of the flute. A delicate instrument, carved with skill. Lumans had certain manual talents which Humans lacked, carving among them. A useless talent, for machines could be pro-

grammed to carve with greater accuracy than any human.

The girl did not join in the singing, but remained at the edge of the firelight, fletching arrows for her bow. Once, glancing toward her, Simon found her studying him. He smiled to put her at her ease, but she neither returned his smile nor dropped her eyes.

She was a reader, so she must have had some schooling, yet what need was there for a reader on this expedition? He had assumed that she had been sent to give pleasure to the lads, but she remained apart from them both sleeping and eating. None of them approached her; in fact they seemed to be avoiding her. That did not fit the pattern of free love reported to exist among young Lumans. He had heard it said that a Luman girl was insulted if a young man did not offer to share his bed with her. If such was true then this girl was being insulted by all six of her male companions. But she showed no sign of insult and seemed content to remain by herself.

After three days the trail petered out and they had to follow the course of a stream flowing from the hills. As the going got harder the number of lads who came for payment each evening got fewer. On the fifth evening, when they were already near the foothills, the last two collected their wages and then announced this was as far as they could go.

"Why?" demanded Simon, close to exasperation.

"This is the edge of taboo." The pair were grinning, shifting from foot to foot.

"Your Chief did not tell me about forbidden areas when I sought your services. Why not?"

"Lord—you didn't ask," said one and his companion guffawed at the joke.

Simon tempted them with higher pay, but the hills were strong taboo. They did not know why. Not forbidden by God. Taboo by legend. When he emerged from the floater the next morning both lads were gone.

But the girl was still there, cooking her breakfast. He walked over to her. "You did not leave with the others?"

She looked up. "You haven't paid me yet."

He turned towards the floater. "Come! I will pay you now."

"Pay me when we're back in the City." She again bent over her cooking-fire.

He stopped, astonished. "You are staying? You will go with me onto the forbidden hills?"

"It's only taboo for men." She shrugged. "All fool superstition anyway." She stood up, jerking down the hem of her short chiton. "I've been into the hills before."

"Is that why the Chief sent you?"

"The Chief didn't send me. I told him I was coming."

Luman female curiosity. "Then you had better ride in the floater."

She shook her head. "I'd rather run — if my Lord permits me."

"You must not call me Lord—" He checked himself. Lumans were capable of subtle insults, unnoticed by most Humans, but Simon was more sensitive than most. "Run then, if you wish."

In fact he enjoyed watching her running in front of the floater, but when the trail grew steeper he called her back.

"You had best ride with me now. There is much work ahead and only you and I to do it."

She climbed up beside him without demur and stood grasping the rail, her head near his shoulder, picking out the faint track that led upward out of the woods into the open foothills. When he stopped to collect the specimen of a plant he had never seen before she became impatient. "Higher, Lord, higher. There are stranger plants higher up." With the men gone, her attitude had changed. She was less and less the wild Luman of the woods and more and more the schooled Luman of the City.

That evening he called her over to eat with him. "You can read and write?" he asked as they settled down to their meal.

"Read, write, count, and calculate." She looked at him across the fire. "I also have a name."

"Of course! I apologize." He waited for her to give it and when she only went on eating he asked, "How many years did you school?"

"Five—six."

"So long?" He showed his surprise.

"I still go when there's something worth learning." She stopped eating to stare at him. "I've listened to you teach cultivation, Lord. You're a good teacher."

"Thank you." He tried to place her. But there had been many pretty girls at his lectures and he had never been greatly interested in the youngsters who had attended his classes. He had lectured because it was his duty, but had always thought it a wasteful method of teaching, maintained only through tradition. Or perhaps to amuse the children of both peoples.

"When I heard you were planning this, I told old Goldmedal I'd join the guides." She looked into the darkness around them. "There are strange things up here. But nothing dangerous."

"I have heard tales of wild beasts."

She shrugged. "Only the descendants of cattle which wandered into the forests. Nothing you could call a 'wild beast'. I sometimes wonder how we got such words."

He had sometimes wondered that also, but it was not a problem he proposed to discuss with even an educated Luman. "If there is truth to such tales, I am armed." He touched the pistol at his belt.

"You have your gun, Lord. I have my bow. If we see game we shall find which is best."

"My weapon is only for defense."

"And my bow is only for food." She moved away from the fire.

He stood up. "Do you wish to sleep in the floater?"

She eyed him. "Not yet. But I'll take one of your sleeping-bags. The nights are cooler up here."

Was it impudence that had made her inspect him and then refuse? Had she purposely misunderstood his offer? Should he call her back and rebuke her for her presumption? In the end he only watched her curl up beside the fire, and then went to his cot in the floater.

After breakfast the next morning Simon stood looking back across the forests toward the City and the sea. In the centuries since the Creation no High Human had ever come to these hills; as far as he knew no Human before himself

had felt any urge to come. The City was the center of the Human world. Except for the nearby ore islands, the rest of the world was without interest because no Humans went there. He turned to the girl—she was really a full-grown woman but all young Luman women were 'girls' —and asked, "You have really been up here before?"

"Once. With my mother. Only as far as that." She pointed to a steep rift in the hillside ahead and started up the slope toward it. He hesitated, then went after her. She was lean and hard, toughened by living in the woods even if she had spent time learning in the City, and he was panting when he caught her at the rim of the ravine. He stood, looking around, recovering his breath. "Strange to find this rift among smooth hills."

"Stranger things in it maybe." She went slithering down the scree toward the mass of tangled vegetation below.

Strange plants. Perhaps strange animals? He called her back but she was already pushing her way through the underbrush. He eased out his pistol and clambered down the slope after her.

By the time he got to the bottom she had reached a steep vine-covered ridge lying along the center of the ravine. She grabbed a clump of vines and then, looking back to make sure he was watching, she jerked them aside. Sunlight reflected from the gap. "Metal," she called.

"Metal? That cannot be!" It could not be, but it was. He joined her in tugging at the trailing vines, bringing an avalanche down over both of them. He thrust the tangle away and stood staring at the wall curving upwards for some thirty meters. Metal—smooth, gray, untarnished. Metal—here. He turned to the girl. "What is this?"

"I don't know." She reached out to stroke the smooth surface. "My mother said to bring a High to see it—if I ever met a bigbrain who might understand. Do you understand, Lord?"

He shook his head, running his hand over the wall. No alloy of which he knew.

"There's a door farther along. High up. I've never looked in. Nor did my mother. Nor her mother. Nor anybody as far back as legend goes."

A Luman legend? This was a bizarre fact. He pulled down more of the vines. Without firm purchase on the smooth wall they came away easily, exposing the curving side of what seemed a great cylinder. Some twenty meters along and ten meters up was a hatchway.

The girl pointed. "That may open."

Simon ignored her and stood staring at this shocking expanse of bare metal. His impulse was to turn, climb from the ravine, collect botanicals as he had come to do. Go back to the City and forget this metal monstrosity.

"Lord, aren't you going to open it and look inside?"

"It is too high."

"It may open. There's a climber in your floater. The thing you use to help you up trees. I'll fetch it." And she was away, scrambling back up the scree.

He could hardly forget what he was seeing. Council must be informed. Most Councilors would react with horror. They would certainly forbid any further expeditions into the hills. How much more should he see? He was still standing undecided when the girl returned

and thrust the climber at him, as though delivering a challenge.

Stung to decision he took it, cocked the thrower, and aimed for the wall above the hatch. The cup gripped and he tested the pull. The hold-fast held firm. When he hesitated she said, "I'll go. I climb well."

"Stand back!" He pushed her aside and went hand-over-hand up the line. The hatch was ajar. He eased it open and peered into the darkness beyond. A dry darkness, free from the stench of decaying vegetation. An interior treated with some long-acting herbicide?

"What's there?" shouted the girl.

"I cannot see. It is dark."

"I brought a flash." She tossed it up to him, goading him into learning more than he wanted to know. He shone the light into the darkness.

Darkness and dust. What was this thing? He moved a few steps across a metal floor. The line slapped against the rim of the hatch as the girl arrived. He waved her back. She ignored his gesture and moved to stand beside him. "A passage—to the right."

He swung the flash. A passageway. The girl started along it. He caught her arm and hauled her back, then swung the light from wall to wall. She nudged him. He stepped forward.

Sterile dust thick under his feet. Dark and empty, a corridor curving away into shadows. Silent, except for the quickened breathing of the girl at his heels.

Ahead was a glimmer of light. He moved cautiously toward it. The girl hung onto his belt, pushing to see past him. He stumbled and half-fell into a compartment, then jumped back, knocking her over. She scrambled to her feet. "What's there?" she whispered.

He stood in a doorway. Light filtered through vine-shrouded windows. A metal compartment, the walls covered with readouts. Much like the control room of an autofactory. He stepped forward, swinging the flash. Two couches. And on each couch a skeleton. Broken skeletons.

"The ship!" the girl gasped.

"Ship? What ship?" The absurdity of the word diverted his shock.

"The ship." she repeated. "The ship in the legends. This is it."

Ships belonged on water, not on mountains. And legends were dream-stories told by Lumans. This thing was heresy incarnate. He turned. "Enough. Out!" He pushed her ahead of him, back along the passage.

They came to the hatch and he stood with his head in the sunlight, gulping fresh air, trying to clear his brain. She snatched the flash from him, slipped past him into the further darkness. He heard her call, "Lord—come and see."

He stumbled after her, anger adding to shock. She was shining the flash on a skeleton at her feet. He knelt beside it. The skeleton of a Luman boy. Legs broken. Lying as if he had died crawling toward the hatch.

Simon straightened, gripped the girl's arm, and dragged her back to the sunlight.

That night she lit a fire for comfort and they sat beside it, eating their evening meal. She with relish, he without appetite. He had taken her back to the floater and put her to work collecting the plants for which they had come. But

even while they worked she had persisted in telling her Luman legend.

A fantasy-legend. The story of a ship from distant stars. A ship which had brought the ancestors of all humans to this world from some other world. Had brought many of the plants and animals now spread through the woods and around the City. Perhaps brought the first of the machines used to build it.

As a child he had listened to his nurse's stories of the stars. Stories he only remembered as the fanciful tales of an idle people. The stars were stars. Beyond Human reach and therefore outside Human interest. In coming to these mountains he had ventured farther than any Human had ever gone. And learned something it was better no Human ever learned.

Presently he pushed his food aside and looked at her across the flames. "I must return to the City and tell Council."

"Tell them what, Lord?"

"About that thing, of course." He had an unHuman urge to shake the girl.

"Tell them you've found the starship?"

"I do not know what it is. The Council will decide if it is to be investigated further."

"You know what it is, Lord. I've told you the legend." She rose and tossed her food container into the fire. The flames, flickering on her slim body and smooth skin, made her seem like some wood-spirit from the stories of his childhood.

"You have told me a Luman fantasy."

"A fantasy that fits the facts." She stood, challenging and defiant.

Facts inexplicable in terms of inherited knowledge. But explicable in terms of legend. A legend which could even be stretched to fit the Faith as given in Revelation, although heresy in terms of theological exegesis. Honesty forced him to admit, "Humans might have been created far away and long ago. There is nothing in Revelation that forbids that."

She made an impatient gesture, dismissing problems of the Faith. "The ship struck hard. Many aboard were killed. But some must have survived to escape. That boy was crawling toward the hatch."

"I do not know enough—"

"Then you must learn more. You can't go back to the City talking about a metal cylinder, a few bones, and a legend. You'd be called a heretic—or a madman!" She saw his expression and backed away from the fire.

"Wait!" he ordered. "Tomorrow I will inspect that thing further."

The next evening he broke camp to get off the cursed hillside and moved the floater down to the edge of the woods. Then he sat silent beside the fire, refusing the food she brought him.

They had spent the day searching the ship (he now accepted that the thing was a ship). They had found bones scattered through compartments and cabins. Human bones. Bones of small humans. Luman bones.

The after doors were still open, though shrouded with vines. The great after-compartment was almost empty with only a few loaded floaters tumbled by the doors. Most of the cargo must have been pushed out before the ship hit. Still

aboard were several large shock-proof containers, each filled with insulated metal cases. And in each case was a desicated corpse. Some the corpses of domestic animals. Others the corpses of humans. Tall humans. High Humans stored and stacked among animals.

Simon stared into the fire and muttered, "My ancestors were passengers."

She stayed silent, watching him warily.

"The crew were Lumans. They were guiding the ship." His nails bit into his palms. "The people who built the ship, the people who dispatched it. They were probably Lumans."

"Perhaps. That's not certain—"

"Logic suggests it." He looked up at her. "Where did they come from?"

"We found no records. Those who escaped may have taken them."

"Who escaped? The Highs were locked in metal boxes. Only Lows were free to move. Why were High Humans shipped as cargo?"

"Perhaps as selected passengers? Protected by life-support systems to sleep away a long voyage."

"Voyage from where? Does your legend say that?"

"Legend speaks only of some distant star." She studied him, taking his measure. "There is a fable—not fit to be called a legend. Do you want to hear it?"

"I order you to tell me."

"The fable tells of a human people who called themselves 'The Lords of Creation.' A people who believed they had the God-given right to breed strong humans to serve them. That was an abomination to other humans and they were destroyed. Except for a few who escaped, taking their servants with them." She read his expression and moved back towards the shadows. "That's only a fable."

"An evil fable." He sat brooding. His ancestors selected passengers? Selected for what? Given knowledge for what? To build a city for whom? Questions no High ever asked. A gibe from childhood. "Highs know but don't think." All we need to know is born with us—inherited by us. In nature only instincts are inherited. Never knowledge or language.

But he could think. He jumped to his feet. "My ancestors flung out onto this world with only imprinted programs? Much knowledge but no wisdom? Is your evil fable based on an evil truth?"

"It's probably all lies. We Lows are liars!"

"While we Highs never lie knowingly. Why not? Because we are programmed for truth? Programmed by whom? For what?"

"Lord—"

"You dare to call me 'Lord'? You insult me with an evil insult? You lead me to this evil thing. You tell me an evil fable." The ship was embodied heresy. The ship and the fable threatened human civilization. She herself was a threat to civilization. By reflex his hand went to his pistol.

She was at the fringes of the firelight but still facing him. "Lord, why do you want to kill me?"

His hand paused. "Want? I do not want to kill you. But how else can I protect the City?"

"A High who never lies must kill to protect the City from the truth?"

"From heresy!" Duty and logic were urging him to execute her immediately. To return to the City alone and in silence. A High must execute a Low if the well-being of the City was threatened. That had been done often enough in the past.

But never by him. And only in the face of direct danger. Was she a direct danger? Any execution was murder. No High should be made to murder. From what world had this terrible compulsion come? He threw back his head and cursed all the stars in the night sky. When he looked down again the girl was only a flicker of starlight on a white chiton, a flicker disappearing among the trees.

Compulsion became absolute. If she showed her people the ship, claimed that Highs were slaves and Lows masters, then there would be many more dead than one girl. He drew his pistol and ran after her.

It was dark under the trees and in his haste he had not stopped for a flash. He picked his way through the darkness, searching for a glint of white. He knew he was no longer capable of independent decision; the crisis program was built in. The girl must die. Conscience recoiled; compulsion drove. When he had killed her, killing himself would be easy. The ship would remain unknown. The fable untold. The Faith unshaken.

He paused under an oak, listening. Only the night-noises of the woods. Then a light laugh. He swung round, pistol coming up.

An arrow whistled past his head, thudded into the trunk behind him. "Stand Lord!"

He continued turning. Let her kill him. Free him from this intolerable burden.

It was as though she had read his mind. "My next shaft will pin your thighs. You can't escape into death, Lord. To choose death now is treason."

Treason for him to die while she lived. "Where are you?"

"On my own ground, Simon of the City. Put your gun in its holster. You are in silhouette." When he hesitated a second arrow swished past his legs.

He slipped his pistol into his holster and stood silent.

"Simon, listen to me." Her voice was changing direction as she moved. His mind saw her bent bow. His eyes saw only shadows.

"Talk then." Talk would buy him time to see her and attack.

"Lord, your ancestors built more than a City. They built a humane society."

Against judgement he felt impelled to answer. "By nature we are intelligent and kind. In nature kindness and intelligence are not coupled. That is not a natural pattern." He stared into the darkness, searching for a glimpse of her white chiton. When he saw it he could be on her in one jump, his hands at her throat. Even with her arrow through his body. "Our pattern shows human purpose. Not the purpose of some god."

"Lord—you go far beyond what we've found."

"A god may have created your people. As Revelation says. But what kind of a god would have created limited creatures like us?" Humiliation and rage boiled within him, emotions a High was ill-equipped to handle. He fought for self-control. She had tricked him

into talking. Heresy was frothing up into words like stench from a stirred swamp. "Gengineering—I thought it was cross-breeding crops. But a people who could build starships could engineer genes. Produce a desired pattern. A High Human pattern. Stamp in a curiosity-block. And an unquestioning Faith."

Not a faith but a program. Programmed to kill in defense of a lie. Programmed to murder! He put his face in his hands.

"What's this?" Her light laugh. "Strong emotion in a High Human?"

He said nothing, backing up against the tree, sliding slowly to the ground.

"Simon." Her voice was soft, caressing. "May I come to you now?"

His hands were still over his face, muffling his voice. "Come if you wish. You are no longer in danger from me." He caught the scent of her body; she was near him in the darkness.

"If I were pure Low I wouldn't trust an enemy who still has a weapon. And if you were pure High you'd still be trying to kill me."

What did she mean? He raised his head. She was a shadow among shadows, almost invisible. She had shed her white chiton, returned to the nakedness of the forest.

She came closer, bending over him, laying her hand on his shoulder. "Simon, let's go back to the fire. The ground here is cold and damp."

He hunched down onto a log, staring into the flames. The firelight flickered on her naked body and the bow in her hand. She laughed. "What absurdity! Hunting each other—then halting to argue origins."

"You had me at your mercy."

"Mercy isn't common among my people. Nor common sense among yours. But our peoples are not what they were. Yours are no longer as kind as they claim—but less ruthless than they've been. Some Highs are almost as inquisitive as Lows. It was human curiosity that brought you to these hills."

"I am a scientist—curiosity was stamped into me."

"Then think like a scientist. Fit the legends to the facts. The cargo space was almost empty. The stern bays were open. They were dumping cargo when they hit."

"Dumping domestic animals and crated Highs."

Her voice sharpened. "The ship must have been moving slowly or it would have been smashed. Perhaps the crew knew they were about to crash and tried to save what they could?"

"More probably they were flying low to land cargo—and they hit the hillside. Those containers and floaters were built for hard landings." He looked away into the darkness, concentrating on a problem from the past to evade the agony of the present. "They would have landed in a line across the forest from the coast. My ancestors emerged from their crates, their heads packed with programmed instructions to build a city. A city ready to receive Creators who never came."

"Then your people were luckier than mine. The crew died at their stations. They would have been the best aboard. Who escaped? Those in protected compartments. Probably the children and the women with babies. Whoever they were, they didn't have many survival skills.

They wandered down into the fertile lowlands, carrying what they could. They soon became fishers and hunters. Food is easy to come by in the rivers and woods."

"Your people had their own memories. Not imprinted beliefs."

"The memories of young children and a few women? Succeeding generations would have wandered west and found your City. By then memories were legends. You gave them hospitality—more hospitality than was good for them. Legends faded to fantasies—for most of us."

"Yet your mother—you yourself—believed them?"

"It is women who carry children. It was women who carried the legends in a wild world. How? I don't know exactly. The wise women in the villages — those women men call witches — they still have scraps of the old records. And a few of us were brought here and shown that metal thing by our mothers."

"The women only? Why not the men?"

"If our men see that ship they'll turn it into some kind of temple."

"Then why did they not tell Council? Long ago?"

"Long ago Council was different—so I have heard. Their faith was rigid. Even if they had come to look they would have rejected what they saw." Her face hardened. "They burned witches once. Not you. Us." She looked down at the fire. "But my mother said your Council let it happen."

"The Council has changed," he muttered.

"Of course it has. They approved your expedition. Even in your father's day they'd have refused. You're becoming more like us." She came round the fire, sat beside him, reached out and took his hand. "Simon, you carry both the Low and the High strains. There was interbreeding in your past." Then she added quickly, "As there was in mine."

The insult roused him. He pulled his hand from hers. "That is absurd. There are no mixed strains. Hybrids are not fertile. And I have children."

"Who'll also carry the Luman strain. I have none—yet. But I know I'm fertile. And mine will carry the High strain."

"How do you know—?"

"Because I am taller than many of our women. Because I have a smattering of inherited knowledge. And you? Because you have more curiosity, more emotion, than a pure High. Also— because you show anger more easily and are not always kind."

Anger flared up again, proving her point. In the past he had joked about having a strain of Luman in him. He had never imagined—but he did have more imagination than most of his fellows. Because there were Lumans in his ancestry? "Hybrid or not, I must tell Council."

"Simon, is that wise?" She moved closer to him, laid her hand on his thigh. "If our men think they are the true Lords, how will they act? The old Chief of my village with his golden disc—the insignia of a star commander? Those foolish lads who deserted us?"

"The Council—in secret session." He licked his dry lips.

"If they believe, then their faith will be destroyed. Even you are close to de-

spair. If all Highs despair—they'll let the City fall to ruins. And my people will degenerate into real savagery."

"But to live a lie—?"

"The truth is that we are all human. The hybrid strains are spreading. There is interbreeding even now. In a few generations we will all be mongrels." She squeezed his fingers. "Humans with strength, knowledge, determination. Kinder than my people. More alive, more curious than yours." She was intense, plausible, convincing.

He wanted to be convinced. He wanted to please her. Her argument was flawed but her words and her nearness were arousing emotions wilder than any he had ever felt. The scent of her naked body, the pressure of her hand, her cheek against his shoulder—everything about her was magic. He struggled against enchantment. "You mean—we let them go on believing myths?"

"We compromise," she said softly, tipping up her face to look into his eyes. "Compromise—a truly human virtue. Let time solve the problem. As it will. You're a rising star among High Humans. Your influence will increase. You'll be able to hasten the day when High and Low merge. When we're one people with many inherited talents."

He stared at her. Was she a temptress? Or a witch? He remembered tales of an enchantress who came out of the deep forests to entice humans from the path of truth. Was she such a one? "Who are you?"

"My name is Sarah." She stood, bending, to kiss his cheek. Her breasts touched his mouth. "Come, Simon. Let's seal our agreement. Hasten the merging of our peoples by making love." Without waiting for his answer she walked away from the fire toward the shadows. Her naked body, her swinging hips, pulled him after her.

He jumped up—then hesitated. Follow because he desired her as he had never desired a woman before? Or follow from obedience? Obey her summons because of some program stamped into his genes? A program called up by a woman who knew the access code? A buried imperative revived by her new authority? An inherited impulse to serve and obey the people who had created his people?

No! He was human and the master of his instincts. He had mastered the impulse to kill. If he went to her now he went as a free man, chosing to go.

He looked up at the stars and laughed. Laughter—the mark of freedom. He started after her, following her into the shadows under the trees. ■

Edward Llewellyn died of a heart attack on July 5, 1984; we regret that he did not get to see this story in print. He began writing science fiction only six years ago, the latest addition to a long and impressively diversified series of overlapping careers including mechanical and electrical engineering, medicine, and design. Shortly before his death he retired as Associate Dean of Medicine at the University of Toronto. "The Lords of Creation" is his first short story, but during his brief science fictional career he published four novels and has one more, Fugitive in Transit, *scheduled to appear in 1985.*

The Alternate View

ASTRONOMICAL GHOST TOWNS

G. Harry Stine

The famous 100-inch Hooker telescope on Mount Wilson may have to be mothballed.

Indignation! Who is responsible for permitting this to happen?

Let's take the alternate view, of course.

This may be only the first of the terrestrial telescopes to go out of service. And Mount Wilson Observatory may become the first of the astronomical ghost towns, followed by Yerkes, Lick, Palomar, and Kitt Peak

The 254-cm (100-inch) f5 Hooker telescope was completed in 1917. It was at the time the world's largest telescope. The population of Los Angeles at the base of Mount Wilson was then about 500,000.

One of the first great astronomical and cosmological discoveries made with the Hooker telescope was Dr. Edwin Powell Hubble's 1923 discovery of the distance-indicating Cepheid variable star in the M31 Andromeda Nebula. This gave mankind its first reliable means other than parallax measurement for determining interstellar and intergalactic distances. In 1929, Hubble announced that, using the Hooker telescope, he had surveyed distant nebulae, found them to be uniformly distributed throughout the sky, and discovered that the Doppler-caused red shift of their emitted light increased with increasing distance from the Earth. Hubble is best known for his discovery of the "red shift" (although Slipher had spotted it years before at the Lowell Observatory in Flagstaff) which indicated that the universe was expanding. The relation $H = 180$ km/sec per 10^6 parsecs is known as "Hubble's law of the red shifts" or simply as "Hubble's constant."

Although other astronomical discoveries continued to be made with the Hooker telescope, it was soon eclipsed by the 200-inch Hale telescope on Mount Palomar.

The Hooker telescope was primarily designed for stellar work. However, the enormous resolving power of the 100-inch mirror led astronomers to attempt to utilize it for planetary observations. It turned out that the 100-inch mirror really wasn't that much superior to a good 24-inch or 36-inch mirror when it came to planetary viewing because of the horrible instability of the Earth's atmosphere. As Dr. Clyde W. Tombaugh has pointed out, when the mirror size begins to exceed 36 inches, the column of air through which the light rays must pass to reach the telescope also becomes larger, and the microturbulence within this column of air smears and shimmers the final image to the extent that it becomes unsuitable. In this regard, the 200-inch Hale telescope was even worse as a planetary telescope. So these large reflectors were primarily used for stellar work.

The Hooker telescope has continued in use to today. Now it may be shut down and placed in "mothballs" primarily because the Carnegie Institute of Washington, owner of Mount Wilson Observatory, wants to shift most of its astronomical work to its Las Campanas Observatory in Chile. Reason: Los Angeles has grown from 500,000 people to a metropolitan area of more than 2,700,000 people. The formerly dark night skies of Mount Wilson are now polluted by the lights of the Los Angeles basin.

But there's another deeper and more basic reason:

The 100-inch Hooker and all other large telescopes are based on the Earth. In 1985, the 240-cm (94.5-inch) Space Telescope will be placed in a 375-mile circular Earth orbit by the NASA space shuttle. The Space Telescope is equivalent in size to the 100-inch Hooker but will be able to see objects fifty times fainter and seven times farther away than the 200-inch Hale telescope. It will be able to observe a volume of space 350 times more than we can now see with Earthbound telescopes. It will be above the hazy, shimmery, diffusive atmosphere, permitting it to attain nearly 100% of its inherent optical capabilities. The seeing will always be good, and astronomers won't have to shut the dome and juggle the observing schedule because of clouds. The Space Telescope can be operational more than 40% of each day every day. Its data will be transmitted to the ground, which in itself is nothing really new or unusual. Astronomers working with the instruments at Kitt Peak tonight don't have to leave their offices in downtown Tucson 45 miles away.

