
SCIENCE FICTION
analog
SCIENCE FACT
JULY 1978
$1.25
TERRAFORMING EARTH
TO BRING IN THE STEEL
Donald Kingsbury
Jack Williamson
Jack Chalker
0 07
753314

SCIENCE FICTION GAMES

MicroGames are small, fast-playing, and inexpensive. But not trivial. A MicroGame is a complete science-fiction wargame...one you can put in your pocket and play at lunch. *More* play for *less* money? Try a MicroGame and see.

$2.95

OLYMPICA

The U.N. Raid On Mars, 2206 A.D.

OLYMPICA is a challenging tactical game of combat on and below the dusty surface of Mars. The attacking U.N. force — infantrymen whose hand weapons reach six miles, laser tanks, and rocket lifters — must take on strongpoints and infantry united by the religion/machine/telepathic oversoul that controls Mars . . . the WebMind.

OLYMPICA includes a 24-page rule booklet with color cover, 8¼" x 14" game map, and counter set. The price is $2.95, or $2.50 to subscribers to *The Space Gamer*.

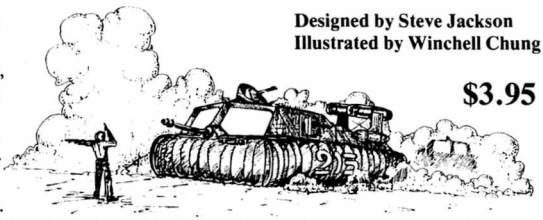
Designed by Lynn Willis
Illustrated by Paul Jaquays

G.E.V. *more battles from the world of* OGRE

G.E.V., sequel to the popular **OGRE**, adds more detail to this fast-moving simulation of armored combat in the next century. **G.E.V.** is a new game — but is wholly compatible with **OGRE.**

Stacking and terrain rules, new unit types, the Mark IV Ogre, and more . . . Scenarios include Raid, Breakthrough, Ceasefire Collapse, and The Train. And within hours, you'll be inventing your own.

G.E.V. includes a 24-page rulebook, counter set, and three-color 12" x 14" game map. The price is $3.95 — $3.50 to *TSG* subscribers.



Designed by Steve Jackson
Illustrated by Winchell Chung

$3.95

And don't miss any of the other MicroGames. Fantasy, science fiction, past and future...they're all here.

OGRE pits humans against the giant cybernetic tanks of 2085. CHITIN I shows the Harvest Wars of intelligent insects. WARPWAR lets players design their own ships for interstellar combat. RIVETS recreates what happened when all the humans died – but the idiot robots kept fighting... MELEE, WIZARD, and DEATH TEST are all parts of THE FANTASY TRIP, a role-playing system. MELEE covers gladiatorial combat, and WIZARD pits magicians against one another; DEATH TEST uses the MELEE rules (not supplied) to take one to five players through a "programmed" adventure. Each of these games is $2.95 ($2.50 for subscribers to *The Space Gamer)*, except the larger WIZARD, which is $3.95 ($3.50 to *TSG* subscribers). Subscriptions to *The Space Gamer*, Metagaming's magazine for science-fiction and fantasy gamers, are $8 for six bimonthly issues, $15 for twelve.

METAGAMING

Box 15346-AS
Austin, TX 78761

Look for MicroGames at your hobby shop . . . or order directly from us.

JUNE IS ANNE McCAFFREY MONTH AT DEL REY BOOKS

To celebrate, we are publishing two exciting new novels by the lady who taught dragons to fly and spaceships to sing

In hardcover...
Volume 3 of the super-bestselling series
THE DRAGONRIDERS OF PERN

THE WHITE DRAGON

The most eagerly-awaited new sf novel of the year! In this enthralling sequel to *Dragonflight* and *Dragonquest*, Jaxom grows to maturity... teaches Ruth, his beautiful white dragon, to fly and fight...and, together, they soar into another time and another epic adventure.

Cloth, $8.95

In paperback...
The first novel in an exciting NEW series

DINOSAUR PLANET

When an exploration team lands on the planet Ireta they discover that life forms are the same as those on Earth during the Mesozoic period. They begin to suspect that their expedition might not have been the first. Beset on all sides by carnivores, they can't contact their pick-up ship. They're stranded on DINOSAUR PLANET.

27245/Paper, $1.75

AT YOUR BOOKSTORE NOW

If you want The Best in Science Fiction and Fantasy, you need only...

Published by BALLANTINE BOOKS
A Division of Random House, Inc.

DEL REY BOOKS

BEN BOVA
Editor
VICTORIA SCHOCHET
Associate Editor
ROBERT FONES
Editorial Assistant
HERBERT S. STOLTZ
Art Director
GERALDINE PRASIOTIS
Advertising Production Manager

Next Issue on Sale
July 4, 1978
$10.00 per year in the U.S.A.
$1.25 per copy

Cover by Vincent Di Fate

Vol. XCVIII, No. 7
JULY 1978

SCIENCE FICTION
analog®
SCIENCE FACT

CONTENTS

Analog Science Fiction/Science Fact is published monthly by The Condé Nast Publications Inc.: Condé Nast Building, 350 Madison Avenue, New York, New York 10017. S. I. Newhouse, Jr., Chairman; Robert J. Lapham, President; Fred C. Thormann, Treasurer; Mary E. Campbell, Secretary.
Second class postage paid at New York, N.Y. and at additional mailing offices. Subscriptions, in U.S. and possessions, $10.00 for one year, $18.00 for two years, $25.00 for three years. In Canada and Mexico, $12.00 for one year, $22.00 for two years, $31.00 for three years. Elsewhere, $13.00 per year, payable in advance.
Single copies in U.S., possessions, and Canada, $1.25. For subscriptions, address changes and adjustments, write to Analog Science Fiction/Science Fact, Box 5205, Boulder, Colorado 80323. Eight weeks are required for change of address. Please give both new and old address as printed on the last label. Postmaster: Send form 3579 to Analog, Box 5205, Boulder, Colorado 80323. First copy of new subscription will be mailed within eight weeks after receipt of order. The editorial contents have not been published before, are protected by copyright and cannot be reprinted without the publisher's permission. All stories in this magazine are fiction. No actual persons are designated by name or character. Any similarity is coincidental. We cannot accept responsibility for unsolicited manuscripts or art work. Any material submitted must include return postage.

POSTMASTER: SEND FORM 3579 to ANALOG SCIENCE FICTION/SCIENCE FACT, BOX 5205, BOULDER, COLORADO 80323.

Editorial and Advertising offices: Condé Nast Building, 350 Madison Avenue, New York, New York 10017

Subscriptions:
Analog Science Fiction/Science Fact, Box 5205, Boulder, Colorado 80323

editorial

dark age

It happened again yesterday. The letterhead bore the name of a Community college in California. The writer, a member of the Language Arts Division of the school, identified herself as "a (sic) instructor of a science fiction literature class." And she referred to this magazine as ANALOGUE.

A small thing, certainly. Many people mistakenly add a "ue" ending to our title. Unsettling that it came from a self-professed teacher of science fiction, of course.

By itself, worth nothing more than a rueful shake of the head.

But this kind of incident is not an isolated, forgettable, phenomenon.

There are hundreds—perhaps thousands—of teachers giving science fiction courses in the nation's schools who know SF intimately, and love it well. But there are even more of them who don't know the subject, yet loudly maintain that *it is not necessary to know something in order to teach it!*

That attitude can lead us to a Dark Age. Because that attitude is becoming prevalent throughout our educational system.

I admit to a strong bias in this matter of teaching science fiction. I've been labeled a curmudgeon by personages no less august than Frederik Pohl and James Gunn, and they are probably right. But I *am* biased. More than that, I am angered at the fact that teachers consider ignorance to be bliss. And I'm particularly upset that most teachers of SF courses don't even realize that science fiction magazines are still being published.

This has been brought home to me time and again, whenever I attend conferences of meetings of SF teachers. There are always a number of them who stare blankly and say, "Analog magazine? *What* kind of a magazine is Analog?"

Last November, for example, it happened at the special science fiction seminar that preceded the annual National Conference of Teachers of English. I attended the seminar to chat with the teachers who were interested in science fiction and, sure enough, I was asked the inevitable: "Analog? What's that?"

I replied, rather hotly, that I found it difficult to understand how a teacher can presume to instruct students on a subject of which he is apparently ignorant. I asked the gathering how many teachers had been asked to give a course on Shakespeare without knowing his plays, or on anthropology without knowing the subject matter. The answers ranged from bemused stares to self-conscious excuses.

In due time I left the gathering and repaired to a taxicab to return to the Analog office. I gave the cab driver the address and later added, "That's the Condé Nast Building."

"Condé Nast?" he immediately replied. "They publish my favorite magazine."

The Condé Nast Publications, Inc., publishes many national magazines, including Vogue, Glamour, Mademoiselle, Brides, etc. And tastes in Manhatten are often, well, unpredictable. So it was with a bit of trepidation that I asked the cabbie, "Which magazine is your favorite?"

"Analog!" he responded cheerily.

I almost asked him to turn around and go back to the hotel where the NCTE meeting was being held. *He* should be teaching science fiction, and some of those teachers ought to take a turn at pushing a hack.

Then I recalled my first experience with SF teachers, years earlier, at a meeting of the Science Fiction Research Associates. I naively asked the teachers in that organization if there were any way that Analog could be used in their classes. Their reaction was very educational—for me.

Almost every one of them was aghast at the thought of using something *new* in their classes! Analog is published monthly, you see, and this would force the teachers to read the magazine each month if they wanted to use it in class. What's worse, the magazine doesn't have any teacher's guide, no helpful notes to explain the contents, no lists of questions for quizzing the students. There are no critical analyses of these newly-published stories, the teachers also pointed out to me, which means that they wouldn't know what to say to the class about them.

I wish I were exaggerating. I wish I were joking. But that was the actual response I received from those teachers.

Certainly not all teachers expect to have their classroom work set up for them beforehand. But at least in the science fiction area, where the knowledgeable teachers are so rare, most teachers look for predigested information that they can use without much effort on their part. They want test questions (and answers) handed to them.

And I have a strong suspicion that

500 years from now, clairvoyant women will link their minds with super-intelligent machines to warp the fabric of space and send mile-long starships across the interstellar void in an eyeblink of time. Two powerful alien races will vie with humanity for control of nearby habitable planetary systems and a third race will attempt genocide on a cosmic scale. This future is yours to control in...

STARFORCE: Interstellar Conflict in the 25th Century

StarForce is the bestselling, science-fiction simulation game from SPI, the leading publisher of conflict simulation games. *StarForce* brings science-fiction to life as you maneuver your starships on an accurate map of a 40-light-year "globe" of interstellar space. Through a unique system of notation, pieces are moved in *three* dimensions and much of the strategy in the game centers around how devious you can be in your use of this novel "real-space" environment. You can play the game in two different versions in any of its thirteen different scenarios. *StarForce* comes complete with a 22" × 34" starmap, 200 cardboard playing pieces, complete rules (including a science fiction background story) and plastic parts tray. *StarForce* is available in two packaging styles: the *Softpack* (in plastic box with cardstock map) or the *Hardbox* (in bookshelf-size box with *mounted* map sections).

SPI is the largest publisher of military and science-fiction simulation games. Here are some of the other titles available:

- ★ **BattleFleet Mars:** Space Combat in the 21st Century
- ★ **Outreach:** The Conquest of the Galaxy
- ★ **StarSoldier:** 25th Century Tactical Combat
- ★ **Sorcerer:** The Game of Magical Conflict

SPI is the publisher of ***Strategy & Tactics Magazine,*** the most widely read and respected publication in the history/simulation field. Each issue of *S&T* comes complete with its own simulation game (which deals with the subject of the featured article). Why not subscribe when you send in your order for *StarForce*?

Prices apply to all orders deliverable to USA or APO/FPO addresses. SPI pays postage on all domestic orders. Allow three weeks for delivery. Payment must accompany order. New York residents add sales tax. Foreign customers add $3 per year surcharge on subscription and $2 surcharge on any game order. US funds only. Products are returnable for cash or credit (specify) if returned *intact* within 15 days of receipt.

SPI has been serving customers by mail since 1970

Send check or money order to:

SPI, Dept. 430
44 East 23rd Street
New York, N.Y. 10010

Please send me the following games:

- ☐ **StarForce** (softpack): $8
- ☐ **StarForce** (hardbox): $12
- ☐ **BattleFleet Mars** (softpack): $12
- ☐ **BattleFleet Mars** (hardbox): $18
- ☐ **Sorcerer** (softpack): $9
- ☐ **Sorcerer** (hardbox): $12
- ☐ **StarSoldier** (softpack): $9
- ☐ **Outreach** (softpack): $9

Please enter my subscription to Strategy & Tactics

- ☐ 1 year (6 issues): $14
- ☐ 2 years (12 issues): $26
- ☐ 3 years (18 issues): $36
- ☐ Please send free brochure

Please print:

Name _____

Street _____ *apt* _____

City _____ *State* _____ *Zip* _____

FOR OFFICE USE ONLY

CusCode Total $ Credit Post Tax

science fiction is not the only area where this attitude prevails.

To all those inadequate teachers—but more importantly, to the good ones—here is a piece of happy news. There is a new book out, called *The Creation of Tomorrow*, by Paul A. Carter (Columbia University Press, 1977). It is a gem, and it should be required reading for anyone giving a science fiction course.

Subtitled *Fifty Years of Magazine Science Fiction*, this book offers more insights into themes, the social background, and the practitioners of science fiction than anything I've read since James Gunn's *Alternate Worlds*.

Paul Carter is a professor of history at the University of Arizona in Tucson. According to the book's jacket blurb, the first SF magazine he ever read was the June 1938 Astounding. In 1945 he sold a short story to this magazine. That's the extent of my knowledge about him, except for what I've gleaned from his book.

The man knows science fiction. He's done the work. He's not only familiar with the fiction published in the magazines (and outside the magazines, as well), but he's equally familiar with the letter columns of the magazines—the mark of a careful researcher, true devotee, or both.

The Creation of Tomorrow won't give inadequate teachers the kind of instant multiple-choice question-and-answer list they want. But there is a wonderful feast of food for thought in this book. To follow just one line of reasoning that's woven through the chapters:

Early in the book, speaking of Hugo Gernsback's founding of magazine SF, ". . . Gernsback does seem quite sincerely to have conceived his mission as a species of popular education, in an age (circa 1926) when a college degree was not yet the expected goal of most young Americans."

That's a facet of science fiction's origins that most researchers in this field have overlooked rather completely. Yet it explains so much about the popularity and success of science fiction among the bright young urban middle class teenagers of the twenties and thirties. They could learn things that their schools never taught them!

A few pages later, Carter quotes Gernsback's editorial policy, ". . . to publish only such stories that have their basis in scientific laws as we know them, or in the logical deduction of new laws from what we know."

As clear a definition of "hard core" science fiction as you will find anywhere. Further on, speaking about John Campbell's dedication to "hard core" SF as Editor of Astounding, Carter points out that, "Campbell, with the sound editor's instinct for a readable story" frequently violated his own rules and bought stories with little or no real scientific content, a characteristic of his that "made it hard for logical academic critics to classify."

At another juncture, Carter discusses van Vogt's "Black Destroyer," and makes the point that the scientific

assumptions made as part of the story's background are crucial to the development of the tale.

". . . the reader who knows little and cares less about science will miss the message entirely," Carter writes, then continues,"To attempt to *teach* science fiction, as has been much in vogue in recent years, without awareness of this dimension of the subject can be disastrous." (His italics.)

Carter has hit the crux of the problem of teaching science fiction. Teachers whose training has been exclusively in English literature and Education courses are not qualified to teach science fiction. Not unless they know a lot more about science fiction, and science, and our technological society, than most English teachers are ever required to learn.

One way to solve this problem is to use a team-teaching approach. Let the science fiction course be taught by the English Department, if you must. But bring in "guest lecturers" from the physical sciences, sociology, political science, psychology, and other parts of the campus.

Carter also touches on an even deeper problem. In a nicely-executed discussion of postapocalypse stories, he quotes letters in the 1941 Brass Tacks columns from several readers, including P. Schuyler Miller and L. Sprague de Camp.

The subject of their debate was the possibility of a future Dark Age.

De Camp claimed that even if western civilization had its pins knocked out from under it by global war or natural disaster, there are so many books and readers in the world that civilization would not collapse all the way back to barbarism. A Dark Age need not follow an apocalypse, he argued. Miller countered that when people must spend all their energies gathering food and staying minimally alive, reading might easily become a useless luxury, and spreading illiteracy will inevitably cause a backslide into a Dark Age.

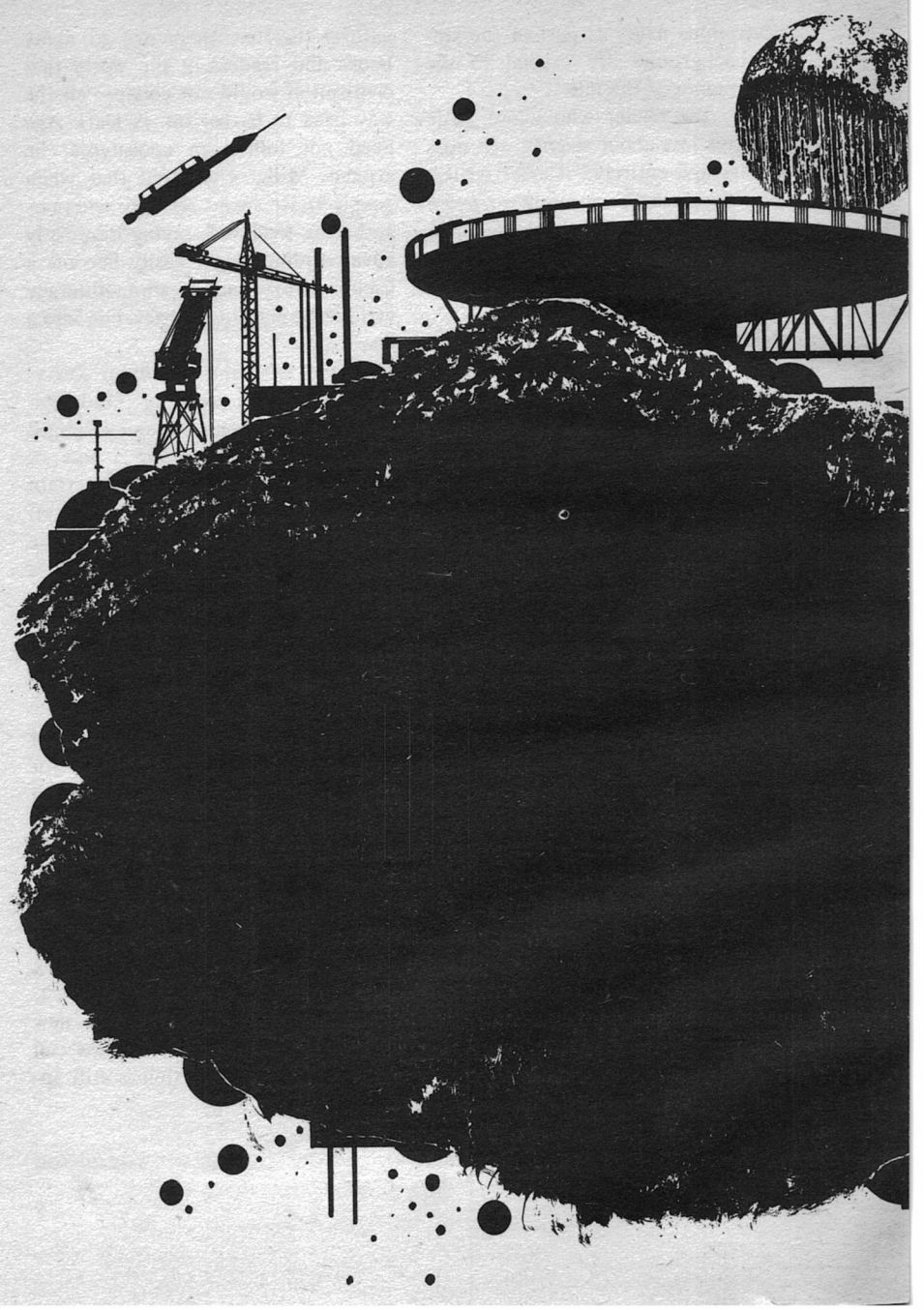
Carter, with the benefit of thirty-five additional years of hindsight, points out that mass illiteracy "might well be reached *without* a loss of machine technology, given certain trends in that technology (e.g., television) as reinforced by some of the doctrines taught in American colleges of education: that, indeed, a highly mechanized civilization might be able to coexist with mass functional illiteracy."

We are at that stage now. In New York City, hundreds of public school teachers are being investigated for functional illiteracy; they have been accused of obtaining their teaching certificates under dubious circumstances.

That's what frightens me about our educational system today. It's not merely that science fiction is being taught poorly. *Everything* is. Civilization needn't collapse before a new Dark Age begins. The darkness can start while the civilization is still apparently flourishing.

Like now.

THE EDITOR



Donald Kingsbury

to bring in the steel

There are legends waiting to be made in space. And when they are, people will make them.

Vincent Di Fate

1

So his ex was dead. It was like her, too—she'd used the wrong poison and died horribly. Meddrick Kell remembered the time she had been in a rage about him killing animals and had put all his shotgun shells in the fireplace thinking they'd burn gently. God, that was long ago.

The mountains of Earth erupted in his memory, striking him with giddiness. He relished the green mountains for their loneliness; they gave him the same sense of peace as did the bleak desert of an asteroid. His wife hated being alone. She was never happier than when she was partying in a fifteenth floor penthouse with a dozen desperately elegant drunks who besotted their wit in style with Chivas Regal and Johnny Walker. Probably it was two days of being alone that had driven her to suicide, he thought sarcastically.

Kell toasted the nude on his cabin wall with an imaginary drink—alcohol and drugs were sparingly used in puritan space villages where the members prized clearheadedness because they prized survival. "Here's to the last alimony check!"

Then he returned to the letter from his daughter. He was always astonished by Celia's typewritten prose. She was only seven years old. Two of the paragraphs described her mother's death convulsions. She might grow up to be the System's best horror story writer if she could learn to avoid words like "eclampsia." *What the hell does "eclampsia" mean? I suppose it's all the fault of that typewriter.*

He'd never met Celia. Helen had never even sent pictures. She just cashed alimony checks. Celia was five years old before Kell received his first letter, in fat, painful child's scrawl. The fax image that had been lasered in from Earth was still glued to the wall beside his nude's left breast. It had made him laugh for days because it was so like all the women he had ever known.

Dear Daddy I want a typwreter
xxxx ooo.
LOVE Celia

Kell didn't know how to buy a gift for a girl. His only experience with children was with his older brothers, all of whom had been raised by their father in a womanless world high in the Sierra Nevada Mountains. Consequently he grappled with the idea of selecting just the right typewriter for Celia as if it were a major Asteroid Belt crisis. The choice was too vast. Finally he had given up in bafflement and ordered for her the most expensive IBM model just to be on the safe side.

You could still get cheap manual-input line printers where one knob selected the type face and the memory was restricted to a single line, but he hadn't been sure a child could use one. What finally decided him on the IBM Vosowriter 2200 was the hard wired program that taught children to read while it taught them to type. On top of that it included:

(1) A full screen with editing capabilities.

(2) A hook-up to a 500 page random access cartridge for manuscript revision.

(3) A dictionary with definitions and completely cross-indexed thesaurus.

(4) An auxiliary voicewriter which allowed words to be inputted via speech. The words appeared on the screen in BFA—Basic Phonetic Alphabet, a slightly expanded version of the long popular Pitman Initial Teaching Alphabet—handy because it was hardly distinguishable from the Roman Alphabet. A parallel program looked up the word in the magnetic bubble dictionary and replaced the phonetic spelling by the standard spelling—if the word was contained in the dictionary.

That was where Celia found words like "eclampsia," "admissibility," and "ingurgitation." But at the bottom of each of her letters was always a hand scrawled P.S. in very short words. "I want a hole W. Shaekper drama album MGM-LM-5632."

No matter how he tried, Kell had never been able to compose a letter in reply to his daughter and so had delegated that job to his secretary. His secretary's first cute effort had been condescending, distant.

"It's too cold!"

"You're a very cold man," said his secretary with the frankness that was usual between them.

"I don't give a tinker's damn if I'm as cold as the night side of a space corpse, do it over!" Kell had growled.

"What'll I say?"

"David, if I knew what to say, I'd write it! You're an expert at smoothing out all my reports. Not only that but you've been blessed with two younger sisters. You know how the little monsters think! Ask your girlfriend, ask anybody, *just do it*."

And so the correspondence had gone on for two years as they maneuvered in from the Belt toward the orbit of Mars. This, Celia's latest letter, ended with the hand printed line, "I want to come to Pittsburgh I want to come to Pittsburgh I want to come to Pittsburgh." Pittsburgh was the name of Kell's ship but the name was applied loosely to the whole symbiotic spaceship-asteroid complex.

What was he going to do with her? It would be a disaster to send Celia off to his brothers, and he'd have to act quickly to keep her out of her grandmother's hands. There were boarding schools, but he didn't know anything about that way of life and didn't trust it. He should talk to a woman; they knew about such things, but he didn't know any women well enough to discuss anything that close to him.

Kell punched out the code for David's bodyphone. "David. I have an Earthside emergency going. Contact Histon McKinner in San Francisco and have him pick up Celia and take her into his personal home right now. Her mother is dead. See that he takes legal action so that I get custody."

"It's dawn at San Francisco right now. I'll take care of everything in three hours."

"Great."

Dawn in San Francisco. The fog would be red in the bay and the white stucco walls along the hillsides would be pink. *What will I do with her?*

There was no dawn on the asteroid called Pittsburgh. The spaceship that had brought them out to the Belt was leeched to the rock's surface like a great space bird of prey, its huge sunward facing mirror keeping the planetoid in darkness, its talons grasping its victim, its beak devouring her substance. The mirror soaked up energy which had been lasered 400 million kilometers across the solar system from a power station circling the sun well inside Mercury's orbit, energy which out here in this dark energy desert was used to smelt four tons of rock per second, to refine it and to deliver three tons of waste per second to the vaporizers where ionized slag was accelerated to eight kilometers per second and blasted out forward along the line of orbit, day after day, year after year, in thundering flame. Twelve years the beast would spiral inward. When the ship finally reached Earth its claws would be clutching the digested remains of its victim, something like 300 million tons of refined metal. Most of it had already been sold to the Japanese.

Kell thought about his daughter all during his inspection tour of the smelter. He constantly wandered over the asteroid poking into everything. He was known as the man to have around during a crisis, probably because he was so perceptive that a part of him was predicting a crisis and planning for it before it ever happened. Today he was slower than usual.

It was the Pittsburgh's second journey to the Belt. She had carried thirty-five veterans from the first trip back with her. Kell was not a veteran, he had signed on as a foreman, but that had not stopped him from rising to second in command. Small space colonies were made for village democracy. Seniority rights, and absolute chains of command were not tolerated in an environment where a leader's mistakes could be lethal.

Kell had always had an answer when quick answers were needed and so he had risen. He always had an answer because he was that engineering freak who was fascinated by obsolete technology. When he was twelve he bought a bag of iron oxide and built himself a forge in the Sierra Nevadas and learned to smelt iron. When he was fourteen he turned out a rifle barrel from his own steel on his own lathe. He blew glass and built radio receivers out of homemade vacuum tubes.

In space he was a natural. Hundreds of millions of kilometers from Earth, problems developed that could not be solved by looking up a widget in a catalog and having it flown in. Earth was a year away by the fastest ship. Kell could do things like make an electromechanical gadget that would substitute for a computer. No matter that it was five thousand times as large as it should be; it worked.

The two women he had tried to live

with now shunned him. One wouldn't tell him why. The other was a girl whose relationships never lasted more than two months and who, herself, was mostly a hermit. No use talking to them about Celia. And the women who had babies? The rule was that no children could be brought from Earth and none born during the journey to the Belt and none born while the ship-asteroid symbiosis was being established, but that after rooms had been burrowed in the asteroid, then babies were quite acceptable.

There were eighteen children on the Pittsburgh, the eldest being four and a half. Kell doubted his popularity with their parents. Once he had made a vigorous attempt to legally limit the number of children after a baby had been found lost and injured in one of the machine shops.

No, he had no one to consult, so he consulted himself.

There were no rules about importing children once the smelter had been set up; it had just never been done. He tried to imagine what it would be like to hold Celia in his arms, but he had never held a child in his arms. He tried to imagine himself talking to her but he had never talked to a child. It would be nice to have someone around who loved him, but he had never been loved.

He tried to reach Celia through his own childhood. He remembered himself frying eggs over a wood stove in the Sierra Nevadas, and the time he had stolen an ax and gone into the woods to chop, slicing the leather off his boot toe neatly and earning a beating, and the times he saved the squeezed lemons from the garbage to give flavor to the crystalline shadow-preserved June snow that he loved to suck. But those were boy's memories that he couldn't transfer to the freefall environment of this termite colony. He had no way at all of understanding the girl his vain wife would have spoiled.

His daughter wouldn't like him. If she stayed on Earth at least she could preserve her fantasy about him. But if she stayed on Earth there might be no one who knew *how* to love her.

When he found himself not writing a report that should have been finished in five minutes, he became annoyed. There were ways of ending thoughts that lured you into an endless maze. He pulled out a black die with silver eyes that he knew was perfectly balanced because he had machined it himself. "Odds she stays," he said aloud, "evens she comes." He spun the die off the end of his thumb and it arced over until it was sucked against the ventilation screen: a six. Evens. *So she loses her illusions*, he thought cynically. It was a relief to have the decision made.

But he was vetoed.

The Pittsburgh community had evolved a simple and effective form of democracy, relevant to a group that numbered only 230. Any man could propose a law. He merely had to post it in the computer. A bulletin board might have served as well. If the lawmaker was wise he worked out the

wording with three to a dozen supporting friends first. Those that the law affected were then put on a voting list. Debate followed in the form of attached comments and ammendations. These were typically formulated by individuals in their spare time or by spontaneous group sessions.

If the issues were controversial a sizeable body of comment would appear over a few days. Eventually a compromise version was posted and voting took place at the convenience of the individual voter. Votes were entered on a scale of from one to ten, plus for a yes, minus for a no. To pass, a bill had to accumulate more than 50% of the eligible votes, however, any issue that polarized the community was placed on the agenda of the monthly town meeting. The vast majority of laws were passed without "going to meeting."

Kell's request to ship Celia out to the Pittsburgh had been denied by the majority. The minority who voted with Kell did not feel strongly enough about it to see that it was sent up to a meeting for debate. There was a wide consensus, cautiously stated, that Kell would not be able to properly perform the functions of a father.

Men in power are often surprised when people refuse to carry out their orders, and can be enraged when it is a simple personal request that is denied. Kell showed his rage by being more distant and by smiling more fixedly.

He had been alone all his life; he enjoyed being alone but to be *denied* his daughter converted his state of being alone to that of exile and pain. Emotions have two faces. Love can be the peace of union and the agony of having betrayed someone you love. Hate can be the towering triumph over a crushed enemy or the rotting torture of impotence. Grief can be a sobbing relief or the longing for something that can never be.

The pain of his loneliness burned in him, demanding that he bring his daughter here to this barren place. For keeping Celia from him, the rest of them, all 229 of them, could drop like flaring torches into Sol, one by one.

He laughed.

They had given him one small out, a sop to his ego probably, a fatal error, that. He could have her—if he could find someone to take care of her. They didn't think he could do it. He smiled, not trying to force his face into pleasant lines. He smiled for himself. They didn't know how much power he really had.

On Earth the executives at Ventures Metal knew who was jockeying this orebody through the Belt and across the Mars-Earth gulf. Ventures knew who the other captains consulted when there was trouble. On Earth, where the money was, they valued this hunk of metal that when brought to port would line their vaults with more than the gross national product of many nations. So Kell felt in his bones that he could afford multimillion-dollar whims.

He would put in a requisition for a mother for his child with the same

care that he might ask for a specialized machine tool. The workpersons of Pittsburgh would get the mother they had so righteously demanded. Would they get a mother!

Lisa Maria Sorenti.

He did not know her personally, and she was not even that notorious unless you followed the San Francisco Bay Area scandals but he had once seen her in action at a wild party. Three men had fallen in love with her in the few minutes he had watched her flawless performance of the ingenue. But *he* had seen her with his own jaundiced eyes. Her only skill was an electric charm. She was dishonest. She loved to be loved. She did not like men. She was indifferent to women. She was deathly afraid of being poor when she was old. And she would do anything for money, anything.

2

The two San Francisco executives shook hands like old friends who spoke and dealt with each other often, but who just hadn't met solidly for a long time. They both wore lace shirts and short pigtails.

"Histon!"

"Roy!"

"How's Stacy?"

"She's great."

"And the kids?"

"They're great, Roy. Linda's just joined the Little League. She's a great little batter. We've got a new one. That's why I'm here. It's Meddrick Kell's girl; sweetest tyke you ever met. Linda has her out playing baseball right now. Her mother committed suicide. What's not good about it is that I'm afraid Kell has split his can."

"He never had a can to split. How's Celia taking it?"

"Do you know her?"

"Yeah, I had more dealings with her mother than I wanted. Alcoholic bitch and all that."

"Kell wants Celia shipped out."

"Unusual but what's the problem? We have a supply ship going out."

"Pittsburgh voted him their number one no good father. They didn't buy it."

"They know they need him! What the hell!" roared Roy.

"They'll agree to her being shipped out if he can get someone to take over as governess—but no one wants the job."

"So ship one in with Celia. Expensive but then Kell is a billion dollar man."

"That's what Kell thought of," said Histon morosely.

"He always had an answer. When they add up the debits and the credits, remember I hired him."

"Yeah. Now he wants you to hire Lisa Maria Sorenti. As Celia's governess."

"You're *kidding* me, Histon!"

"I told you he'd split his can."

"Wow. A nice problem."

"You know her? I know *of* her."

"I just happen to have her manager's phone number. Occasionally I give it out to hungry young men who are going into space and need a beautiful memory of Earth to come back

to. We pay the bill so they'll want to come back. She's expensive. But her manager gets it all. Some women are dumb."

"She hasn't been in the news for quite some time."

"You're wrong," said Roy. "Last week she had her manager hauled in for assault and battery and then went down with tears in her eyes and bailed him out."

"I see."

"I'll show you her file in living holo." Roy went to the computer terminal. "Her manager sent me these takes to keep my memory fresh." The computer terminal began to display the pictures.

"God, what firm boobs," said Histon, staggering back.

"Nice, but look at those hips! She's a goddess!"

Histon moved his head so that he could get a better view of her tilted face. "She'll never make it as a governess."

"We could send him a bright college girl who loves children and is thrilled by space. I know one who wants to go. She's a chemist."

"Naw. I told you he's split his can. It's got to be Lisa Maria Sorenti. God, look at this one of her in the sea! He doesn't know what he's asking for. She'd blow Pittsburgh apart. I hear she wiggles, too."

"He *always* knows what he's doing. I conclude that he *wants* to blow Pittsburgh apart. If I have judged Kell correctly, he'd take deep affront at being told he doesn't qualify as a father. He's angry about that."

"What'll we do, Roy?"

"You came here just to give *me* this problem, eh?"

"Yeah."

"You bastard."

"Think you can handle it?"

"He's a youngster of 33. I'm 62. Therefore I am twice as smart as he is. Sure I can handle it. I'll bet you one hundred billion dollars that I can handle it."

"Great. And how's your wife?"

"Great. We're going down to Redwood City to visit the grandchildren tonight."

3

Three AM. Hunting headlights found the shape of her car in the gloom. "That's it." And blinked out. The stocky man kissed her goodnight but she had the final say before she left his Mercedes. She held onto his ears and stared into his eyes for a last minute, knowing that he could see the moonlight glowing from hers. "G'night Punkinhead." And then she was gone.

She had a mnemonic for all of them so that she might never forget a face or a name. Her Pumpkin Head image for Mr. Pokinhet matched his constant grin and the way the silly man lighted up every time he saw her. Some of her other images were not so complimentary and she dared not use them as endearments. Lisa Maria Sorenti envied the girls who had settled for "darling."

Like the salty skin of a lover, the

flavor of the Pacific was on the air. Exhausted, she merely stood by her sports car until the Mercedes was gone, waiting for energy, listening to the whisper of her engine's flywheel. What a beautiful night.

She could remember the days of her childhood when the smog was so pervasive in the Bay Area that you couldn't even see the stars. Now, so a spaceman had told her, you could pick out the Orbital Solar Power Station that fed the San Francisco grid, always at the same point in the sky to the south, unmoving as the stars moved. But she had never been able to differentiate it from a star. Sometimes she caught a factory flowing overhead, they moved so fast.

She eased out of the parking lot on flywheel power and then kicked in the small alcohol motor when she reached the parkway that had grown up over the trail of Spanish priests. It took her twenty minutes to reach San Francisco. She wondered how different her life would be without the earthquake that had killed her mother. Actually she liked San Francisco much better now that the scars of rubble were gone. It was a more peaceful town, more open. Or maybe it only seemed more peaceful without her mother's bitching.