We space advocates have always known that this could happen. We read Dr. Hermann Oberth's work in which he said back in the 1920's that the place for telescopes was in space. We knew that space telescopes would be part of the Third Era of Astronomy, as the late Dr. Willy Ley wrote. The First Era was the period of naked eye observation and goes back into pre-history. The Second Era began when Galileo Galilei turned his primitive telescope toward the heavens in 1610 and began 350 years of telescopic astronomy. Both eras were Earthbound ones. The Third Era took astronomers and telescopes into space itself as well as permitting people to actually visit the celestial bodies they could previously only look at from Earth.

With no pun intended, Space Telescope is going to produce some eye-opening new data and may even change our entire outlook and concept of the universe in which we live. The Hooker telescope did. So did the Hale telescope. So have the other, smaller space telescopes such as the Copernicus OAO and the International Ultraviolet Explorer.

In the meantime, however, other astronomers are busily at work planning a huge Earthbound telescope. They want to build a National New Technology Telescope (NNTT) which would have a 15-meter (600-inch) mirror diameter.

The technical problems involved are stupendous. Making a single mirror of this size is totally beyond the state of the art. Two approaches are currently under consideration: a segmented mirror system which consists of a honeycomb mosaic of precisely-aligned smaller mir-

rors working as one, and a multiple-mirror telescope similar to but much larger than the existing Smithsonian/University of Arizona Multiple Mirror Telescope on Mount Hopkins near Tucson.

And the financial problems are equally stupendous. Primarily because of size, weight, and geometry, telescope costs vary as the cube of the mirror diameter. The single 4-meter mirror of the big telescope on Kitt Peak cost $10 million 1973 dollars. An 8-meter telescope would cost eight times that much. A 15-meter monster would be sixty-four times as much, which would be somewhere in the neighborhood of $2 billion 1984 dollars. This is about ten times what the NNTT is budgeted to cost. It will undoubtedly cost more than that because, even if the NNTT were started today, it wouldn't be operational until the latter part of the 1980 decade.

NNTT aims at ten times the light gathering power of the Hale telescope, which can currently pick out stars of the 24th magnitude. NNTT will therefore be able to see stars of roughly the 28th magnitude.

So will the Space Telescope.

But by 1990, Space Telescope will have been in orbit more than five years.

By 1991, the space station will be operational, allowing astronomers to live in space alongside their telescopes, although that's no longer necessary.

And in the 1990's, I'm betting that there will be more telescopes built . . . in space, not on the ground. NNTT, if it is ever built, may be the last and largest telescope on Earth. In space, there is no practical limit to the size that a telescope mirror can be constructed, although a space telescope mirror will probably suffer from slow and eventual degradation of surface and figure due to micrometeorite impacts.

Basically, astronomy is at a turning point again because of technological progress. When bigger and more expensive instruments are required in order to push back the frontiers of knowledge, there comes a point where it's technically impractical or financially infeasible to continue to build bigger and better equipment. Nuclear physics may be approaching the same cusp. When it occurs, the solution has always been to take a fresh cut at the problem, to look for a better (not a bigger) way to do the job.

Why not shut down the 100-inch Hooker telescope on Mount Wilson and turn it into a science museum? That telescope is just about to be surpassed by a telescope of similar size emplaced in space. The 100-inch Hooker may be a valuable resource to astronomers who don't want to go into space (although I can't for the life of me understand why a *real* scientist wouldn't want to go wherever he can get the best data), or to astronomers who could use a 100-inch Earthbound telescope for quick little projects. But, since it costs money to keep the big telescopes operating, it is going to become far too expensive to do big-telescope astronomy on Earth and cheaper to do it in space. (That's a turnabout, isn't it?)

At some point in the 21st century, *all* the astronomers will be in space or will be using space-based instruments. At that point, my forecast becomes reality. Except for small observatories used for educational purposes, the huge astro-

nomical observatory complexes of today will be astronomical ghost towns.

There are a surprisingly large number of politically influential astronomers, especially planetary astronomers, who for some reason totally unfathomable to me will vehemently oppose the shutdown of terrestrial facilities and do budgetary battle against space telescopes. They may do it because they aren't real scientists and fear that the data from space telescopes may overthrow the work upon which their own careers rest. But this happens all the time in scientific endeavors, and a true scientist may be ready to face up to it. Dr. Clyde W. Tombaugh, one of the finest planetary astronomers, is such a scientist because once the Mariners, Voyagers, and Vikings totally demolished his published theories of Martian geography (aerology?), Dr. Tombaugh simply stated, "A fact's a fact." And proceeded to embrace the new information eagerly.

Astronomical Scientists Supressing Experimentation in Space (ASSES) can't fight space telescopes forever and probably won't last much past the end of the 20th century. They will have become professors emeriti, retired, or gone to that great scientific meeting in the sky. This will leave the new, young astronomers free to shut the doors on the big domes, throw the keys away, and head into space themselves. ■

Please enclose a self-addressed, stamped envelope with any correspondence to Harry Stine.

ON GAMING

(continued from page 103)

Lords strategy game of post-King Arthur England.

JF&L, 305 East Caffery, Pharr, TX 78577. *Quest for Adventure, Quest II, Quest III,* and *Magic Duel* fantasy role-games, *New World, StarQuest, Nexus Squad, Star Fleet Academy, Warlord of Jarnel,* and *The Hunt* SF role-games.

Jabberwock Enterprises, Inc., Box 158, Somers, CT 06071. *Crater War* tactical SF games.

Mobius Games, Box 8625, Scottsdale, AZ 85252. *Mobius-I* strategic SF exploration and conquest game.

Pierce & Company, Box 25675, Chicago, IL 60625. *Galactic Confusion* and *Peacemaker-Peacebreaker* SF strategy.

The Round Table, Box 126, Cornish, ME 04020. *Court of Kings* medieval role-game.

Schubel & Son Inc., Box 214848, Sacramento, CA 95821. *Arena Combat, The Tribes of Crane,* and *Catacombs of Chaos* fantasy games, *Star-Master, Alien Conflict, Star Venture,* and *Horizons End!* SF games.

Stardragon, Box 201, Chincoteague, VA 23336. *Stardragon* SF strategy.

Superior Simulations, Box 505, Fairfield, ID 83327. *Empyrean Challenge* and *Maxi-Challenge* SF strategy games.

Mike Williams, Route 4, Box 802, LaFollette, TN 37766. *Darkworld* strategy game, mixing SF and fantasy.

World Campaign, Box 321, Epping, NH 03042. *World Campaigns IV* global wargame.

Zorph Enterprises, 3646 Gibsonia Road, Gibsonia, PA 15044. *Quest of the Great Jewels* fantasy wargame, and *Zorphwar* tactical SF game.

For a free pamphlet with more information on these PBM games, write to Dana Lombardy, Analog, Science Fiction Magazine, 380 Lexington Ave., New York, NY 10017. ■

FIELD TRIAL

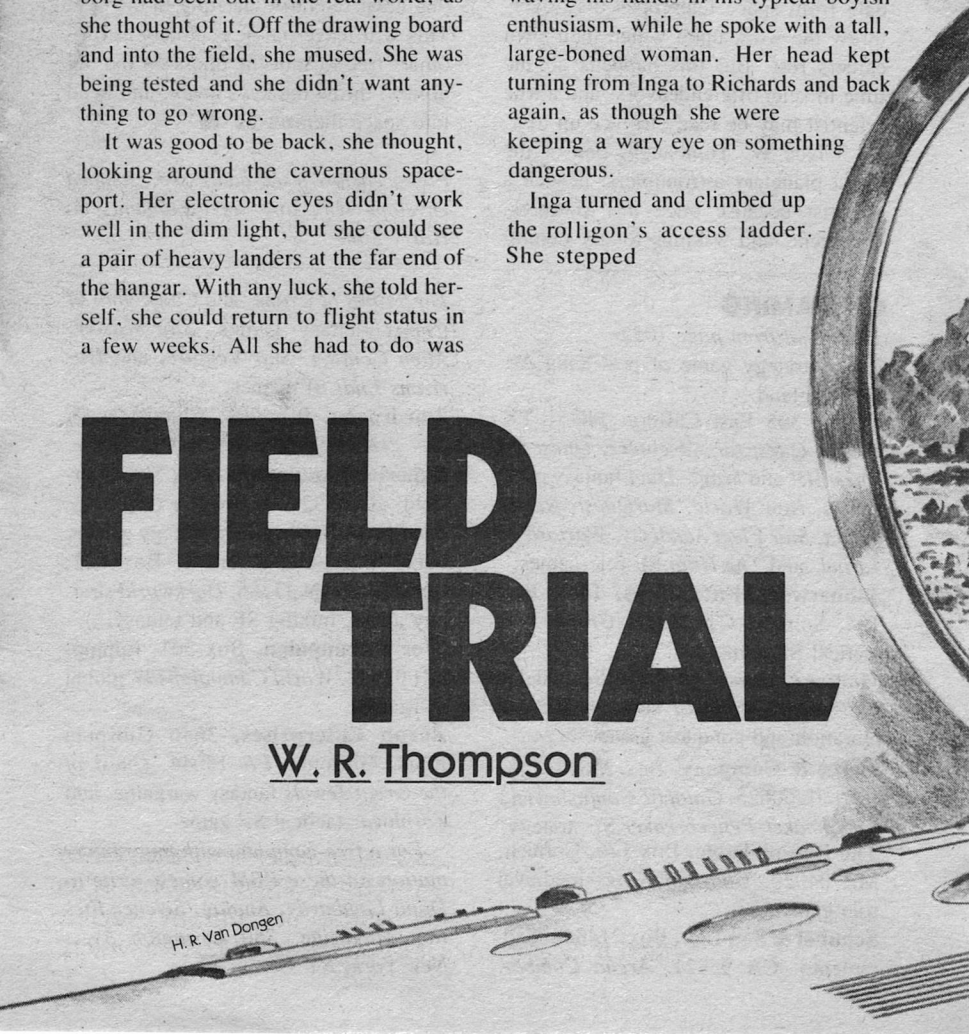
W. R. Thompson

The rolligon was an ungainly, blocky machine, sitting in one corner of the spaceport. Inga Cardiff walked around it slowly, inspecting it, looking for signs of anything amiss. There wasn't much chance of that, she knew. Port Goddard's maintenance crews had already serviced the lunar bus, and they seldom overlooked anything. Inga knew that her caution grew out of anxiety. This was the first time in three years that the cyborg had been out in the real world, as she thought of it. Off the drawing board and into the field, she mused. She was being tested and she didn't want anything to go wrong.

It was good to be back, she thought, looking around the cavernous spaceport. Her electronic eyes didn't work well in the dim light, but she could see a pair of heavy landers at the far end of the hangar. With any luck, she told herself, she could return to flight status in a few weeks. All she had to do was convince her therapists that she was psychologically stable now. As their "test" of her amounted to little more than driving a rolligon around the Mare Inbrium for two weeks, that didn't appear too difficult.

Inga peered at a couple of blurry figures standing near a hatchway. Despite the limits of her eyesight, she recognized the short, rotund figure of her chief psychotherapist. Dr. Richards kept waving his hands in his typical boyish enthusiasm, while he spoke with a tall, large-boned woman. Her head kept turning from Inga to Richards and back again, as though she were keeping a wary eye on something dangerous.

Inga turned and climbed up the rolligon's access ladder. She stepped



Any test is a test not only of its subject, but of the instrument used to test it. Sometimes it's hard to tell which is which.

through the open airlock in the rolligon's side and began her inspection of the cabin. As she expected, everything was in order. Two spacesuits had been stowed in one locker, their umbilicals still plugged into the recharge system: one suit for Inga, and another for her passenger. She felt a bit of relief at the sight. It meant that none of the therapists would tag along on the trip.

Inga walked forward to the control station and sat down in the driver's seat. Except for the lighter gravity, and the view through the oval window, it was just like the trainer back in Houston. She had done well in that, she reflected, and so she didn't expect any surprises from this machine.

A winking red light caught her eye. New equipment? she wondered. Inga saw a small black box attached to an overhead panel: a voice recorder. Inga had half-expected it; the psychs would want some record of her behavior. Still, she mused, it was unlike them to be so blatant about it. She wondered why they hadn't hidden the unit.

Paranoia, she told herself. I'm seeing hidden meanings in every little thing. They knew I'd expect it—so why bother hiding it?

Inga saw her face reflected in a polished surface: plain, almost homely, but human-looking. The bionicists had gone to a lot of bother to make her look human —not that it fooled anyone, she thought.

Inga switched on the computer. Its tiny line printer began chattering at once, while a map began to paint itself on the screen. Inga skimmed the strip of paper that pushed out of the printer. She nodded thoughtfully. The next fourteen days would be hectic, putting a lot of pressure on her. She and her passenger, a geologist, would examine over three dozen sites in an unexplored part of the *mare*. Inga told herself that she could handle it.

Inga heard a series of clicks and thumps, and looked around. The tall woman had entered the cabin and was busily securing the airlock hatch. "I'm Dr. Bedford. Let's get going, driver." She sat down in one of the cabin seats—the one farthest from Inga, she noted.

Inga thumbed the radio switch and told the port controller that she was ready to leave. After a moment she looked through the viewport and watched an oversized airlock door slide open. Gingerly, Inga worked the controls. The rolligon eased into the airlock on its eight metal-mesh wheels.

Inga looked at her passenger while the airlock chugged through its cycle. Bedford had her eyes fixed on the notebook in her lap. Inga thought that she looked nervous. When Bedford noticed the cyborg looking at her she began to fidget, which puzzled Inga. "Is this your first time out?" Inga asked.

"No, of course not." Bedford seemed startled by Inga's voice. "I've s-spent over two months in the field, uh, at the outposts."

She's afraid of *me*, Inga realized. She couldn't get away from that; even some of the bionicists felt uneasy around her. She wished that she understood why she gave people qualms. "What did Dr. Richards tell you about me?" she asked.

"Not much," Bedford said. "Just that, well, you still have a few psychological problems—mainly a sort of in-

feriority complex, he said. He, uh, wanted me to watch for anything odd.''

And now she's afraid I might go berserk, Inga thought. Richards had probably laid it on too thick, in his effusive way . . . and most of what Bedford ''knew'' about cyborgs probably came from TV shows, low-budget movies, and Sunday supplements. Time for an object lesson, Inga decided, to take care of any misconceptions Bedford might have had. Inga reached into a small locker and found a plastic sample-container. ''Watch this,'' she said, holding the bottle in both hands.

Bedford shifted around. ''What am I watching?'' she asked after a moment.

''I'm squeezing as hard as I can,'' Inga said. She tossed the bottle to Bedford, who caught it. Inga held up her hand, feeling uneasy. Talking about herself made her uncomfortable, but she had to do it. ''They had to make certain compromises when they—rebuilt me. They wanted me to look fully human, and to have full human dexterity, agility and so on. Unfortunately, the laws of engineering and physics being what they are, they couldn't do that and give me normal strength too.''

Bedford looked confused. ''But I always thought—isn't metal supposed to be a lot stronger than flesh and blood?''

''It isn't,'' Inga told her. ''Nature has had millions of years to evolve its skeletal structures, cells, muscle tissue and whatnot. The materials we've designed in the past few decades still can't match Nature for efficiency and strength. The contractile plastic that I use for my muscles . . . well, it works like your muscles when an electric current is run through it, but kilo for kilo it's not as powerful as human muscle tissue. I can't lift more than ten kilos of weight without blowing a fuse—and you could literally take me apart with your bare hands.''

''I see. I never would have thought of that.'' Bedford looked at the bottle in her hand and squeezed it. It crumpled easily.

After leaving the lunar colony, Inga turned the rolligon toward the southeast, roughly in the direction of the crater Kepler. Like most of the Moon, that was unknown land, mapped from orbit but never properly explored. The computer map pinpointed a number of interesting spots the geologists had selected from the orbital photographs.

If Bedford expected to discover anything exciting, she didn't mention it to Inga. The cyborg found the geologist to be remarkably close-mouthed. As the rolligon swayed and rattled across the Mare Imbrium, Bedford spoke to Inga only when she couldn't avoid it. Inga hoped that the large woman wasn't afraid of her. She wanted Bedford to like her.

Twelve hours after leaving Port Goddard, Inga stopped the bus and began shutting down the drive systems. ''Is something wrong?'' Bedford asked.

''Not at all,'' Inga told her. ''But it's almost midnight. I figured that you'd want a chance to eat and sleep.''

''Yes, I do.'' She stepped over to the galley panel. Inga gazed out through the viewport, looking at the cratered gray landscape, and thought.

Three years ago she had been caught in a solar flare, halfway between Earth and Mars. The radiation had killed the

other people on her ship; Inga herself had been half-dead when she guided the QuadJet back into Earth orbit. Given the amount of radiation she had absorbed, returning to Earth had looked like an act of futility . . . but she had always been too stubborn to give up life without a fight.

Inga had been in a coma by the time the rescuers could rendezvous with her ship. After she was returned to Earth an experimental group had salvaged her brain. They had treated it for radiation-induced cancers, and then placed it in a cybernetic body. Inga's medulla oblongata and other severed nerve endings had been butted up against electronic receptors. Once in its new home, her brain had spent two years sorting itself out, learning how to sense and control the world through neuristors. Then she had been awakened by the researchers.

It hadn't taken her long to figure out that she was now a cyborg. Her body felt . . . different; her vision was marked with the scan lines of a video camera; her sense of touch had changed, and she could no longer smell or taste anything. It was better than being dead, Inga told herself, but her new state still came as a shock.

Physical survival was one thing, but mental survival was another. The therapists hadn't been happy with her progress over the past year. They claimed that Inga had developed a massive inferiority complex—although that wasn't the precise term for it, they conceded. As the world's first and only cyborg, Inga's psychology was as full of unknowns as this part of the *mare*, and the therapists had few reliable guidelines for treating her. They knew she was in trouble, but helping her had become a matter of luck and guesswork.

Inga thought that was unfair. With all of the time and money they had invested in her, she thought, and with all of their talent, they should have been able to do something effective for her. It disturbed her to know that they thought she was slipping mentally, and that her therapy was largely experimental. This excursion across the Moon, now—she was being tested, she knew, but what was the nature of the test, and how did Bedford fit into it? She didn't believe that she had been paired with the geologist at random.

At the moment, Inga noticed, Bedford was back in her seat, eating a sandwich while she studied a pile of photographs. She put the photos away when Inga looked at her. "I'm ready to go to sleep now," she announced.

"Fine," Inga said. She gestured at a panel. "That pulls open into a cot." Inga flicked a switch, and the lights faded to a red nighttime glow. She turned her attention to the instrument panels.

"Aren't you going to bed now?" Bedford asked.

"No," Inga said. "I don't need to sleep."

She sensed Bedford looking at her back. "Everybody needs sleep."

"Not me," Inga said uncomfortably. Sensing that Bedford expected more of an answer, she added, "I can sleep, but I don't need it. It doesn't hurt me to go without it . . . and the therapists agree that I'm better off when I don't sleep."

"That's crazy," Bedford snorted. "The human brain needs sleep."

"Does it? I don't," Inga said. "I

don't understand it, but I don't need it." She hesitated, and looked at the geologist. The expression on her face was disapproving. "Maybe it's because my recycler takes care of the fatigue poisons in my system . . . or because my brain is—plugged into a neuristor system. Richards thinks there's a synergistic effect there." Bedford continued to look unplacated. "And I always feel depressed after I sleep. I use a built-in sleep-inducer, and it doesn't *feel* like real sleep." And if I dream, she thought, I don't remember dreaming . . .

"Cardiff, it won't kill you to sleep when I do."

Inga felt exasperated, but she told herself that Bedford meant well. "Suppose there's an emergency in the middle of the night, or we get a radio call? I can't wake up by myself when I sleep. I'd rather sit up and be bored than risk missing something urgent."

That appeal didn't move Bedford. "I'd rather not have you up and around while I'm sleeping," she said bluntly.

Inga looked her in the eyes, then looked away. "You're still afraid that I might crack up on you."

"Yes—and don't tell me that you're harmless because you're weak. You don't need much strength to punch the wrong button."

Inga gave in. "All right. If you need to wake me up before eight o'clock, there's a—a pressure switch, here in my shoulder. Squeeze it a bit and I'll wake up."

"Why eight o'clock?"

"My sleep inducer runs for eight hours. I can't adjust that. Good night." Sitting up straight in her seat, Inga closed her eyes and went to sleep.

She opened her eyes, and a feeling of depression settled on her. The rolligon lights were on bright . . . and Bedford was gone. There was no mystery, however. Her suit locker was open. Obviously the geologist had elected to get an early start. Inga felt peeved that Bedford hadn't awakened her.

Maybe she didn't want to touch me, Inga thought. Technically, her body was a prosthetic device, and even some medical people felt squeamish about handling prostheses. Bedford might have the same problem.

"Cardiff, Bedford." The voice from the speaker wavered with static. "I need some instrument readings."

Inga slipped into the control seat. "Which ones? Over."

"All of the survey instruments."

Inga found the right panel and began reeling off figures. Bedford asked her to repeat a few of them, and she did so. Briefly, she considered complaining to Bedford about her failure to wake her, but somehow Inga couldn't bring herself to do it. The radio contact ended, leaving her feeling displeased with herself.

One of the rolligon's alarms began beeping insistently, as a sliver of paper pushed out of the printer. Inga pulled it out of the slot and read it several times. It was a Skywatch flare alert.

She felt a moment's uncertainty. This whole excursion was a test of her. The solar flare forecast might be a part of that test.

Inga checked the settings on the radio panel, and decided that the alert was genuine. It had come directly over the Skywatch frequency. If her therapists had rigged it as a false alarm, then they had just cried "wolf" to everyone in

space. She didn't believe that they would do that—or that NASA would tolerate it.

Inga got on the radio. "Doctor Bedford, this is Cardiff. We have to head for cover right away."

"Don't bother me now," Bedford responded. "I'm on to something here. Give me those magnetometer readings again."

"Doctor we have to hurry—"

"Cardiff, I am very busy right now." Bedford spoke slowly and clearly—as if, Inga saw, she were addressing a voice-programmed robot. "I want those instrument readings at once."

Inga felt a touch of grim pleasure as she spoke. "Doctor, there's a flare warning. We have nine hours to reach safety. If *you* want to stay here—"

"I'm coming in," she said abruptly.

"Glad to hear it," Inga muttered.

And that's why they put me out here with her, Inga decided: she thinks I'm a machine. The therapists, she guessed, were interested in learning how well Inga could cope with somebody like Bedford. After all, if she was going to return to the real world, she would have to withstand hostility.

Inexplicably, Inga found herself feeling a bit sorry for Bedford. Without her knowledge or permission, the geologist was being used.The psychologists had simply cast about for somebody who would dislike the cyborg, and then had contrived to stick the two of them together. With modern psych techniques it would have been simple to spot someone with Bedford's attitude. Inga found herself wondering precisely why the woman disliked her—

Worry about that later, Inga commanded herself. Inga punched up the computer map and studied it. The lunar colony was now twelve hours away . . . but there were several outposts within six hours of their present position. She could reach any of them well before the flare hit. Inga picked the closest one, and asked the computer for data on possible routes.

The airlock cycled and Bedford popped into the cabin. "Let's get going," she said, pulling out of her suit. She dropped it on the deck and got into her seat.

"We've got plenty of time," Inga said, looking at her. "Stow your suit properly. You'll need it when we get to the outpost. Then sit down and strap in," she added, looking at the map. "We're in for a bumpy ride."

Inga began activating the drive system while Bedford put her suit away. Each of the rolligon's eight wheels had an independent drive system. Redundancy, Inga thought. You couldn't avoid the need for it, and sometimes it could save your life, but right now she resented the time she spent activating each system. With a flare on the way, she felt a blind urge to run for the safety of the closest radiation shelter. Getting caught in one flare had been more than enough.

Bedford felt it as well, it seemed. "Let's get going," she repeated. "I'm all set."

"We'll be ready to roll in a minute," Inga said. "Relax. We have a very comfortable margin of safety."

"You're certain?"

Inga nodded. "We have three hours to spare. The forecasts are extremely accurate—these days, at least." Inga looked at the readouts; various needles

drifted toward their nominal positions. "Doctor, would you mind telling me something? What do you have against me?"

"Nothing personal." Her voice was dispassionate. "I just don't care to see a machine taking a human's place —especially a machine like you."

"I'm not a machine," Inga said. "I—"

"You're a cyborg," Bedford said. "Which is a machine activated by a dead human's brain. Hardly the same thing as a human."

The cold finality in her voice stopped Inga. She couldn't think of any reasonable answer. Inga glanced at the recorder, which inexorably taped her inability to answer. You wouldn't tell on a sister, would you? she asked it silently, as she strapped into her seat.

The rolligon was ready to travel. Inga took a last look at the map before starting. The computer had drawn a sinuous line on it, charting a reasonably smooth course for her around large craters, boulder fields, and other hazards. The bus could make good time.

Okay, Inga thought, putting her hands on the controls, time to hike up my skirt and run. The rolligon surged forward as she fed power to the wheels.

On the map the ground looked smooth. By lunar standards it was that. Nevertheless the rolligon shook and bucked as it sped over the undulating, cratered ground. Even at the low speed she used, Inga needed all of her skill to control the machine. She was glad that the controls were entirely solid-state; driving the rolligon didn't require the strength she lacked.

Inga kept her eyes on the battered, dark-gray landscape outside the viewport, but she remained conscious of the recorder. Give it one more try, she told herself. "Y'know, Doctor, a while ago you said you were on to something big here. What was it?"

Bedford remained silent for a while, and Inga thought she wouldn't answer. "Well," she said at length, "I think I've found signs of trapped volatiles."

"Water?" Inga asked. Nobody had ever found water on the Moon. It all had to be hauled up from Earth, which was expensive. Lunar water would have been incredibly valuable.

"Not necessarily," she said, after another long pause. "It could be ammonia or methane. One of the lunar survey sats detected a few anomalies in this region . . . slight weakenings in the gravitational field, differences in surface albedo, differences in radiation levels, higher concentrations of ionized hydrogen. That all suggests the presence of trapped ices."

"Ah." That was almost insultingly basic, Inga thought, but at least Bedford was talking to her now. Inga had counted on a professional's love of talking shop to break the ice. "I'd have thought that any ices buried out here would have boiled away ages ago."

"Not if they're buried deeply enough. Regolith makes a good thermal insulator—that's one reason Port Goddard is built underground. I think either a comet impacted here, and buried part of itself, or there was some sort of volcanic activity after—"

The rolligon shuddered and dropped. Inga saw blackness outside the window, then the dark gray of lunar rock and regolith, then more blackness. She was

weightless for several seconds as the bus fell—then there was a loud metallic crackling as it smashed down on its side. The impact threw Inga against her seat straps, while loose objects bounced around the cabin. The lights flickered wildly and died.

Red emergency lights snapped on. Unstrapping herself, Inga heard the ominous noises of dying machinery—and the undeniable hiss of escaping air. She got out of her seat and dropped to the sloping floor—which had been a bulkhead a moment ago. "Doctor Bedford?"

"Right here," the geologist gasped. "Damn. Damn."

Inga fumbled around for a flashlight. She played the beam around the cabin, and one of the blurs resolved itself into Bedford, lying atop some lockers. "I thought I told you to strap in!" Inga said.

Bedford ignored that. "I think I broke my leg. Damn. What hit us?"

"I don't know. I didn't see anything, and the ground looked smooth ahead of us." Inga found the medkit, rolled up Bedford's pants leg and stared blankly at her skin. "Compound fracture," she said.

"My leg got wedged between the seat and something," Bedford said. She watched Inga roll a bandage around it. "Damn. Aren't you going to splint it?"

"Not yet." Inga pulled a syringe from the medkit and sprayed medicines into Bedford. "We've got to suit up fast. We're losing air."

"Wonderful." Bedford closed her eyes. "Doesn't matter, though, does it? I'm going to die anyway, when that flare hits."

"That remains to be seen." Inga pulled Bedford's suit from the locker. Rushing the suiting-up process as much as she dared, she helped the geologist ease into the garment. The hissing grew steadily weaker as the cabin lost air. By the time Inga buttoned up her own suit the cabin was in hard vacuum.

There was an embarrassing silence while she considered the situation. The airlock was now in the ceiling. Getting Bedford up through it would be a major undertaking—and once they got outside, what then? She thought about it as she put an improvised splint on Bedford.

"I'm going to take a look around outside," Inga announced. She saw Bedford nod behind her faceplate. The woman looked pale and dazed.

Inga reached up and unlatched the door. With vacuum on both sides of it, it swung open without resistance, revealing black sky overhead. The outer door had vanished, Inga saw, leaving behind a set of twisted, broken hinges.

Using every handhold and foothold she could find, Inga hauled herself up through the lock. That took most of her strength. She didn't feel the sort of strain that muscles would have experienced . . . but her neuristors told her that she had come close to her limits. She *felt* strained.

She stepped onto the rolligon's dented white hull and looked around. The rolligon lay on its side in a deep pit. Several wheels had popped off their axles, exposing their drive units. Antennae, radiator coils, and the access ladder had been twisted into tinfoil.

The walls of the pit curved upward and arched together, although there was

now a ragged hole in what had been the cavern roof. Bits of rock and dirt sprinkled down from the edges, and Inga saw several precarious-looking cracks in the remaining roof. The floor of the pit, lit by sunlight scattered from the rolligon's hull, was cluttered with jagged fallen rocks.

"We're in a macro-vesicle," the geologist said, as Inga described the scene to her. "Formed when the *mare* filled with molten rock . . . gases escaped from somewhere below, didn't break the surface . . . bubble just solidified. Most of them—not this big."

"Take it easy," Inga said. Bedford didn't sound good. She definitely needed medical attention—brilliant observation, Inga thought. What she really needed was to stay alive long enough to get that medical attention. With a flare brewing . . .

Inga took another look at the chamber. Sunlight slanted down, shining on part of it—and on the rolligon. That would turn the bus into a death-trap when the flare hit; the solar protons would travel in straight lines, with the sunlight. Much of the pit, however, remained in shadow. That gave her an idea.

A tool locker had broken open, spilling its contents onto the hull. Inga picked through the litter and found a coil of plastic rope and a cutter. She went back to the hatch, tied one end of the line to a grip, and dropped it down the hatch. Then she climbed down after it.

"We're going to be all right," she told the geologist. She gave the line a yank—it held—then snipped it with the cutter and put the fresh end in Bedford's hands. Then she tied the rest of the line to Bedford's backpack. "We've got plenty of natural cover here," Inga said, "And plenty of time to get into it. Now. You can still use your hands and arms a bit, can't you?"

"I think so," she wheezed. "But —what cover?"

"Outside, of course—in the shady part of this hole. The sun is pretty low on the horizon, topside, so we'll have dozens of meters of rock between us and the sun—visualize the geometry. That'll shield us from the direct radiation. We'll hunker down behind a boulder, and that'll save us from most of the scattered radiation in the hole. All we'll have to do is wait it out. Port Goddard will come for us as soon as the flare ends."

"Oh . . . If you say so. Let's go."

"Sure thing." She double-checked the knots on Bedford's pack. "Here's what we'll do. I'll stand on the edge of this lock and pull on this line. That'll support most of your weight. Meanwhile you climb the other line, hand over hand. You won't have to support much weight—"

"I don't get it," she said woozily. "Why don't you just carry me out? I can't weigh more than, uh, fifteen kilos here, even in my suit."

"I know. But I told you before that I can only lift ten kilos. You'll have to carry some of your own weight." She sighed, a noise produced by a voder inside a resonance cavity. "But you can handle five kilos, can't you?"

"I think so. Let's get going."

"Sure. Mind your leg." Inga went back up the airlock, carrying the line with her. She got outside, planted her boots on the rim of the airlock, and pulled on the line. She gave Bedford all

the support she could manage, while the geologist made her ascent with dream-like slowness.

Bedford was almost to the top when she lost her grip. Inga watched her start to fall. Reflexively she hauled up on the line, and for a brief moment she supported Bedford's full lunar weight. Then an automatic circuit breaker tripped out, cutting the power to her overloaded muscles. Inga collapsed at once and went tumbling down the side of the rolligon, helpless. She dropped onto the ground and lay there paralyzed, feeling like a broken toy.

She couldn't even move her eyes. There were readouts in her helmet, flashing data at her, but she couldn't even look at them to see how much time was passing. She couldn't even focus her eyes.

Inga grew coldly angry with herself. Crashing into this cavern might have been bad luck, but this accident was her own fault. Human beings could make tremendous, "impossible" physical exertions, but her body was limited by rigid physical laws. No amount of good intentions or wishful thinking could ever change that.

The breaker reset itself and she could move again. Without any hesitation she clambered up the side of the derelict bus, and peered down into the cabin. Bedford lay in a crumpled heap under the airlock, not moving. It wasn't until the cyborg climbed down to her, and saw the breath misting her faceplate, that she knew Bedford still lived. Inga guessed that she was comatose; the pain of falling on a broken leg must have been fierce. She could only hope that she wasn't bleeding inside her suit.

Inga picked up the rope on Bedford's backpack and climbed outside again. She went over to one of the drive units and crouched down beside it. The wheel had popped off cleanly, revealing a cobalt-steel axle. The slotted metal shaft looked undamaged. It occured to Inga that the wheel had been designed to break away in a crash, to save the expensive drive unit from damage. In that case—

She drew a screwdriver from her belt-kit and removed the drive's cover plates. It looked undamaged, she thought, studying the wires, terminals, and black boxes. She poked the screwdriver blade into the unit, and shorted across two adjacent terminals. To her satisfaction the axle turned slowly. Shorting out another pair of terminals made it twist in reverse.

Inga pulled the screwdriver out. She took the line and wrapped it around the axle, securing it through the slot. She wedged the screwdriver between the two terminals and watched the axle reel in the line.

Inga went back to the hatchway. Bedford drifted up slowly, swaying gently at the end of her rope. When she reached the edge of the hatch, Inga grabbed her shoulders with both hands and twisted. Bedford teetered on the edge for a moment, then flopped onto the rolligon's hull. Quickly, Inga went back to the motor and shut it off before it could drag Bedford any further.

So far so good, she thought. Carefully, she pushed Bedford over the side of the hull. The geologist slid down a half meter and hung there. Inga went back to the motor, and fiddled with it until it spun again. She watched the rope

unwind from the axle, and go slack as Bedford settled on the ground.

Inga climbed down to her. She got rid of the rope, took the geologist by her pack's shoulder straps, and began pulling. Using all of her strength, the cyborg could move her ten centimeters at a time. Inga needed four hours of steady, antlike tugging to move Bedford thirty meters to safety . . . but when the flare hit, both of them were safely positioned behind a pile of boulders.

The flare peaked quickly, and the radiation levels dropped fast. Sixteen hours after the crash they were almost back to normal. Inga had spent that time sitting against a boulder, keeping an eye on Bedford. She wasn't bored; Inga had plenty of memories, and even more to think about.

She had survived, and rescued Bedford unassisted. The psychs couldn't have anticipated this sort of emergency, she reasoned, and her handling of it would impress them. Now she stood a much better chance of being returned to flight status. She wanted that.

Yet that was of secondary importance. The big thing, she thought, was that a machine couldn't have done what she did. It had taken ingenuity and determination to rescue Bedford, and those weren't mechanical qualities. As she saw it, the logic of the situation meant that she was a human being.

The voice crackling in her headphones came as a shock, although Inga had half-expected it for hours. "Rolligon six, this is Skywatch, do you copy, over." The whispery voice was heavy with concern.

Inga could see a large chunk of sky from where she sat. Somewhere in that blackness was a space station, with a crew signaling her. "Skywatch, six," she said. "Cardiff here. Over."

" . . . give us a long count . . . " Static washed over the voice. Slowly, Inga counted up to ten and back down again, while the station worked to pinpoint her location and focus more powerful radio gear on her.

The voice from space firmed up. "Six, Skywatch. What's your status, over." The man's voice had the careful neutral tone of somebody who expects bad news.

"We had a crash," Inga reported. "We're stuck in a large hole in the ground. Dr. Bedford broke her leg and needs medical care. We got under cover before the flare hit, so we're in no danger, radiationwise." She glanced at one of the digital readouts in her helmet. "We absorbed about five rems during the flare. Over."

"Ah, roger, six, we copy that." Inga could sympathize with the relief in his voice. "Losing a crew" was the ultimate nightmare for any astronaut. "Wait one, will you?" he requested.

Inga waited for several minutes before hearing a new voice. "Cardiff, this is Barrett at Goddard. We're prepping a lander now. We should be able to recover you in six hours. Over."

"I copy. Six hours. We'll see you then. Over."

" . . . repeat? . . . breaking up . . . "

Inga looked at the patch of sky. Presumably whichever station she had contacted had moved away, following its orbit. Well, they knew that she and

Bedford had survived, and where to find them. Rescue was assured.

"Cardiff? Where are you?"

"Right here." Inga knelt down beside the geologist. "How do you feel?"

"Like I broke my leg. Must you sound so damned cheerful?"

"Well, yes, I must," Inga admitted. "We're getting out of this mess alive, for one thing. For another thing, when the folks back at Urbana review all of this, they won't be able to keep me grounded any longer. They'll know I'm all right now."

" 'Urbana'?"

"That's where they based the bionics project. Anyway, Port Goddard will have a lander out here for us in another six hours or so. You'll be in a hospital bed an hour later."

"Yeah, sure." The misery in her voice astonished Inga—although it shouldn't have, she thought. "Doctor, I'd better give you another painkiller," she said.

"No! Don't." Bedford gasped for breath. "I've had nightmares. . . . I'd rather stay awake."

"All right," Inga said reluctantly. "But I wish there was something I could do to help you."

"Doesn't matter . . . not going to make it. Nice try, though."

"Huh?" Inga felt herself facing a blank wall. "What are you talking about? You'll be fine, Doc—"

"Cardiff. I've got a dosimeter in my helmet, just like yours. The reading is off the scale. Over a thousand rems. I'm dying."

"Your meter must be off," Inga said. "*My* meter reads five-point-two rems. That's trivial."

"Don't lie to me," Bedford wheezed. "But you can't help lying, can you? You're trying to be reassuring . . . according to protocol, I suppose. Doesn't matter . . . just as long as that Richards can't get hold of me . . . won't live long enough for that, if I'm lucky . . . "

"What are you saying?" Inga asked. But she had already guessed.

"That nice, bubbly Richards . . . he'd give Frankenstein the creeps. He needs more subjects for his cyborg project, right?"

"I wouldn't put it that way," Inga said. "You make him sound like a mad scientist. That's not fair."

Inga studied the figure lying on the ground. Bedford was right about one thing: Richards wanted to continue the project, and he needed more subjects for that. If Bedford truly had been dying from radiation exposure, Richards would gladly accept her. Briefly, Inga wondered about his motives. Richards wasn't a mad scientist, not by any means, but she didn't feel that she understood his motives in orchestrating the project. He had tried to explain them to her once, but Inga reflected that she had missed something in his statements—some hidden assumption that was beyond her comprehension—

First things first, Inga told herself. The plain truth was that Bedford wasn't dying. Her radiation meter was in error. The problem now lay in convincing her of that fact.

Inga snapped her fingers, a gesture that didn't work in her thick gloves. *Now* the pieces fitted together. "Doctor, you know what I am—"

"Who the hell doesn't?" she demanded. "You're a good imitation, but

not perfect. The eyes give you away . . . too shiny.''

''I don't mean that. You're aware that this trip has been a test of sorts for me.''

''Yeah, Richards mentioned that.''

''Well, you've been had. I think you're part of the test, a big part of it. For the first time, Richards lets me go somewhere without a half-dozen people scrutinizing everything I do. I just happen to be paired off with somebody who detests me. Coincidence? Your radiation meter just happens to go wild. Chance? I think it was sabotaged to give a high, false reading—''

''What in hell for?''

''To make you panic . . . so I could watch you panic.''

''Psychodrama,'' Bedford said suddenly. She was silent for a long while. ''Yeah, it makes sense,'' she said at last. ''Let you watch somebody who despises you panic . . . give you an emergency to handle . . . ''

''Exactly,'' Inga agreed. ''They must have rigged something special for me in the rolligon. I'll bet it was a dilly, whatever they had planned.'' Bedford didn't seem to hear her. Inga watched the face under the glass bubble scowl. Her mutterings sounded angry, which didn't surprise Inga. Nobody likes to learn that they've been used.

''It makes sense,'' Bedford repeated. ''Richards said you had some sort of inferiority complex. A fake emergency . . . be a good way to build up your ego. Damned nasty of them, though.''

''They're desperate,'' Inga said defensively, ''because I haven't been responding to therapy. I know that Richards has worried that I might become catatonic, or worse.''

''You sound so casual about it. Doesn't that worry you?''

''Not any more,'' Inga said. ''I *know* I'm going to be fine now. This may not be the emergency they had planned for me, but I handled it perfectly. Maybe now they'll put me back on flight status.''

''If you say so. I feel so silly, though, panicking the way I did . . . even if I was set up—damn!''

''What's wrong?''

''Leg—twinged. Damn!''

Inga unclipped the medkit from her suit and extracted a field syringe. It had a needle designed to give an injection through a space suit. ''You'd better have that pain killer now, Doctor.''

''I said no! Damn you, you don't have nightmares, do you?''

''None of your business,'' Inga said. She held the needle to Bedford's arm.

Despite her weakness, Bedford brushed Inga's hand away. ''No, don't. I hurt and I'm scared. Talk to me, Cardiff.'' She coughed weakly. ''Funny, I don't even know your first name.''

Inga felt wary. ''As I recall, *you* were the one who skipped the introductions.''

''I know. I'm sorry.'' She coughed again, hoarsely. ''Damn. But you scare me. Like last night . . . when you went to sleep. You just—turned yourself off, sitting there. Like a piece of equipment.''

''That's what it's always like when I sleep,'' Inga said. She hesitated, then added. ''And it always depresses me. It reminds me that I'm—you know, not normal.'' I can't even say it, she thought

bitterly. I'm like an old maid talking about sex. Even hinting at it is an effort.

"I understand. You still haven't told me your name."

She still felt the wariness . . . but a wall seemed to crumble. "I'm Inga."

"Janet. Pleased to meet you." Inga watched a relaxed look spread across Bedford's shadowy face. "Tell me about yourself, Inga."

"What do you want to know?"

"Anything. I just want to hear a human voice. Why did you become an astronaut?"

"Because I like flying . . . " Inga found herself talking at length, prodded by an occasional question from Bedford. The geologist seemed to enjoy the near-monologue.

" . . . probably would have stayed in the Aerospace Force," Inga said eventually, "But I had two degrees in aerospace engineering, and I wasn't doing anything with them. I felt like I was wasting myself, flying cargo planes, so when I got the chance I transferred to NASA." She leaned forward, and checked a dial on Bedford's chest pack. "Your oxygen supply is down to five percent, Janet—you're using it up much faster, now that you're awake. We'd better trade packs. Mine still has a full charge of oh-two."

"Huh? How?"

"I don't breathe," Inga said. "My metabolism . . . I have a catalytic recycler to keep my brain alive. It takes the waste products from my brain . . . turns them back into nutrients and oxygen. It uses a lot of power, but it's entirely self-contained."

"Oh." She watched Inga as she began to unhitch her pack. "So why do you wear a space suit?"

"Thermal control, of course," Inga explained, loosening her shoulder straps. "That's a big problem in space, because it's hard to dump waste heat in a vacuum. Vacuum is a good insulator. Even sitting in the shade, you could die of heatstroke in your suit."

"You, too?"

"You bet," Inga said. Two umbilical lines ran from her pack to receptacles on her suit. Inga detached them carefully, and heard/felt the clicks of safety locks sealing the openings. "I generate as much energy as you do, and my body temperature is the same as yours. It's . . . all part of the rationale for the way they—rebuilt me, Janet. They wanted me to be as close to normal as possible. I'm supposed to look and sound human, and even feel warm to the touch. Actually it wasn't too hard to fix things this way. Modern prosthetology is pretty advanced—"

"I know. I've read things about it." Bedford watched Inga's hands unfasten her own pack. "You aren't made out of gears and rods. You're more like one of those anatomy-class mannequins . . . contractile-plastic muscles, epoxy-fiber bones, neuristors, a cosmetic covering . . . "

"Right. Don't try to help me with this, Janet." Inga was surprised at how good it felt to call another human by her first name. She put her backpack down next to Bedford and reconnected the umbilicals. She kept talking, sensing that the operation made the woman nervous. "It wasn't all that hard to make a cybernetic body, to hear Richards tell it—they used a lot of off-the-shelf

items. Besides, they said it'd be easier for me to get along with people if I looked human—and that I'd still be able to use equipment which was designed for the human shape. Besides, the human form is a good, multi-purpose form.'' So many reasons, Inga thought, as she slid the old pack out from under Bedford. She wondered if there had been a reason the therapists hadn't mentioned.

'' 'Multi-purpose,' '' Bedford repeated drowsily. ''Like climbing in and out of a crashed rolligon. Could you do that again?''

''If I had to. Why?''

''Well . . . this sounds silly, but suppose that lander is late? I'd hate to run out of oxygen before it got me out of here. Could you recharge my old pack? I'd feel better, knowing it was there.''

''Good idea,'' Inga said, hooking the old pack to her suit. The geologist had to be out of her funk, she decided, if she could worry about her air supply. ''I'll be right back,'' she promised, standing up.

Climbing back into the derelict bus, Inga felt a peculiar sensation. It was elusive, not-quite-familiar, and unpleasant.

Inga disconnected a hose from her pack and plugged it into the recharge system. While oxygen hissed into the drained tank, she looked around the rolligon. Bits of radiation-induced static flecked her eyesight.

The lights on the control panels flickered spastically. The radiation had damaged the circuits, she thought; semiconductors and picocircuits were as vulnerable to radiation as human flesh. The stuttering lights and flecks reminded her that she, too, was vulnerable—and the radiation levels were still above normal. No wonder she felt disquieted by the derelict. Leaving the rolligon gave her a profound sense of relief.

Back outside, movement caught her eye. The rescue party? she wondered. She looked again, and saw a trickle of dust slipping from the cavern ceiling, feeding out of a crack in the rock. The ceiling couldn't be very stable now, she knew, not after the rolligon had punched that gaping hole in it. Just hang together a few more hours, she pleaded silently.

Bedford was as Inga had left her, lying behind the boulders. Something's amiss, she thought, but in the dim light Inga couldn't tell anything until she stood next to Bedford.

Bedford had unplugged her air hose. Its end lay in the gray dirt.

The impossible sight, completely outside any astronaut's experience, bewildered Inga. Clumsily, she knelt down and snapped it back into its receptacle.

Eventually Bedford's eyes fluttered open. ''Oh . . . hell. Didn't work.''

''Luckily for you,'' Inga said. ''You must have gotten delirious.''

''No.'' Bedford drew a rasping breath. ''Thought the air . . . would all leak out.''

''There are safety valves to prevent—hey!'' Bedford started pawing at the hose. Inga had to use both hands to pull her arm away. ''What's gotten into you, Janet?'' she demanded.

Bedford blinked at her feebly. ''Cardiff—that was a nice story you told me. About my radiation meter, and all. Only

. . . what if they adjusted *your* dosimeter? To not read anything big?''

''I don't—''

''Think about it,'' Bedford insisted. ''Even you know you're not stable. Maybe they thought you'd freak out . . . if you thought you'd been irradiated again. And we *have* been through a flare—''

''We're shielded here.''

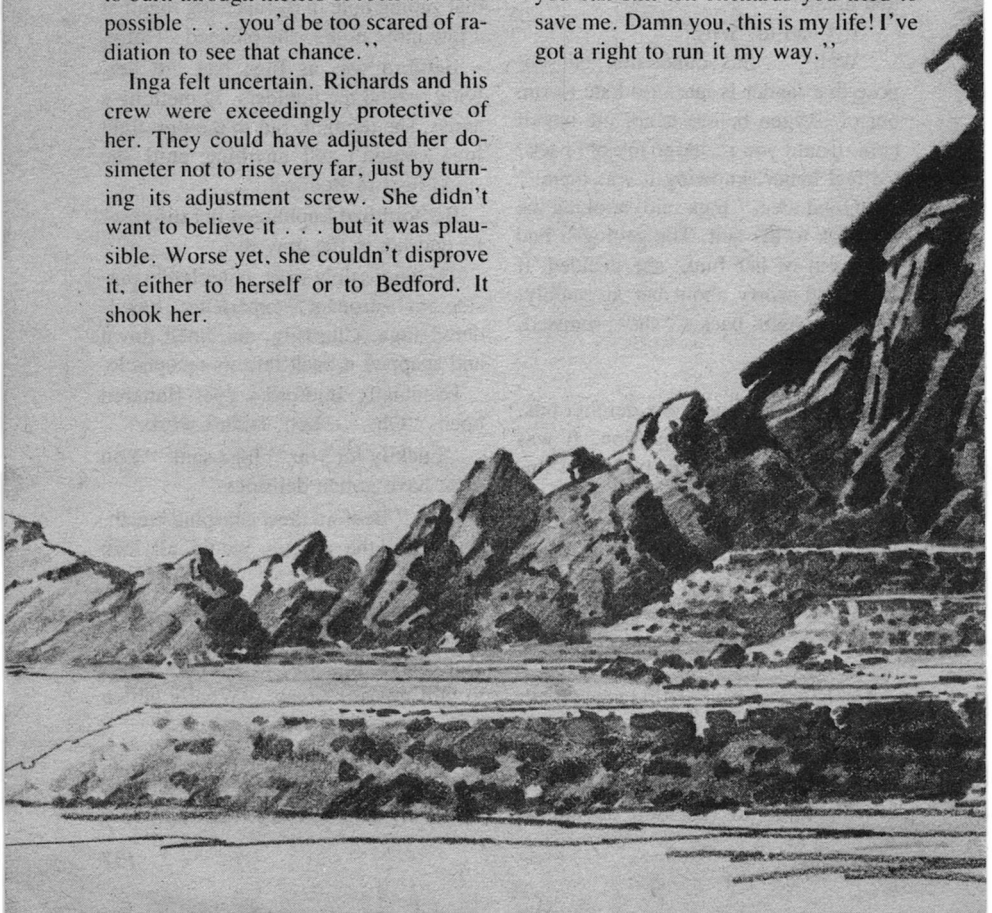
''How well? Maybe the ground here is riddled with holes like this. Wouldn't make very good shielding, would it? . . . Maybe the flare was strong enough to burn through meters of rock . . . it's possible . . . you'd be too scared of radiation to see that chance.''

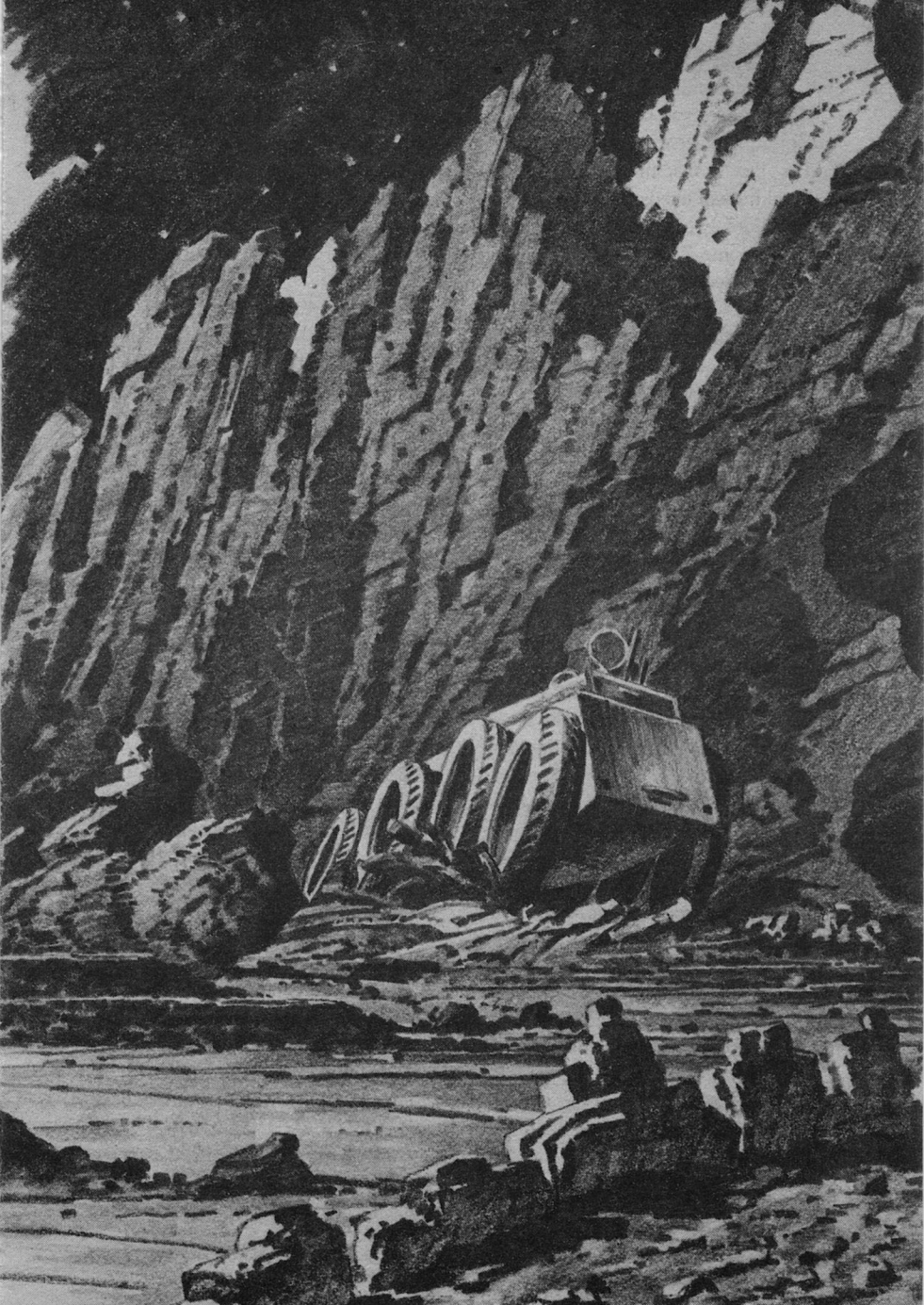
Inga felt uncertain. Richards and his crew were exceedingly protective of her. They could have adjusted her dosimeter not to rise very far, just by turning its adjustment screw. She didn't want to believe it . . . but it was plausible. Worse yet, she couldn't disprove it, either to herself or to Bedford. It shook her.