I hope the hell Nick's not home!

She stopped off at an all night McDonalds for a quick twenty-five dollar hamburger and kidded the busboy to amuse herself. She always felt comfortable in a hamburger joint when she was depressed. Some of the excitement of her first job as counter girl rubbed off on her, back from the days when her life was less complicated. She had a wry nostalgia for the post-earthquake period when people helped each other.

Her apartment house wasn't far away. It was on a hidden street with trees and a sloping hill. She smiled at their electronic doorman. "Hi Packard." He hated to be called Tex.

"Good morning, Ms. Sorenti."

One even had to smile at the damn machines these days. They said it was because that made it easier for the pattern recognition circuits. But she suspected the companies of trying to program humans to feel that machines were cute three year old children. Then they'd start introducing real machine intelligence.

"Park the car. Charge the flywheel."

"Yes ma'am." Her car moved away, driverless. "Have a good day," added the machine, brightly.

She requested a key-use printout and got it. "Damn!" Nick had been home since ten-thirty. He hadn't used to spend so much time with her. She was tired, but she skipped two up elevators just to be that much longer away from him. When she arrived at her apartment, she inserted the keycard and noiselessly opened the door. She peeked in the bedroom. Yes, there he was all sprawled out in the moonlight. Suddenly she wanted a glass of milk because the kitchen was as far from the bedroom as you could get.

Lisa Maria sipped her milk in the

dark, staring for a long moment at the pale whiteness of it between sips. When she needed Nick he wasn't there, he was out floating in the bars. He said he was making contacts for her. She didn't know. Half the time it was probably other women. She didn't care. Now that she was trying to figure out a way to do without him, he was always here. She felt sorry for herself.

They talk about me as if I was the strongest woman in the world, and I can't even get rid of Nick.

The thing that was sending her into an absolute panic was knowing she didn't know how to get along without him. Hamburger Queen of Market Street, that's what she was when he found her. *He* had rented that first opulent apartment where she had learned to hold court and titillate the jaded amidst her exotic array of indoor plants. *His* clever maneuverings brought her to the fringes of society and the warmth of the money that was coming in from space. It was *he* who gave her the books that had opened up those conversations between her and the great minds of California. He even read her poetry when they made love. He still did that. And wrote it. He was composing his magnum opus now that he had beaten her.

She sparred with his memory, trying to understand her trap. Nick was a cunning master of that singular conceit borne by all San Franciscans who think that their city is the only place on God's Earth where one can sin in a state of grace. He had plotted her outrageous escapades with a sure business hand, and had reaped for her the protection that went along with notoriety. "Pure sin," said San Franciscans as they laughed.

He had taught her never to talk about money, that such talk was sordid and would break the magic upon which she existed. In return she had worshiped him with the pride of a woman who *knows* that her man is not one of the suckers.

So Lisa Maria was twenty-five and didn't know how to ask a man for money. She didn't even know how much Nick charged for her. She didn't know how to pay the rent, or take out a loan, or buy a car. It had taken her a year to muster courage to ask someone who she should see to find out how much money she had. And six months more to comprehend that she was dimeless. She did not know if she loved Nick; she *did* know that she hated him passionately. It was easier to hate him than to hate herself.

She undressed and slipped into bed as silently as a snake in grass, but he woke up anyway as he always did.

"Big eyes, you have a date tomorrow for lunch at the Robin's Nest. One o'clock sharp. Roy Stoerm. It's a twenty-four hour date."

"Oh Christ Nick! You *know* I can't tolerate twenty-four hour stands with strangers. I won't even have any sleep by one. And the Robin's Nest is hell-and-gone across town. Give me a break. I'll have wrinkles and I'll be dull."

"I know what I'm doing. He's from Ventures Metal. They could fill in the Bay for a golf course. And he's not a stranger. He's sent you some of your best tricks. You were at one of his parties a month ago. The crew of the Glasgow."

She turned her back. *I'm going crazy.* "But I've never met *him*!"

"You will tomorrow."

I wish I was a chemist. But her mind couldn't linger over such an image long, it was too insubstantial and meaningless to her. She saw other pictures—herself welding steel beams, or punching buttons in a space factory with random flashing lights (an image borrowed from TV), or jockeying a horse, or selling hamburgers. Anything. The tears were cascading down her cheeks. For Christ's sake, anything. Anything but this body that carried man-trap scent with it wherever it went.

4

A sarcastic San Francisco Chronicle journalist had once described her as the mongrel goddess who had bounced down the steps of a California pantheon after an orgy to which all the Nordic, Roman, Celtic, and Mexican deities had been invited. It was true that Lisa Maria Sorenti had Swedish and Irish and Italian and Mexican blood, and that she was illegitimate, but the rest of what the journalist said was tongue-in-cheek slander.

Her eyes had never decided whether they were Mexican or Swedish, the irises were black rimmed with ocean foamed interiors; her hair (fresh from the hairdresser) rippled with black light as she flowed through the lunch hour crowds like driftwood avoiding the boulders of a busy rapid. Her summer dress was Spanish moss being helplessly carried along.

I wonder if he'll like me?

The Robin's Nest had been carved out of some old brick warehouse, and skylights bathed a jungle of greenery. She spotted him immediately—he was the only man seated alone facing the door like a lion waiting beside a mouse hole. And immediately she shifted her eyes, as if to seek someone, allowing him to see her profile, letting him watch her grace as she turned to the hostess. She smiled ravishingly at the hostess, long enough for him to sip of that smile and desire it for himself. She invented a trivial conversation, punctuating it with lively gestures, exaggerated just enough to carry across the room. Only after he had had ample chance to become intoxicated did she allow herself to notice this Stoerm. She met his eyes, held his eyes for a dizzying second, then dropped hers demurely. She spoke to the hostess again, one sentence, then looked back at *him* questioningly, holding off any real reaction until the exact moment he started to rise. Then she rushed forward, delivering her warmest smile full force before she took his hand, gently, tenderly. He was only half out of his seat.

"You must be the Stoerm in my heart."

"Roy," he said beaming.

He pulled out her chair and seated her and then sat down and appraised her while he discreetly beckoned the wine steward. Instantly she had her mnemonic for him: the Eye of the Stoerm. She could feel the power circling him lazily and the calmness within that circle. *He knows exactly what he's going to do with me.* She hated that in men, but she dared not back away into the violence of the power; she was propelled into the eye, toward closeness. She had an irrational desire to hug him, to cling to him, and that frightened her because she did not see love in his eyes.

"I'll have a Cuban Apricot," he said, "and you?"

"A Daiquiri."

"You've been in the papers again."

"Did you read *that*? That was a *horrible* story. I'm so *embarrassed*." She dropped her eyes in practiced modesty and was surprised to feel a real rush of humiliation. *Oh God, everyone knows that my man beats me.* Hate for Nick; black hatred.

"I'm interested in your troubles."

She couldn't have spoken about them. She would have cried. But no one ever topped her or rattled her. "Tell me about your wife," she teased.

"I'm in that worst of all possible situations; my wife understands me."

She laughed. Thank God for a man who can make a woman laugh. He attempted a few more times to open her up, and she gently countered him. She was an old expert at not talking about herself, and she felt him bow graciously to superior force and begin to talk about himself. She learned a lot about his job of recruiting spacemen.

"Why don't you hire me? I'm looking for another job."

"What can you do?" he asked with a chuckle.

She hit him. Affectionately, of course.

He tried to lead her into drunkenness during the lunch conversation which went everywhere pleasant bantering could go, and nowhere, but she *never* gave up control of her body on the job; neither through drugs nor alcohol nor through reactive emotion. Once he stealthily sent a patrol through her guard to destroy the bounds she placed on her anger and she just as deliberately ambushed the patrol with boredom. *He plays games. He's testing me.* For what purpose? *He's trying to push me into the storm to see if I'll be blown away.* When they left the table she took his arm and kept her body close to his.

In Roy's car, a small Chevrolet of the kind favored by the really rich who liked to maintain a low profile, she puzzled over this man. She could tell he liked her but he was unusual in that he was indifferent whether she liked him or not.

She did not know where they were going. An upper class bacchanalia, perhaps? She wondered if she was to be the hors d'oeuvre or the liqueur.

After one pit stop for fuel—an alcohol-synthigas mix—they arced over into the region of the Peninsula that was being heavily invaded by the

riches pouring in from space as San Francisco established itself as the multinational capital of space enterprise. In selected areas the middle class suburban sprawl that had grown like cancer over the Peninsula during the 50s and 60s was being replaced wholesale by the palaces of the very wealthy, leaving only the stately trees that had been planted so long ago. Even the endless winding asphalt streets were gone and the palaces were approached from under the ground through a network that rejected unidentified vehicles.

Roy Stoerm put his Chevrolet's flywheel on charge in the garage. A car could travel 100 kilometers on rotational energy, which came from space generated electricity, before it had to cut in its ten horsepower internal combustion engine.

They rose via elevator into a sun gorgeous room where Roy introduced Lisa Maria to Stacy Garcia who was an executive at Ventures Metal and wife of Histon McKinner. Stacy wore her charm with the economy of somebody who has had the languid niceties of beautiful trivia atrophied by constant use of precise authority. She was obviously staying home from work just to meet Lisa Maria. She had just as obviously never met a whore before in all her thirty-five years.

"I leave you in good hands," said Roy. "I have some business to conduct this afternoon but I'll be back for dinner."

Stacy took her hand and gave her a grand tour. The proudest thing she owned was a jade piece given her as a gift by Han Tao Hsia, Commissar of the Red Star Space Fleet. Ventures Metal bought heavy computer-driven mining equipment from them and occasionally rented their space tugs. The Chinese had been the first to use the hybrid chemical-nuclear single stage Earth-to-orbit freighter, forcing the Americans and then the Russians to follow their lead. Stacy Garcia was a frequent visitor to Peking and spoke fluent Cantonese.

At a den in the back, Lisa Maria met the housekeepers, two enthusiastic English PhDs who maintained this palace and took care of the children, and who were trying to beat each other scripting the Great American Disc Drama when they weren't cooking and gardening and shopping and changing diapers. Stacy said with a twinkle in her eye that she sometimes babysat for them.

And then at the window overlooking the park she pointed out a small naked child running beneath the redwoods below the swimming pool. "Will you do me a favor and take care of Celia while I'm out shopping for dinner? Her mother used to let her run wild so she bears watching, but she won't give you any trouble. My little brats are at the ballet."

"She looks adorable. I've always wanted children." That was a lie but Lisa Maria lied easily. "It takes the right man."

"You might say that. Men make good children to practice on before you try raising some real ones. Go

swimming if you want."

There were four immense redwoods, probably left over from the vanished suburbia, and ten smaller redwoods no more than six man-heights tall. Beyond that grove was a polyglot woods. She sat on the grass beside the pool, watching the girl. *Seven year old girls are so free. I'd love one if I could deep-freeze her on weekends.* Celia would glance up at her but as soon as their eyes met Celia dropped hers and busied herself with some stick or task. *Oh, she's a flirt already.* That's when Lisa Maria fell in love with Celia.

"I know that game! You don't fool me one bit! Come here."

Ten minutes later, in her own time, the child appeared in front of the strange woman. She held out one tiny finger at arms length and let it descend so slowly that her hand trembled. "My Daddy lives in a place where things fall *that* slowly," she announced. "He's going to let me live with him." And then she rushed off.

It was another half-hour before Celia delivered herself for further conversation. "Aren't you ever going swimming? I have to swim now every day to get full of the sunshine because where My Daddy is the sun is all shrunk." She looked at the intruder disapprovingly. "You can't swim with your clothes on."

"If I took them off I might get caught." Lisa Maria didn't mind getting caught, but she *did* mind not knowing what the ground rules were in a game of Blind Man's Bluff. Bafflement made her very conventional.

"Last man in is a glyptodont. C'mon."

"In my best dress?"

"Nobody swims with their clothes on, *dummy*."

"Now that's not really true."

"Oh maybe in darker suburbia they aren't civilized," she said with impatient disdain, "but not *here*. Here you can only get caught with your clothes off if you are in the house."

I'll ruin my hairdo. But she went swimming anyway and regretted it. Celia used her shoulders as a diving board and there were games like "spaceship docking" which consisted of Celia ramming her head as hard as she could against Lisa Maria's. It went with a ritual.

"Capowie! Bang!"

"Who's there?" *Oh my aching head.*

"Linda."

"Linda who?"

"Linda hand with the cargo."

Eventually Roy Stoerm came to the rescue with an enormous bath towel and Celia cuddled up inside it with her new playmate, both shivering in the sunset.

Dinner was served on a long table with candelabra and gold plates, each place set with seven different kinds of knives and forks and spoons and chopsticks of some golden alloy, while the center of the table was recessed to hold the main dishes in special depressions which either heated them or refrigerated them.

The children trooped in. Stacy and Histon had four from ages seven to thirteen and there was also Celia in an ankle length white gown. They were remarkably disciplined, all bowing and saying hello to Lisa Maria. They didn't interrupt each other, but were ready to get a word in edgewise as soon as they found a slot. Celia was the most impatient. Once when she did interrupt Histon she was required to get up and put a red chip in an ancient Chinese laquered box.

It was a whole evening's mood alien to Lisa Maria until Roy made a phone call to his wife telling her that he had been detained by business. That touch put her comfortably at ease.

The eldest boy rushed out into the kitchen to fetch something that had been forgotten. The housekeepers chatted with the children. It was fashionable to hire housekeepers with PhDs to train the children in the intricacies of witty table conversation and to select their Drama Discs. They were not allowed to watch TV.

As if by some signal the congregation became silent. Stacy began to say grace in a Spanish so melodious that Lisa Maria was transported in time to the tiny apartment of her scrappy grandmother whose parents had picked tomatoes in the Imperial Valley and whose daughter was passionately anti-Catholic. The grandmother had kidnapped Lisa Maria one day when she was five and taken her to be baptized in an awesome and nameless Cathedral that Lisa Maria had never been able to find again in spite of all the church collecting she did. The only Spanish she knew was the word for sin, "pecado."

Histon and Roy controlled the conversation, focusing on her but with the skill of film directors who were out to flatter their star and hide her wrinkles and edit her bad scenes. Stacy played script girl. Even the children, who seemed to know in their worldly way that she was a wicked lady, ad-libbed for her when she forgot her lines. *Sometimes I don't understand notoriety,* she thought. She was basking in their attention and smiling too much and drinking ten percent faster than she should, always danger signals. *It's a trap.*

"Histon made the dessert. He won't even give *me* the recipe," complained Stacy.

"If you're stuffed I'll take your portion," whispered Celia into Lisa Maria's ear.

5

They drank Pimpeltjens from tiny ceramic goblets after dinner, the children dispersed, the housekeepers cleaned up, and the four of them retired to the spacious room that was now starlit. They analyzed the Argentinian revolution and how a group of multinationals had banded together to put down the killing and re-establish order. Killing was bad for business. Histon and Roy chuckled over the subtleties of how the French and Socialist arms dealers had been tricked into taking a loss of over twenty-six billion dollars.

All in all, the after dinner conversation was becoming heavy. Lisa Maria laid her head on Roy's arm and closed her eyes, hinting. Histon and his wife discreetly excused themselves and Roy took her affectionately by the shoulders for a walk through the palace and into a cozy den where he kissed her. She understood everything now. The den's couch would swallow them and the room was private. This was Roy's night off from his wife.

"How are you doing?" he asked.

"It was a lovely evening." She held him and returned the kiss, stroking his neck under the short braid. "A nice change for me."

"I had Nick thrown in jail this afternoon. Thirty days," he said calmly as if he had been complimenting her on the smoothness of her skin.

She froze. She backed away. She stared at him.

"I said I welded him."

In the middle of her shock she felt her arm swinging—*is this me*?—to slap him viciously. "I don't want Nick hurt! He's my problem!" And she backed away, beyond arms' reach, afraid of that center of calmness which she had not even disturbed. And as she backed up she felt herself caught in the hurricane of power that circled him, then tossed wildly away on the wind. Nick was all she had. She didn't know how to get along without him. "Don't hurt him," she pleaded.

He just stared at her.

"You multinational bastards are all the same. You think you run the world!"

"We try to provide a little leadership where it is necessary."

"I want him back!" she screamed.

"I have absolutely no sympathy for Nick. He beats you. He's taken all of your money; he's stripped you bare." Stoerm opened up a report and threw it on the desk top. "I have a complete financial report on him—and you. It is not hard to find out things about you. You don't even like him."

"You want him out of the way?"

"Yes."

"Because *you* want me?"

"Yes."

"Because you're going to solve all my problems—just like Nick? *I hate you.*"

"Not like Nick. I'm going to solve all of your problems, but I'm going to give you a choice. You can go back to Nick in thirty days if that's what you want. I just want him out of the way while you make up your mind."

"The answer is *no*, you gonorrhea drip!"

"Your salary would be 20 million dollars a year."

Suddenly there was no floor under her feet. She was not sure that Roy's face was upside-down or right-side up or that he even had a face.

"In noninflationary terms that you can understand, Miss Hamburger Queen, that's eight hundred thousand hamburgers with french fries and cole slaw, retail."

Panic. Roy had dismissed Nick—her protector, her old man—with one blow and in the next moment he had stripped her of her free will, and she

didn't want to go *there*. The mere thought terrified her. Space. Only space paid salaries like that. She was being hogtied and shanghaied into space.

"I don't want to go."

"Think of the money."

"You *bastard*!"

"You're broke now. You'll be thirty-two when you get back, still in the prime of your life and you'll be worth one hundred and forty million dollars."

"Those women who go into space are chemists or electronic engineers or mechanics or something. I can't even get rid of Nick. Why me?"

"We have a mad spaceman out there. He's quite functional. He's worth billions to us. He has that gift for turning disaster into victory. We don't tamper with a good thing. We pamper it. He put in a requisition for you."

"So you're buying me?"

"We're offering you a contract and making it worth your while."

"A dream girl off the shelf."

"You're good at it."

"For seven years? Most guys I can't *stand* after two hours. Does he think I come with a valve in my belly button so that he can deflate me when I'm not in use?"

"It is a much more complicated situation than that. In fact it is a dangerous situation. He didn't want *you*. He wanted his daughter Celia."

"That cute kid? She's a darling."

"Those little asteroid villages are very tight. Probably the Earth hasn't seen anything like them since the New England colonists of the seventeenth century. They voted no. They told him he wasn't a qualified father. I'm sure they are right. His psych profile shows a complete blank on women and children. He grew up without women, and he has had no success with the few short relationships he has had as an adult. He abandoned his child before she was born."