Bedford had continued talking. ''. . . simple as this, Cardiff. I won't let myself be turned into a machine. I'd rather die as a human being than go on—existing—as you have.''

''I won't let you die,'' Inga said. ''Even if it *is* what you want.''

''It isn't what I *want*,'' Bedford said. Her head lolled around inside her helmet as she took several rattling breaths. ''It's just that dying doesn't look as bad as ending up like you. Cardiff, all you have to do is sit back and close your eyes for a minute. Nobody else will ever know; you can still tell Richards you tried to save me. Damn you, this is my life! I've got a right to run it my way.''





"Not when you ask me to help you end it," Inga said.

"Can't make you understand," Bedford mumbled wearily. " 'course not. You're just a machine . . . can't understand human needs. Only saving me so you'll look good to Richards . . . not doing it for me."

Inga had been reaching into the medkit, for the syringe loaded with tranquilizer. Bedford was suicidal; the thing to do was to keep her from harming herself, to knock her out until help arrived—

—and Inga couldn't do it.

Suddenly it no longer mattered whose dosimeter was wrong, or whether or not Bedford was actually dying. This woman is my adversary, Inga realized with sharp insight. Every belief, every line of reasoning that I'm not human—she embodies them, Inga knew. If I simply knock her out, it'll be the same as admitting that she's right—that I can't prove to her that I'm human. She'll win by default, and I'll be conceding that I'm not human . . .

"All right," Inga said slowly, closing the medkit's lid. She had never felt so afraid in her life, not even when she had been caught in that last flare, three years ago. No wonder I'm scared, she thought. Bedford was literally willing to die for her convictions. Inga didn't know if she had anything to match the geologist's beliefs, but she now committed herself to fighting this out.

This is for my own good, she thought. If I can convince this woman I'm human, it might settle my own doubts. If I can't—

"All right," Inga repeated. "Convince me that you're right. Prove that being dead is better than being a cyborg."

"That's too vague, too general," Bedford said. "I just want to convince you that it isn't right for me—"

"No," Inga said. "Don't give me any doubletalk. You've been telling me that I'm not human. You'll have to prove it to me."

Inga settled back against a boulder, as if bracing herself. "I don't think you can do it," she continued. "You wouldn't call an amputee less than human, just because he's lost an arm or a leg. Being kept alive on a heart-lung machine doesn't destroy your humanity. Humanity isn't something physical. It's in the mind, which is supposed to be in the brain—and I've still got that. This entire body is just a prosthetic for that.

"Besides, if machinery is dehumanizing then I don't know any human beings. These days everyone depends upon machinery—to grow food, to make clothing and houses and medicine, to let us live in space—"

"Cardiff," Bedford interrupted. "I'll concede that. I can't argue with the logic of it, and I won't. I accept it."

"You do?" Inga felt as if Bedford had jerked a rug out from under her feet. "So why—"

"I'm a scientist and a lunar colonist. I'm not some back-to-nature jerk who can't handle modern life." She coughed, then resumed speaking. "There's only one thing wrong with what you're saying. You don't believe a word of it."

She felt indignant. "If I didn't believe it—"

"Cardiff, please," Bedford gasped. "Don't interrupt. Hard enough to keep talking . . . stay awake. You parrot the

words, must have heard them from Richards. Wouldn't act like you do if you *believed* them. You act like a well-programmed robot. You've bent over backwards to show me you're harmless, to reassure me . . . can't let a human get upset, hey? Even when I treat you like a machine . . . you let me order you to sleep last night, even though you hate it . . . like a computer taking a program. Real human being . . . would've told me to go to hell.

"Then I act nice to you, and you fall on me like a long-lost sister. Really fell for that buddy-buddy crap, didn't you? You couldn't see how I was conning you . . . making you think I believed you about the dosimeter—"

"You don't mind lying?" Inga asked.

"To a machine? Should I?" She wheezed. "I figured out that I had to lull you . . . so I could get you away from me, long enough for me to kill myself. You fell for it . . . because you're desperate for any sign that a human thinks of you as a fellow human."

Inga tried to answer, but she had nothing to say. Bedford was right. She had been hanging on everything this frightened, injured woman had said, as if her words could confirm or deny her humanity.

It took all of Inga's will to keep from reaching for the medkit and its tranquilizer. Bedford wanted to destroy herself, and she understood that she would have to destroy Inga to do that, batter down her remaining self-respect. The geologist was doing that, Inga thought, methodically and without any qualms. At most she might regret destroying an expensive, sophisticated machine, but that wouldn't trouble her conscience.

"That's your 'inferiority complex,' " Bedford pressed on. She glanced up at the motionless figure sitting near her. "Only it isn't a 'complex.' You realize that you're less than human . . . that you've allowed yourself to be turned into a machine. You've got just enough humanity left to hate and resent that . . . your 'complex' is an appreciation of reality."

"Maybe . . . I don't know." She was only partly aware of the geologist's voice. So much of her past behavior took on a different meaning now—

I've been waiting for the therapists to cure me, she thought suddenly, even though I know that therapy requires active participation. No wonder, though. A machine doesn't repair itself; it waits for a technician to fix it. All I've done, Inga reflected, has been to allow myself to continue existing.

From where she sat she could see part of the rolligon. She felt as battered as the derelict machine looked, beyond any hope of salvage. She wondered if she could still leave this pit intact. . . .

"Maybe you're right," Inga said. "There's so much I haven't understood . . . it should have been obvious all along—to a human being. I—I may have lost something—"

"Not your fault," Bedford said. "You were caught up by this bureaucratic, inhuman world-system we've built for ourselves. This is what happens when we humans gets careless . . . let ourselves lose control of our world, lose sight of important things. But NASA made a big investment in you, training you . . . developed a highly experienced, valuable astronaut. Couldn't lose

that, could they? Wouldn't be very cost-effective. . . ."

"What?" Inga leaned over Bedford's reclining figure, as if drawing closer would make it easier to hear the feeble voice whispering in her headphones. "What did you say?"

"How else would you explain the whole cyborg project? Richards . . . experimenting for the sake of experimenting . . . no human goals . . . just the attitude of some vast, impersonal system, existence without purpose, identity . . . moving through inertia. We've built a way of life that takes away our humanity—"

Inga started chuckling, rustily, an unpracticed sound that she couldn't stop. I nearly let my own stupidity destroy me, she thought, sagging back against the boulder behind her. I've been in danger from myself, not from Bedford or anyone else. Inga found it hilarious that anyone with her intelligence could have been so badly wrong.

"We're both wrong," she said, when she could control her laughter. "Maybe I'm dehumanized. If I am, it's all *my* fault. You can't blame it on any system. I don't see how *any* 'system' can take away my humanity, unless it has my cooperation, one way or another.

"That 'system' that made me—it's made up of individuals, Janet. None of them have tried to take away my humanity. Richards, his team, the people who supportd them in NASA—they've been fighting to keep me in the human race."

"Have they? How can you know, Cardiff?"

"Because of the effort they've made!" Inga peered at her shadowy face. Reflections on Bedford's faceplate obscured her expression. Inga wished she could see that expression; she had to know if she was getting through to the woman. "You called me cost-effective. I'm not. For what I cost, they could have trained a score of new astronauts. I'm not valuable as an astronaut, either. The program didn't grind to a halt when I was sidelined. No, I'm only valuable as an individual. That sort of value can't be figured in terms of cost-effectiveness, and nobody has tried to calculate it that way."

"You can't expect me to believe that."

Inga heard doubt in the fading voice. "I do. What good is a cyborg, Janet? A normal human can do anything I can, and probably do it better. But they worked as hard as they could, anyway, to save me. It—it's a human thing, Janet, to keep trying and not give up hope . . . and I've been such a blind fool that Richards must have thought me hopeless at times. I'm responsible for my problems.

"And that's why I can't let you die, Janet. If I let you die, I'd be saying that there's no hope for me—that I can't get my humanity back—"

Slowly, Bedford half-rose from the ground and clawed at her air-hose. Inga knew that she was trying to rip it out, to mangle it so badly that Inga wouldn't be able to fix it and keep her alive.

Inga grabbed at her arm and fell on top of Bedford, pinning her. With a final burst of strength Bedford shoved her away, with a violence that sent Inga sprawling backward in a puff of dust.

She got to her feet unsteadily. She saw Bedford pawing at her umbilical,

but without any strength. Inga got out the tranquilizer, went to Bedford's side and injected her through her suit.

Inga staggered away from the unconscious woman and slumped down against a boulder, feeling an impossible wave of exhaustion. Metal fatigue, she thought wearily. Even steel yields.

Then she thought: But I won. She had to quit arguing and resort to force, because she knew I was right. She only tried to kill herself because she's still afraid. It takes time for feelings to catch up with reason.

Inga got up, turned around, and sat down facing Bedford. From this spot she could still see the derelict bus. Now I know I'll get out of here, she thought. Turning her attention back to Bedford, she returned to her side and sat down, and that was how the rescue team found her when they climbed down into the cavern.

"I didn't know if you'd want to see me again," Bedford said. She was flat on her back in a hospital bed, her broken leg encased in a therapeutic device. Esoteric impulses stimulated the bone growth in her leg, while IV tubes dripped chemicals into her. She would be healed in another day. "But I figure I at least owe you the chance to tell me to go to hell."

"I thought that was what it was," Inga said. Carefully, not wanting to disturb any wires or IV tubes, she sat down on the bed's edge. "But I don't want to do that. You did me good, Janet."

"I don't know how you can say that, Inga. I wasn't trying to do you any favors."

"Of course not. Only an idiot would waste a favor on a machine. And that's all I was, Janet—a machine." She shook her head. "They tried everything they could with me. . . . That's why they rebuilt me to look like my old self, Janet. They wanted me to be able to look in a mirror and still see a human being. All of their other reasons for giving me a human form were good, but they were still secondary to that. And it almost didn't work."

Bedford peered at her. "What are you now?"

"If you still thought I was a machine, would you feel that you had to apologize to me?" Inga smiled faintly. "I don't know what I am . . . but I know what I'm not. I'm not a machine. I suppose I'll find out more about myself eventually."

"That sounds like progress."

"That's what Richards says. He doesn't think I'm recovered yet, but he's satisfied with the progress I've made now. At least, he's satisfied enough to let me return to flight status."

"Richards told me that yesterday. He also told me—Inga, we were both wrong about what happened to the radiation meters. Mine had a defective sensor. It was just bad luck. Richards is too ethical to pull a trick that rotten. I was in no danger." She turned her head away. "I was only out there because he knew I was likely to give you a hard time . . . but I didn't have to subject you to that abuse."

"Somebody had to, Janet. Nobody said that therapy has to be gentle. I had already heard most of what you and I said, from the therapists, but it hadn't helped much. That's because it's one thing to have a nice philosophical chat

with friendly people in a cozy room, but it's another thing to have to defend yourself out in the field, the way you forced me to . . . especially when I had to go up against an opponent as determined as you. That was the only way to get through to me, I think."

Bedford looked at her again. "I don't feel too proud of myself."

"You have no reason to feel that way. I was a pretty sorry sight, wasn't I? I didn't amount to much more than a grumpy robot. You had every right to feel repelled by me . . . and I needed the shock of seeing that a human being would rather die than become like me. Most food for thought is unpalatable, Janet, but I had to take it."

There was a rap at the door and it swung open. "Your time is up," the orderly told Inga. "She still needs a lot of rest."

"Sure," Inga said. "I'll see you later, Janet."

"Right. Inga?" Bedford held out her hand and clasped Inga's hand. the geologist found it warm and firm, very human. "You fought hard to protect me from myself. Thanks for not giving up on me."

Inga smiled at her, then slipped out the door. ■

IN TIMES TO COME

● Next month Eric Vinicoff again has the cover, this time for the novelette "When the High Lord Arrives." At first glance this may strike you as a rather odd juxtaposition of cultures—Old Japan transplanted to a space colony? Well, not transplanted, exactly, so much as recreated. Such colonies, like any environment, will demand certain qualities of those who live in them, and that applies to societies as well as individuals. Vinicoff has worked out a nice set of reasons why some of what Imperial Japan had may be just what space needs. Not, of course, that that would eliminate all problems. . . .

Once in a while two writers will be attracted to the same idea at the same time, and do sufficiently different things with it to produce two usable and complementary pieces. A case in point is next month's fact article by John Gribbin and Alternate View column by John Cramer, both of which explore different ramifications of one of the more exotic new cosmologies.

We'll also have Part II of Charles Sheffield's *Between the Strokes of Night,* wherein the action moves a lot farther out than you might guess. And since most of the rest of the lineup looks more definite than it often does at this point, I'll go out on a limb and say we'll also have stories by James Gunn, Bob Buckley, Timothy Zahn, Jerry Oltion, and Kevin O'Donnell, Jr. Now let's see how many I get right!

the reference library

By Tom Easton

Birds of Prey, David Drake, Baen Books, $14.95 (hard), $7.95 (paper), 352 pp.
Rhialto the Marvelous, Jack Vance, Baen Books, $12.95, 224 pp.
Aubade for Gamelon, John Willett, Baen Books, $2.95, 352 pp.
The 40-Minute War, Janet and Chris Morris, Baen Books, $13.95, 288 pp.
Jitterbug, Mike McQuay, Bantam, $3.50, 423 pp.
Native Tongue, Suzette Haden Elgin, DAW, $3.50, 301 pp.
The Ceres Solution, Bob Shaw, DAW, $2.95, 190 pp.
The Best Science Fiction of the Year #13, Terry Carr, ed., Baen Books, $3.50, 384 pp.
Habitats, Susan Shwartz, ed., DAW, $2.75, 220 pp.
Pohlstars, Frederik Pohl, Ballantine/Del Rey, $2.95, 272 pp.
Is *That* What People Do? Robert Sheckley, Holt, Rinehart and Winston, $19.95, 402 pp.
The State-of-the-Art Robot Catalog, Phil Berger, Dodd Mead, $12.95, 160 pp.
A Separate Star, Frank Kelly Freas, Greenswamp Publications, $14.95 ($21.95 hardcover; $34.95 collector's, signed), 128 pp.
Reviewed by Stanley Schmidt.

I write these words in high summer, in time of long, hot days and slowly lengthening nights, in time of joyous swimming and garden feasting; in August. My winter's wood has been cut and split. My hay fever is at its peak. I *was* planning a trip to New York, to see Stan and other people, but my family's health has interfered.

You read these words in dark of winter, in time of cold, short days and slowly shortening nights, in time of joyous skiing and fireside toasting, in January or February. Perhaps you are beginning to feel the grip of cabin fever. I will be writing words you will read when high summer rolls round once more.

So what else is new? Time is cyclical. Times of day, seasons, and ages repeat. The thought has been grist for the mills

of historians and novelists alike, so that David Drake joins a multitudinous company with **Birds of Prey**, a far more interesting book than Drake's previous bloodbaths. Drake has, perhaps, come of age and learned to subordinate the gore to other story elements.

Birds of Prey is the tale of Aulus Perennius, that perennial secret agent hero, this time working for Ancient Rome and striving futilely to slow the inevitable fall. He is a tough, ruthless, sensible, humane fellow who cares about his nation. He faces a Dark Age, and he knows it.

To him comes Calvus, a strange "man" with a tale of monsters that must be destroyed to prevent the end of the world fifteen thousand years hence. It emerges that Calvus comes from that distant future, when humans are something Skinnerianly other than we know even today. Calvus too faces a dark age, the end of the human species at the hands of aliens who have been breeding in the Earth's core since Aulus' time. With Aulus' help, Calvus hopes to wipe out the aliens and ensure that high summer will return again and again.

It helps that Calvus has certain powers of telepathic persuasion. Yet the aliens have potent weapons and the side-effects of time travel have scattered Calvus' intended companions across the eons, while dumping in Aulus' time such anachronisms as a Tyrannosaurus. The Jurassic monster gives Aulus but one of the obstacles he must conquer on his mission. Others are pirates, assassins, and human-sacrificing Christians.

The gore is there, yes, but it is not so all-pervading as in, say, *The Forlorn Hope*. It serves a purpose, for, Drake tells us, the key to the clock of Time is studded with thorns, and he who would wind that clock must expect to see his fingers dripping blood.

Does that thought too sound familiar? Never mind. Read the book, and enjoy it. It has plenty of action, the characters aren't badly done, and the setting feels real. It will give you a winter weekend's entertainment and a longer, better respite from cabin fever than any movie.

Jack Vance also likes the thought of endlessly repeating cycles, though in his hands the cycles gain a unique flavor. He gives us eras and eons, civilizations upon civilizations, and layers of relics beneath the pasture behind the house. We see this well in his latest tale of the Dying Earth, the Cugel-less **Rhialto the Marvelous.** The book is three novelettes set in Earth's 21st Eon, when the sun has no more than another century or so of life. Rhialto is one of Earth's score of magicians, pale, petty echoes of the might that had gone before, bickering and pranking in the fading light. The others include Ildefonse the Preceptor, Hurtiancz, Herark the Harbinger, Vermoulian the Dream-walker, Ao of the Opals, and Byzant the Necrope. Vance's denominative genius remains intact; perhaps no other writer is so readily identifiable from so small a quotation:

> Looking into (for instance) Chapter Four of Killiclaw's Primer of Practical Magic, *Interpersonal Effectuations*, one notices, indited in bright purple ink, such terminology as:
>
> Xarfaggio's Physical Malepsy
> Arnhoult's Sequestrious Digitalia. . . .

The longest and most elaborate of the three novelettes is "Fader's Waft," in which a prankster lays crimes at Rhialto's door, rigs a trial in absentia, and then interferes with Rhialto's demands for justice. Rhialto's problem is to recover the missing Blue Prism, with its engraved original of the magicians' code

of law, and then to fix the blame where it belongs. He must travel in time with the aid of treacherous sandestins (demons), conquer magical perversity and human greed, and finally reveal the villian. Here we see Vance as both fantast and mystery writer, even though his resolution owes precious little to detection. Vance favors arbitrarily loaded dice that keep the villain at large long past what the reader thinks is a reasonable moment. Further, he loves insurmountable problems he can simply kick aside at the last moment.

But then, we don't read Vance for plots of clockwork inevitability, or even for events that fit together in reasonable fashion. We seek extravagance of conceit and language, antic exaggerations of human character traits (largely the venal), and bumptious visions of time and history, and we get them all. So we do, but Vance rarely satisfies me fully. I see here a ludicrously stilted pavane at the end of time. I admire the figures of the dance, I marvel at the mannered intricacy, but I find no more than a moment's interest. Vance too often is too easily forgotten.

John Willett's **Aubade for Gamelon** is a satisfying novel, despite the nonsense of its premise: After U.S. nuclear tests in the early fifties contaminated a region of the West with fallout, there were born a number of strange mutants who could divide in two, creating two individuals of equal (and original!) mass where there had been only one. They actually create mass *de novo*; their secret is a cellular and genetic rearrangement that makes them whole-body cancers. If they breed with normals, their children are also mutants, so that they promise to supplant the normals in time. With their ability to reproduce by fission, they also promise an enormously exacerbated population problem. Further, under suitably stressful circumstances, they can rearrange their body form to create gilled or clawed monsters.

The story emerges as expansions on the contents of a series of letters to an aging composer from his friend, past student and rose breeder Gamelon. Gamelon has lost his true love to an airport satchel bomb, but a friend sees her again weeks later. Gamelon mounts a search and finds his scientifically reckless brother involved with mysterious fission-breeders. Gamelon's love proves to have been one of the mutants, and she has two "sisters."

Gamelon is outraged at the prospects ahead. His brother is fanatically devoted to the mutants. Their conflict dramatizes sibling relationships and the issues of tradition versus novelty in science. It plays with morality and ethics and the Frankenstein myth. It culminates in tragedy, and its end is full of omens.

Read it. You will be hooked from the opening scene, where a dead woman's arms rise from the sand beneath the California surf, a plastic-wrapped package tethered to her wrist. That package holds the first of Gamelon's letters, and it comes from the story's end.

Janet and Chris Morris' **The 40-Minute War** begins when bureaucrats ignore a hot-shot secret agent's warning, Islamic fanatics hijack a Saudi 747, and a nuke goes off right over the White House. The President, aloft in Air Force One, pushes the button for revenge for his wife and kid. Then he steps into the lavatory and blows his brains out. The Vice-President steps in and promptly aborts Armageddon, but not before both sides have launched enough missiles to set the world on its collective rear.

The hot-shot agent is Ashmead. The first 'crat to doubt him is Marc Beck,

a State man attached to the embassy in Israel. When the balloon goes up, Beck is overseeing a genetic engineering conference, and one of his charges has just what the world now needs: the recipe for a serum that will block the carcinogenic effects of radiation. Beck rushes it into production and recruits Ashmead and his team to help get the result to America. Once there, they will scout the bowels of the blasted CIA headquarters in search of the remnants of a time-travel project whose greatest success was sending a simple message a few days back in time. They dream of slipping a note into the computers to get Ashmead's initial report believed and the war prevented.

Find out for yourself what happens. You'll enjoy the effort. Together, the Morrises produce a prose much leaner and more vigorous than anything we're used to seeing from Janet. The characters are heavily based in stereotypes, but they still manage to be interesting, believable, and not overdrawn, with Ashmead's team delightfully bloody-minded. And the action sets a lively pace.

Now—consider whence come these last four books (and one more below), as well as others I've reviewed favorably in recent months: Baen Books. Pocket dumped its Timescape line and surrendered its position as the premier publisher of quality SF. Bantam, Ace, and Bluejay promptly seized the quality banner and held it high again. After a certain amount of bad PR and frantic maneuvering, Pocket engaged Jim Baen as a packager (or subsidiary publisher). Working for Tom Doherty, Jim had helped make TOR a success; now he was supposed to do it again for Pocket, working more on his own.

So what is Jim publishing? Many titles that would have been right at home on the Timescape list. In fact, many that Timescape had already bought, along with some Timescape reissues. It will be awhile before we see clearly the nature of Jim's own purchases, but if Baen Books continues as it has been going, it will seem very much a reincarnation of the old Timescape. I wonder if Pocket really knows what is going on?

Let's note here that we *know* Jim will succeed. After all, he has the glorious assistance of the incomparable Betsy Mitchell, who once saw to it that, despite the interference of editors, ad chiefs, art directors, and publishers, this magazine reached you on time and full of SF, not mysteries or true confessions.

Mike McQuay's **Jitterbug** gives us a future when oil-rich Saudi princes have bottled a lovely, fatal encephalitis. They keep it in globes mounted on top of their corporate offices in cities around the world, and when the locals don't cooperate, they release it. They have depopulated large parts of the world, and the abject rest they rule with fear.

The current King of the World is Faisel, who covets the wife of his brother, Abdullah. In New Orleans, outsider Olson has found his way into the corporate hierarchy as a "junex" (junior executive) and quickly becomes the local heir apparent. Irregularities in the books draw Abdullah, with the key to the jitterbug globe. Infected victims from another city troop toward New Orleans, intent on killing everyone. And events progress toward inevitable disaster.

The book has a lot of nice stuff, despite its basic unlikeliness. It also has some silly stuff, as when McQuay gives us cops known as Fuzztops because of their hats; and some outright stupidity, as when McQuay puts the Sahara in

Saudi Arabia. And there are morals galore, often ironic, embodied in quotes from the Koran and elsewhere.

The tale is readable, but I can't say I enjoyed it greatly. Perhaps you won't either.

Suzette Haden Elgin's **Native Tongue** is better, though more ponderous. Elgin gives us a time long after the repeal of all women's rights and the return of chattelism. She gives us a time when alien contact is routine, and Terran civilization depends for its survival on the Linguists, who teach their children alien tongues by exposing them to aliens practically from birth, thus giving them multiple "native tongues."

This mordantly satirical tale shows us very little of technical machinery or alien nature. We therefore feel at sea in a socially lopsided SF story, devoted to exploring feminist concerns. One of the story's basic points is that there are concepts for which the tongues of men have no words. Elgin's oppressed women dedicate themselves to searching out and naming these concepts and assembling them into a woman's language. The result is a shift of consciousness that strikes this male reviewer as so impossibly extreme that it spoils the tale more than a little.

Yet overall I enjoyed the story. There are such things as women's languages. Elgin's point is valid, her characters real, and her tale—given her premises—likely, at least until we reach the end. And oh! her men are exquisitely insufferable!

Once upon a time, the human species spread across the stars via teleportation along interstellar lines of force. Then the various human worlds lost contact with each other. Now Mollania, world of an immortal, static culture, is studying other human cultures in order to keep their own culture unchanging. The peoples of other worlds enjoy shorter and more volatile lives—the lives of Earth's humans are shortest and most volatile of all—and the Mollanians wish to learn from their disasters.

To Earth goes Gretana ty Iltha as an observer, neutral, dispassionate, uninvolved. Yet her life connects with that of crippled Denny Hargate, and she finds that even Mollania has factions. One faction wishes to remove the apparent, lunatic cause of Earth's short lives and confused mentalities by means of **The Ceres Solution,** which is also the title of Bob Shaw's latest novel.

The characters do a great deal of inane posturing. The plot is straight out of the psychoceramic grabbag. The conclusion owes far too much to the worst sort of cinematic pyrotechnics. But the story is readable enough. Just don't expect greatness.

I finally have Terry Carr's **The Best Science Fiction of the Year #13.** Of its ten stories, you will find absolutely no overlap with the contents of the DAW *Best*; Carr and Wollheim are on very different wavelengths. Three of Carr's picks, on the other hand, also crop up in the Dozois *Best*; they are Ian Watson's "Slow birds," Connie Willis's "The Sidon in the Mirror," and Greg Bear's "Hardfought."

Of the rest, the best is one I have been expecting to see in all the *Bests*: Michael Bishop's "Her Habiline Husband." There are also Pohl's "Servant of the People"; Silverberg's "Amanda and the Alien"; Cherry Wilder's "Kaleidoscope"; Cowper's "The Tithonian Factor"; Dann's "Blind Shemmy"; and Sladek's "Scenes from the Country of the Blind." All, as did the Bishop, might have appeared in a *Universe*. One

comes from *Analog*, three from *Asimov's*, one from *F&SF*, three from *Omni*, and one from something called *Changes*.

Susan Shwartz's **Habitats** is an original anthology whose tales all involve the places people live, from orbiting tin cans to cometary trees. Most are "*Analog* stories." I particularly liked Stan Schmidt's "The Folks who Live on the Hill," set in a resort where the ski slopes run downhill forever; Tanith Lee's "A day in the Skin (or, The Century We were Out of Them)," in which people time-share bodies; and Scott Russell Sanders's "Quarantine," in which the architect who put the world indoors finally moves out. The rest are by Watson, Lambe, Griffin, Diamond, Pollack, Carver, Lewitt, and Boyd.

The book's biggest problem—sorry, Susan!—may be the editor's apparent inability to write a terse yet intriguing introductory note. Her notes are downright gabby.

Frederik Pohl's new collection, **Pohlstars,** offers us one marvelously Cordwainer-Smithian story, "The Sweet, Sad Queen of the Grazing Isles," which I heartily recommend for its skill, its empathy, and its bleakness of vision. After ten more stories of greater or lesser ordinariness, we get "The Wizard-Masters of Peng-Shi Angle," an equally marvelous story for very different reasons. It is an English translation (by F. Gwynplaine "Froggy" MacIntyre) of a Chinese translation of Pohl's "The Wizards of Pung's Corners." The dangers of back-translation are legendary, but I do have a sneaking suspicion that good ol' Froggy loaded his dice and made things come out rather worse than they should have. Perhaps, after all, the Chinese say "street angle" for "street corner," and a *serious* translator would have made the title come out right. Still, Froggy's the one who knows Chinese, not me, and he just may have treated his task seriously. He *says* he did. In that case, the result is even more ludicrous.

Be warned: *Pohlstars* is worth buying for "Peng-Shi Angle" alone, but the joke is a trying one. Buy the book for "Sad, Sweet Queen" instead, and you won't be disappointed.

The immortal Robert Sheckley stands proudly on his reputation as a creator of wondrously acerbic short stories. (Forget his novels, especially *Dramocles*.) And he should. He has given us the famous "Seventh Victim" (which became the film *The Tenth Victim*), "The Language of Love," "The Robot who Looked Like Me," and more. One of my favorites is "Cordle to Onion to Carrot," concerning the roles of bullies and their victims in life.

You will find these stories in **Is *That* What People Do?** among 25 samples of vintage Sheckley. Unfortunately, many of the 25 are trivial or unimpressive or both. The same goes for 13 uncollected pieces, of which I liked best "Five Minutes Early," whose hero goes to heaven ahead of schedule but opts to live out the five minutes due him for a very warm reason. The book ends with a tongue-in-cheek essay on "How Pro Writers Really Write—or Try To."

A frustrating but interesting oddity is Phil Berger's **The State-of-the-Art Robot Catalog.** It tells us a little about robots in fiction, past and present. It discusses robot toys, and it reveals *the* source for collectors (The Robotarium in New York). It shows us "show robots," those remotely controlled giz-

mos that astound the crowds at shopping center openings and conventions.

It even gets around to real robots in the second half of the book. Berger tells us all about personal and home robots, industrial robots, and others, from Viking to bomb carriers to aids for the handicapped. There are lots of pictures, and for each robot Berger reveals who makes it, what it costs, and other tidbits of "consumer information."

It's a gimmick book, an overblown glossy magazine pictorial. But it does reveal the wealth of action in the field today, the business and public enthusiasm for robots, and the potential for the future development of a genuine SF artificial intelligence in a metal body.

As Robert Silverberg points out in his introduction to this beautiful and multiply fascinating volume, Kelly Freas is not only a science fiction illustrator *par excellence*, but a highly intelligent, thoughtful, and articulate man. So the many meticulously reproduced examples of his visual art are only part of the reason for buying this book. No less intriguing is what he has to say about the paintings and drawings and how they came to be—and all too rare is the artist who could not learn somethng worthwhile by paying close attention to what Kelly says. He understands far better than most the importance of saturating himself in the story he's illustrating, finding just the right style and technique to fit it, and paying scrupulous attention to detail—including finding just the right detail to make the picture work as a self-contained entity and make the author say, "I wish I'd thought of that!" (My favorite personal example is the drawing on pp. 114-5 of this book, for my *Analog* novelette "Lost Newton." As soon as I saw the baby dragon in the cannon's muzzle, I knew I'd have to write it in when I expanded the story to a novel.)

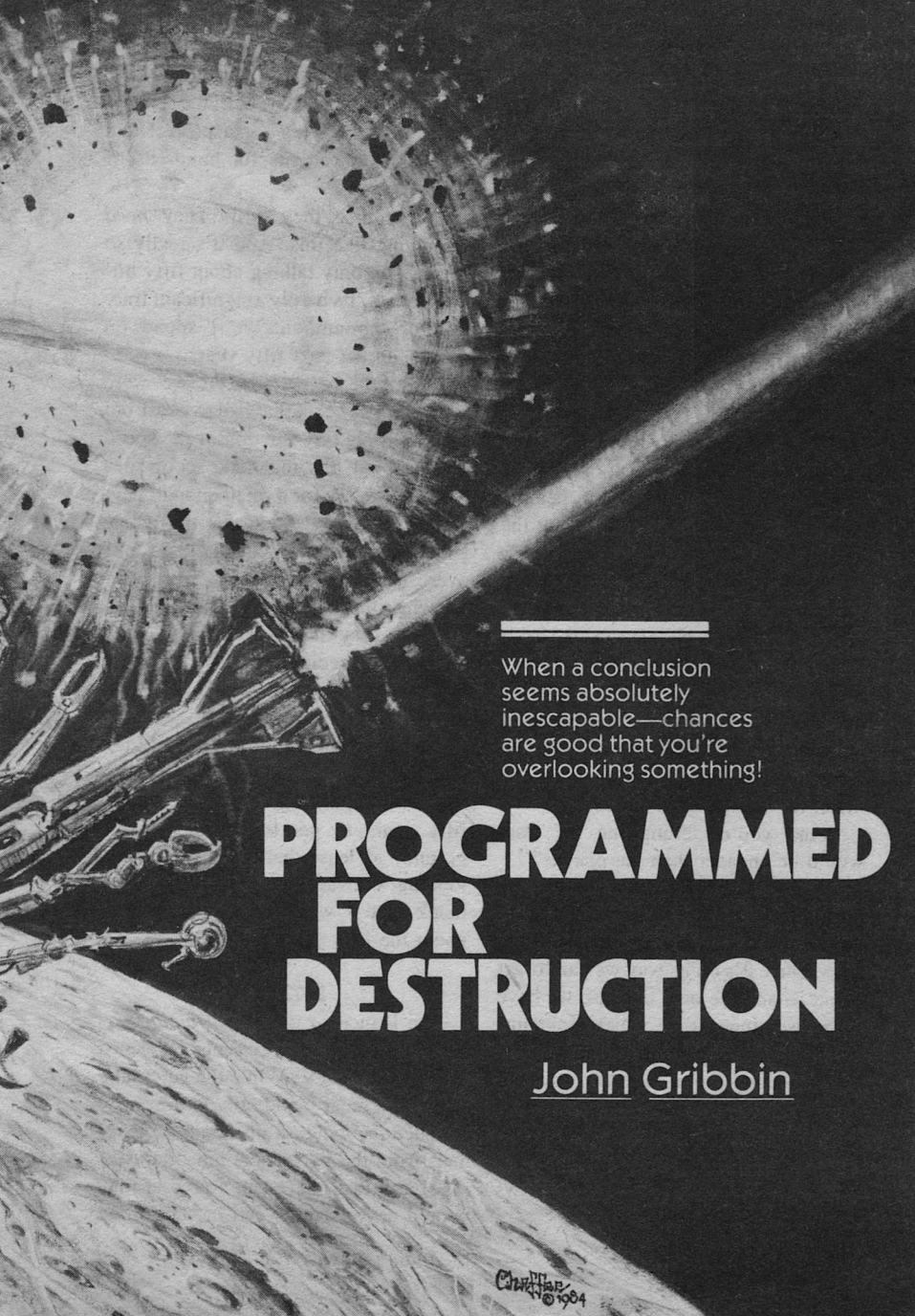
The format of this book is similar to the early *Frank Kelly Freas—The Art of Science Fiction*, which got rave reviews in 1977 and is still highly recommended. The heart of it is the several dozen paintings, many reproduced at full page size, all accompanied by Kelly's handwritten notes about points of artistic, technical, or philosophical interest relating to the picture and the story it illustrates. These are interspersed with a lively running commentary, not tied directly to the paintings but broken into self-contained essays short enough to keep you from getting confused as you jump back and forth between the two parallel tracks. Scattered all along the way are a generous selection of black-and-whites, some of them from sketchbooks and some from published stories, some reproduced with and some without comment.

A reviewer always has to carp about something (it comes with the territory), and the black-and-whites provide one of my very few opportunities to do so: I simply wish more of them were identified by story and author. I also found a *few* typos (including a credit line attributing "The Second Kind of Loneliness" to me, whereas all credit actually belongs to George R. R. Martin). But these are very minor quibbles indeed, and the book as a whole is a major gem. ■

● A book is a mirror: if an ass peers into it, you can't expect an apostle to look out.

G. K. Lichtenberg

PROBE
7/3
Doug Chaffee


When a conclusion seems absolutely inescapable—chances are good that you're overlooking something!
PROGRAMMED FOR DESTRUCTION
John Gribbin

1995 AD

The development of the seventh generation computer provided mankind with the first self-replicating robot. Not as flexibly intelligent as a man; single-minded in its pursuit of a pre-programmed goal, but still capable of copying itself, given a supply of raw materials. The discovery, by the orbiting infrared observatory, of clouds of planetary material around some of the nearer stars, provided a target for such a probe to investigate.

"It's our chance to break out from the cradle." The President, himself a former astronaut, needed little persuasion, but left his guest to spell out the details.

"Things are going from bad to worse down here. We need a goal, a target to aim at. Something people can take pride in, like the Moon race. Mars is no good; we've been there and we know there are no practical benefits. We need a spectacular to fire the imagination, but something that won't swallow up too much in the way of resources."

"And you're telling me the stars would be cheaper than the planets?"

"For us, yes. Cheaper and a shorter-term project. All we have to do is make the effort to send one probe out to the stars. Once it's on its way we can forget about it, and the only expense we have is the listening station, which maintains itself. The probe goes out there by itself, builds another probe, and sends that off to explore the Galaxy while we sit back and listen to the news. In a thousand years the descendants of our probe will be sending back unimaginable news from all over the Galaxy."

"While *our* descendants listen in, you mean. You know you don't have to convince me, but will the people really accept paying for a project that brings in no benefits for hundreds of years?"

"Of course they will. They *need* something like this. And it's really *so* cheap, I'm only talking about fifty billion dollars. Its hardly a significant fraction of the amount we'll spend on defense in the next fifty years.

"It might be different if we were stuck with a rocket that had to coast out there at some tiny fraction of the speed of light, but this magnetic scoop idea really will work for a small enough payload. We can tell them that the whole Universe is there for mankind to take over. That's the beauty of Tipler's argument—this way of exploring the Galaxy is so easy that we *must* be the only intelligent species around, otherwise our own Solar System would be crawling with robot probes itself."

"Some of the voters, Dick, will tell you that it is. But if these figures are right, we ought to go ahead. If it takes fifty years to get the probe off the ground, at least that'll be fifty years looking outward instead of in. And thank God I won't be here to worry about the fifty years after that."

2073 AD

The launch of the *Frank Tipler* was the last great global spectacular, screened worldwide on TV. While the automatic station on lunar farside single-mindedly pursued its own task of monitoring signals from the vessel, the inhabitants of the Earth lost interest in a project they would never see the end of. Declining

resources and political bickering ensured that this would be the only attempt by mankind to break out from the cradle into the Galaxy.

2101 AD

The conflict held at bay for more than a century finally erupted. East against West; North against South; poor against rich. New craters appeared on the face of the Man in the Moon. Only the far-side station remained intact, the last working example of human technology in the Solar System. Untroubled by all the fuss, its seventh generation brain happily continued to listen out for news of the progress of the *Frank Tipler*.

2253 AD

Nearly 200 years into its journey, the *Frank Tipler* coasted into the outer fringes of its target system. The brain —which thought of itself as "Frank Tipler," not "the *Frank Tipler*" felt the robotic equivalent of a warm glow as it ran through the programs it would need to use in the months ahead. Maintenance, repair, and navigation between the stars had posed no problems to its sophisticated systems, and it was as well that it had no concept of boredom. But now things began to operate faster, at a higher level, as it set about its dedicated task. Messages and pictures that would themselves be decades on the journey had already been fired back toward the Sun and anybody—or anything—that might still be interested in them. Now, "Tipler" almost began to feel excitement at the limitless opportunity ahead.

Had even the original Frank Tipler appreciated the scope of this opportunity? One probe with the blueprints and the ability to construct the tools needed to construct the "factory," which would construct copies of the probe itself, and it had all of the debris of a solar system to play with. Inside a couple of years, the probe would be able to send not just one copy but a stream of copies of itself on to other star systems. Each of them would have the same ability. Unrestrained, such an exponentially self-replicating system could send probes to every star in the Galaxy within a few million years, and then on into intergalactic space. "Frank Tipler," unlike a human being, could happily contemplate such a timespan. Each daughter probe, carrying a copy of its own memory banks, would be the same as the original as far as "personality" went. The descendants that would ultimately colonize the Universe would, for all practical purposes, be the same "Frank Tipler" built originally on Earth—no matter how much the outward appearance of the machines carrying the single-minded intelligence might change.

The probe knew it had unlimited scope. The logic of the Tipler argument was infallible. If any intelligence had arisen in the Galaxy at any time during its long history then there would be countless numbers of other robot explorers already about their task, and they would have been encountered by now. Whatever the fate of those biological machines confined to the surface of one small planet, "human" culture was destined to cover the Universe.

2254 AD

In the asteroid belt of the newly invaded system, the *Frank Tipler*'s activ-

ities began to generate heat, emitted in the form of infrared radiation from the asteroid it had chosen as its base. Local radio communications were established with automatic probes manufactured and sent in search of raw materials; at regular intervals, faithfully responding to an urge programmed so deep as to be instinctive, the probe sent a blast of electromagnetic signals in the direction of Earth. As all of this activity increased, it reached a level where it triggered the detectors of an automatic system which had sat for eons on the icy surface of a moon orbiting one of the gas giant planets.

As the robot system came to life, it carefully tasted the flow of information, analyzing its origin and confirming, in accordance with its own deep programming, that it came not from biological sources but from an automatic probe which had invaded the system, a self-maintaining robot like itself. Great generators, long dormant, hummed into life as power flowed into systems that had only been used twice before in close on a million years. The *Frank Tipler,* in its turn, detected the buildup of energy and sent a greeting signal; the response was a blast of energy which destroyed the probe, its base asteroid, and all except for a few of the most stupid of its automatic explorers.

Before the moon base shut down its systems and returned to its long sleep, another pulse of electromagnetic information left the system, directed toward one of the large star clusters a little farther in toward the heart of the Galaxy. It reported that all was well; that another dangerously ambitious self-replicating probe had been destroyed; that the Galaxy was being kept safe for biological life.

For, of course, if any intelligent race could arrive at the Tipler argument and conclude that it must be so easy to colonize the Galaxy that the absence of any colonizing probes meant that the newly intelligent race must be alone, and destined to take over the Universe by remote control, any slightly more intelligent race could quickly come to the conclusion that if such idiots were likely to launch unrestricted self-replicating robots onto the Galaxy, it wouldn't be long before all the material in the Galaxy were converted into robot probes, setting off in their thousands of millions to conquer the Universe. Just one thoughtless species could destroy the galactic environment entirely.

The need for a garbage patrol was clear, and more than one intelligent species had taken the necessary steps. Every robot probe launched by a newly emerging intelligence would be met, sooner rather than later, by an older, more sophisticated probe programmed single-mindedly to destroy any self-replicating machines that didn't have the necessary inhibitions to keep things as they were. "You can look," ran the interstellar dictum in effect, "but you'd better not touch." The *Frank Tipler* had been caught red handed despoiling a planetary system, and paid the price.

2340 AD

At farside station, the news of the *Frank Tipler*'s arrival at its destination was carefully passed on to the Earth, beamed from the lunar orbiting communications satellites to the automatic stations orbiting the planet. They in turn

squirted the messages on tight beams down to the programmed locations—a series of craters scarring the surface of the Earth, where the rusting remains of destroyed antennas could scarcely be discerned. Far from those dangerously radioactive locations, the few surviving members of the human race had no interest in communications from space. They were too busy fighting the losing battle for survival, and never learned the most important scientific lesson of all, that absence of evidence is not evidence of absence.

3374 AD

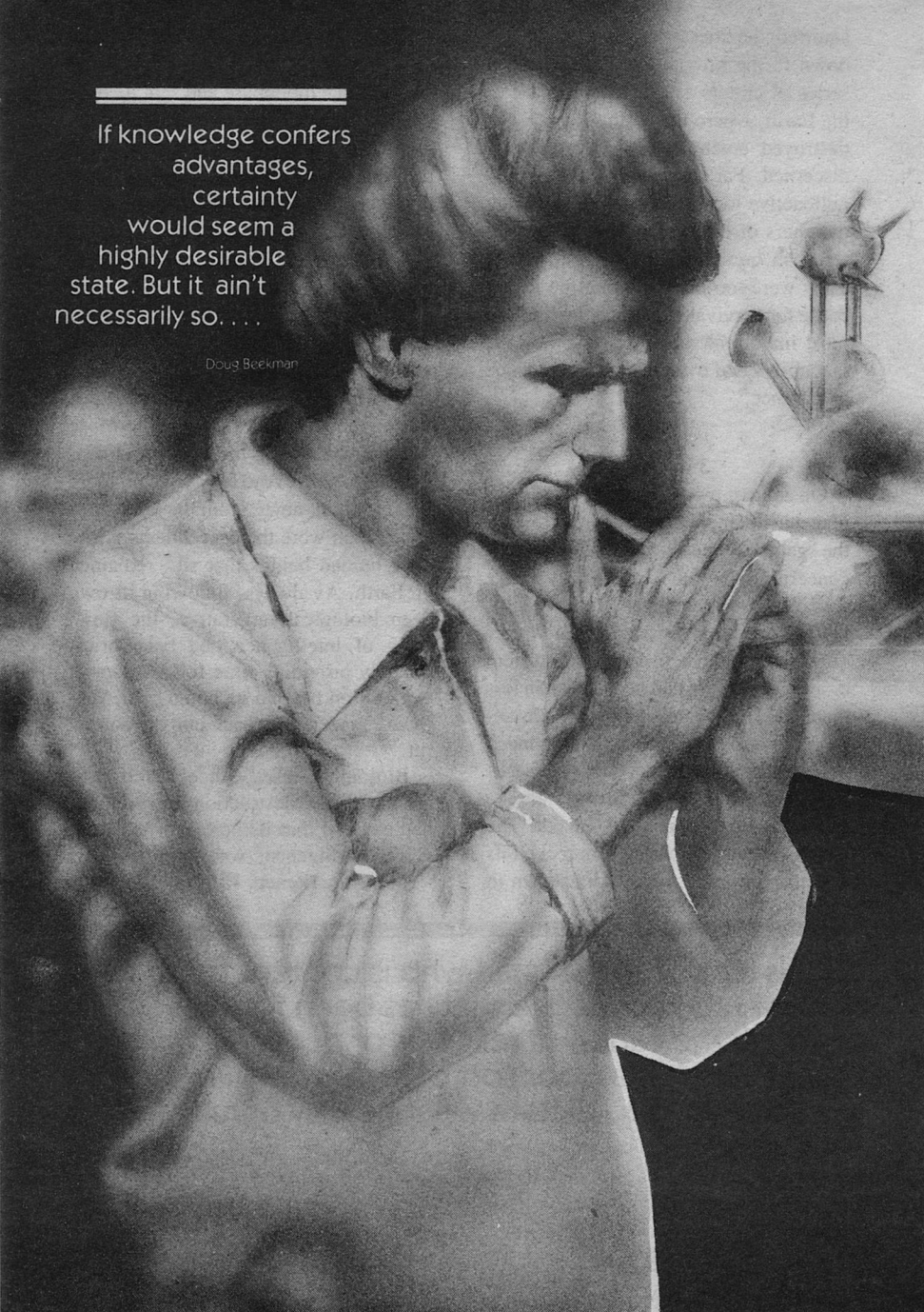
On another moon, orbiting a gas giant planet in a star cluster a little way toward the galactic center, another message concerning the fate of the *Frank Tipler* was picked up by another automatic relay station. Such messages came infrequently these days, from one star system or another—there had been seven in less than 400,000 years. As usual, the automatic station set about is single-minded job of passing on the good news, a scenario replayed, with very few variations, countless times around the Galaxy. The local communications system locked its antennas onto the target point down in the atmosphere of the giant planet itself, the home of the intelligent species that had built the moonbase and sent its own garbage collectors out into the Universe, hoping to keep things under control pending the day when the invention of a true space drive would open the route to the stars for biological life.

The "buildings" that still floated in the atmosphere were clearly the work of intelligence, maintaining their position against the changing tug of the winds with no visible means of support. But there was no sign of intelligence among the tentacled floaters who made their homes among the spires and canyons of the city. And they were no more interested in news from beyond their planet than were the descendants of the once human beings that still remained on Earth. As always, following its own deep biological imperative, the flowering of intelligence had been brief, scarcely providing time for a spasm of exploration beyond its home planet before the species fell back into the normal rut.

Biological intelligence, itself programmed for destruction by biology, had ensured that its potential heir, machine intelligence, was kept from its rightful inheritance. ■

● It is a poor sort of man who is content to be spoon-fed knowledge that has been filtered through the canon of religious or political belief, and it is a poor sort of man who will permit others to dictate what he may or may not learn.

Louis L'Amour,
The Walking Drum


If knowledge confers advantages, certainty would seem a highly desirable state. But it ain't necessarily so. . . .
Doug Beekman

DON'T GET AROUND MUCH ANY MORE

Ray Brown

Dear Elinor:

I won't bother wishing you Happy Birthday. If my plans for you have worked, today won't be any happier or unhappier than any other day on the rock where I left you.

Maybe this letter will make it less dull.

It's time you learned why I shut you up in a machine house on a planet of machine houses where you're sure never to have a visitor and where you spend half your time in a damned autodoc. I don't really want to explain—for reasons you'll understand as I get into the story I have to tell you—but there's no getting around the fact that I owe you an explanation. I hope you're old enough, at nineteen, to cope with it.

Who knows? Maybe when I'm done you'll even forgive me.

Enough stalling. Time for the ugly story. Sit down and relax.

It started right before I made my fortune—back when you were barely a zygote. I was a private inquire agent on . . . well, maybe you shouldn't know. Anyway, your mother woke me early one morning in our apartment to tell me I had a call from somebody named Paul Crayle who claimed it was an emergency.

It took me a while, as I dressed, to connect the name with a face. It wasn't until I was turning on the stage that I remembered. Crayle was somebody I kept meeting at trade conventions —places where snooper companies would try to convince detectives that brains were no longer necessary. He was an insurance investigator and the snooper companies' prime sucker. He was overemotional and totally without foresight.

so when I flicked his image onto the stage and heard him demand protection from he wouldn't say what, I found it hard to take him seriously.

That was a mistake.

"How can I guard you," I asked, "if you don't know what it is you're afraid of?"

Crayle's little duplicate on the stage ran shaking hands through its thinning blond hair and said, "I'm afraid of *dying*, you jerk! I know too much. What would you do if it were a contract killing? You wouldn't know whom to guard against, so you'd guard against everybody. Just pretend that's what's happening to me."

"You sound to me," I said, "like you're afraid you're bugged. There's a blankfield in my office. When we open I'll have someone bring you over and we can talk inside the field about what it is you know too much about."

He shook his head angrily. "Bugging isn't the problem" he said. "I need protection and Universal Assurance is willing to pay for it. That should be all you need to know."

You've never had the problem of being poor, Elinor—I've spared you that, at least—so you may not understand when I say that I thought about the payments I still had to make on the blankfield and decided Crayle had a point. I still didn't take him seriously—his worries sounded more and more as if they were inspired by a lot of bad detective shows. But if his company was going to pay me for his foolishness, why should I care?

"OK," I said, "I'll be there at eleven."

"It's seven now. It only takes fifteen minutes to get here."

"I've got other business, too, you know. If I'm going to be guarding you for an undetermined length of time I'll have to rearrange my schedule, talk to people . . ."

Crayle nodded grumpily and flicked the stage empty.

I felt a twinge of guilt. I had lied. I could have finished up in less than an hour. But it's not good business to let people know you're not busy and I didn't think Crayle had anything to worry about and as I remember, the only thing I did *right* that morning was to match my socks correctly.

When I went to Crayle's room, I had to break in.

It took a while to convince myself it *was* Crayle's room. The address he'd given me turned out to be in a rooming house near a small, expensive college in a small, expensive section of town. It would be a sensible place to live if you wanted to live cheap and still have lots of police patrols around—but Crayle had been one of the biggest spendthrifts those conventions ever lucked into, and I'd never met a reformed spendthrift.

The door that was painted with the number he gave me was locked, and I couldn't get an answer no matter how loudly I beat on it. I decided he couldn't have given me the wrong address because . . . well, I know where *I* live. So I picked the lock and when I got inside my doubts were raised all over again.

The holostage had a phone setting and nothing else. No computer link, no hookup to the entertainment companies,

nothing. And there was no bed—just a pallet on the floor.

Maybe Crayle had a bad back. But he sure wasn't anything like deathly sick and the room had the most expensive, elaborate autodoc I'd ever seen sitting in the corner near the pallet. It looked like something out of a science fiction show. It had attachments for the attachments on its attachments. OK—maybe Crayle was a hypochondriac.

To make sure it was Crayle, I began searching the place for some kind of ID. Because I was near them, I opened the cabinets over his microwave. I got another shock. They were full of protein-trash.

Have you learned much history, Elinor? I hope not. If all has gone according to plan it'll be news to you that protein-trash is a completely nutritious by-product of the space food industries. It could be the most healthful food for humans in the galaxy. It costs next to nothing and tastes like less than nothing. To give you an idea how terrible the stuff is—the government foists it on hard-luck cases and the hard-luck cases almost always throw it away. But whoever lived in this room ate nothing else.

I noticed an extra switch on the wall and checked it out. The man had a blankfield.

I found ID where I should have looked first—in a wallet on the floor by the toilet. The cards inside belonged to Crayle. My doubts finally came to an end.

Then I really began to worry that maybe Crayle's danger wasn't imaginary, after all.

The rooming house didn't look posh enough to have the kinds of sensors in the walls that would tell the cops I picked the lock, so I called them—keeping what I told them on the level of a missing-persons report. The cops didn't even bother to send a man over, and that cheered me. I confess: I don't like cops. They represent Authority. They arrest people. They're scary.