"Sounds like a great guy."

"I had lunch with him once. He has a barrier personality. I don't mean he doesn't have emotions. He does. He smiles when he is filled with hate, things like that. Have you ever met these people who function perfectly in a group and have no friends? He's one of those. I think he took it hard when they wouldn't let him have even the symbol of a one-to-one relationship. They said he could have his daughter if he could find a governess. So he smiled and chose you."

"You're hiring *me* as a babysitter for that innocent girl?"

"Exactly."

"Your mind has been rotted by RPX."

"I'm not worried about Celia. Those colonies are wonderful with their children. I'm worried about the grown-ups."

"Because of me?"

"He wants you there to generate the hurt he can't inflict himself. And I think he chose his weapon with his usual brilliance. He's going to prove that *they* are emotionally incompetent to handle women, and that *he* is the

good father. While he's tending to Celia, you'll be smashing marriages right and left and raising hell."

"You sound like a shrink right out of a Berkeley sewer."

"I'm an aerospace engineer from La Jolla who could never build ships but turned out to be handy with people."

"Men make me sick," she said. She took his hand and held it against her breast. "That's soft! How can you call that a weapon? How can I respect creatures who fall apart when they are smiled at!"

Roy laughed and pulled her body to him. There were tears in his eyes. "I'm a strong man. I've been happily married for forty years and I wouldn't trade in that woman for Nirvana, but I'm already thinking strange thoughts when I've only been with you for a few hours."

"It's not fair," she sulked, "that men are so weak!"

"Then why have you spent every waking hour for the last ten years developing your charm to the exclusion of everything else so there is nothing left of you but the charm?"

"You *bastard!* Here you are wrecking my whole life,"—she was crying and horrified because they weren't fake tears—"and telling me that there is nothing behind the makeup that a man might love."

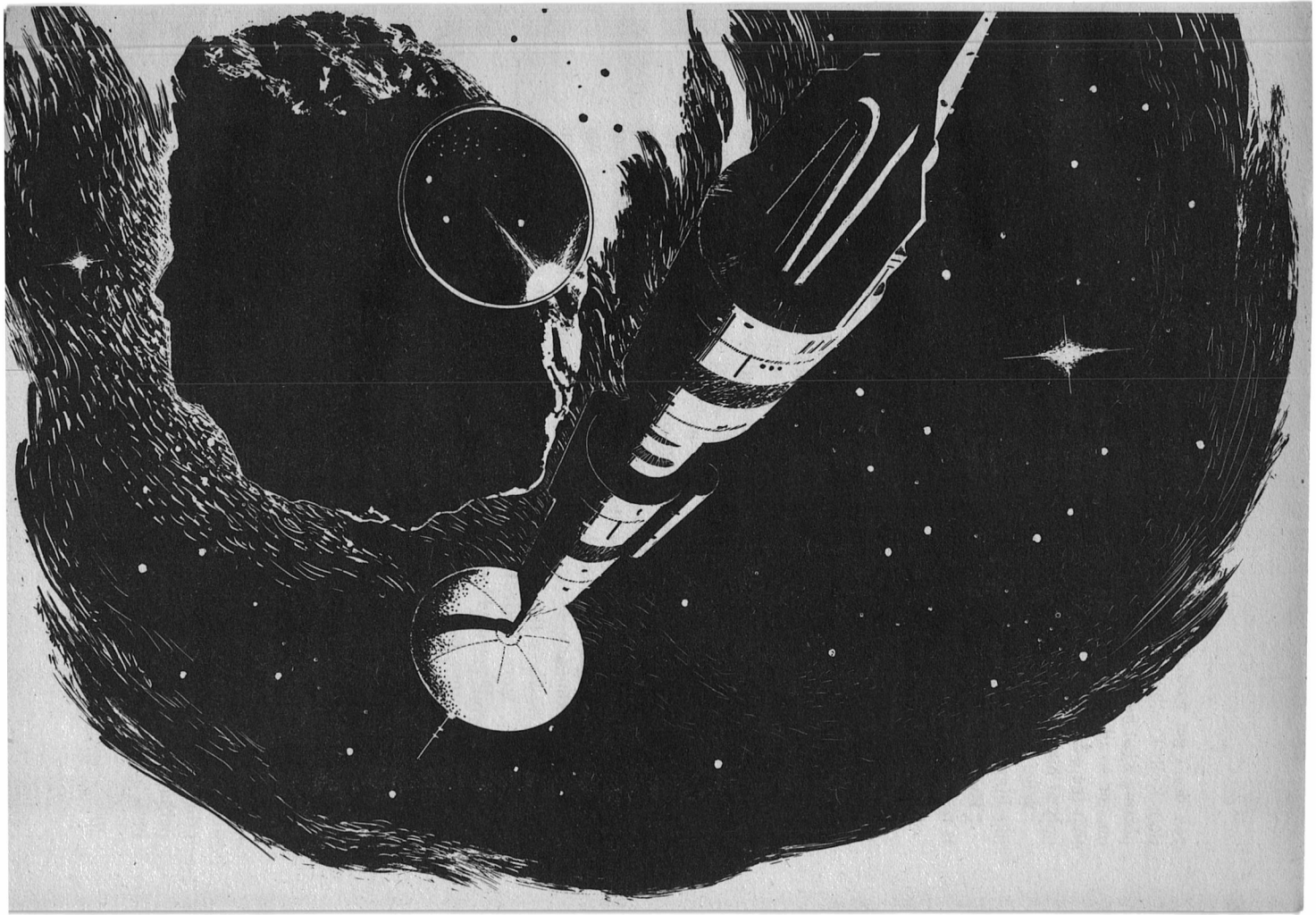
"Name ten things," he smiled.

"Ho, you think you've got me now, and I'm going to tell you everything about myself. I'm not going to tell you a damn thing! You already know too much."

"God, you have beautiful eyes!"

"The better to wreck your colony with!"

"Nope. Here's your contract. Have a lawyer check it out and make sure that it is ironclad. Notice the clause in there about wrecking colonies. You all have to deliver the steel, all of you together, to collect your monies. That's insurance we take out to assure cooperation. But *you* have a special clause. You're not allowed to do your stuff on any male in the Pittsburgh complex *except* Meddrick Kell. Or



you don't get paid. See, I'm smarter than Kell. I've lived longer. He's importing what *he* sees as a deadly weapon, and so all I have to do is make sure that the weapon is going to be pointed only at him."

"What about *me*! What if I don't like him! He sounds like a creep!"

"Think of the money. Your mantra is money."

6

The equatorial Free Port at Tongaro in the Pacific was the world's busiest spaceport. Lisa Maria couldn't believe it when she saw one of the eight thousand ton single-stage Boeing freighters sitting like a thirty-five story mushroom on the pad as it was being fueled.

The freighters were lifted by a hybrid chemical-nuclear motor that burned LOX with nuclear-heated hydrogen. The tungsten/U-233 fuel elements were manufactured and reprocessed in space where the radioactive by-products were collected and mounted on a sail-powered basket that spiraled them into the sun. In the distance, beyond the bulk of the ship, was an electrolysis plant that manufactured LOX and LH from seawater and solar power beamed in from space.

Because Celia's father was in the mining business Lisa Maria batted her eyes at a handsome drop-ship jockey and he took them out to see one of the drop-ships being scrapped in a flickering of cutting torches. These were perhaps the heaviest spaceships ever built by man, rivaling in weight battleships of the Yamato class, but had only one flight in them, down. The jockeys who rode them to Earth called them rafts. They were assembled crudely of massive metal in a low orbit and needed to be able to perform only two functions: to hold together while they burned off their heat shield in the atmosphere and to float when they hit the water. Sometimes they were scrapped at Tongaro and sometimes towed all the way to San Francisco or San Diego or Yokahama.

More to Lisa Maria's liking was the smaller two stage passenger ship. The lower module was a sleek hypersonic craft that went to mach-9 on a scramjet powered by hydrogen and air, and then circled quickly back to Tongaro to pick up another piggy-back rider for up to five trips in one day. The upper module was a compact ship backed by either a hybrid power plant or a LOX/LH power plant. She was less enthusiastic when she was taken inside. It wasn't like an airliner at all. There was no more headroom than in a car.

She could still see a patch of the Pacific through the tiny porthole when she was strapped in. *Good-bye Earth.* Celia took her hand. She was so frightened while the countdown began that her heart was thumping in her chest.

Think of the money.

Her heart did not stop pounding all during the thundering of the rockets. That lasted no longer than the wait in a bank line. Free-fall came before she was used to the acceleration. She

could see a patch of the Earth through the tiny porthole.

Woman and child were given a spartan room in the low orbit Rockwell Station. They stayed there seven days receiving an intensive space survival course in a class of twenty new recruits. It was ten percent theory and ninety percent training in automatic reflexes, like how to slap a patch on torn suit webbing in four seconds. The people in the course were mainly new workers. The Station's primary function was to rent lofts to businesses who needed zero gravity and vacuum and unlimited power. Once Lisa Maria took Celia to visit the factory where the brains of her typewriter had been manufactured.

Five days of concentrated effort to put her space legs together finally hit Lisa Maria with the incredible gut realization that she was forever free of Nick, her great love, the man who had made a woman of her. Suddenly there was no way to stop grinning. Normally she could control her rather compulsive smile but that fifth day any attempt to be sober resulted in a mellifluous laugh which activated so many male fantasies that she had to hide in the woman's room to calm the storm.

There she wrote a joyous love letter to Roy, teasing him about being another Nick who was only too willing to arrange her whole life for her. "After all," she penned, wishing she could use her happiness for ink, "you are keeping all *my* money in *your* bank." She had it faxed down to Earth by an operator who fell in love with her when he took the letter and she ended the evening "on air" in the cabin of her space-survival instructor, learning how to make out in free-fall.

"Lisa Maria! Oh! Come to the window! Look. That's the C.L. Moore! That's *our* ship over there!" The ship was essentially a long cylinder attached to a great dish that sucked power, not from the sun, but from a point close to the sun. Celia was bouncing from floor to ceiling, from ceiling to floor. It was the seventh day.

Far away, well inside Mercury's orbit, circling twenty-million kilometers from the flaming surface of Sol the Star, was a power station built by man. The sun clawed at the intruder with erupting solar flares like an angry tiger striking through his gravity bars. It was a dangerous place to be, but it was the right place to be if you wanted power—an energy flux of seventy-eight kilowatts passed through every square meter.

The power station was a strange looking beast with a delicate appendage of radiators that spread away from the sun like a comet's tail. Mounted behind the shadow of the giant heat exchanger was a graceful laser cannon that poured gigawatts of power across the inner solar system to the birds of prey that mined the Belt. Lesser cannon fed the ships outbound from Earth's orbit. The stations themselves, deep in the sun's gravity well, were supplied by sailing ships that tacked upon a rich photon wind.

Inside the solar power station

named Goliath an operations officer was making contact with the C.L. Moore. He was scanning with a communications laser and every time his beam crossed the Moore's parabola, the Moore sent out a time signal which fed into a computer on the Goliath that narrowed the scan. It wasn't a fast process. There was a sixteen minute time lag between output and feedback, but within half an hour the communications beam was centered on the Moore's receiver.

Eight minutes later the C.L. Moore was powered. Her drive was essentially a proton accelerator that ionized hydrogen and pushed it to 100 kilometers/sec using laser energy drawn from her parabolic mirror. The cabins and freight holds and hydrogen tanks were built around the long accelerator while the mirror was free mounted to the starboard. If such a ship were strapped for fuel it might take two years to reach the Belt, but the normal journey took from ten to fourteen months.

The C.L. Moore was carrying spare parts to the Pittsburgh, and heavy machinery and thirty persons for the Osaka. Her captain was a computer. She was to return empty to Mars, refuel there and bring home a load of passengers.

Lisa Maria went stir crazy after only five days. At first she was hyperactive and quietly hysterical. Sex with the other passengers didn't help. Counting off the days by fives on the cabin wall didn't help. Gradually she slipped into a mild catatonic depression. She wrote THINK OF THE MONEY on the wall and stared at it for hours. She hated space. Once she wrote Nick a long letter asking him to take her back but never faxed it. Celia took care of her.

Celia read her bedtime stories like Pooh Bear and when she could get her attention played Shakespeare drama discs. If she skipped a meal Celia fed her sternly. The spaceship protein was terrible, but the fresh vegetables were juicy and at the peak of flavor.

"You have to eat if you are going to be strong enough to take care of me!"

When Lisa Maria began to come back to life Celia put her arm around her and spent three days reading to her the classic "Planet of Magic" about the redhead Trudina and the dark Jindaram, Princesses of Zahelan, daughters of the Crimson Moon, defeated candidates for the post of High Enchantress. Their souls had been created by the Red Witch, fresh, without past lives, and the girls had been raised to introduce a new age of innocence to the Planet of Magic. But the old wizard Taslt defeated them at the Temple of T'halil because of their vanity and cleverly shipped off their souls in a silver cage to the Planet of Forgetfulness, Earth, where no one could remember their past lives and were doomed to repeat the same mistakes life after life. Of course, Trudina and Jindaram learned how to conquer their vanity after many trials and tribulations, without even knowing who they were, and finally returned to the

Planet of Magic and defeated Taslt and brought on the Age of Innocence.

Lisa Maria started to smile again and wrote poetry steadily for two weeks which she had never done before in her life. She was feeling the impact of the little girl and understanding why women and men who had children were more mature than those who didn't. Children took you back through your own childhood and gave you a fresh look at decisions you had made in innocence and forgotten about but were still using, and it showed you your own parents in a new light. She found it upsetting to see herself angry when Celia did the things that had once annoyed mother Sorenti and to be *sure* that she was *right* to be angry.

Then one evening, which wasn't any different from the spaceship day, while they were making a game of eating raw carrots together, Lisa Maria began to talk about things that she had kept secret from everybody all her life, even Nick. She didn't mind talking to Celia about the hidden feelings of a whore. She knew Celia would never grow up to be like her. In fact, Celia wanted to be a starship captain, and though she might never be because starships weren't invented yet, she would become something like that. So it was easy to talk to her. Celia just giggled or gasped or put her hand over her mouth. Then Lisa Maria read Celia a bedtime story the girl had never heard out of the favorite book of grandmother Morantes about a woman called Ruth, and their friendship solidified forever. Six months later the journey was over.

They glided in from behind and so they saw Pittsburgh's dish first. Only when they were right on top of the colony did they see the "sunrise" of the slag-jet pouring out, illuminating the shadowed face of the asteroid.

"My Daddy! My Daddy! You'll love My Daddy. He writes better letters than I do!"

Lisa Maria thought about Daddy Kell's very very bad reputation. *I'll strangle him if he doesn't treat her right.* She wasn't worried about him. All she had to do was put on her professional hat and she could handle any man alive from sadist to fool. It wasn't going to matter whether she liked him or not.

She was worried about the women. For every job out here there were a hundred applicants thinking about the money. The women—she had seen the personnel file on the women of Pittsburgh—were so overqualified it made her sick in the pit of her stomach just to think about it. How did a woman ever get to the point where she could build and design machine tools?

She couldn't do *anything* they could do. Even the thing Lisa Maria pretended to do because it was feminine, to be an artist, was fake. She remembered her humiliation while Roy admired the glazes on her pottery, pieces she had bought in an obscure shop in Arizona while she was "doing ceramics," pieces she had lied about to her own group, to Nick, to the San Fran-

cisco Chronicle, to the world. Sometimes she rigged it so that she took a friend to the pottery to help her remove still warm pots from her kiln. *I can't do it!*

She thought of the money and got ready for the debarkation.

7

When they were through the Pittsburgh's airlock Lisa Maria was wearing the personality she reserved for policemen. Celia spotted her father immediately—the nose and the half-bald head were unmistakeable—but immediately she shifted her eyes, as if to seek someone, allowing him to see her profile, letting him watch her grace as she turned to Lisa Maria for emotional support. She smiled ravishingly at her governess, long enough for her father to sip of that smile and desire it for himself. Only after he had had ample chance to become intoxicated did the child allow herself to notice her father. She met his eyes, held them for a second, questioningly, holding off any real reaction until the exact moment he made a slight hand touch against the wall that told her he was going to come forward. Then she launched herself into a glide full force and stopped herself by grabbing him by the ears. She tilted his head and gazed at him. "You're my Sugar Daddy," she said smiling. No one noticed Ms. Sorenti.

David showed Lisa Maria the termite digs. Pittsburgh was already old enough to be quite spacious. Each member had their own cave and the public rooms could be quite enormous. There was jungle park, a series of large caverns filled with tropical vegetation gone slightly insane in free-fall. There was a large spherical room, laced with padded tubing, for four-sided football. The goals were at vertices of a tetrahedron. He didn't show her the working rooms but she could feel the smelting and the blasting through the rock. The whole complex had a vibrating tone to it.

He sat down with her and took her through the laws. Smoking and drugs were forbidden. All air-seal doors were to be closed after use. She was only allowed in those areas which her key card would open for her. The Captain had absolute authority in all cases where there was no law. And so on and on.

David introduced her to many people. They seemed friendly and proud and curious and small-townish. She was warily friendly in turn. It was like deciding to eat mushrooms and having a badly edited black-and-white guidebook to go by. She was going to eat them one tiny bite at a time and watch for several days to see if she got sick before risking another bite. Somebody had been very kind and put plants in her room. It was spartan but neat.

Kell avoided her for three days. She let him. She lavished Celia with attention, especially when people were watching, but Celia soon lost herself in the labyrinth, sublimely at home; the children she adopted, the adults she adopted, and she joined one of the four-man football teams. Lisa Maria

was left alone. Enough. It was time to strike.

She waited for him to return from his rounds with the patience of a spider. Before he knew she was waiting, before he could finish closing his door, she was inside, and closing the door herself. She looked him straight in the eyes without smiling.

He was damned if he was going to look away, but she could sense his fear. "Hello," he said.

She waited until the last echo of his greeting had died before she chose to ignore him. His room was messy, lived in. Socks took a minute to fall if they were dropped. They had been dropped. There were no plants. There was no beauty. The nude on the wall seemed forlornly unhappy in this place without beauty.

"Mr. Kell, I'm flattered that you think I'm worth 140 million dollars."

"I don't think anything. I wanted my daughter."

"And you just brought *me* here to educate your daughter."

"You've been good to her," he said evasively.

"And my special talents?"

"It was getting dull around here," he said in an uneasy boy's voice.

"So I'm to entertain you?"

"Entertain yourself." He was smiling and she knew he was hostile.

"So I'm to entertain you by entertaining myself?"

"I don't really care what you do."

"Mr. Kell. Have we ever met before?"

"Once. At a California orgy."

"Oh, we *have* met! I knew it! Which one!" She smiled for the first time, mischievously, tauntingly.

He snorted.

"No, tell me." She batted her eyes. "Refresh my memory."

"We were at opposite ends of a large terrace with a glass roof. You were wearing a one piece red bikini."

"One of my more modest days."

"Three men were with you. I remember one of them kissed your hand. You wore a revolting red toenail polish."

"And you never forgot a detail of it."

"They were falling in love with you. All three of them at the same time."

"And you were the fourth?"

"I was thinking what fools they were to be taken in by such superficial charm. You were there for the money."

"That's when you found out I could be bought, is it?" She was drooling venom. She turned and took the nude off the wall. "You won't need her. You've just bought yourself a 140-million-dollar fantasy and you're going to have to live with it. For seven years."

"Not here!"

"You can't handle me?"

"Of course not. I'll introduce you to some of our more competent Romeos." He was grinning. "We have lots of them." He hated them.

"Listen, you centimeter marvel, you don't get out of it that easily. *You* bought me."

"I don't like you any better than

you like me," he snapped.

"What woman ever has?"

"Get out. I never made a deal with you."

"You don't understand something, Mr. Kell. It doesn't matter a damn whether I like you or not. It doesn't matter a damn whether you like me." Her eyes were blazing. "You bought me. I was struggling to take control of my own life. Maybe I would have made it. So I didn't. So I'm buyable. So I'm a whore. Thanks for rubbing it in with a hundred ton stamping press!"

She watched his pain. It was interesting because it was real pain. She let him feel the knives for precisely fifteen seconds. He spoke waves of pain to her but said nothing.

"That'll teach me to wear red monokinis!" she pouted.

He didn't laugh. He was too busy feeling the pain. "Get out."

Without paying any heed to him she carefully disassembled her bitch personality, like a dressing room makeup takedown. You had to wash under your chin and even get to the very roots of your eyebrows. A quiet sixteen-year-old country girl sat there in front of her mirror selecting a new role. It had to be worked out right down to the motions of the fingers.

For a while he didn't notice that she was smiling at him with warm adoration because the shift was too swift for him to follow. She let the smile grow, powered by her amusement. It was exactly the smile of a woman who has just been proposed to by the man she most wants to spend the rest of her life with. The embarrassed excitement in her hands was just right.

"What makes you suppose I'm going to leave? Do you think I'd come all this way for a man I didn't love?" And she let her eyes fall away so that he could see her lush eyelashes. "You've saved me from a fate worse than death. You just don't know it yet."

Cut. She switched off the lights. Pain. The visual perfection of a woman madly in love. Fade to the physical sensations of love. A tender kiss. A touch of his biceps. Slowly. Not too fast. Let him get used to it. He had become impotent, of course; they always did after that treatment. It didn't matter. Such men had to be taken apart before they would ever fit together sexually. He looked like such an incompetent creep.

She undressed, floating there in the dark, careful not to touch him physically, but careful to let the fabric of her suit brush his skin.

"I'm tired. So are you. We'll just sleep." No pressure at all to begin with. She was willing to wait days until he became used to her body before starting to turn him on erotically.

Think of the money.

Her seduction was interrupted by his work. It was interrupted by his fear. But she knew when to withdraw and when to come back. On the fifteenth evening, he brought her a flower to wear in her hair. He put it there himself and half-undressed her and couldn't stop looking at her. She knew she had him hooked.

Later, when he was half-asleep as men are apt to be after lovemaking, and so still that he was visibly settling in the asteroid's minute gravitic field, she snuggled up to him, chewing the flower stem. Funny, when they had offered her 140 million to keep this misanthrope happy, the job had seemed like a formidably impossible one but now that she knew him she wasn't awed at all. If you asked him questions and listened, he answered. He was already confiding in her. Why hadn't other women succeeded? She slipped the flower behind her ear and kissed him all over the cheek. *Women are such fools! Except me.*

David was sighing over her and brushing against her by then. Secretaries had such gall. The chief rocket engineer kept turning up for carrot juice when she was in the cafeteria. And one of the married men who had a baby found excuses to visit when she was with Celia. *Men are such fools! All of them.* They approached the subject of sex like armies of crabs. She teased them. Whenever they made one of their sidewise hints, Lisa Maria lit the lights in her eyes and allowed herself to dream aloud about Kell's sensual prowess until they stopped. It was all a lie, Kell was a lousy lay, but lies never bothered her when they worked. This one kept her admirers muzzled and, of course, the stories got back to Kell in the form of leers and cracks and raunchy digs and so he became more tender and tried his best to live up to his new found reputation. It was all boringly predictable.

At night she dreamed about being a real human being and doing the things that other women did. She'd seen them driving the rock chewers and setting a broken bone and relining furnaces and troubleshooting the comm equipment and playing a wild game of football.

One evening when Celia and her Daddy and Lisa Maria were eating together in her cave-cabin, it drove her crazy to hear this child chatter on about being a starship captain. She sounded so sure of herself! It was the crack that split the rocket engine.

From some distant place in her skull she began to listen to her possessed vocal chords speak about art, using her voice. She had done thus and so with her paintings. Metal sculpturing was very satisfying but somehow there was no greater thrill than finding a new ceramic glaze that fixed the sunset or captured the essence of a San Francisco fog. Lies, all lies, but she couldn't stop talking about it.

One week later, with the casualness that another man might offer a diamond pendant, Kell took her to an old machine shop that he had fixed up with a kiln and wheel. The kiln would cook pots in either a vacuum, an oxidizing, or a reducing mode with a computer that controlled the time-temperature profile and the amount and kind of atmosphere present.

The wheel had a magnetic frictionless bearing like in the automobile flywheels, and was made out of solid gold so that once moving it was difficult to slow down. Metals were not

Pittsburgh's problem.

"Nobody drinks out of mugs," she said inanely.

"Make something else."

"What would I use for clay?" she said desperately.

"Ah, I had to do some research on that. But I made you up six different kinds of clay you'll have to try out, different fusing temperatures, different properties. I have the photomicrographs of the particles if that would be of any help." And he showed her the cans. He had prewetted the clay to control dust.

Thus did Lisa Maria Sorenti meet the real Meddrick Kell. She was furious. *Remind me never again to suggest anything to that man that might even remotely sound like a physical problem.* There were no Arizona craft shops to rescue her. She was caught in her lie, and since she had never had that happen before in her life, she had no handy personality to deal with it.

Her first emergency reaction was to make the lie real by transforming herself into a real potter overnight. It didn't work. The shapes that desperation produced were no better than the shapes dabbling had produced when she had her San Francisco studio. And creating a beautiful shape was only the beginning.

She became secretive. "Don't you come into my studio," she told Kell with quivering voice. "I'm the kind of artist who doesn't work well with someone watching." That bought her another week.

Finally she knew she had to face the music. She slaved over a special meal which she cooked in the cafeteria for Kell alone. She wore her best perfume and put a flower in her hair so he wouldn't know she was wearing perfume. She made up her eyes with subtle care in order to conjure an achingly beautiful image.

"You're such a nice man," she said holding his wrist. "And you're *my* old man." She let her fingers be nymphs walking in what was left of his hair. "Do you love me enough to keep a secret?"

"Yeah."

She nibbled at his ears. "I'll be mad at you if you tell *anyone*. I'll be so mad at you I'll never speak to you again."

"Not even when we have sex?" he kidded her.

"I'll *space* myself if you tell anyone!"

"Once you've told me a secret, it's not a secret anymore," he said philosophically.

She let the tears gush from her eyes. "You have to promise!"

"Aw, you know I never talk to anyone."

"I'm not a potter. I'm a fake." She held his face and made him watch her screw up and bawl so that he'd know she was vulnerably feminine and needed protection.

Lisa Maria expected some kind of emotion from him—an angry condemnation, perhaps, or maybe he'd laugh at her. But he didn't do anything. His face went blank. He shifted into what she called his "computer mode."

Pregnant pause. "When *I* lie," said

his computer voice, "it is because I want something to be real that isn't. Is that why *you* lie?"

She nodded, not breathing.

"The solution is simple. Become a potter."

"But I can't," she cried. "I've tried!"

"Give me an estimate of the number of hours you've spent potting."

She thought. "Fifty."

"That doesn't qualify as a try. No one can become a potter in fifty hours. You'll *try*. I'll show you how. You have the time."

"Are you going to tell on me?"

"I'll show people the first beautiful thing you do. It took me a thousand hours to make my first iron when I was a kid and another two thousand hours to learn how to make rifle-barrel steel."

"I've felt so incompetent since I've been here with all these amazing women."

"List for me the things that you'd like to be able to do that they do."

"Everything!" she said defiantly.

Pregnant pause. "If you mean the things they do every day, yes that's possible for you to learn in seven years. If you mean everything they *can* do, no that's not possible."

"Is there anything *you* can't do?"

He laughed. "Pot. And I can't write. Celia is teaching me how to write novels these days. We're working on a novel together. She says she hasn't got enough experience to write a novel so I'm responsible for filling in her blank spots. It's killing me."

Kell set up a simple schedule for her. First she had to master her tools and materials. The goal he gave her was something she felt confident that she could do—learn to make ugly shapes that didn't blow up or crack when bisqued. She was to test her glazes on the successful pieces. A month's work, she thought. No, more like two years, he said and shrugged. Then she could begin.

He began to take her on his rounds. He gave her a stern lecture. On Earth you could go through school and get a C and be promoted. Here if you got a C you got promoted to Death. "Everything you learn to do, bring it up to full competence—or don't do it."

They were eating up the whole asteroid and refining it to metal that had to be stored in such a way that the center of gravity stayed on a line through the slag-jet. He gave her lessons in driving a rock chewer. He put her with a maintenance crew. He showed her how to operate the computer controlled electron beam machine tools that built their spare parts. No matter how small the task he gave her, he pushed her ruthlessly until she reached full competence.

Sometimes he was too busy to bother with her for days. He left her with her pottery or with Celia. She might be with him only while he slept. Sometimes he went straight around the clock without sleeping.

She got fascinated by metalworking in gold and took lessons from a Swedish engineer who enjoyed her attention. She couldn't resist having an

affair with him even though he was married, the temptation to defy Roy Stoerm and get away with it was too strong. She was risking her twenty million a year, but that gave it value in her eyes. She didn't let herself notice that she had picked the most stable and secretive man in all of Pittsburgh.

They made a golden beer stein together as a lark when Lisa Maria bemoaned the fact that it would be useless for her to throw mugs on her wheel. Inventing a beer mug that worked was hilarious. The final version sat on the air (sinking ever so slowly as things did around the asteroid) and had a pleasant inertial feel to it. A special mechanism spun the liquid so that it "fell" to the walls of the stein which when tipped created a gyroscopic resistance that caused a small scoop to throw a sip of liquid from the stein's mouth.

Gently, without any tangled emotion, her Swede withdrew from Lisa Maria having gotten whatever it was that he wanted, to leave her alone again with Kell, feeling the hostility she felt when she had no one but him. It was dangerous to trust a man, and if you felt like trusting him he was very very dangerous. Her Swede wasn't dangerous because she *knew* she couldn't trust him.

Wanting to trust Kell reminded her of Carl Chrisholm. Nick had introduced them and rented her to him after his wife's funeral. She was just becoming aware then that Nick was betraying her and Carl seemed so honest. He was older, rich, respected, considerate, gregarious, never dull, and a one woman man. He took her everywhere. She liked his home, she liked his children. It was strange to love a man and not be cynical about it, to find yourself giving more than you thought you had. Glorious.

She remembered telling Nick goodbye in her mind. *I don't need you. I have Carl!* And one evening she told Carl that she loved him and wanted to be his woman and he'd been so pleased and so loving. The next day he went out and rented a new mistress.

So to hell with Meddrick Kell. Lisa Maria replaced her Swede with David and continued to live dangerously. She had to fake it with Kell because of Stoerm's contract, but nothing in the contract said she had to trust him. She didn't like men who made you love them and all the while were planning to space you.

8

The emergency came suddenly, as they always do. Every eighteen days the solar power station Gilgamesh that supplied Pittsburgh passed behind the sun. Slag-jet Motor One was shut down for overhaul and Slag-jet Motor Two was fired as soon as Gilgamesh reappeared. But this time Motor Two failed within the hour after start-up.

Every available person was called on to help diagnose the trouble and get repairs operational. While the motors were not firing, the asteroid was not spiraling in toward Earth. Too many delays meant that they would reach

Earth when Earth was gone and so their orbit would have to be adjusted to a much later arrival date. The consequence was extra months, perhaps an extra year in space, and grave financial fines for the crew of the Pittsburgh.

Lisa Maria was helping by tending to Kell's comforts and by running errands for him. He was pushing himself mercilessly, planning the whole operation so that all systems would be up in minimum time. She had just brought food to the command center when navigation phoned in a report.

"The single trouble we've got up here is a rock that's going to take out the mirror. The new orbit gives us a collision course. Even if Number Two started firing right now we wouldn't get out of her way in time. She's a small one but she's got to be taken care of within the hour. Details are coming though your fax right now."

"Shit!" said Kell when he got the charts and read them.

"What's the matter now?"

"Goddamn collision. Lawson, take over. Lisa Maria, suit up. We're going to do in this rock ourselves."

"Kell, you're tired," said Lawson.

"It's okay. It'll relax me. I need a vacation from this mess. I'll be back with you in a couple of hours."

Lisa Maria followed his instant exit like his shadow but she didn't want to go. "Are you sure I can help?"

"We have your reflexes up to speed. No problem for you."

The skintight tension suits allowed for hard work in space because they sweated like real skin. Both of them stripped and suited up almost faster than the eye could see. "What am I supposed to do?" she pleaded.

"Obey orders. Can't spare anybody else here. Don't worry. It's a picnic. A damn nuisance, but not a real problem."

Seconds later they were blasting off Pittsburgh in one of the open cockpit ships. Only then did Kell relax. "Do you know why they call these things convertibles?"

"They convert people to corpses?" she said, hanging on. Being in the center of a sphere of stars dominated by a single star was an awesome experience.

"They used to drive on the highways of California in these things. The country air feeling. The thrill of the wind in your face."

"Jesus!" said Lisa Maria, hanging on for dear life though she was strapped in.

"We can laser some of these rocks out of the way. But you still have to visit them and cancel the rotation. The laser pits them on a line through the center of gravity and the back reaction of the vaporized gases acts like a reaction jet. This rock is too big. We've got a rocket with us to do the job. A homemade sparkler, my design, lousy specific impulse, but good enough. We only need to add a quarter of a meter per second to her velocity."

"Do you ever get in collision orbits with other asteroids?"

"Naw. Our navigator is too good for that."

Once the acceleration cut out it was as if they were suspended. Within this glittering sphere she couldn't even tell whether they were mice in a toy rocket car or whether their bodies were as huge as a planet. The human mind cannot comprehend velocity or size without objects that move in relationship to each other.

"You know what they used to do in convertibles?" said Kell. "The object of the game was to run out of gas under the stars. That was an excuse to nuzzle."

"I saw the same disc. It was made in 1947. But there was a moon in the sky."

He began to caress her body.

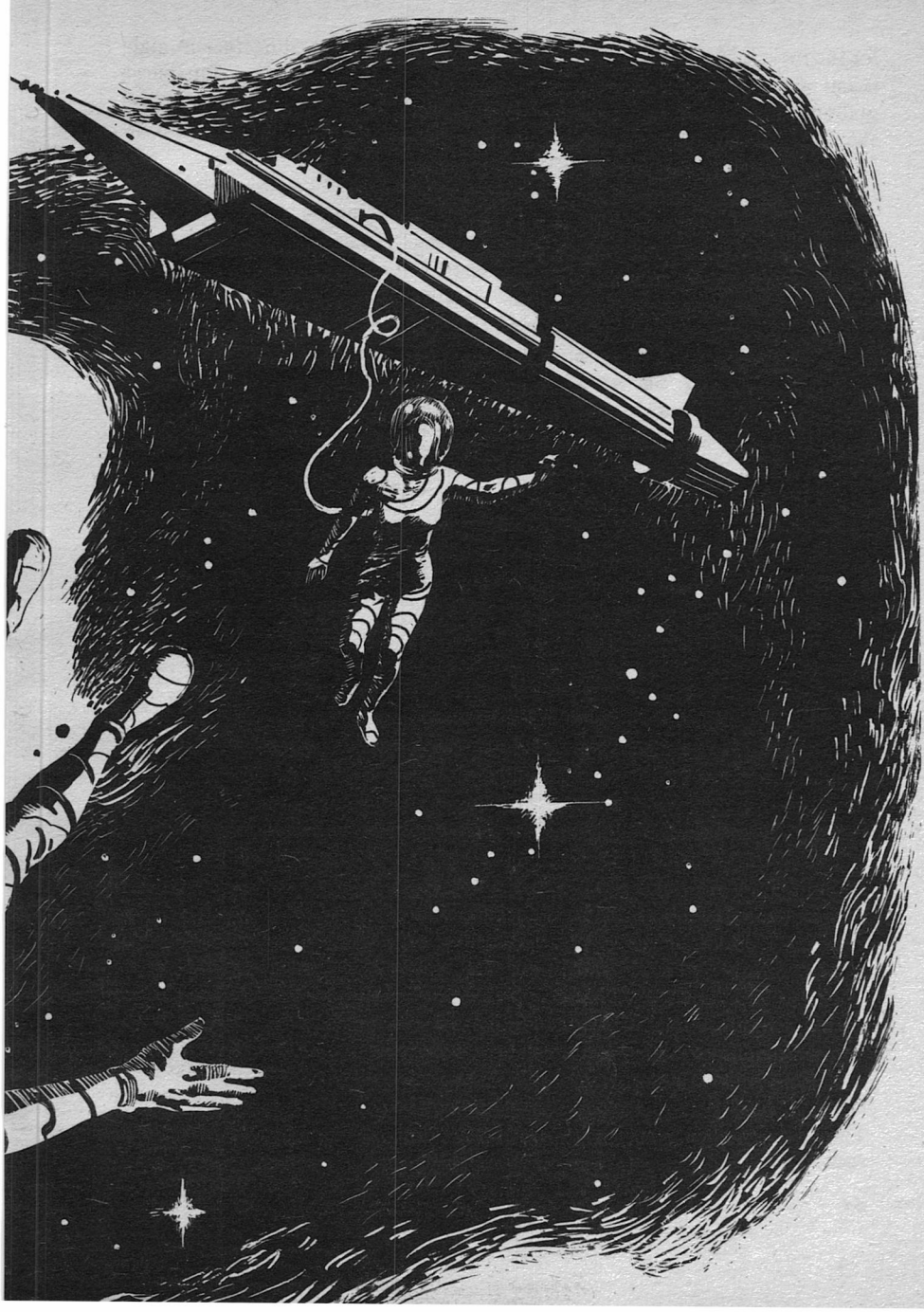
"Get your electrically heated paws off of me!"