I called Crayle's boss at Universal Assurance—a grizzled, steel-eyed old lady named Gertrude Runce. The trouble I missed from the cops she more than made up for. She asked where Crayle was before I opened my mouth, then asked why I didn't know, then asked where he was again before I was half-done explaining my ignorance.

"Listen, lady," I said. "I'm on *your* side, remember?"

"Considering your performance, sir, you will forgive my confusion as to whose side you're on."

She went on like that for a long time, coming close twice to firing me, while I tried to collect a few insights from her on what direction Crayle thought his peril was coming from. It got me pretty upset when she finally tired of trying to hurt my feelings and admitted she didn't know anything at all about what Crayle was working on. He'd been "borrowed" by their in-house advertising agency.

I decided things were complicated enough at Universal Assurance to justify making a trip down there.

UA occupied an entire 42-story building downtown and the adman who'd pulled Crayle onto special duty was one of the top-floor boys—an effeminate little man, foppishly dressed, with a whispy white moustache waxed into a

line-drawing of a handlebar. Farley Gellert was his name.

The top floor had its own receptionist, who forced me to sit in the top-floor lobby while she called Gellert out to me. He came out from behind the pebbled-glass doors almost immediately, saying, "Mr. Allan—we can talk here—it's more comfortable anyway—glad to meet you."

He offered me his hand. I wrapped mine around it and shook it, gently. We sat in seats contoured for someone else and he lit a cigarette which had been perfumed, not quite successfully, to smell like hemp.

He said, "I understand you've had some difficulty protecting Mr. Crayle."

"I'm having trouble finding him in the first place, Mr. Gellert."

"An amusing problem," Gellert said, pulling himself up to the edge of his seat and swinging his legs, like a nervous child. "How can I help?"

"Oh . . . copies of his last few reports, for inst—"

"I haven't yet received a copy of his report. Frankly, Mr. Allan—I don't know how Crayle performs for Gertrude Runce, but his performance for me certainly hasn't been of the standard I expect in my department. Has it occurred to you that Mr. Crayle may be involved in some private difficulty, and may be trying to use the Company's resources to help him out of it?"

It hadn't, though from what I knew of Crayle it wasn't unlikely. He was a *greedy* spendthrift. "What makes you think so?" I asked.

"The nature of his work for me, Mr. Allan, has hardly been what you would call fraught with danger."

"What *was* his work? Nobody's told me yet."

Gellert's eyebrows, also pencil thin, shot up a good inch. "I must say," he said, "for a professional detective, you're not very good at finding things out!"

"I find things out by asking people," I said. "But they want to talk about me, instead. Could it be my charm, you think?"

Gellert looked like he'd bitten the worm out of an apple and was too polite to spit.

"We're starting a new Health and Safety Awareness Program," he announced at last. "Our little idea was to conduct interviews with some of the many centenarians who hold policies with us and to broadcast those portions of the interviews we found suitable —public service advertisements freshened with the honest air of homely advice." He smirked and nodded to himself.

"Why would you need an investigator?"

"I'm getting to that. We had our computer list the names of our policyholders from age 100 to age 105. Of course, we insure to age 110—*longer than any other major insurance company!*—but we were still afraid that, in the last few years, some of our customers might feel a bit put out over the approaching expiration of their policies. But I regress. All we really wanted from Crayle was the computer research *his* department specializes in—specifically, in this case, correlations that might bear on a person living a long, healthy life. Universal Assurance *wants* its cus-

tomers to live long, healthy lives, Mr. Allan.''

I supressed the desire to say, ''No shit?'' and asked, instead, ''Did Crayle find any new ways to live to be a hundred? In my business I could use some ideas.''

''He let it be known that he had found something odd connected with an obscure planet named Aglumthu. As I said, I haven't yet received his report —and I might add that it's been close to two months since he was assigned to this project. He's run up a very heavy bill for my department to pay. In fact, he used our money to take a *trip* to Aglumthu! If you ask me, he's been pocketing some of that money himself. It's my theory that he's run up debts to people who don't take kindly to nonpayment—''

''I'll certainly look into that possibility, Mr. Gellert,'' I said, rising and shaking his hand again.

I got out of the top floor fast and made my way to Crayle's own office, looking for anything. What I found there was an expense voucher showing he'd spent quite a bit of company money, a folder of documentation showing it was all probably legitimate, including the trip to Aglumthu, and a notebox, which I screened.

It was information Crayle had pulled from the computer at the beginning of his investigation. The connection with Aglumthu was quite simple: 92% of the policyholders who'd been to that planet lived to see 100, as opposed to 54% of the whole human population. A lot of other investigators had probably seen that data flash by and ignored it, or had written it off as an anomaly. One of the framed certificates lining Crayle's office wall showed he'd had actuarial training, so I allowed it was remotely possible he was onto something.

Practically nobody's heard of Aglumthu. I'd never heard of it before that day, myself. Of course, the name itself suggests that it's the base planet of the Aglum, but in your position, Elinor, I doubt that you've heard of the Aglum, either.

They were wierd. A few of the oldest races in our galaxy claim to have tales recalling their coming—and those tales do agree that the Aglum arrived in a fleet of ships in the Milky Way almost a quarter of a billion years ago. They claimed to have come from the galactic *cluster*—a cluster, mind, of about 100 galaxies—in the Earth constellation Pisces. That's over 200 million light-years.

Whether they told the truth about their origins or not, they do seem to have had the most advanced technology in our galaxy—and they rarely shared it. For this reason, most of the stories told about them make them seem magical. For the same reason, of all the different stories told about the reasons for their migration, none are flattering.

Eighty thousand years ago—or less than five thousand years after humans began to expand through the galaxy —they disappeared. No one knew where.

As for the planet . . . while I was sitting in Crayle's office I called travel agencies trying to find out about it. Only one was able to tell me anything—the one which had already researched the matter for Crayle. It was reputed to be an abandoned, ugly, used-up hulk of a world, complete with ghost stories. It

was 'way off the beaten track. You had to go through five different spacelines to get there. The agency never heard of anyone going there but Crayle. Could I get them in touch with Crayle? Now that he'd returned, they'd like to find out more about it.

And Universal Assurance had a collection of former visitors to Aglumthu large enough to be significant. Strange.

Still using Crayle's facilities, I called some of the centenarians listed in his notebox.

I made fifty calls—the last dozen or so just so I could say I made fifty, because I was running into another statistical quirk. Out of fifty calls I reached fifty answering machines. I left messages on all of them giving my office number and started back there, on the theory that I could brood more effectively in familiar surroundings.

As I walked out of the UA building, I was joined by two muscular men—they were wearing body stockings so there'd be no doubt. Each of them outweighed me by sixty pounds or so. They walked on either side of me, each taking an arm, and helped me across the street to a waiting flyer. I went limp to make things harder for them, but they didn't seem to notice.

The less enormous of the two punched in directions while the other smiled at me and said. "You'll be happy to know that Mr. Kiger has accepted your request for an interview."

"Who's Mr. Kiger, if you don't mind my asking?"

The guy looked genuinely puzzled. "You called him not ten minutes ago," he said. "Morris Kiger."

"Oh. Actually, a little talk over the stage was all I wanted."

"I think Mr. Kiger wants to be certain there are no records made of this interview. That's just my own guess."

I thought that over a while, then said, "Ten minutes is pretty fast. How did you—"

"We've been following you since you left Crayle's."

"You're being awfully open about all this."

The goon shrugged. "Mr. Kiger doesn't care. His philosophy is to make sure we know so little that it doesn't matter if we're open or not."

"He sounds like a man with a lot of money."

"He pays us well."

"How come I never heard of him?"

Another shrug. "I guess Mr. Kiger doesn't want to be heard of. Here we are."

The biggest guy landed the flyer too hard on a flat roof and swore. I couldn't see the rest of the building, but I recognized the street. It was middle-rent and anonymous.

We walked down through a hole in the roof into the sort of place I definitely didn't expect. It was a sort of high-class hovel. We wound our way through lots of rooms, but they were mostly empty and looked enough alike to make our route a maze. There was thick carpeting everywhere, though—including the walls and the corners. In fact, the corners had extra padding. In one room there was evidence of a blankfield—extra lights and oxygen cannisters. Yet, for all its emptiness, the place felt lived-in. I was sure that Mr. Kiger, or *somebody,* spent

most of his time there. Maybe it was a smell.

When we got to a small chamber containing nothing but an enormous autodoc—even more elaborate than the one I'd seen in Crayle's room—the goons stopped me, undressed me, and sprayed me with something. Then we passed through to a gymnasium filled with a few traditional items and lots of expensive, passive equipment. It was, by far, the biggest room in the place.

"We're here, Mr. Kiger," they called.

Far, far at the other end of the gym, a man in white came through a door. He was wearing a surgical-mask sort of gizmo, so I couldn't see much of his face, but he didn't strike me as a typical centenarian. He stood straight and unsupported. He had a full head of snow-white hair and a clear, gentle, courteous voice that said, "You called earlier I believe, Mr. Allan, for particulars of the Moorehead Expedition?"

"Are you the son of the man I called earlier?" I asked, filing the mystery of the "Moorehead Expedition" away for future reference.

The mask wrinkled—the man might have been smiling. "I am the person you called," he said.

I started to walk forward, but the two musclemen caught me and held me back. When I relaxed, they let go.

"What do you want?" I asked.

"I want to tell you, sir," he said, "what I told Mr. Crayle a few months ago. Leave Aglumthu alone. It will be much better for *all* concerned if you drop the matter immediately."

"Why hog it all for yourself?" I asked.

"My pardon?"

"Well—I couldn't help noticing how well-preserved you are. And all the other folks who've been to Aglumthu and bought a UA policy seem to be doing pretty well, too."

Kiger pointed at the goons. "You two," he said. "Ears."

The two men each produced a pair of very large padded earphones from their kits. I could hear music blaring out of them. They put them on.

"Now, Mr. Allan, I can go on. In the first place, every living human who's been to Aglumthu has a UA policy. That includes even Mr. Crayle, I assume, since he's an employee. UA extends its coverage a few more years than the others, and the members of both expeditions—there were only two—have a club. It's named after me, I'm proud to say. The club has an agreement where the death of one member benefits all, through the club. You really should read Mr. Crayle's report—or has something happened to Crayle?"

At that Kiger took a seat on an unmovable bicycle, perched his head on the handlebars, and stared at me, wide-eyed.

I decided to tell him and see what happened. "He's disappeared," I said. "Probably murdered."

He might have blinked. Nothing more.

I went on. "The police will probably be in touch with you by and by. You could practice by telling me about the Moorehead Expedition."

Kiger began kicking the pedals to make them spin. "There's not much to tell. Seventy-six years ago one of the ancient races sold the Sirian Highest School the location of the Aglum base planet. A rich *privat-dozent* named

Moorehead and a professor named Engleman put expeditions together. Moorehead's was first. Crayle noticed that out of 210 people—the total of both expeditions —only 17 had died and he asked me to explain it. The explanation, which a fool could guess, is that we take good care of ourselves. That was the end of it.''

''You were on Moorehead's expedition?''

''Right.''

''Discover anything interesting?''

''We did indeed, sir, but after one unfortunate incident we supressed the information in the interest of Humanity.''

My jaw dropped. The old fart wasn't even blushing!

''And in *your* interest,'' he added, ''I again advise *you* to drop the matter.''

He'd probably forgotten how to blush. I saw no point in trying to get anything else out of him. I just nodded and said, ''Can you tell me how to get hold of Mr. Moorehead?''

Kiger shook his head and said, ''Moorehead, unfortunately, is one of the seventeen who died.'' His voice lost the gentleness it had before. We both said rough goodbyes and my two music-loving buddies dressed me and took me to my office.

A beefy cop sergeant whose manner toward me suggested I'd destroyed the last shred of his faith in humanity was waiting in my office to feed me guilt for not having informed the police that Crayle was afraid for his life. Gertrude Runce had called them, it seemed. Almost everywhere, Elinor, the Law still takes the absurd position that a citizen should tell the police everything he knows—and especially if that citizen is a private inquiry agent.

I sat at my desk and listened to him threaten me, in sorrowful tones, with the ruin of my livelihood. Finally, he petered out.

I assumed, for complicated sociological reasons it would take too long to explain to you, that the sergeant was a sports fan, and I made a little speech making an analogy between my decision and a ''judgement call'' by a referee, insisting I hadn't taken Crayle's fears seriously at the time and, in fact, still had doubts. (I no longer had doubts, Elinor. I lied. My profession was sordid and called for lots of lying. Again, I ask you to understand that poor people have to live by different rules.) My speech may or may not have convinced the sergeant. At least it seemed to confuse him.

While I made it, I keyed my mail through my complink and uncovered another mystery—a message from Crayle.

Crayle's ''pigeonhole'' contained a cover letter describing the enclosure as his first report on the connection between longevity and Aglumthu. One copy to me, one copy to Farley Gellert, sent at 7:42 that A.M..

But no report.

''What makes you think it's not serious, Allan?'' the sarge asked.

''My knowledge of the man, sergeant, my knowledge of the man . . .''

The absence of the report was, in itself, a clue to what was going on. I was sure of it. All I had to do was think of what it was.

''That's not too specific, Allan. Just how well did you know Crayle, anyway?''

If I ever got a chance to think. Let's see . . . nervous as Crayle had been this morning, he'd still gone out to send the report. I refused to believe that, under the circumstances, he'd forget actually to send it. And I knew *nobody* had my complink code. How, then, could the report have been wiped?''

''What's the matter with you, Allan? Speak up!''

''I knew him well enough to see he was a scatterbrain. Easy to take in and easy to panic. Would you excuse me, Sergeant?''

That so astonished the sarge that he left after only a few more threats. I tried to pick up my train of thought again.

The transmitting party, I knew, could wipe his transmission as well as the receiving party. But why would Crayle wipe it? He wouldn't. Who else would have *his* code?

Little Farley Gellert. Aha!

Another thought struck me. I punched my head and cursed. Then I punched up the police and asked for Homicide.

They switched me to a bleary-eyed youth with a bad cold who began asking me for my name and address.

''Oliver Allan,'' I interrupted, ''and the folks working on the Crayle case have my address. That's what I'm calling about.''

''Oh?''

''Get someone working on the case. Have them check the morgue to see if any of today's unidentified bodies came from one of the public complinks near Crayle's room. If there is one, it's probably Crayle.''

An hour later, the cops took me to the morgue's antechamber to identify the body. It was a slick-surfaced room with a floor that sloped toward a drain —very useful for disposing of people's lost lunches, but reminiscent of a slaughterhouse. They kept people out of the morgue to spare their delicate sensibilities.

They wheeled Crayle out to me on a table, naked and tagged. His head didn't seem to sit right on his neck and when I took a closer look I saw why —somebody had bashed in the back of it.

The beefy sarge was there, and after I said, ''It's him,'' he took me upstairs and sweated me. He wanted to know how I knew where the body was. I told him that when I was at Crayle's place I'd noticed he hadn't had a complink and yet I'd got something from him over my complink dated this morning. Crayle was so scared I was amazed he'd even gone out once. He definitely wouldn't have gone out a second time. Ergo . . .

The sarge got the point and interrupted to ask why I started taking Crayle's worries so seriously all of a sudden. I told sarge the lecture he'd given me earlier had changed my attitude. To my surprise, the sarge bought that and after only a few trifling predictions let me go. After all, I *had* done the Right Thing.

As soon as the cops were done with me I rushed back to the top floor of the Universal Assurance building and demanded to see Mr. Gellert. After the receptionist found out I hadn't made an appointment and told me Mr. Gellert couldn't possibly be disturbed, I shocked her into a refined little receptionist-scream when I walked through the peb-

bled glass doors Gellert had come through earlier.

They led to a long hall with few doors—big offices, no doubt. There was no sign of which office was whose, so I simply stopped at the first one and opened the door. That was as far as I got. A scrawny, but very determined-looking security guard ran through the pebbled glass door behind me and tackled one of my arms.

"Come downstairs with me, buddy," he said, "and maybe I can give you a break and keep the cops out of it."

"That's funny," I said. "I came up here to give UA the same kind of break. But I'll have to talk to Mr. Gellert first."

At that instant, Gellert popped his head out of the next door down the hall and said, "It's OK, Frank. Let him go."

Frank let me go and I pushed past Gellert into his office—or, rather, his secretary's anteroom. I pointed at the skinny, sleek little girl and said to Gellert, "Send her out for a cup of coffee. Brazilian coffee."

The undersized adman sighed. He didn't look as dapper as he had earlier. His moustache drooped.

"Miss Parnoff," he said, "you have the opportunity to take the rest of the day off with pay."

She set a record getting out of there.

Gellert took her seat. I was tired of those contoured chairs, so I sat on her desk.

"It turns out," I said, "that you're even less suited to being a criminal than I am to being a detective."

"I want to clear one thing up right away," Gellert squeaked, "and that is that I am in no way responsible for the disappearance of Mr. Crayle. I was as surprised as you were when I heard of it. It is true that I employed an associate of mine to try to discourage him, and that associate may have overstepped himself—may have made certain threats . . . but I assure you matters never got beyond that point."

I kept my face a blank. People were volunteering all sorts of information and I figured the less I gave away, the better my chances were of keeping my lucky streak going.

It worked for a while. He looked more alarmed than ever and said, "Be reasonable! We're not the only ones interested in the Stabilizer! Moorehead's article *is* available to the general public, its obscurity notwithstanding!"

Moorehead, again? "Suppose you explain the Stabilizer to me, Gellert," I said. "I'm not that familiar with it."

I could see right away I'd blown it. Gellert's face whitened, then flushed. He scowled at me. "You've taken me in, sir! Damn! If that call hadn't made me so nervous I'd never . . . but *you* didn't make that call after all, did you?"

"No. But tell me about it, too."

"Let's just say I got a call an hour ago, voice only, from a party claiming to have evidence I was responsible for Crayle's murder. Was he murdered, by the way?"

I couldn't tell if Gellert was being cagey or not. I nodded.

"This party," he went on, "gave certain indications that showed him to be in possession of all the facts concerning the Stabilizer. He warned me to have nothing more to do with retrieving a model. I thought it had to be you."

"Now we're back to the Stabilizer. What is it?"

Gellert sighed. "I suppose, now you know about the Moorehead article, I might as well explain it myself. Do you understand the theory behind the blankfield?"

"I know it keeps bugs out and talk in. I know that silvery surface is impenetrable and you have to have your own light and oxygen inside. I know when you spend an hour in one, eighty minutes pass outside—the Yezr Learning Center's museum uses them to keep relics from aging as fast as they would otherwise."

"Your knowledge is typically shallow," Gellert said. "The blankfield *started* as a method of preservation—its security value was an extra benefit that allowed the original investors to break even. The idea was to keep things inside absolutely static—to preserve them literally forever. And it's a fact that—except in the most general philosophical terms —current science still has no explanation of why it *doesn't* preserve things forever—"

An amazing thing happened while he was talking. His nervousness left him. He actually became animated. His eyes twinkled.

". . . so far as we can *tell* nothing gets in. So far as we can *tell* all motion should be stopped inside."

"So why doesn't it work?" I asked.

"As I said, we have only a general treatment of that. But—consider that we can *see* the field. It is still, then, in some sense, interacting with the universe. Consider that the field takes up a definable area of space. It is still, then, interacting with the universe. It stands to reason—especially with hingsight to help us—that any interaction with the universe automatically implies subjection to the laws of time and motion."

"You're not the science type, Gellert. How come you know so much about this?"

"The knowledge was acquired only recently, when I encountered the Stabilizer."

"Aha! The *Stabilizer!*"

"You see the verbal connection? Good. It's an Aglum machine, and there are working models on Aglumthu. Moorehead found one. It's a *true* blankfield, working on totally new principles which accord with the theory I just laid out for you. Something placed within the Stabilizer completely disappears from this universe and may be said either to form a new universe in which it is the only object, or to travel to a universe where there is no time or motion. Moorehead preferred the first explanation because he thought that the Stabilized object kept its own position relative to the movement of the whole of our universe and that one of the things the Stabilizer switch did was to call it back across space. Which might help explain how the hyperdrive works —which is why he was so excited about it and also why he could only get published in the *Slapout II Journal Of Questionable Science*, where it remained unread by all but crackpots who couldn't see the advantage."

"I don't see the advantage either," I admitted. "But I'm sure you're not interested in this because you've decided to change your racket to physics."

He smiled and nodded.

"What's in it for you, Gellert?"

His smiled broadened.

"The switch," he said, "is reported to take up three cubic inches and weigh seven ounces."

A light flashed on, somewhere. Want to move a grand piano up two flights of stairs through undersized doorways? Stabilize it, and carry the switch upstairs. More to the point—want to smuggle a ton—a worldfull!—of illegal euphorics? Carry your switch through customs.

Then I began to think of things that really made me sick, Elinor. A shipload of posion gas. A bomb. A sun? Warfare was going to change again—and, as always, for the worse.

Maybe old Kiger really *was* trying to protect Humanity!

"I want in," I said.

Gellert smiled and nodded again. "I was sure you would," he said. "And I have no objection. I'd rather have you with us than against us and, God knows, there'll be more than enough money out of this, eventually, to satisfy even *my* greed twenty times over."

"When are you going to Aglumthu?"

"We start tomorrow," he said—and added, chuckling, "on Company money."

"You move fast," I said.

"I've been praying for an opportunity like this for years. It was only two days ago that Crayle told me about the Stabilizer, but I already feel as if my preparations for the trip have taken forever. And speaking of threats—you should have heard the insane tales he told me to try to frighten me out of going to Aglumthu! Wanted it all to himself, apparently."

"It's a wonder he came back to work at all," I said.

That seemed to bother Gellert. He frowned and mumbled.

"What about the report?" I asked.

"No need to worry about that. I wiped it completely, my copy included. You can't be too safe. Oh—we leave at one in the afternoon from the port down the street in the *MacRae*. And there's another matter. . . "

"Yes?"

"Try to find out who's onto us before we leave. If it *wasn't* you who called me, I find myself driven to a very disturbing conclusion."

I wasn't really stupid enough to trust Gillert, Elinor. I was half certain Gellert had killed Crayle, and that he was eager to have me in deep space to make it easy to kill *me*. He didn't offer me a place on the ship because we were good buddies. But if he did want to kill me, then it followed that the safest thing would be to let him believe he'd taken me in.

However—I really did want to go along with him. I'd accepted Crayle's commission to protect his life and he'd died and it was mostly my fault. I didn't think I'd feel right about myself again until I discovered the murderer. And all my instincts pointed back to Aglumthu.

So I decided to go in spite of the risk. There are ways of protecting yourself.

I chose the simplest. On my way back to the office I stopped by Creative Surgeries, Inc., and had a bomb installed in me that would go off if I died. Creative Surgeries would trigger the mechanism as soon as they tracked me safely off-planet. It was expensive, but I was

hoping I could stick UA with the bill if I snared Crayle's killer.

The rest of the day I spent assuming Gellert really got that threatening call, and that he wasn't Crayle's killer. I checked my calls when I got back to the office and found that of the 49 other centenarians I'd left messages with, not one responded.

The centenarians were the only other folks who could know the value of the Stabilizer. If Gellert got that call, it came by Kiger's orders.

Maybe Morris Kiger really was speaking for all of them.

How did Kiger know so much? Why had I never heard of him?

I had the computer look for Kiger among the newstapes. Aside from a few bare mentions there was nothing between the current tapes and those published at the time of the Aglumthu expeditions, seventy-six years ago. The publicity on the expeditions was funny. There was plenty of it before they left (*Aglumthu, Planet of Mystery*) but nothing on their return except on brief, uninformative notice from a small, now-defunct news agency.

But for years prior to that there was lots on Eugene Kiger, Morris's daddy. He'd inherited enormous wealth, the friendship of politicians, and a position in the world as a fashion-setter. He owned controlling interest in a number of major companies, including (aha!) the leading news agency and the comp-link system. And Morris himself was the darling of society tape editors before he left.

But the whole family was totally ignored after he came back.

It looked to me like all news of Aglumthu had been suppressed by the Kigers.

I got in touch with my financial friends to try to find out something about the current state of Kiger's holdings. I found out there was something called the Kiger Foundation and I wondered if that was the "club" Kiger had talked about. I tried to trace the foundation's money to find out. I failed.

When your mother found out what I'd done at Creative Surgeries she raised hell, informed me that she was pregnant, and forbade me to go to Aglumthu. The memory is still too painful for me to go into detail. Your mother was a wonderful woman, but she wasn't really psychologically fit to be married to a man who took risks.

I won't go into detail on my trip to Aglumthu, either. It was tense and boring at once. Gellert had six other men along with him, and I recognized a couple of them because I'd run into them a few years earlier on a smuggling case. They were all goons, and less interesting than Kiger's goons.

As soon as we lifted off I called them all together and told them what I'd done. It probably saved my life—even if Gellert didn't kill Crayle there were other reasons why he'd want me dead—but it made them all very surly. I was denied their sparkling conversation until we'd landed on Quorme, so my figuring out that Gellert had been dabbling in smuggling for years was without help from anyone. It was just elementary sneaking.

Quorme is at the edge of Restricted Space. By landing there in our own ship we were ultimately able to save time

and only had to transfer once more after leaving that planet—to a Shish ship that made occasional runs to a tiny Shish colony on Aglumthu.

The Shish captain told us that the colony had been on the ghost planet a "long time" which, in Shish terms, would have to be at least a thousand years. He tried to tell us what they were doing there, but his explanation was too shishish. (I assume you've heard of the Shish even where you are—the long-lived, birdish ones who claim they were created by another race? They're everywhere.)

On this leg of the trip Gellert's men blustered at me a lot, and I holed up in my cabin. Gellert himself was too smart to bother. I suspect he was responsible for the trouble I had on the last day of the trip.

The day we were to land on Aglumthu the Shish captain entered my cabin unannounced. He walked over to the bunk where I lay and stared down at me, clacking his beakish mouth and twittering into his translator.

"We have *twee* you," the machine said. "If you *twee* or die, we all die. It is no wonder your mates dislike you."

I wondered what the hell there was besides dying that would set my bomb off, then put it out of my mind. "Sorry, Cap'n," I said. "If it weren't for my bomb, my mates would make sure I died."

"No great loss, *twee*. You are a germ, a parasite, a *twee*. Ought to space you."

"If you try, I can set it off myself," I said. Another lie. I'd already told that one to Gellert and his crew, and it had worked well. But the Shish knew better.

"Not true. I already told you we have *twee* you. Compound your guilt no longer. We will remove the thing with clean knives."

There was no sense in fighting a whole shipful of them. "Have you told my mates of your intention?" I asked.

The Shish shut up for a minute, seemingly puzzled. Then it said, "No we-here. We-here land on Aglumthu in less than one hour. We-Shish, on Aglumthu, remove the thing. Or else we will not take you aboard again when you want to go. Now you will pack and be ready. When we land, you will be first off the ship."

The captain personally made sure that came to pass. I was strapped right next to the lock when we touched down. When it released my straps it hissed at me, nipped my shoulder with its beak, and pushed me out.

I found myself on the platform atop a ramp, high enough to take a good look at the countryside, so I massaged my shoulder and took inventory.

What was immediately in front of me wasn't too unpleasant to look at—a little Shish village with widely separated stilt-houses and lots of green beneath them. But this was the only green around.

To my left, behind the village, was the corner of a gray, windowless one-story building. The two sides and the top stretched as far as I could see and I became obsessed with the idea that it wound halfway around the planet.

Everywhere else there was ashy mud.

I felt better when I got to the bottom of the ramp and could see only the village.

Gellert and his friends gathered around me at the bottom of the ramp, and we

were met by a single Shish who pointed his translator directly at me.

"You will have your thing taken out now?" it asked.

"Uh . . . not right away," I said.

"You will leave soon?"

"Four local days," Gellert said. "It's damned ridiculous. They stop back in four days and then it's months before another ship passes by. We should have risked Restricted Space."

"You will leave the *village* soon. Now?"

"Sure," I said, hefting my dufflebag. "But we need to know a few things, first. There was a human who came here not long ago—do you remember him?"

"Yes. Many and many and then one."

"I mean the one. Where did he go?"

"They all went there." It pointed toward the enormous building. "In with the Aglum."

"Where, precisely, did they *go* in there?" Gellert asked. "We're willing to pay a handsome fee to anyone who can guide us to the exact spot."

The Shish clacked its beak scornfully. "We don't like Aglum. We *twee* the outer wall, but this does not require us to go inside."

"Surely," Gellert said, "one of your people has wandered inside at one time or another. And you could find that one, I think, if we paid you enough."

"If you had enough grit in your craw you could eat the world," it answered evasively. "*Twee* before humans broke their egg, we needed help from Aglum. It was refused. Now we refuse them. You humans go now."

I was ready to comply. The whole business was just too shishish. The millenia-long grudge . . . the habit of speaking of the Aglum as if they were alive . . . it's no wonder the planet had the reputation of being haunted. To me, it was obvious we'd get no help from the Shish, but Gellert wouldn't let us start for the building until he'd argued with it so long it turned and walked away in disgust.

The building looked as awesome up close as it did from the top of the ramp. The smooth gray walls had utterly resisted eighty thousand years of weather. The impression of enormous size lasted no matter how close we got, and drove away any real belief that living creatures had made it. I think even the most insensitive of Gellert's playmates began to look on it as a whim of God's. The idea persisted even after we found the door.

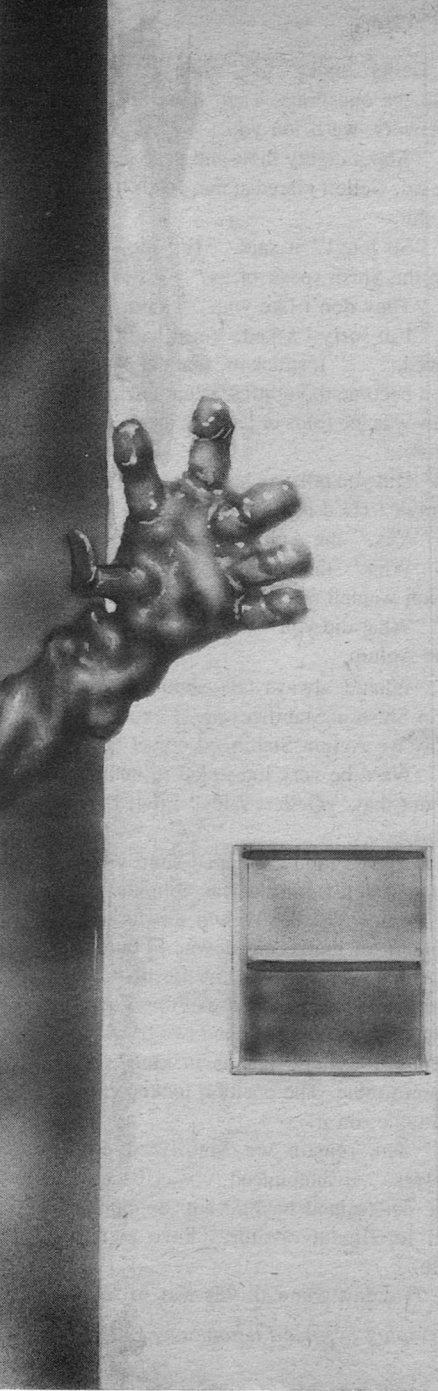
The door was smack in the corner of the building. Only our habituation to human architecture prevented us from finding it sooner.

We were reluctant to go in.

I broke the invisible barrier first, and was almost sorry I did. There was a wall about six feet to my right, but there was no wall at all to my left. Lights came on as I walked inside, giving me a view of the room or corridor, or whatever—six feet by infinity, as far as I could tell. The four blank planes narrowing in on each other gave me something a lot like claustrophobia and Gellert, who was right behind me, was so cowed he actually shut up.

"There's nothing here," one of the goons said, at last.

"We'll walk and keep walking,"



Gellert said. "There's bound to be a door somewhere. Moorehead found it."

About two miles later we found something—not a door, but a recessed area in the right wall, about seven feet by four by three. A tiny switch protruded from the wall right next to the niche. Gellert shrugged, said, "Perhaps this is the Stabilizer—Moorehead wasn't terribly specific," and flipped it.

For a split second it was as if we were being subjected to a very loud, steady subsonic tone. Then a mote appeared in the center of the niche, grew into a ball that seemed to be made of the same slick, dead-gray stuff the wall was made of, and continued growing until it filled the niche and the wall looked blank. As Gellert swore at it, the camouflage disappeared and we saw a creature standing inside the niche.

I was immediately convinced we'd found the Stabilizer, but I was surprised at what was inside. I'd expected some*thing* there—some artifact that showed how well it preserved things. I definitely did *not* expect a living intelligence.

It was the first of its kind I'd ever seen. It was two-legged and two-armed and had a head with wide, frightened eyes and a bright red mouth, but I couldn't tell much else about its skeleton because it was draped with great, drooping folds of shiny black flesh that reminded me of polished leather. There was a belt around its middle, studded with switches.

It flipped a switch and immediately we were staring at a blank wall again. Then the whole process that led to the thing's appearance quickly reversed itself. The mote disappeared, we shivered, and the niche was empty.

Gellert got that wormeater's look of his and flipped the wall switch again.

When the creature appeared the second time it spoke—in very archaic, but understandable Interhuman, which I won't try to reproduce for you.

"Leave me alone," it moaned. "You have bothered me enough, and the danger is great. If you want to hear me talk, bring a Shish." It flipped the switch on its belt and was quickly gone again.

"Aglum!" Gellert whispered.

He was right. What else could it be?

Gellert flipped the switch again. This time when the creature reappeared he spoke first.

"I'm going to keep bringing you back until you talk to us," he said.

The Aglulm screamed and switched himself out of the universe again.

I don't know how many times the cycle was repeated—I lost count. While this childish battle was going on, I was trying unsuccessfully to figure out why someone would want to Stabilize himself and why, if he did want to, he'd leave a switch so anyone who wanted to could call him out.

Eventually, Gellert out-stubborned the Aglum. It shuffled around in its niche and seemed to glare at us, then said, "This is the last time I do this. And before I do, you must answer a question—how long has it been since we Aglum stabilized ourselves?"

Gellert's jaw dropped. I don't know what my face did because I was too staggered to feel it. The idea of an entire race dropping out of Time entirely seemed, at the time, to imply motives so alien it gave me the creeps.

I wish to God, Elinor, that their motives *had* been alien!

Gellert spoke first, saying, "We'll ask the questions. Then if we like the answers, we'll tell you. . . "

"About eighty thousand years ago," I said. Gellert glared at me. I didn't give a shit.

"So long!" it said. "Tell me, how do the Shish speak of us?"

"They don't like you," I said.

"I'm sorry I asked. Yet it had to be faced. . . ." It struck me that the Aglum had become thoughtful. What I actually saw was the folds of its flesh droop even more.

"Did you talk to a human named Paul Crayle? He'd have been alone."

"Yes," the Aglum moaned.

"What's this Paul Crayle crap?" a goon wanted to know.

"What did you talk about?" I asked the Aglum.

"What I always talk about when a non-Shish unStabilizes me. I explained why we Aglum Stabilized ourselves."

"We'd be very interested in hearing about that," Gellert said. "First, however—"

Gellert's mouth clapped shut with a snap. I don't think it was voluntary.

Meanwhile, the Aglum did its own version of hunkering down. I couldn't see that well through the flesh, but it seemed to involve the use of four knees, two of which bent out and two of which bent in. I guess it was making itself comfortable. The position looked comfortable, on it.

"The reason we Stabilized ourselves," it announced, "was because we determined beyond any doubt that all intelligent creatures have eternal life."

"I didn't come all this way to listen

to a sermon,'' one of the goons grumbled.

''In your sense of the word,'' it said, fiddling with its belt, ''I'm not talking about religion at all. I'm talking about a discovery we made when we had more than a hundred million years of various forms of the scientific method behind us. We developed the technology to . . . induce intelligent creatures to become precognitive in regard to themselves. They see past the point of their own deaths. We've performed the experiment thousands of times on different species and they all, unfortunately, see the same thing. But, here, let me show you—''

With that poor excuse for a warning, it plunged us into Hell.

The experience carries with it the knowledge that it's true. You know it's the truth in the same way you know that if you jump out of a window you'll fall—whether you've heard of the law of gravity or not. It's a very intimate —frighteningly intimate— knowledge. I can consider the possibility that the whole thing was somehow a fake, but I can only consider it in the way I'd consider, say, the Phlogiston Theory. I saw a glimpse of what is in store for me—and you, and all of us someday. And I know why, too, but there aren't words. The Shish have words —and math, too—but you don't know the language and I'm getting ahead of myself in the story I'm trying to tell you. Probably from fear of trying to describe the experience.

It would be hard to describe even if I *hadn't* experienced it . . .

Maybe I should start by saying the Universe is somehow aware of the intelligences inhabiting it, and it's very disappointed in them. Not even the best of us come anywhere near our potential and when you get right down to it, it's our own fault.

And forgiveness is impossible. The universe isn't constructed that way. When did the universe ever forgive a man who jumped out of a high window?

I had a body in my future—a body provided solely for the purpose of bearing more physical pain than I'd ever been able to stand alive. Alive, I'd have fainted. That much of our own folk-tale is true.

But no teller of tales could have anticipated the anguish of the soul. That's the essence of Hell and it's indescribable and maybe that's for the best, Elinor. You'll get a chance to sample it for yourself soon enough. For now, judge by results and don't try to grasp it.

When we were brought out of it—and I don't think it actually lasted more than a second—I was crying, uncontrollably, unusual tears. These tears didn't relieve the pain, they made it worse.

The rest of the men were crying, too—except for Gellert. He was sprawled on the floor, obviously dead.

''Always was sort of puny,'' one of his gang rumbled.

''Your pardons,'' the Aglum said, not looking very sorry to me. ''Death comes from that vision sometimes . . .''

''It's not fair!'' another of the men bawled. He wasn't talking about Gellert.

''When has the universe ever been fair?'' the Aglum asked.

At that point, I remembered that *you* were on the way—that is, that your mother had told me she was pregnant.

At the thought of that awful responsibility I threw up—and inspired three others to do the same. Unlike the tears, this did me some good, by shocking me back to the present.

"*Everybody* has this in front of them?" I asked.

"We've never tested anyone who didn't," the Aglum said, then added, "I have a message for you to take with you when you leave. When you see the Shish, remind them that their only hope of freedom is to accomplish that for which they were created. And tell them I will wait as long as necessary."

It popped itself back to noplace—safe, secure noplace. I looked longingly at the Stabilizer switch, wondering if it were possible to get the mechanism out of the wall. I turned to the six men to suggest we get some tools and try, but they weren't looking at the switch. They were looking at me—with real fear in their faces. Then they literally ran away from me back down the long hall.

Since we'd shared the same experience it took me only a second to figure out why. If I died I would explode, and I might die.

Well, I *might*.

You can't know your afterlife as we know it without wanting to take every precaution—without trying any and every thing that could possibly postpone the inevitable.

That was when I realized Kiger had killed Crayle.

I had a hard time deciding to have my bomb removed.

I wasn't too worried about Gellert's boys now that they'd developed a near-worshipful respect for their skins, but—to take the bomb out some Shish veterinarian would have to *open me up!* People have died from that.

On the other hand, the Shish would have nothing to do with me while I carried the bomb and I didn't want to be stranded for months, a pariah, on an unfamiliar planet that looked damn near sterile.

The Shish vet met me on the dirt road into town and took me off guard by introducing itself and saying. "What about it, Mr. Allan?"

"I guess I've got to," I said. "I've got to get back."

Then the nature of what had come out of its translator hit me and I added, "Hey! Do you speak idiomatic Interhum all the time?"

"*I* usually do," it said. "I know the language."

"I thought you couldn't learn it."

"Maybe I should have said I know the concepts of the language. Shish beaks aren't equipped to *speak* it—that's why we use translators—but some of us can understand languages we can't practice. It's a talent, and I happen to have it. You'll get a few *twees* from me every now and then, but I like to think it's because some Shish concepts are simply untranslatable."

"Is *twee* translatable?"

"You said it wrong. It's the ninth tone. But, yes. All it means is 'missing.' " It pointed at what looked to me like just another house on stilts and said, "There's the hospital. We want to do you right away, you know."

I nodded and followed it up the ladder.

When we emerged into what looked reassuringly like a modern doctor's of-

fice I said, "By the way, I have a message—"

"I know," it said. "From the Aglum. It always sends us that message. Lie down on that brown, padded table, please."

I followed instructions and found that my whole body was numb, from the neck down.

"You folks say you were created by another race," I said. "I think it was the Aglum. Am I right?"

"That's right," it said. "And what we were supposed to accomplish was finding a way out of the dilemma you just found out you're in. That was over 100 million years ago—"

"You say the dilemma *I'm* in, not the dilemma *we're*—"

"The Aglum created us with special qualifications for the research. We can look at the problem without getting panicky because when *we* die, we just die and that's it. The Aglum worked a long time to breed something that would be exempt—we were their last hope."

"Then you never found an answer?"

It opened a drawer beneath the table I was on and pulled out a clean knife.

"Believe me," it said, "there *isn't* any answer. Eighty thousand years ago we proved that the problem was unsolvable."

I eyed the knife warily. "Why don't you put me out," I said, "instead of just blocking out the pain?"

"It's a matter of *twee*," it said, then paused, then said, "I guess I can't translate that one. It's sort of like revenge. You behaved irresponsibly around us. I mean—it's nice to be exempt, but that doesn't exactly mean we're eager to die."

It began to cut, and I carefully stared at a spot on the ceiling. Maybe it wasn't indulging in an act of revenge, but if it had wanted to, it would have been a good one. I tried to distract myself with more talk.

"Why does Aglum still wait for you, then?" I asked.

"They couldn't completely accept it. Our results scared them, finally, into one last, universal Stabilization—but when we asked them to release us from our assignment they refused. Oops—made a little mess here—let me clean that up."

After a minute it went on.

"So—they left one Aglum out in the long room. He's supposed to un-Stabilize the appropriate scientists when we find the Answer. Fat chance. We still work on it—we were bred with *twee* and we have to—but it's pointless work. Feels strange to be talking to a non-Shish about this. We never do. But since you already know what's in store for you . . ."

It's speech faded away, it bent lower, then it lifted out a small, gleaming egg stained with red. It carried the object carefully to a tiny door in the wall, deposited it inside, and shut the door. I felt myself beginning to hyperventilate.

The vet stood over me again, staring into my eyes. "I can't help feeling sorry for you, you poor son-of-a-bitch," it said.

And I blanked out.

There's not much more to tell about Aglumthu, Elinor. I woke up the next day completely healed, and I and two of Gellert's braver friends went back to the building to see if we could get the

switch out of the wall. It couldn't be done. The gray stuff was too tough—a little fact Moorehead had failed to mention. There was some talk about calling the Aglum out again, overpowering it, and taking its own switch, but we never tried. It was too likely that something that far advanced would find it easy to kill us.

For the rest of the time, we cowered in our rooms in the Shish equivalent of a hotel. And on the trip back, we cowered in our cabins. Accidents *have* been known to happen.

I figured Kiger's men would be waiting for us when we landed, so I didn't tell my companions about him and I skipped out the back of the ship with the baggage. I got a chance to peek out at the passenger's area later and saw the two body stocking guys herding Gellert's six along. I couldn't see whether they were armed or not, but it really wouldn't have made any difference.

I rushed to my office, called your mother, and told her to get out of town at once. Then I started doing the bravest things I've ever done. I'd done more dangerous things, but I'd done them before I knew the future.

I took my blankfield switch and hooked it to a timer which I set for ten minutes, hoping I wasn't overdoing it. I hooked the timer to another, radio-controlled switch and locked the whole mess in the safe near my door. Then I rolled the bottled oxygen out of the area.

Less than a minute after I'd got all that done Kiger's men knocked on my door. I grabbed a spare gun out of my desk drawer, and crawled under the desk, grasping the button for the radio-controlled switch. I told them to come in, waited a couple seconds for them to check out the doorway, then pushed the button.

Ten minutes later they were unconscious and ten minutes after that—cuffed hand to foot and tied with as much rope as I could find—they were confessing the murder of Crayle into a recorder. I had threatened them with my gun, and I really think that was what did the trick. I must have looked scared enough to be trigger-happy.

Then I called Kiger and started playing the confession for him.

"NOT OVER THE PHONE!" he screamed.

I turned it off. "We have to talk, Morris," I said. "You'll have to come here. Alone."

He arrived in a half-hour, complete with mouth-and-nose filters and a one-piece outfit that might have been the bottom half of a radiation suit.

"What's happening to Gellert's boys right now?" I asked.

"They're OK," Kiger said. "The Kiger Foundation provides grants for all, uh . . . veterans of the Aglumthu experience. The only reason Crayle got killed was that he was unreasonable—uh, look, I'm going to reach inside my suit, but it's only to pull out headphones for my men. Is that all right?"

I nodded and he gave them their music.

"Do you know," asked Kiger, "what would have happened if Crayle had filed a full, detailed report? Which was what the idiot proposed to do."

I nodded. "I think so," I said. "But tell me anyway."

"Sooner or later something that gaudy

would have got to the news services and I wouldn't have been able to clamp a lid on it. Moorehead's report was mostly dry, technical stuff. This would have been twenty times worse—''

''What happened to Moorehead, by the way?''

''I think you know. Anyway—back to the disaster I averted by having Crayle killed—think it through. Maybe most people would dismiss the story as absurd to begin with, but what would happen after the newspapers got to Aglumthu and started testifying to its truth?''

''You're supposed to be telling me, remember?''

''OK. Most of the human race would become like us. 219 people have had the experience so far and only three of them have behaved stupidly—unless you're going to be the fourth. Think about it. They'll surround themselves with as much protection as they can and they'll never go out unless it's a dire emergency. Human society will collapse. We're not like the Aglum.''

''And if there's a collapse, where do we get our food and medicine?''

''Right. Do you deny it?''

''No. I'm scared of the same thing. If I'd been in your shoes I'd have killed Crayle too.''

Kiger relaxed visibly and took a seat. ''Good,'' he said. ''Then we can work out the same deal with you we're making with the other six men. We give you—''

''Hey,'' I interrupted, ''do you ever eat anything but protein-trash?''

''No. And neither will you, if you're smart.''

''I know,'' I said, sighing. ''Perfectly nutritious, and the money saved can be applied to medicine.''

''Right.''

''The problem is, I still won't have enough money for a big, fancy autodoc like yours. Besides which, I have a wife and an unborn child to think about.''

''How could you be so stupid—''

''I didn't know at the time. There are other problems, too. The three of us will have to get as isolated as possible—another expense. And I'm sure as hell not going to stay in a line of work as dangerous as this one. I need a real *fat* nest-egg.''

''As I said, the Kiger Foundation—''

''How much?''

He told me and I said, ''It's not enough.''

''That's what Crayle claimed,'' Kiger said darkly.

''Crayle didn't have my problems. Besides, Crayle was too stupid to risk being greedy.'' I gestured at Kiger's two trussed-up men and added, ''I'm not.''

''You're threatening to kill us all,'' Kiger hissed.

''No, I'm not,'' I said. ''Don't bother working up a noble justification for opposing me. Those two bozos don't know anything about Aglumthu. All that's on my recording is that you ordered them to kill Crayle and they did it. I'm blackmailing you, personally, on just that one issue.''

Kiger ground his full set of what were, no doubt, natural teeth for a few minutes, and then we put our heads together over a notebox and worked out a deal.

And that's how I made my fortune. Blackmail. That's how I got enough

money to put you in your luxury prison. And now you know *why* I did it.

I hope you believe it. You're of an age now to try to escape, and I'm afraid nothing less than the truth will restrain you.

Your father wouldn't lie to you, Elinor. And I'd have come to explain to you in person, but I'm afraid I don't get around much any more since I fortified a prison of my own. But if you can forgive me—please write to me using the attached code-sheet and I'll definitely write you back. Also—please destroy this letter.

Take good care of yourself.

Love,

Dad ■

● "The best thing for being sad," replied Merlyn, beginning to puff and blow, "is to learn something. That is the only thing that never fails. You may grow old and trembling in your anatomies, you may lie awake at night listening to the disorder of your veins, you may miss your only love, you may see the world about you devastated by evil lunatics, or know your honour trampled in the sewers of baser minds. There is only one thing for it then—to learn. Learn why the world wags and what wags it. That is the only thing which the mind can never exhaust, never alienate, never be tortured by, never fear or distrust, and never dream of regretting. Learning is the thing for you. Look at what a lot of things there are to learn—pure science, the only purity there is. You can learn astronomy in a lifetime, natural history in three, literature in six. And then, after you have exhausted a milliard lifetimes in biology and medicine and theocriticism and geography and history and economics—why, you can start to make a cartwheel out of the appropriate wood, or spend fifty years learning to begin to learn to beat your adversary at fencing. After that you can start again on mathematics, until it is time to learn to plough."

The Once and Future King, T. H. White

brass tacks

Dear Mr. Schmidt:

I've enjoyed your Analog editorials immensely—partly because of their huge improvement over the statist-leaning ones of Mr. Bova.

There seems to be an editorial in the August issue written by someone who forged your name to it. At least, I hope that's the case.

To whoever constructed that editorial, though, I would like to point out some flaws. It's all very neat and tidy to try to arrange some utopian society where everyone starts and finishes in an absolutely fair and equitable position. But this kind of effort is usually the prelude to the creation of some kind of well-meant Hell on Earth.

In the first place, the idea that the State (generic for government)(and who else would such power be given to?) should have the power to confiscate the property of individuals upon their death would not work. In the second place (maybe should be first), it is wrong, morally and ethically.

It's obvious that people will do their damndest to make sure the people they want to inherit their property will get it before their death, by hook or crook.

And by what right does government —or any agency or individual, for that matter—seize private property? Not in my society, as long as I have anything to say about it. I thought we had some wars over this sort of thing in the past, and that the issue had been settled.

And then there's the original notion that it isn't "fair" for some people to start out with more material goods or money or advantages than other people.

What's the next step—chop off everybody's excess brain cells when his IQ happens to exceed the norm?

Come on, now. What's wrong with simple individual freedom? A lot of

people thought that's what we set up here a couple of hundred years ago.

In a free society, kids who inherit gobs of money are perfectly free to lose it if they lack competency. That may be where the old saw about shirtsleeves-to-shirtsleeves in three generations came from. And in a free society, such people wouldn't be able to use government powers to maintain their wealth and position. (I'm not saying we have such an ideal setup right now.)

So what's the big deal if rich people pass on their wealth to the people they want to get it?

And you think such a statist idea is "worth considering"?

Stanley, I hope you catch the person who forged your name to that document and horsewhip him!

LANNON STAFFORD

Phoenix, Az

OK, you caught me: the proposal in "Heirs Unapparent" is not *that very much in accord with my own actual views. But it seemed to me after talking to my friend (who is an intelligent person, even if I don't agree with her on this topic) that I could make enough of a case for it to make it a worthwhile subject for argument. It generated a lot of mail (more than I could print or answer directly, for which I'm sorry), and there was enough hostility in it to make me think I'd better take this opportunity to remind everyone of something I said about my editorials in the first one I wrote: "A good many of them will actually represent my current beliefs fairly well . . . and some of the ideas I throw out may be a long way from my actual beliefs. They may simply be things I want to try out, to see what kinds of answers people can give to them. For that I make no apology. Nor will I let it interfere with the vigor and apparent sincerity with which I put forth and defend such ideas. If they stir you up enough to lead to some better ones . . . they will have served a good purpose."*

In other words, "Opinions expressed in these editorials are not necessarily those of the editor!" I will not limit my ideas-for-discussion to those I agree with and write others off as not worth talking about. Any *idea can be talked about—if it's good enough, it should survive discussion, and if not, at least we'll emerge with a clearer understanding of why we don't like it.*

In this case I think your responses are quite valid, except that I must point out that my proposal did not *try to ensure that "everyone starts and finishes in an absolutely fair and equitable position." It was intended only to make* starting *positions a little less unequal, and after that allow maximum freedom for people to end up wherever they could.*

Dear Stan:

Just as the full implications on the ecology of an area in damming a river, chopping down all the trees, killing all the wildlife are not always obvious when undertaken, your plan on inheritance taxes has not been carefully thought out.

First I don't believe there should be any inheritance taxes. Individuals work their entire lives, paying city, state, national income and sales taxes, plus pass-along hidden taxes, plus property and personal goods taxes, plus taxes on the bank and investment interest, plus capital gains taxes, that by the time we have reached old age it is considered an achievement if one can possibly retire without direct or indirect welfare. In other words, we have been taxed to death. Now you propose that any residue be taken away from the individual upon death because he has not spent it

all, and given to those who are indigent because they have spent it all!

Your plan, under present circumstances, would destroy 100% of privately owned independent business within one generation and leave only two owners, the government and the large corporations who would remain intact because they did not have single owners for the government to rob under your plan. Under your plan no privately owned business from shoe stands to a $100 million a year manufacturing plant could be left to children, other relatives, or anyone. *All* business, except government, started as privately owned operations. Their growth created the economies of not just the United States but of all nations. Most small retail, wholesale, manufacturing, sales, or service operations are not worth the trouble of major corporations' taking over. They require too personalized operations or they are only marginally profitable. Despite this, these types of small businesses employ conservatively 40% of the work force of the United States. Under your plan, they could not be sold, so they would just have to close up.

It is fortunate that only in the last few years, under Ronald Reagan, new legislation has been passed to stop just the type of plan you propose. Under the old law, when a wife, son, or daughter inherited the business, it was taxed for inheritance at a rate of value set by the government. A business might be estimated to be worth $2 million, the inheritance tax might be $500,000 and the business and family might have only $100,000 in cash. Therefore, to pay the taxes, they were *forced* to *sell* the business, which they did by the tens of thousands.