They both laughed inside their helmets.

Forty minutes later they decelerated and the computer brought them to rest beside their slowly tumbling rock. "How far have we gone?" she asked.

"From San Francisco to New York. And shut up. Do everything I say."

The rock was roughly twelve meters in diameter. He fixed a small rocket to its equator and they had a pinwheel flare until the rotation was stopped dead. Then he did some measurements against the stars and drilled a mount



for the rocket. Meanwhile she dragged it out and brought it over. She was gliding back to the convertible when she felt an explosion throw her violently until she snapped taut against the ship line. It was all over before she could turn to see what had happened.

"Kell!" she screamed.

By reflex she pulled herself into the cockpit and sent out a radar scan for debris, asking the machine to select a human identity. It picked him up almost immediately. She ordered the convertible to "home" on him, and seconds later was pulling him out of the sky.

There was blood all over, boiling and icing, black in her headlamp. She had no time to ask whether he was dead. She was pulling out her patching equipment at the same time she was deciding what to do with the piece of rocket sticking out of him. Cut it flush to the skin or pull it out? The quickest. Pull it out. Patch instantly. Thank God he wasn't wearing a pressure suit. You couldn't decompress a tension suit unless the helmet shattered. Switch on the physiological monitor. Sudden tears. The pulse was poor, the breathing poor. He was still alive.

And the rock was still heading for a collision with the Pittsburgh mirror. But. . . .

He'll die if I don't get him back.

She forgot that she had radio contact with Pittsburgh in her panic to do the right thing which, whatever it was, had to be done swifter than thought. The longer she waited to deflect the rock, the more energy it would take, and if she let it go altogether it might take more energy than Pittsburgh could bring to bear. The only rocket power available was in the convertible's motors.

Crying because Kell was dying, she nosed her vehicle against the rock. Careful! A false move and she'd only start the rock spinning. Free-fall had taught her much physics. Outside the dominating field of Earth, Newton's laws were so evident that they became built into the nervous system. Aim through the center of gravity. Lightly does it; she was nose heavy by about two or three thousand tons. Lock on the stars so that the gimbles of the motor will act against any spin. Set the accelerometer to stop the firing when they had changed velocity by a quarter of a meter per second. Set for minimum thrust. Fire! The motor roared to life. *God, dear God, let there be some fuel left.*

There was. She had enough fuel remaining in her tanks to take her back to the Pittsburgh in twelve hours. Kell would be long dead. Only then did she remember the radio. She was crying but she turned off the tears because she had that kind of control.

"Convertible Three to Navigation. Come in."

"Come in Lisa Maria!"

"We've had a terrible accident. I don't know what happened. Kell's hurt, maybe dying. I can't get back." Her voice was rising into hysteria.

"Lisa, listen. I got that. I want to know something. We have a radar fix on the rock. It has moved out of colli-

sion orbit. Did you know that?"

"Yes. When the rocket blew up, I used the convertible's fuel."

"Great thinking!"

"I can't get back in time," she cried.

"Lisa. Put Kell's monitor on broadcast. Dr. Hendrick will be right on the line. Home on the Pittsburgh with whatever fuel you've got left. We're coming after you. Flat out. All the delta-vee we've got. Surgery will be set up when you get here. And you, wench, are *you* all right?"

It all went quicker than she thought it possibly could considering the fact that she was in "New York" and the ambulance was in "San Francisco." The return was a jumble of frantic memories—Kell being whisked away at a rapid glide, Celia's face in pathetic anguish: "Is My Daddy dead?" and the two women who helped her desuit before she fainted, a man trying to shield her while Lawson insisted on debriefing her, a woman she hardly knew reaching out a congratulating hand. Sleep.

When she woke up, David was with her.

"How is he?"

"He's not easy to kill. Rumor has it that his blood is too cold to boil even if you spaced him. Actually, he's better. Lawson is talking about you. He thinks you've soaked up Kell through your pores. He couldn't give you a higher compliment."

"I felt so awkward."

"You didn't make a mistake and everyone knows it."

"It was just reflex."

"Spaceman's reflex."

"Is that another compliment?"

"You're going to get tired of them. Someone put in a commendation for you and everyone has voted yes already at ten on the scale."

"Well, the company is paying me twenty million dollars a year to bring in the steel and if this barge doesn't reach port we don't get paid, right?"

"Right!"

"I want to see Kell."

She found him talking into a hands-off phone about the lining of Motor Number Two. He signed off when she came in. "You're the one who can answer my questions," he said. "How did I get here?"

"I saved you."

"How come the mirror is still there?"

"I saved it."

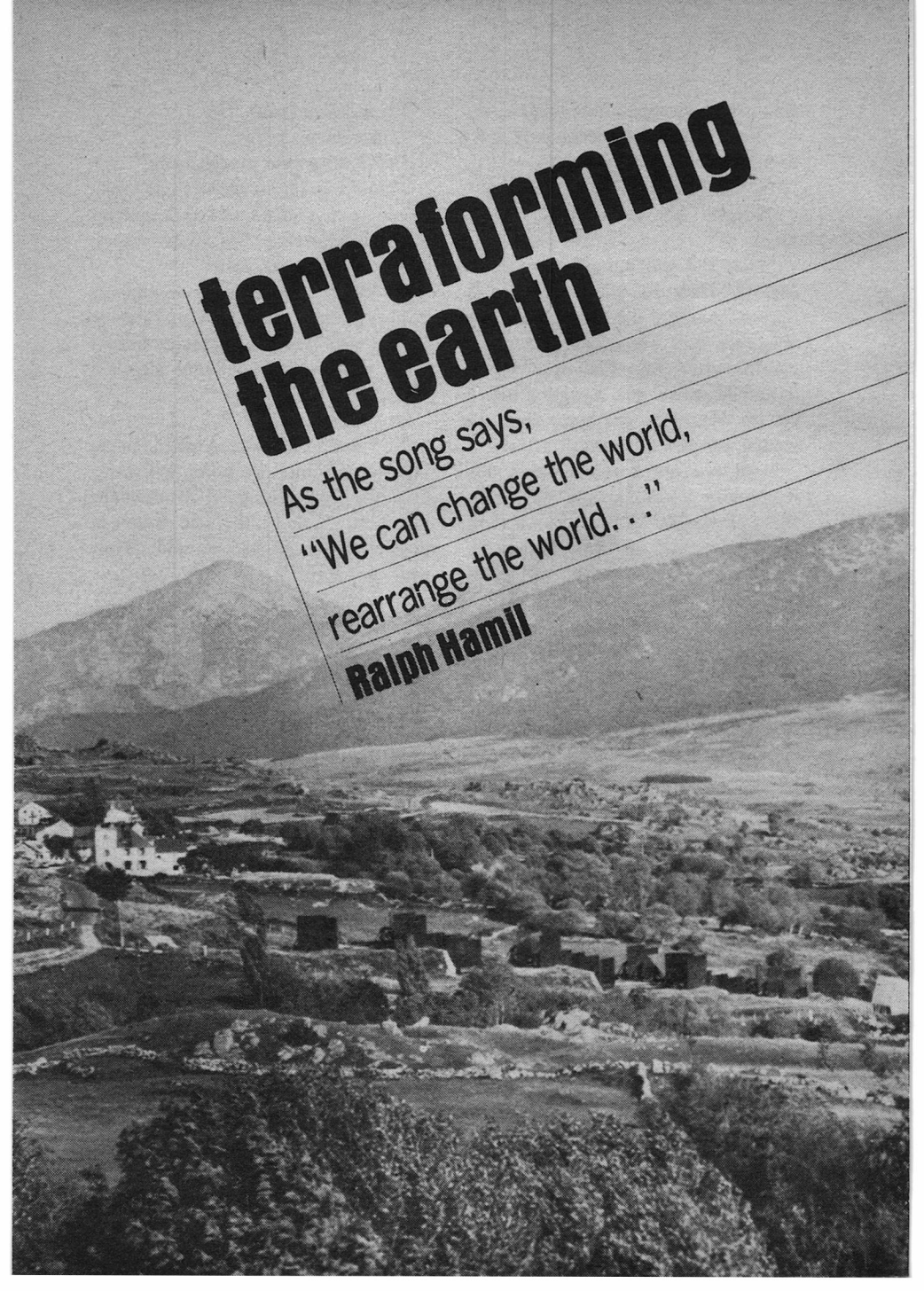
"What did you bring me along for if you are that competent?"

"I thought the experience would do you some good but you turned out to be as useful as a bloody corpse. Next time I won't bring you."

"Do you know what my last thought was?" he said. "I thought I had killed you and I loved you."

"Do you know what my last thought was?" she said. "I was worried sick about the mirror. I thought I might not get my 140 million dollars."

She took his hand and looked at his eyes looking into hers. *I'll never tell you I love you*, she thought at him, *because then you'll hire a new mistress and I'll be unhappy again.* ■

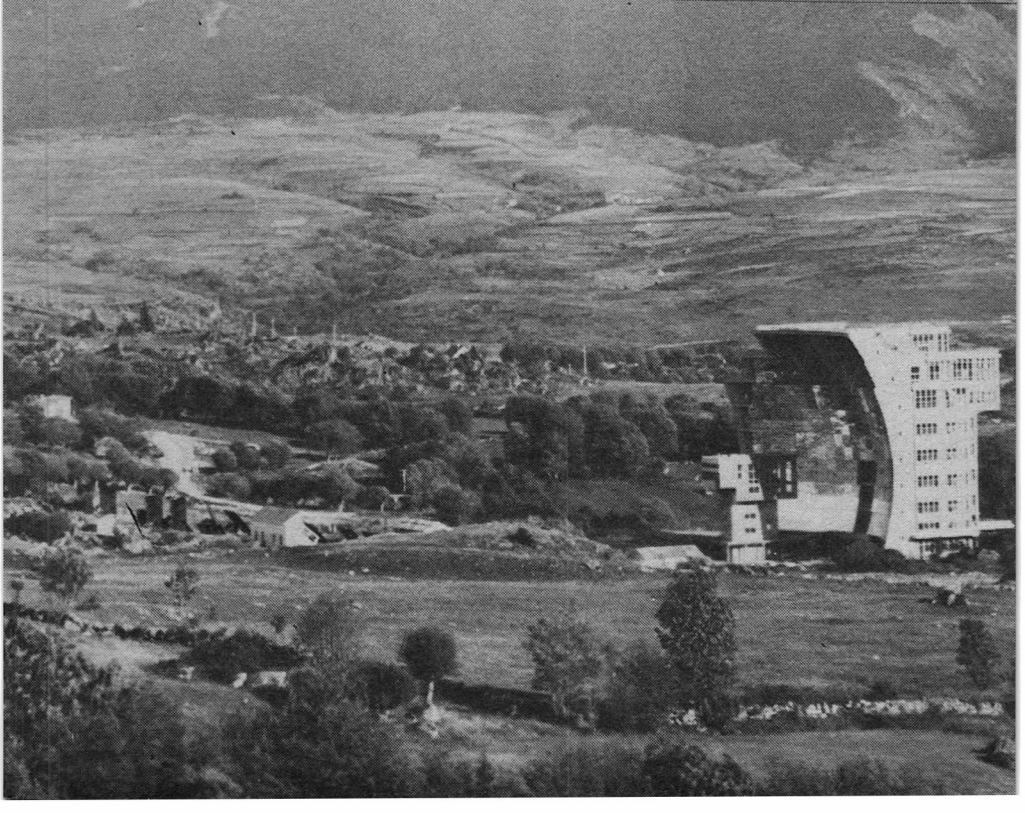

terraforming
the earth
As the song says,
"We can change the world,
rearrange the world. . ."
Ralph Hamil

Those familiar with science fiction and/or speculative books on the future of space travel have heard of the concept of "terraforming"—making a planet habitable for mankind.

To terraform Mars, one starts by bombarding it with masses of ice from Saturn's Rings or elsewhere to restore its water. Venus might be seeded with bacteria that will breathe its carbon dioxide, exhale oxygen, and thus bring down its temperature to humanly bearable levels. It is on Earth, however, that the most important work of terraforming awaits completion. This planet could use some alterations.

Since the development of agriculture, eight millennia ago, the vast forests of China, Europe, and North America have been leveled for farmland. Most of Holland and much of Manhattan were reclaimed from the sea. Cities that dwarf Babylon have spread across the globe. The Nile, Euphrates, and Congo have been dammed and the Bosporus bridged. Ancient dreams to canalize Corinth, Suez, and Panama have been realized. One can travel by train from Lisbon to Ho Chi Minh City—assuming you are politically acceptable to all the countries en route. For his comfort and convenience, man has radically altered the surface of the Earth, not always improving it.

Despite these great works the lot of



most of the planet's four billion people is hard. Upon independence, Third World countries have characteristically found themselves with a fast growing capital city on the seacoast with a road and a single line railroad connecting it to a raw material producing area inland. Only the capital and a few other large towns enjoyed electric power or airports. The infrastructure—built by and for outsiders—was and still is inadequate. In their first National Plans, these countries paid particular emphasis to developing their physical infrastructure: power generation, building a national electrical grid, integrated rail and road networks, and improved port facilities.

At the world level too there is a need to rationalize and coordinate future growth. International cooperation is needed to undertake many of the important projects of the future. Geophysicist S. Fred Singer, when an Interior Department official, remarked, "We are moving into the age of planetary engineering and now is the time to discuss proposals for modifications and their consequences before the need for such modifications becomes urgent."

As the world's oil, gas, uranium, and—eventually—its coal deposits are used up, research is turning increasingly to developing energy technologies that rely on sources of benign renewable power. Of such technologies, there is only one that is statistically important in today's world energy balance. True, there is some geothermal capacity, minuscule contributions from such old standbys as wood, peat, manure, and work animals, and demonstration plants relying on fuel cells, solar, tidal, and wind power as well as prototype breeder reactors. Pilot plants to provide small amounts of power from thermonuclear fusion and the difference in temperature in ocean gradients are also only a few years away. But only one can be counted on today.

This proven technology is, of course, hydropower: energy—almost entirely electrical—generated by running water through dam conduits amounts to some 350,000 megawatts (MW) of capacity worldwide. It constitutes twenty-three percent of the planet's electrical capacity. In many countries, hydro is the major mode of generating electricity and the potentialities of further development in parts of South America, Africa—notably Zaire—and Southeast Asia are enormous. In speculation on energy futures, it gets little attention, in part, because for the U.S. outside Alaska, there are not many suitable sites for major dams remaining. Nevertheless, from space, these existing dams and the reservoirs behind them are the most noticeable man-made objects in daytime.

Hydroelectricity is clean energy, although damming rivers sometimes leads to backwater sedimentation, rapid silting, and disruption of marine life and scenic quality. It frequently requires relocation of homes on about-to-be flooded land. But despite high

initial construction expenditures generally involving lead times of five to twelve years, it costs far less to run a hydroelectric facility than an equivalent size fossil or nuclear plant. This is particularly important for poor Third World nations.

Now Watch Us King Canute

The projects listed in the table on p. 61 include those hydroelectric projects comprising one or more dam sites with a projected capacity greater than 6,000 megawatts. These involve, in many cases, major changes in maps of the Earth's surface. They illustrate places where humanity could, given the political will, reshape the face of the globe to its liking.

The listing is intended to be provocative. It includes dams and series of dams already built, under construction, or under serious consideration together with those politically impossible today. For comparison purposes, New York City requires some 8,000 MW; the world's largest conventional thermal and nuclear plants are respectively 3,499 MW and 3,924 MW.

Of those projects, nine rate special interest.

1) The proposed North American Water and Power Alliance (NAWAPA) project was once styled by *Newsweek* as "the greatest, the most titanic, colossal, stupendous, supersplendificent public works project in history." It envisions the diversion of 36 trillion gallons annually from four Alaskan and Yukon rivers through the Rocky Mountain Trench, a 500-mile long natural gorge containing the Columbia, Fraser, and Kootenay Rivers. Spurs would continue to the Gulf of California and the Rio Grande. Canals would be built across the Prairie Provinces to Lake Superior, and through the Dakotas to the Mississippi. Seven Canadian Provinces, 33 U.S. states, and three Mexican states—many drought afflicted—could be irrigated. As an additional bonus, 100,000 megawatts of electricity could be generated, of which a third will be needed to pump the water. Besides costs—conservatively estimated at $200 billion—Canadian reluctance to export its waters are just two of the major obstacles to initiation of the project.

2) The most enthusiastic proponents of planetary engineering projects are the Soviets, who have espoused a number of schemes to dam the major rivers of North Russia and redirect their waters into parched Central Asia. At the confluence of the Ob and Irtysh, a "Siberian Sea" 160,000 square miles in extent would be created. Their waters, as well as the Yenisei's, would be directed 1,500 miles to the south. Eventually a series of canals would allow navigation between the Amur River on the Pacific and the Caspian, which is already linked with the Black Sea and hence the Atlantic. The scheme is faulted by those who fear that with a lessened flow of fresh water, the Arctic ice pack may shrink, with deleterious effects on the world's climate. Some

experts worry that the cool air above the giant reservoirs would injure crops to the south while the added weight of the waters may stimulate earthquakes. Still, Soviet scientists are being asked to design elaborations of the project by 1980—so that the Government can make a go/no-go decision on the project before finalization of the 1981-85 Five Year Plan.

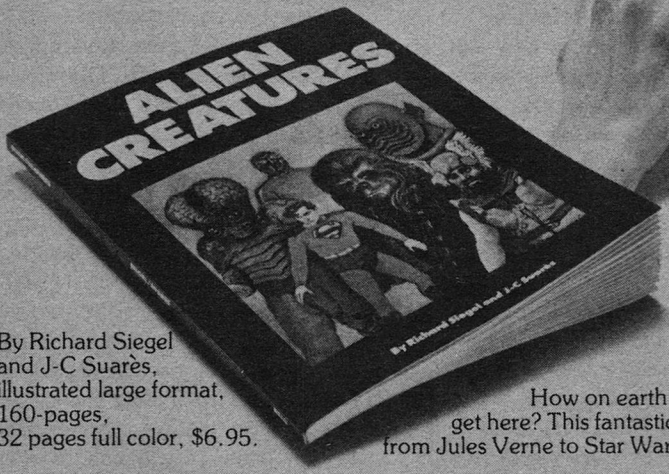
3) Herman Kahn's Hudson Institute has proposed the construction of a 40-mile long dam across the Amazon at Obidos. Some 25 to 40 subsidiary dams would be created upstream and upon its numerous tributaries. Power generated would be sent southward to light Brazil's cities and northward to aluminum plants in Guyana and Surinam. The plan, however, envisions the flooding of a considerable area—perhaps 140,000 square miles of rain forest—thus preventing mineral exploitation, altering local climatic patterns, and lowering the input of oxygen into the atmosphere. The blocking of the Amazon's waters and rich silts could affect both ocean currents and marine life in the Atlantic.

4) In 1928, the Bavarian engineer, Herman Sörgel, published a plan to prevent Atlantic waters from entering the Mediterranean at Gibraltar. Another "superdam" would block off the Black Sea at the Dardanelles. A century later, the level of the Mediterranean should have dropped 330 feet, sufficient to allow construction of two further dams between Italy, Sicily, and Tunisia. The eastern Mediterranean would be allowed to sink a further 330 feet for another century. Other hydroelectric facilities could be constructed at the mouths of the Ebro, Rhone, Po, and Nile, and across the Atlantic. Among the probably insuperable problems of this scheme are its cost—which includes construction of new ports and ship canals—its effect on Atlantic currents and climate, possible propagation of earthquakes and volcanos in that highly active region, and its total political impossibility.

5) A miniature version of the Gibraltar scheme has been proposed for the Bab El Mandab at the entrance to the Red Sea. Power would be produced by running water from the Indian Ocean into a Red Sea lowered by that area's intense solar heat. Another dam outfitted with locks would have to be built at the southern end of the Suez Canal to prevent entrance into the Red Sea of water from the Mediterranean. There are fewer vested political and commercial interests along the Red Sea and the climatic disruption would be less, although there could be a threat from earthquakes along the rift that splits the Red Sea. The project might someday prove attractive to Saudi Arabians wondering what to do with their petrodollars.

6) Sörgel's second scheme, published in 1935, involved the construction of a dam across the lower Congo River. A huge "Congo Lake" covering 350,000 square miles would be formed, eventually overflowing to dying Lake Chad to the north. This "Chad Sea," expanded to 700,000

BLOBS, MUTANTS, WOOKIEES AND CLAY PEOPLE



By Richard Siegel
and J-C Suarès,
illustrated large format,
160-pages,
32 pages full color, $6.95.

How on earth did they
get here? This fantastic voyage
from Jules Verne to Star Wars tells all.

ALIEN CREATURES

REED BOOKS

Now available at bookstores everywhere.

square miles would itself overflow into a "Second Nile" (as Sörgel called it) through Algeria and Tunisia into the Mediterranean. In 1972, the Congo was dammed and the first hydrogenerators installed at Inga where 350 MW are now on line. Planned expansion to 3,700 MW will still account for only a fraction of the river's potential 30,000 MW capacity. Full implementation of the scheme would involve the relocation of millions of people, and the flooding of possibly mineral rich territories. Again it is, for all intents and purposes, politically impossible.

7) Five great rivers flow out of Tibet: the Indus, Ganges, Brahmaputra, Mekong, and Yangtze, and proposals exist for harnessing each of them. Plans for further utilization of the Indus are complicated by Indo-Pakistani disputes over distribution of the waters. Likewise, harnessing the Ganges and Brahmaputra requires agreement among India, Nepal, China, and Bangladesh. Post-Vietnam War friction among the four countries of the lower Mekong basin have thus far prevented the revival of an ambitious scheme for a series of hydroelectric facilities on that river. Though international agreements would not be required for a dam at San-hsia on China's Yangtze, some three million people would have to be relocated.

8) A proposal to dam the Bering Strait and re-establish the land bridge between Asia and America has the fervent endorsement of numerous Soviet scientists, though two contradictory plans exist. Under one scheme, the warmer waters of the Pacific's Bering Sea will be pumped north, melting the Polar ice cap and warming the shores of the Arctic Ocean. The variant would see the frigid Arctic waters pumped south into the Bering Sea with the same result. Needless to say, the melted ice cap would raise the level of the world's oceans, drowning seaports and other valuable land. Cooling the Pacific would also play havoc with plant, fish, and wild life throughout the entire basin.

9) The Qattara Depression is Egyptian desert at its very worst—7,000 square miles of barren sand dunes, alkali flats, and salt plains. The impossibility of sending tanks into it forced Rommel to concentrate his forces into the 40-mile neck between the Depression and the Mediterranean coastal town of El Alemain. German officials are now back in the area conducting feasibility studies on utilizing the 400-foot drop between the Mediterranean and the Depression to generate hydropower and form a lake half the size of Belgium. Besides adding an initial 1,200 MW to the Egyptian grid, a pumped-storage system will provide 5,000 MW at peak times; when fully completed some 11,000 MW would be available.

Ironically, the Israelis are also studying the feasibility of exploiting the 1,200-foot drop from the Mediterranean to the Dead Sea by boring a 50-mile tunnel to carry water to power a 500 MW hydro plant. Mideast peace might someday join Israel, Lebanon, Syria, Jordan, and, perhaps, an inde-

pendent Palestine in a Jordan Valley Authority for power generation and irrigation purposes.

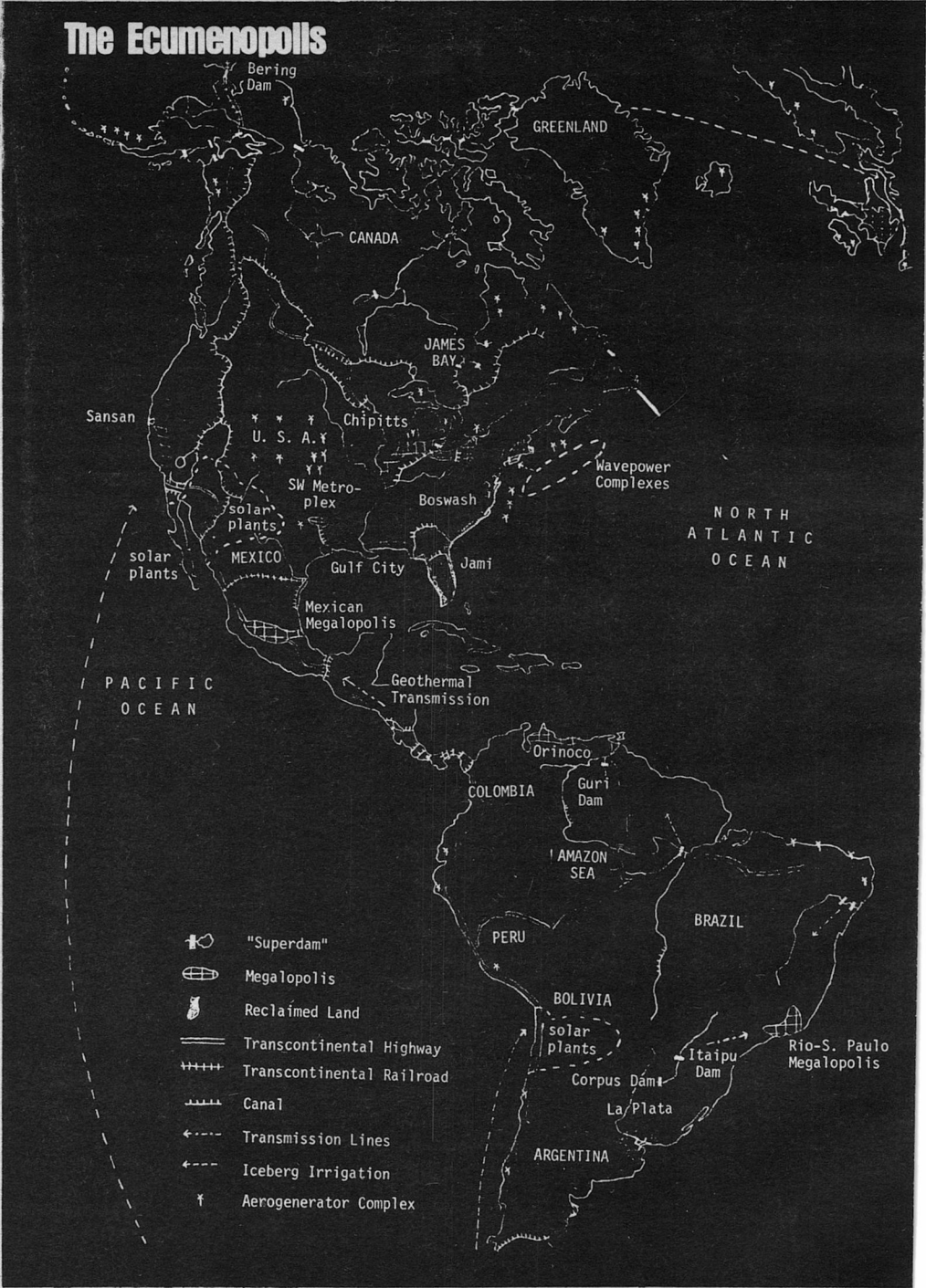
South Australia's Lake Eyre is also below sea level and naturally there is a plan for cutting a channel from Spencer's Gulf. Likewise there is a scheme for restoring the long since evaporated "Lake of Pallas" west of Gabès in Tunisia as well as a project to turn California's Salton Sea into an estuarial lagoon.

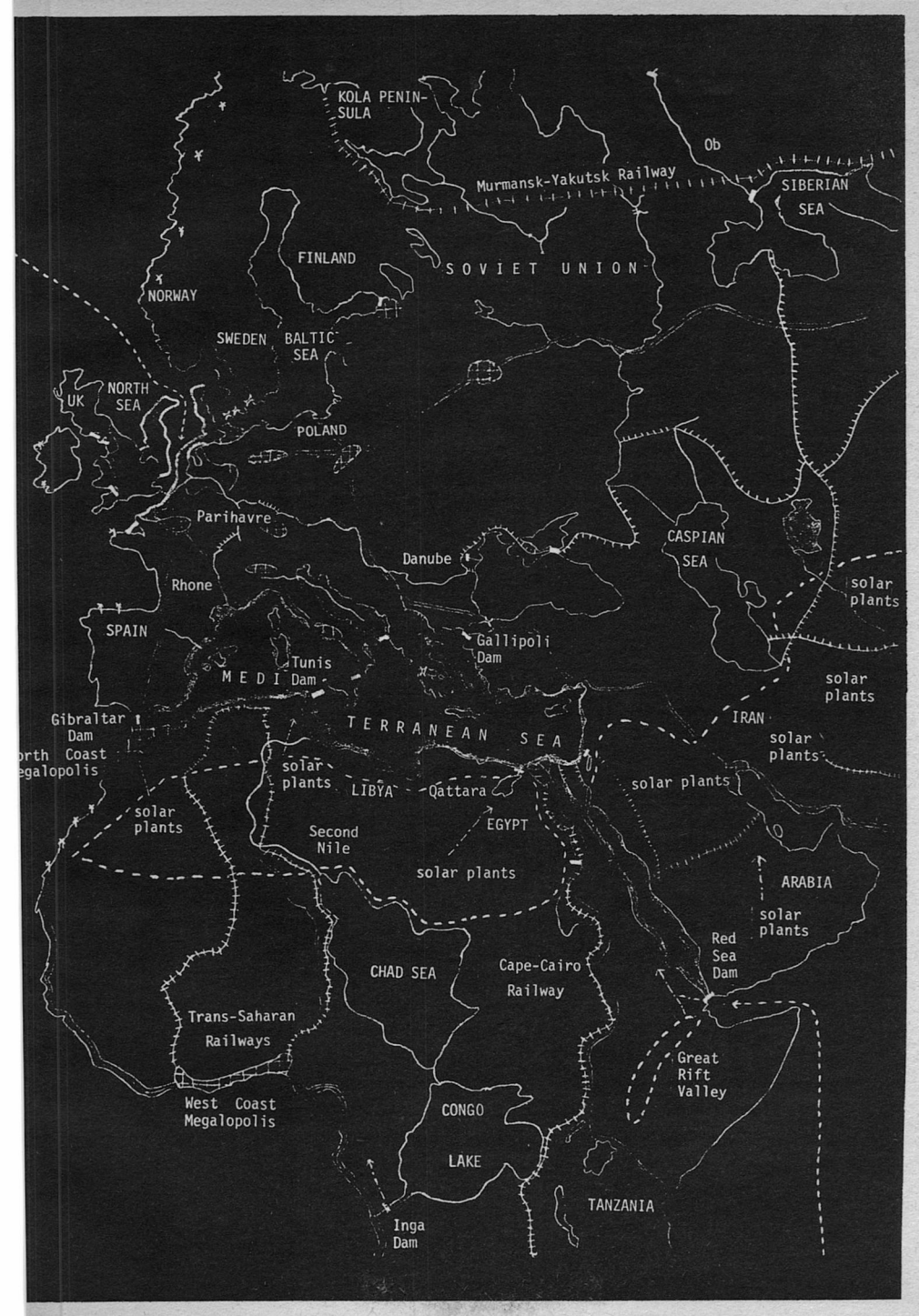
There are other major dam projects where diversion of waters rather than generating of electricity is the almost sole consideration. The Soviets are building dams across the Kerch Strait and the Gulf of Finland, have rejected a proposal to drain the Aral Sea, but dream of diverting the Amur in any of three directions and/or damming the Tartar Strait so as to divert the warm Kuro Siwo current away from California and into the Sea of Okhotsk. Some Canadians hope for year-round shipping by way of the Northwest Passage through blockage of the channels between Greenland and Ellesmere Island and among the Queen Elizabeth Islands to keep those waters iceberg free. There is a similar proposal for plugging the narrow Strait of Belles Isle, and building a 250-mile dam over the Atlantic to deflect the Gulf Stream toward the Maritimes. (Of course, the cold Labrador current would end up chilling Europe.) Canadians have also floated suggestions for flooding Manitoba's Southern Indian Lake, diverting Ontario's Harricanaw River into Lake Huron, and draining Lake Erie through a dam at Detroit. Long on the drawing boards has been a plan for a Missouri Valley Authority along the lines of the TVA, but much of its network has since been built piecemeal.

There is a scheme to dam both ends of Long Island Sound so as to turn it into the world's largest fresh water reservoir. Comparable proposals have been made for the Delaware, Chesapeake, and San Francisco Bays. A somewhat similar project exists for damming the West Frisian Islands to expand yet further the Dutch realm. Mention should also be made of plans to harness the "Underground Nile," flowing more than a mile below the visible Nile, as well as vague schemes to utilize Chinese waters to irrigate the Gobi Desert and form a system of waterways connecting the rivers of Southeast Asia and Siberia.

The longest of all proposed dams are those proposed by the prolific SF writer and publisher, Hugo Gernsback. In 1953, he suggested construction of sea walls straddling the 150-foot depth mark in the North Sea and off the U.S. east coast. That the pumped-out waters would necessarily flood other coastlines did not, apparently, concern Gernsback.

Some proposed dams are for the purpose of harnessing the oceans' tides. A 240 MW demonstration tidal power plant was built in 1966 at the estuary of the Rance River on the coast of Brittany in France. The USSR has built a 0.5 MW pilot project at Kislaya Guba near Mur-


The Ecumenopolis
Bering Dam
GREENLAND
CANADA
JAMES BAY
Sansan
Chipitts
U. S. A.
SW Metro-plex
Wavepower Complexes
Boswash
solar plants
solar plants
MEXICO
Gulf City
Jami
NORTH ATLANTIC OCEAN
Mexican Megalopolis
PACIFIC OCEAN
Geothermal Transmission
Orinoco
COLOMBIA
Guri Dam
AMAZON SEA
BRAZIL
PERU
BOLIVIA
solar plants
Itaipu Dam
Rio-S. Paulo Megalopolis
Corpus Dam
La Plata
ARGENTINA
"Superdam"
Megalopolis
Reclaimed Land
Transcontinental Highway
Transcontinental Railroad
Canal
Transmission Lines
Iceberg Irrigation
Aerogenerator Complex


KOLA PENIN-
SULA
Ob
Murmansk-Yakutsk Railway
SIBERIAN
SEA
FINLAND
SOVIET UNION
NORWAY
SWEDEN
BALTIC
SEA
NORTH
SEA
UK
POLAND
Parihavre
Danube
CASPIAN
SEA
solar
plants
Rhone
SPAIN
Gallipoli
Dam
Tunis
MEDI Dam
solar
plants
Gibraltar
Dam
TERRANEAN SEA
IRAN
orth Coast
egalopolis
solar
plants
LIBYA
Qattara
solar plants
solar
plants
Second
Nile
EGYPT
solar plants
ARABIA
solar
plants
Red
Sea
Dam
CHAD SEA
Cape-Cairo
Railway
Trans-Saharan
Railways
Great
Rift
Valley
West Coast
Megalopolis
CONGO
LAKE
TANZANIA
Inga
Dam

mansk on the Kola Peninsula and have plans for other facilities at Lumbovskaya, also on the Kola Peninsula, and in the estuaries of the Kulovskaya and Merenskaya Rivers. The last might eventually be expanded to 6,000 MW. A plan also exists for a 10,000 MW station on the Sea of Okhotsk as a joint venture with the Japanese. Proposals for tidal power plants also exist for Passamaquoddy Bay, Maine, Alaska's Cook Inlet, New Brunswick's Peticodiac River, Britain's Bristol Channel, Solway Firth, and Morecambe Bay, France's Iles Chausey and Les Minquiers, on the Yellow Sea coast of South Korea, and across Argentina's Golfo San José and Golfo Nuevo. More remote are plans to build tidal power facilities across the entrances to the Bay of Fundy, Cape Cod Bay, Long Island Sound, Chesapeake Bay, and Pamlico Sound.

If the best sites for tidal power stations are in the Northern Temperate Zone, so the best locations for wind-power plants are frequently in the subpolar areas and at sea. Offshore arrays of aerogenerators have also been proposed for off the New England seaboard and along the 300-foot contour southward to Charleston, along the Texas Gulf Coast, the Aleutian chain, Hawaii, and in each of the Great Lakes. Other clusters would run north from Dallas across the Great Plains States. Texans claim their winds could, if fully harnessed, produce 250,000 MW of electricity.

Sites for geothermal plants can be found in numerous countries with earthquake faults or recent volcanic activity. In North America, prospective locations exist along the U.S. Gulf Coast and widely west of the Continental Divide south to Nicaragua. Other concentrations of possible sites are in Africa's Great Rift Valley and in Western Pacific areas such as New Zealand, the Philippines, Japan and the Soviet Kamchatka Peninsula. The Soviets hope to someday build a 300 MW plant harnessing energy from the Peninsula's Avachinskaya Volcano.