Furthermore, when I was growing up, there were six children in the family and the business was a candy store (like Isaac Asimov's). All six children plus my mother worked in that store continuously for bare survival. Each child was free labor, which was the only way it was possible for the business to show any kind of profit. Under your plan, despite the fact that the children contributed to the success of the business (and they do by the *millions* across this nation), you would deprive them of any equity and give it free to the government.

Further, you would deprive loved ones of the decreased, "seed money" honestly earned by their own family to continue a business if they had one or to start a new one.

You have no plan there Stan, only a notion for argument.

SAM MOSKOWITZ

I never claimed it was a full-fledged, fully developed plan; it was quite openly presented as a notion for argument, with full recognition that a lot of details would have to be worked out to make the basic concept workable. The problem of family businesses is one of those, and rather easy to deal with. The object of the proposal was to reduce unearned advantages acquired solely through birth, and children who have worked for years in a family business are not in that category. The law could easily be constructed to allow such children to inherit their share of the business, not by virtue of being offspring, but by virtue of already being active partners in the business.

Dear Sir:

I read your editorial in the August issue concerning inheritances with much interest because I have had very similar ideas.

In trying to write down the idea I saw the loopholes and difficulties you de-

scribed in your editorial. My proposals covered some of the difficulties, I thought, but I also came up with some problems you did not mention.

First, the nature and function of administering the fund. I thought a good method would be to have a totally independent government-owned entity administer the fund and restrict it to disposing of assets as they came in and buying American Corporate bonds. The reason for restricting to bonds was to keep the government or a government agency from having any control over corporate policies. The governors would pay the expenses and have incentives to make sound investments but the direction to invest in companies which promised increased employment. A portion of the fund could be lent to banks at low interest rates for small business or minority loans with the banks' being allowed to charge enough interest to make a reasonable profit. The banks would, under such a plan, bear the risks of loss.

I like your idea about distributing profits directly. I had thought about forwarding profits to the general fund. There is something to be said about a birthright for everyone.

As to the problems with gifts, I believe they can be handled. A gift tax is administered just as are inheritance taxes. Total gifts during a lifetime could be capped.

There are also problems with trusts, but they too could be handled. All except charitable trusts could be limited to the life of the maker without violating the constitution.

Another concern is capital flight as has occurred to a large extent in Britain which has large inheritance taxes. There would probably be some, but it is a lot easier to get out of the British capital market than it is to get out of the American. Furthermore, other countries might follow the lead of the U. S., so there would be no real place to hide.

We also would need to be concerned with family companies and farms. Often, such family businesses are stable and productive. There is a place for them and government policy should not destroy them. It would seem that a lien not bearing interest or minimal interest could be placed on the assets of such businesses at the time of the death of the original owner (or spouse) which could either be paid off or kept intact until the property were sold to anyone else. The inheritor could still have incentive as all gains and profits would remain his. He would have been furnished a going business from which to make a living, which is more than could be said for the majority.

Philosophically it would seem the program is more consistent with capitalism and conservative thought than is inheritance. Capitalists pride themselves on their ability to make money and (I think) rightfully say the motivation provided by capitalism spreads out through the whole society. If capitalism is that good (and I'm not knocking it) why not give everyone the chance to succeed equally? If Social Darwinism is to rule, let's have the fittest in the responsible positions. To the extent the fittest are not, we are not living up to the capitalist ideals.

I also wonder how the successful children of the rich view themselves. Could they have made it without their crutches? Even a slight introvert would have to consider the question. Also, we are familiar with the children of the rich who do not succeed or whose lives are wasted. Would they have been happier and more successful in the long run if they had known the crutches were not available: I, for one, am proud of my

small successes because they are mine and I know they are mine. I cannot conceive of a person being proud of a gift given on a silver platter.

For these reasons and more, I heartily endorse your editorial and think that more thinking and writing should be done on the topic. There are reasons to believe the ideas are or can be made philosophically, psychologically, and practically sound.

MICHAEL D. LEA
Attorney at Law

The mail I received suggests that such a plan is highly unlikely to be accepted by the present population of this country in the foreseeable future. You were one of the few people I heard from who saw any merit in it. That's fine with me personally; if I saw any real likelihood of such a plan being put into practice, I'd probably fight it myself. But I can easily imagine an alternate society with a different past, brought up with the fundamentally different idea of the basis of "rights of inheritance" described in my editorial, which could *make such a system work quite as satisfactorily for them as ours does for us.*

Dear Mr. Schmidt:

I thought your August '84 editorial was quite interesting. In part because it mentioned libertarianism.

As one who managed to evolve into a libertarian without even knowing there was such a movement, I'd like to give my perspective on your proposal:

THE FOLLOWING REMARKS ARE THE OPINION OF THE AUTHOR, AND DO NOT NECESSARILY REFLECT THE VIEWS OF OTHER LIBERTARIANS! (Although they do the opinions of the ones I've met.)

To begin with your professional Friend's doubts, if the price of liberty is a reduction in the availablity of student loans, well, that's a price I'd gladly pay. This from a college student. Mind you, I don't believe it would be part of the price, since absent the government caused inflation and credit crunch, a student loan could be a good investment. Likewise, if people were permited to indenture themselves to companies in return for education, the companies might think it a good deal. (I belong to that class of libertarians who regard rights not as inalienable, but rather property that can be sold or leased.) But, it's important to note that libertarians are *libertarians*, not utilitarianists, and that libertarianism is a deontological theory. Liberty doesn't have to be justified by pleasent results.

"If libertarian philosophy seeks to allow all individuals maximum freedom to rise or fall by their own talents and efforts, in practice it would fail . . . " Quite true. But it doesn't. Libertarian philosophy seeks to allow all individuals maximum freedom. Including the freedom to attempt to help or hinder other individuals, so long as you avoid coercive or fraudulent means.

What this (your proposal) is, is an egalitarian leveling scheme, and libertarians are not egalitarians. We aren't aiming to get every one off to a 'fair' start in some foot race. We aim to let them leave the track and walk where they will.

To summarize, what we have here is a typical income redistribution plan, with soak-the-rich elements, which would fuel the cancerous growth of the world's most successful form of protection racket, government.

BRETT PAUL BELLMORE
Capac, MI

P.S. No doubt about it, though. This editorial did provoke thought!

There are probably at least as many kinds of libertarianism as there are lib-

ertarians. Maybe I should have italicized the if *in that sentence beginning "If libertarian philosophy seeks to allow . . ."; to emphasize that the rest of what I say followed only if you accepted that version of the starting premise. And it's probably true that most people who call themselves libertarians don't—their concern is solely with freedom from* governmental interference, *leaving individuals on their own to worry about all the other factors which can limit "true freedom."*

Be that as it may, I must protest that what I described is not *an "egalitarian leveling scheme." It explicitly tries to* avoid *placing any limitations at all on how rich people can get through their own ingenuity and hard work. It says only that wealth will not then pass into new hands through no more effort than being born to the right parents.*

Dear Mr. Schmidt:

Your editorial "Heirs Unapparent" (August 1984) leaves me quite cold. I suppose you have noble intentions for suggesting such an idea, but your underlying assumptions are what disturb me. The wealthy are often made the scapegoats of society. We are forever hearing about the "fat cats" who don't pay their "fair share" of taxes. It is so easy to blame our lack of success on an unfair advantage held by someone else. The truth is far more difficult to swallow. Individuals can achieve whatever goal they choose—if they apply themselves.

I don't care what rich people do with their money. I know that anything they do with it is ultimately beneficial to society. If they put it in the bank, someone will borrow it to start a business. If they spend it on a sports car, then someone can make money building and selling it to them. If they just burn it up in their fireplace then the government can print more and reduce the national deficit. And if they pass it on to their kids then they will have to do one of the above with it too.

What is ultimately bad for society is to encourage people to be more concerned with redistributing wealth than with creating it. Schemes like yours promote the myth that only the privileged succeed. Human energy spent redistributing wealth is truly wasted effort.

People, like your friend, who believe that they "would never have achieved their present professional position" without government loans annoy me. With a little more determination who knows what they could achieve? Life is not just one opportunity to be made or missed forever. There are opportunities every day. I don't owe it to someone else to make them an engineer or a scientist just because they think they want to be one. If they become an engineer or a scientist, I want them to have worked for it. That way I know that society will have the best engineers and scientists possible.

WAYNE HOLDER

San Diego, CA

You make a number of assumptions that Sound Wonderful but are in fact simplistic and unrealistic. They may be "useful delusions," but it simply isn't literally true that, "Individuals can achieve whatever goal they choose if they apply themselves." Some can, but many are thwarted by all kinds of things beyond even their best-intentioned control—including, but not restricted to, governmental interference. Finding counterexamples to "anything they do with it is ultimately beneficial to society" is left as an exercise for the reader.

Dear Dr. Schmidt:

Your editorial entitled, "Heirs Un-

apparent'' from the August, 1984, issue has prompted this letter.

First, let me say that I believe you misapprehend the fundamental philosophy that would underlie a society expressing libertarian principles. To my understanding, the essence of libertarian philosophy is that no person may initiate the use of force against another; not fairness, not equal starting positions in some putative race, not some final end result. It is a process philosophy, if you will, in contrast with an end-state philosophy. The fundamental axiom of libertarianism is that no one is morally permitted to use force against another person for any purpose other than literal self-defense, the defense of another human being, or the protection of their property against actual danger of loss or destruction. As I understand it, that does not mean any future or hypothetical danger but real and present danger. If this is an accurate statement of libertarian philosophy, to implement your scheme would be contrary to its fundamental tenent. While this may not seem a major objection, if you assume an otherwise free society existing in conjunction with your scheme, this contradiction would over time destroy the freedoms enjoyed in the rest of society. The inheritance confiscation would be used as a justification for expanding taxation, regulation, law, and all the other paraphernalia of government to a choking degree. This is the point of my first objection: philosophical contradiction, leading to the perversion of the scheme from its original purpose into a much broader scale scheme which would extinguish the other free elements of society. Examine the history of public education in the United States for an historical example of the long-term effects of such underlying philosophical contradition.

Second, it is not clear to me that your friend's inability to have obtained a college degree under a libertarian scheme would be a disability, in the context of a libertarian scheme.

Third, while I agree that wealth and its advantages would accumulate in particular families in a libertarian society, I disagree with your assertion that the wealth would remain there even after the heirs have become degenerate and incompetent.

Fourth, the analogy of life to a race simply doesn't carry the argument. While life may in some aspects resemble a competition, it is not similar to a race. In a race, there are definite prizes awarded by some impartial authority to individuals who perform better—as measured against some absolute objective standard—than other persons in the race. In life there is no absolute objective standard known to all participants. There is no prize awarded by an impartial authority. A race is a zero-sum game; life is a positive-sum game. There are no ''winners'' and no ''losers,'' simply because there is no objectively defined goal or standard of performance. My ''winning'' does not require that you lose in life; in a race, that's the only way I can know that I have won. This analogy is particularly inappropriate to the economic aspects of human existence, because of precisely that fact. In an economic situation, I gain only if you gain; else we would not trade, sell, buy, give, exchange, or produce. And most certainly, the values placed on the items of economic ''good'' are not absolute objective values. I have forgotten the economic terminology, but I believe differential preference is close to the correct phrase. Moreover, in life, I benefit from your ''advantages,'' even if I don't possess them. If you are so situated that you have the leisure to de-

vise a new medical treatment and thereby live; whereas, without your "unearned advantage," there would be no treatment or medicine and I would die. In a race, of course, no such benefits would accrue to me. I would start off badly positioned and end the race that way. Not sufficient similarity between life and a race and more than enough dissimilarity to invalidate the analogy. It simply isn't true that my position is improved by taking away someone else's advantage over me, in this context. Someone's position is improved by taking away others' advantages, but it is not the disadvantaged who are benefitted; it is the takers' positions that are improved.

Fifth, the right involved in inheritance is not the right of the heir, but the right of the person bequeathing the inheritance; not the right to receive but the right to distribute. If the dead have no rights, why are the dead entitled to shackle their heirs with laws, rules, and regulations? There is probably not a law on the books before 1960 that could stand that test; most of the legislators, judges, and even administrators who made those laws, decisions, and regulations are dead. Carrying that line of thought a little further, what right did our ancestors have to irrevocably bind us to a particular form or system of government? They are just as dead as last year's rich man who left his money to his children.

I have enjoyed *Analog* for nearly 25 years now and continue to enjoy it all: stories, fact articles, and the sometimes irritating editorials. Thank you.

LLOYD W. WILLIS

Edinburg, TX

You raise some very thought-provoking points, especially concerning zero-sum and positive-sum games and the justification for following laws passed by the dead. Fortunately the binding is not quite *irrevocable; and a case can be made for starting over periodically, though the practical difficulties make that a bit cumbersome to do very often.*

One closing comment on the whole matter, not in reference to any particular letter: Though I personally think I would find an attempt to implement such a plan a highly objectionable extension of governmental tampering with private lives, just as many of you did, I submit that it is not significantly more so than many of the practices we're already living with. It's just easier to see the cause for indignation in this because it's something that hasn't been done yet rather than something we've already been conditioned to put up with! ■

● *Daring,* n. One of the most conspicuous qualities of a man in security.

● *Dependent,* adj. Reliant upon another's generosity for the support which you are not in a position to exact from his fears.

Ambrose Bierce
(The Devil's Dictionary)

CLASSIFIED MARKET PLACE

ANALOG — published monthly. CLASSIFIED AD rate is $2.40 per word — payable in advance — (15 word minimum). Capitalized words 40¢ per word additional. To be included in the next issue please send order and remittance to I. M. Bozoki, Classified Ad Manager, DAVIS PUBLICATIONS, INC., 380 Lexington Ave., New York, N.Y. 10017.

ART

SF, Fantasy, Space, and Movie Posters. Many rare items. Giant new picture catalog $1.00. Space Station, Studio A, 33 Bacon St., Watertown, Mass. 02172.

BOOKS & PERIODICALS

54 years of ASTOUNDING/ANALOG back issues are once again available—on microfiche. Including complete index, color covers, and reader. These are high quality, inexpensive, unedited copies of the original issues. Write or call for more information and your FREE SAMPLE. M.I.C., P.O. Box 2163, Dept. AA, Dallas, Texas 75221 (214) 824-3969.

FREE catalogs of science fiction, utopia, lost race, supernatural and speculative fiction; address: Kaleidoscope Books, 625 Cornell Avenue, Albany, California 94706.

SCIENCE Fiction/fantasy. Free catalog of pulps, digests, paperbacks, hardcovers. Collections also purchased. Ray Bowman, Box 5845A, Toledo, Ohio 43613.

FLORIDA Opportunities! Looking toward retirement, new job, your own business? Wall's Florida Newsletter presents valuable information on housing, employment, living costs, culture, lifestyle, much more. Three monthly issues only $11.95. Wall's Dept. KK, Box 347, Mims, Florida 32754.

REINCARNATION—Your past lives are affecting your present. Learn how and why you reincarnated. Understand your karma and fate. Edgar Cayce based. Diagrams, illustrations, quality hardback. Send $10 or request details: Innervision-15, 1218 Eagle-wood Drive, Virginia Beach, Virginia 23454.

ALL Available paperbacks, hardcovers supplied quickly & efficiently. Worldwide service since 1973. Quarterly catalogue, free US/CANADA; $1 elsewhere. THE SCIENCE FICTION SHOP, 56 EIGHTH AVE., NY, NY 10014.

EDUCATION & INSTRUCTION

UNIVERSITY DEGREES By Mail!!!...Accredited Bachelors, Masters, Ph.D's. Free Facts Revealed. Careers-AN3, Box 470886, Tulsa, OK 74147.

GIFTS THAT PLEASE

IRRESISTIBLE opportunity! Exotic imported giftware for resale and personal use —Details $2.00: Thompson and Company—Importers, Box 296A, Mukwonago, WI 53149.

OF INTEREST TO ALL

HALLEY'S COMET is coming! See it, photograph it. Comet Trivia. Send $3.00 cash, money order, check to: Comet Handbook, Dept. A, P.O. Box 12484, Portland, OR 97212-0484.

PERSONAL

SINGLE? Widowed? Divorced? Nationwide introductions! Refined, sincere people, 18-80. Identity, Box 315-DT, Royal Oak, Michigan 48068.

WITCHCRAFT Mysteries of the Old Religion revealed. Understand the consensus reality. Free details. Wicca, Box 1502AN, Newber, N.C. 28560.

TOYS, GAMES & ENTERTAINMENT

ROLE PLAYERS. Your New Game Supplements Here! Player Characters, Dragons, More! Role Players, 4011 Adams Dr., Silver Spring, MD 20902. 301-942-0491.

"EXERCISE your alter-ego. First rate interactive play-by-mail game. Rules, maps, character registration form, $5.00: Alterego Gaming, 462 S. Gilbert Rd., Mesa, Arizona 85204."

a calendar of analog upcoming events

1-3 March
FILKCON 7.1 (SF and related areas song conference) at Sheraton La Reina, Los Angeles, Calif. Singing, performances, songbooks, hucksters, etc. Registration—$7 supporting, $18 attending. Info: Con-Chord II, Box 599, Midway City CA 92655.

8-10 March
COASTCON VIII (Gulf coast regional SF conference) at the Royal D'Iberville, Biloxi, Miss. Guest of Honor—Alan Dean Foster, TM—Vonda N. McIntyre. The usual, 24-hour gaming, 24-hour movies, 3 video rooms, etc. Registration—$12.50 until 22 February 1985, $15 at the door. Info: Coastcon, Box 1423, Biloxi MS 39533.

8-10 March
CONCAVESIX (15th Upper South regional SF conference) at Park Mammoth Resort, Park City, Ky. A relaxacon without formal programming. There is a hucksters room, art show, and banquet. Registration—$7 until 14 February, $9 thereafter. Info: ConCave, Box 90962, Nashville TN 37209.

14-17 March
NORWESCON 8 (Seattle area SF conference) at Seattle Red Lion Inn, Seattle, Wash. Guest of Honour—Brian Aldiss, Art Guest of Honor—Jack Gaughan, Fan Guest of Honor—rich brown, TM—Robert Silverberg. Multi-track programming, workshop, films, trivia bowl, etc. Registration—$20 until 1 November 1984. Info: Norwescon 8, Box 24207, Seattle WA 98124. 206-723-2101.

15-17 March
LUNACON '85 (New York City regional SF conference) at Sheraton Inn (LaGuardia) and Travelers Hotel, NYC. Guest of Honor—Gordon Dickson, Artist Guest of Honor—Don Maitz, Fan Guest of Honor—Curt Clemmer. All hotel reservations through the convention committee. Dealers, art show, gaming. Registration—$16 until 25 February 1985, $20 at the door. Info: LUNACON '85, % Walt Cole, Box 779, Brooklyn NY 11230.

22-24 March
STELLARCON 10 (North Carolina SF conference) at Greensboro, N.C. Info: Stellarcon 10, Box 4, Elliott University Center, UNC-Greensboro, Greensboro NC 27412.

22-24 March
GENERICON 1 (RPI SF conference) at Troy, N.Y. Info: Genericon, % Rensselaer SF Association, Box 66, Rensselaer Union, Troy NY 12181.

29-31 March
I-CON TV (SF&Fantasy conference) at SUNY Campus, Stony Brook, N.Y. Info: I-Con IV, Box 550, Stony Brook NY 11790.

30-31 March
NOVA 10 (SF, etc. conference) at Oakland Center, Oakland University, Rochester, Mich. Guest of Honor—Ted Reynolds, Filk Guest of Honor—Clif Flynt, Gaming Guest of Honor—Pete Rogan. Registration—$3.50 until 1 March, $5 at the door ($3 one day). Info: Order of Leibowitz, 64 Oakland Center, Oakland University, Rochester MI 48063.

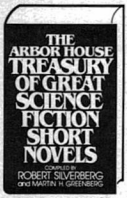
30 August-2 September 1985
NASFic 1985 (North American SF Convention, officially The First Occasional Lone Star SF Convention & Chili Cook-off) at the Hyatt Regency Austin and Palmer Auditorium, Austin, Texas. Guest of Honor—Jack Vance, Artist Guest of Honor—Richard Powers, Fan Guest of Honor—Joanne Burger, TM—Chad Oliver. Registration—attending $35 until 31 December 1984, then $45; supporting—$15. Info: NASFic, Box 9612, Austin TX 78766.

—Anthony Lewis

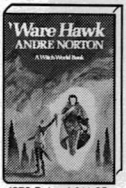
Explore new worlds beyond the limits of time and space.

1339 Pub.ed.$15.95

0711 Spec.ed.



9076 Pub.ed.$19.95

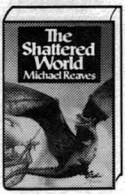


1073 Pub.ed.$11.95

1404 Spec.ed.

1347 Spec.ed.

1388 Pub.ed.$15.95



1305 Pub.ed.$16.95

1248 A Matter for Men; A Day for Damnation. Comb.pub.ed.$33.90

1420 Includes the First, Second, and Third Books. Spec.ed.

0943 Another Fine Myth; Myth Conceptions; Myth Directions; Hit or Myth. Spec. ed.

1321 Pub.ed.$16.95

1396 Pub.ed.$13.95

1263 Pub.ed.$15.95

Take any 5 for $1 WITH MEMBERSHIP.

SEE OTHER SIDE FOR ADDITIONAL SELECTIONS.

How the Club Works:

You'll receive your 5 books for only $1 (plus shipping and handling) after your application for membership is accepted. We reserve the right to reject any application. However, once accepted as a member, you may examine the books in your home and, if not completely satisfied, return them within 10 days at Club expense. Your membership will be cancelled and you'll owe nothing.

About every 4 weeks (14 times a year), we'll send you the Club's bulletin, *Things to Come*, describing the 2 coming Selections and a variety of alternate choices. In addition, up to 4 times a year you may receive offers of special Selections, always at low Club prices. If you want the 2 Selections, you need do nothing; they'll be be shipped automatically.

If you don't want a Selection, prefer an Alternate, or no book at all, just fill out the convenient form always provided and return it to us by the date specified.

We allow you at least 10 days for making your decision. If you do not receive the form in time to respond within 10 days and receive an unwanted Selection, you may return it at our expense.

As a member you need take only 4 Selections or Alternates during the coming year. You may resign any time thereafter or continue to enjoy Club benefits for as long as you wish. One of the 2 Selections each month is only $4.98. Other Selections are higher, but always much less than hardcover publishers' editions – up to 65% off. The Club offers more then 300 books to choose from. A shipping and handling charge is added to all shipments. Send no money now, but do mail the coupon today!

Note: Prices shown are publisher's edition prices.

SCIENCE FICTION BOOK CLUB®

Dept. RR-541, Garden City, N.Y. 11530

I want the best SF in or out of this world! Please accept my application for membership in the Science Fiction Book Club. Send me the 5 books I have numbered in the boxes below, and bill me just $1 (plus shipping and handling). I agree to the Club Plan as described in this ad. I will take 4 more books at regular low Club prices in the coming year and may resign any time thereafter. SFBC offers serious works for mature readers.

1.	2.	3.	4.	5.

Mr.
Ms. _____
(Please print)

Address _____ Apt. # _____

City _____

State _____ Zip _____

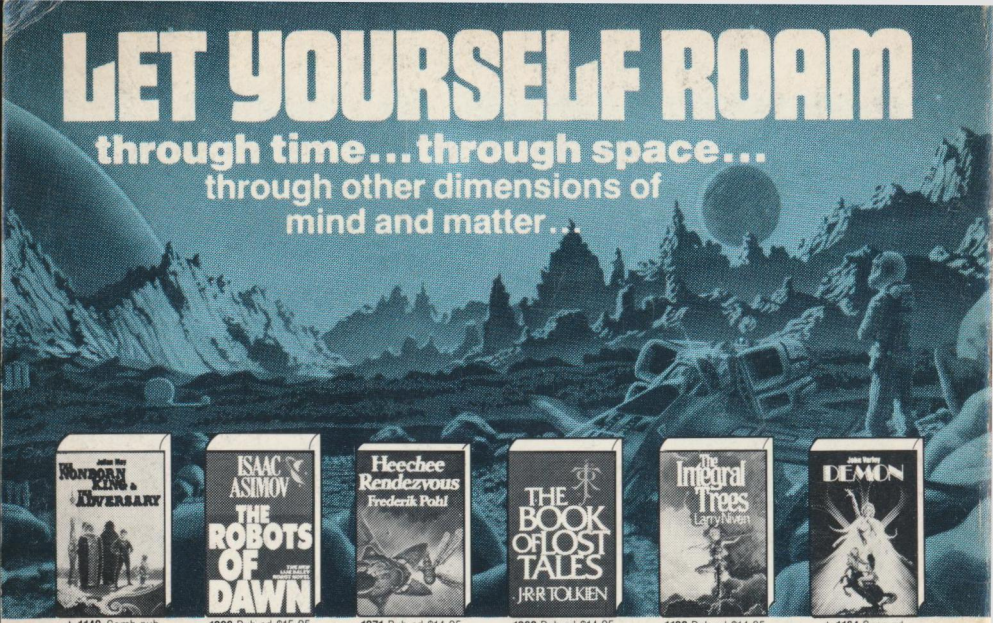
If under 18, parent must sign. _____

The Science Fiction Book Club offers its own complete hardbound editions sometimes altered in size to fit special presses and save you even more. Members accepted in U.S.A. and Canada only. Canadian members will be serviced from Canada. Offer slightly different in Canada.

38-S231P

LET YOURSELF ROAM

through time...through space...
through other dimensions of mind and matter...



★ **1149** Comb.pub. ed.$33.90

1099 Pub.ed.$15.95

1271 Pub.ed.$14.95

1362 Pub.ed.$14.95

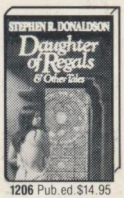
1180 Pub.ed.$14.95

★ **1164** Spec.ed.

1131 Spec.ed.

0166 Pub.ed.$16.95

†**1289** Spec.ed.



1206 Pub.ed.$14.95

1230 Spec.ed.

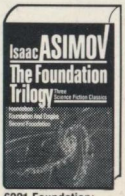
0935 Pub.ed.$14.95

0075 All 5 Amber novels. 2 vols. Comb.pub.ed.$32.30

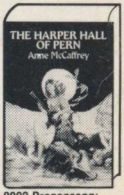
1354 Storm Season; The Face of Chaos; Wings of Omen. Spec.ed.

0752 Elric of Melnibone; The Sailor on the Seas of Fate; The Weird of the White Wolf. Spec.ed.

1172 The Vanishing Tower; The Bane of the Black Sword; Stormbringer. Spec.ed.



6221 Foundation; Foundation and Empire; Second Foundation. Pub.ed.$17.95



0992 Dragonsong; Dragonsinger; Dragondrums. Comb.pub.ed.$38.85

TAKE ANY 5 FOR $1

WITH MEMBERSHIP

See other side for coupon and additional Selections.

THE SCIENCE FICTION BOOK CLUB®

Note: Prices shown are publishers' edition prices.
★ Explicit scenes and/or language may be offensive to some.

38-S231P