The most logical places to harness the sun are in the deserts of the tropics, where, however, very little power is presently in demand. Currently, the world's largest solar plant—1 MW—is located at Odeillo in the French Pyrennes. Plans for 10 MW stations are in the works for Barstow, California and Soviet Central Asia. A 30 MW plant is to be built at Lanzarote in the Canary Islands. Smaller units are proposed or slated for Bridgeport, Texas (6 MW); near Marseilles (3.5 MW); in Southern Italy and the Japanese Island of Shikoku (1 MW each); and at Calama, Chile (.5 MW). Sunny, developed nations such as Australia and Israel and developing countries—notably India and some Middle Eastern and Latin American states—are deeply interested in solar power. Denis Hayes of the Worldwatch Institute believes that the Third World is the more likely to make early use of solar energy—particularly at the village level. Elsewhere, improvements in collec-

tion, conversion, storage, and transmission techniques are needed to make large-scale solar power generation competitive with existing modes.

A World-Wide Power Grid

It is proverbial that the sources of energy supply are far removed from where they are most needed. The richest untapped sources of oil, gas, hydroelectricity, solar, and geothermal energy are in underdeveloped countries or remote regions of developed nations far from demand centers. Power transmitted over long distances, however, loses much of its efficiency. Present-day research is currently conducted on AC and DC extra-high voltage techniques including transmission at very low temperatures. A promising line of research is the turning of hydrogen into metallic form which could lead to a resistance-free superconductor able to transmit power without appreciable loss. The Soviet Union has made considerable progress in this field and has constructed extra-high voltage transmission lines over thousands of miles. The Soviets are building a grid which will connect its power generation sites with users in other Eastern European countries. Eventually, it is envisioned that this grid would be integrated into one uniting all of Europe and Asia.

Other high voltage intercontinental transmission systems could bring power to Europe from hydroelectric sites on African rivers, geothermal stations in Africa's Great Rift Valley, and solar collectors in the Sahara. Like-

wise surplus hydroelectric and geothermal power from South and Middle America could be transmitted to North American markets. As hydroelectric, geothermal, and solar power are being constantly renewed, there would be no element of exploitation. And, as Latin American and African energy demand increases, larger shares of domestic output would be allotted to domestic use.

Extra-high voltage transmission through superconducting cables or via microwave reflectors in Earth orbit would also facilitate the construction of large nuclear or fossil-fuel power plants in unpopulated areas or—in the case of nuclear plants—at sea or on uninhabited islands. In addition, fossil and nuclear systems are far more efficient the larger they are. Advances in power transmission technology will encourage such economy of scale. This will be of particular importance when thermonuclear fusion becomes commercially feasible. It is widely believed that to be economical, fusion plants will have to be far larger than the biggest atomic plant today—some 5,000 to 10,000 MW.

Eventually, given sufficient advances in transmission efficiency, a global grid system could be established. As the Earth turned and different population centers approached peak demand periods, surplus power from the planet's night side could relieve the load on local generators. It has been estimated that the gain in efficiency of distribution occasioned by a global power grid would be equivalent to doubling the world's current power generating capacity.

See Ecumenopolis by Train or Car

The power development schemes cited above will be tasks for generations living in a far more populated world. It will be an urbanized world of endless vistas of high-rise apartments and, perhaps, shanty towns. Wholly new cities—such as the proposed capital districts for Alaska, Egypt, Nigeria, Tanzania, and South Korea—will be built. But the prime characteristic of future urban growth will be the development of linear extensions (strip cities) between existing urban centers. Present day examples include "Balkanopolis" (Athens-Istanbul), "Boswash" (Boston-Washington), "British Megalopolis" (London-Newcastle), "Central European Megalopolis" (Rotterdam-Dortmund), "Chipitts" (Chicago-Pittsburgh), "Delkaria" (Delhi-Karachi), "Gulf City" (Houston-Tampa), "Jami" (Jacksonville-Miami), "Parihavre" (Paris-Le Havre), "Sansan" (San Francisco-San Diego), "Southwestern Metroplex" (Dallas-Fort Worth), and "Tokaido Megalopolis" (Tokyo-Osaka). If, as some fear, the world's population eventually numbers some 20 billion or more, then all the above will have merged into one vast urban complex—"Ecumenopolis"—covering the entire Earth as a continuous system from Cape Town to Patagonia.

Even today, with a world population of four billion, air and—in many areas—auto transportation networks

are approaching saturation levels. Further expansion of both modes is already being limited by the high cost of petroleum-derived fuel and tougher air pollution standards. Governments are reconsidering rail transport expansion.

The Soviet Union, which has consciously eschewed widespread private ownership of automobiles, expects to complete the 2000 mile Baikal-Amur Mainline (BAM) north of the present Trans-Siberian Railroad by 1982. The long-planned line will open up for exploitation much resource-rich territory. Soviet engineers have also dreamed of a "North Siberian Electric Railway" from Murmansk to Yakutsk. A connection between the Soviet and U.S. railroad systems via a Bering Dam, bridge, or tunnel is touted as an appropriate symbol marking the end of the Cold War.

To the south, the Chinese have a scheme for building a rail connection across Sinkiang and down to remote Lhasa in the Tibetan Himalayas. Extensive new railroad development is also planned in Afghanistan, Brazil, Egypt, India, Iran, and South Africa. Mexico has rejected a plan to build a highspeed railroad across the isthmus of Tehuantepec but may build a 550-mile link from Matamoros to Mazatlan.

By the first half of the 21st century, two new technologies may revolutionize rail travel. Second and third generation high speed tracked air cushioned vehicles (TACV) may be commonplace and we may also see atomic powered locomotives. Such was predicted by respondents to the 1975 McGraw-Hill survey of experts on technological breakthroughs and applications. Long-dreamed-of rail systems across South Asia, the Sahara from Algiers to Abidjan, and from Capetown to Cairo might then become realities.

Close coordination between rail transport systems and other modes is necessary to facilitate transfer of persons and goods. This was recognized as long ago as 1937 by American architect, Saco De Boer, who proposed a world road system which would closely connect with parallel, standardized rail and airways as well as ferry service across water gaps. De Boer suggested four routes: 1) London to Rome through East Africa to Cape Town; 2) Paris to Gibraltar through West Africa to the Cape; 3) London to Peking and across the Bering Sea to Chicago and beyond; and 4) Berlin to Singapore then by ferry to Australia and San Francisco, thence south to Buenos Aires and across the Atlantic to London.

The last of these routes is included in the Pan American Highway, the northern and southern portions of which are separated by 240 miles of nearly impenetrable Panamanian and Colombian jungles. The highway is to connect with the vast network being built by Brazil in the Amazon basin.

Across the ocean, Algerian truckers have opened commercial road traffic through the Sahara from Algiers to Lagos via In-Salah, Tamanrassat,

Agadez, and Kano. A western fork will branch off through Mali. Another multinational project is the European north-south road which would connect Poland with the Mediterranean.

Supercrossings

In the projects for intercontinental road and rail networks, particular attention is focused on the straits separating continents and important islands. Given rapid development of tunneling techniques through improved boring machines, many of us might live to see road/rail tunnels uniting the land areas separated by the English Channel, the Strait of Gibraltar, the Strait of Tsushima, and the narrows between the Japanese home islands. There are also projects for bridges over Long Island Sound (at six proposed locations), between Rockaway and New Jersey, across Rio de la Plata, Denmark's Great Belt and the Øresund, the Strait of Messina, Greece's Corinthian Gulf, and the Bering Strait. The Pan Philippine Highway will link Luzon and Mindanao by bridges to Samar and Leyte. Several of these connections would include tunnels—as at the Chesapeake Bay Bridge—to allow navigation. The multiple-dome caisson and new high-strength steel alloys have made lengthy crossings over deep water more feasible.

Engineers can no more resist dreaming of a canal across a narrow neck of land than envisioning a bridge across a narrow neck of water. Besides the transoceanic canals visualized in the NAWAPA scheme, there are proposals for canals across the Isthmus of Tehuantepec, Honduras, Nicaragua, and Costa Rica, at several sites in Panama, between the Gulfo de Uraba and Bahia Humboldt in Colombia, and between Golfo San Jorge in Argentina and Golfo do Penas in Chile. (US aid for these canals could be barred by the pending Panama Treaty.) There is also a grand scheme for linking the three great river systems of South America—the Orinoco, Amazon, and Paraguay-Paraná—by canal.

In the United States, there are perennial projects for linking Lake Erie and the Ohio, the Atlantic and Gulf of Mexico across Florida or Georgia, for deepening the Erie Canal and constructing a canal east of Niagara. Mexico has schemes to build an extension to the US Intercoastal Waterway south to Tampico paralleling a recently planned gas pipeline. There is also a plan for a canal-aqueduct system across Baja California from Mexicali to Tijuana.

The Germans expect to complete a Rhine-Danube link by 1985 while the French hope to complete a Rhine-Rhone canal two years afterwards. Other connections with the Elbe, Oder, Vistula, Tisza, and Vardar may come later. Rumania has a plan for a canal from Cernavoda on the Danube to the Black Sea south of Constanta. The Soviets have a scheme for blocking the Danube at its delta and channeling its waters across the Ukraine to the Sea of Azov to make it a fresh

Complex or Dam	Over	Countries	Eventual Generating Capacity (MW)	Remarks
NAWAPA Scheme	Yukon, Tanana, Copper Sustina, others Rs.	Alaska, Canada	100,000	To provide water for US West, Mexico.
E. Siberia Scheme	Angara, Yenisei, Lena, Aldan Rs.	E. Siberia	100,000	Proposed. Includes 34,000-46,000 MW on Yenisei alone
Amazon Scheme	Amazon R.	Brazil	75,000	Ecodestructive plan would create inland sea.
Gibraltar Dam	Strait of Gibraltar	Spain/Morocco	50,484	Old plan to recover Mediterranean seabed.
Red Sea Dam	Bab el Mandeb	S. Yemen/Djibouti	50,000	But region's energy needs modest.
W. Siberia Scheme	Ob, Irtysh Rs.	W. Siberia	50,000	30,000 MW on Ob. Scheme under criticism for environmental reasons.
Inga Dam	Congo R.	Zaire	30,000	350 MW on line being expanded to 3,700 MW. Overflow to be directed to Lake Chad and Mediterranean.
Ya-lu-tsang-pu Dam	Ya-lu-tsang-pu (Brahmaputra) R.	Tibet	27,000	Proposed.
Tunis Dam	Strait of Tunis	Sicily/Tunisia	22,371	Built after Gibraltar.
Lower Lena Dam	Lena R.	E. Siberia	20,000	Part of E. Siberia Scheme.
Bering Dam	Bering Strait	Alaska/USSR	20,000	Environmentally dangerous.
San-Hsia Dam	Yangtze R.	China	20,000	May be built by 2000.
Mekong Valley Scheme	Mekong R.	Thailand/Laos/ Kampuchea/Vietnam	15,800	Proposed for completion c. 1990. Includes 3,000-12,000 MW dam at Pa Mong.
Mackenzie	Mackenzie R.	Canada	14,000	Part of NAWAPA Scheme.
Ganges Scheme	Ganges R.	India/Nepal	13,000	50 odd dams envisioned.
Itaipu Dam	Paraná R.	Brazil/Paraguay	12,600	Abuilding—will be world's largest when completed in 1988.
Qattara Project	Western Desert	Egypt	11,000	Under serious study. Canal to be built between Qattara Depression & Mediterranean. First stage completed 1986+.
Indus Scheme	Indus R.	Pakistan/India	11,000	Proposed.
Messina Dam	Strait of Messina	Italy	10,440	Built after Gibraltar.
Guri Dam	Caroni R.	Venezuela	10,087	524 MW on line. To be completed c. 1987.
Lower Tunguska Dam	Lower Tunguska R.	E. Siberia	10,000	Proposed
Grand Coulee Dam	Columbia R.	US (Washington)	9,780	3,563 MW already on line.
Purari Dam	Purari R.	Papua New Guinea	9,000	Proposed. 1st stage might be completed after 1985.
James Bay Scheme	5 Quebec Rs.	Canada (Quebec)	8,330	To be completed c. 1996.
Ablakov Dam	Yenisei R.	E. Siberia	8,000	Proposed.
Lower Ob Dam	Ob R.	W. Siberia	7,500	Part of W. Siberia Scheme.
Sergipe Dam	São Francisco R.	Brazil	7,000	Proposed.
Paulo Afonso Dam	São Francisco R.	Brazil	6,774	1,299 MW already on line.
Corpus Dam	Paraná R.	Argentina/Paraguay	6,620	May be built by 1990.
Khuzistan Scheme	Several Iranian Rs.	Iran	6,600	14 large dams.
Igarka Dam	Yenisei R.	E. Siberia	6,600	Proposed.
Osinov Dam	Yenisei R.	E. Siberia	6,500	Proposed.
Tucuruí Dam	Tocatins R.	Brazil	6,480	Under construction.
Sayan Dam	Yenisei R.	E. Siberia	6,450	To be completed by 1983.
Gallipoli Dam	Dardanelles	Turkey	6,115	Part of Gibraltar scheme.
Krasnoyarsk Dam	Yenisei R.	E. Siberia	6,096	Completed 1970. Now world's largest hydrostation.

Examples of planetary engineering—proposed hydroelectric projects

water lake. The Israelis would love to have financing for a canal between the Gulf of Aqaba and the Mediterranean. India wants to link the Ganges, Brahmaputra, Narmada, Tapti, Godavari, Krishna, Penner, and Cauvery Rivers by a series of aqueducts, gravity and feeder canals, tunnels, natural water courses, and reservoirs. There is a venerable proposal for a deep water canal across the 40 mile Kra Peninsula, though the latter might be forestalled by a competing project for a trans-Kra crude-oil pipeline.

Political and financial problems are hindering many of these canal proposals. Their cost effectiveness must be measured against present and probable future competitive transportation modes together with environmental implications. Opponents of the new interoceanic canals warn that mixing the wildlife of two dissimilar zoological regions can result in serious ecological disruption.

Several of these stalled canal schemes might become feasible if nuclear devices could be used for excavation purposes. This would, in the case of canals, be done with special charges fired in strings buried in such a way as to produce the desired cratering and at the same time burying the radiation. Fears of health hazards from radioactivity and/or the possibility of such devices falling into unauthorized hands have hindered initiation of aforementioned projects in Western Siberia, Qattara, Panama, and Thailand. Other proposed peaceful uses of atomic devices include the blasting of harbors in Alaska and Madagascar, and underground reservoirs, and facilitation of oil, gas, and mine production. But the missing element of general world sanity may long inhibit such uses.

The Hydrosphere and Cryosphere

Man has transformed the upper part of his planet's terresphere—the Earth's dry land—but he has, as yet, just begun to tap the resources of two other spheres. These are the hydrosphere—the 75 percent of the world covered by water—and the cryosphere—the 4 percent covered by ice, more if you include the permafrost regions.

Both spheres are presently hostile to mankind but seem certain to play far more important roles in determining human destinies in coming centuries. In particular, if humankind is ever to get a handle on both short and long range climatic trends, it will have to utilize tools to alter productive forces in both these weather factories. Through such already cited engineering projects as the Siberian, Gibraltar, Bering, and Queen Elizabeth barrages, the temperature of at least part of the Arctic could be raised—perhaps increasing the present long-term trend toward chillier temperatures in the Northern Hemisphere. Other examples of climate control include the heating of regions from giant orbiting mirrors, spreading reflecting material over oceans to abort the formation of hurricanes, and conventional seeding techniques.

Both spheres can also serve as exporters of energy to the terresphere. Besides the tides, there are proposals for safe and nonpolluting systems for utilizing the differences in temperature in ocean gradients, wave action, or ocean currents. The first mode seemed the most feasible and, eventually plants of 500 MW capacity may be anchored above the Gulf Stream. The other energy resources of the oceans are vast; 20 percent of the world's petroleum and increasing amounts of its natural gas come from offshore production. Other remaining unexploited deposits exist beneath the Arctic permafrost of Siberia and North America. Transoceanic pipelines may someday transport these fossil fuels as they do at present across Alaskan and Siberian wastes.

Millions of years ago, Antarctica was joined to Africa and South America and boasted lush vegetation. Beneath the glaciers must lie coal far richer than the impure deposits already discovered. An energy hungry world may one day build chains of aerogenerations at Antarctica's Commonwealth Bay where wind velocities reach 200 miles an hour. Deception Island, once proposed as a site for a US naval/air base, is a prospect for geothermal power development.

Many minerals—manganese, iron, copper, gold, silver, cobalt, nickel, lead, zinc, uranium, and others—can, with improved techniques, be recovered from both spheres. Projected ocean mining operations would be immensely beneficial to the United States which must import most of the above minerals.

Both regions are testing stations for tomorrow's technologies; Antarctica, (and, perhaps, someday the oceans) is a multinational realm of peace dedicated to scientific research. The techniques in housing—particularly domed—heating, and powering isolated human communities have applications on other planets. The information gathered on human behavior in polar climes under long periods of close confinement and inactivity has already been used in programming long space voyages.

By the next century, the featureless blue on maps of the world's oceans should be broken by the presence of underwater and floating industrial complexes, mining centers, and maricultural ranches for the raising and harvesting of marine mammals, fish, crustaceans, algae, and plankton. The white spaces of Antarctica and Greenland may be dotted with cities.

In the meantime, the polar regions are a potential source of clean fresh water in a thirsty world. The Saudi Arabians have hired French consultants to study the feasibility of hauling icebergs from Antarctica's Filchner Shelf to Jidda, a rapidly growing desert port. Others have suggested Antarctic iceberg relief for parched areas of Australia, California, Chile, and South Africa. Though Arctic icebergs tend to be harder to handle—they are irregularly shaped and also smaller—Dutch officials are considering towing icebergs from Greenland to

supply clean drinking water in the pollution fouled lower Rhine Valley.

An Interdependent World Requires Coordinated Planning

To safely build the great engineering projects of tomorrow, new international agencies are needed to plan and carry out construction and apportion fairly the additional increments of power, water, or produce. Planning on a multinational or world scale is, as yet, only in its infancy. The countries of the Soviet-led Council for Mutual Economic Cooperation (CMEA) have sought to coordinate their Five Year Plans within the larger context of a Fifteen Year Plan. The United Nations has called for the achievement of specific economic growth rates for groupings of Third World countries over the First and Second "Development Decades" (the '60s and '70s) and set certain economic targets for the year 2000. At regional levels too, UN agencies are playing major roles in promoting cooperation in national planning.

Planning for the 21st century—the 5th through the 14th Development Decades—should be ecumenical. The disparate planning cycles of countries should be coordinated, commencing in the years ending with one or six. This is the practice with all socialist countries except North Korea as well as many developing nations. The United States and West Germany, the sole major countries without national planning, would nonetheless have to play important roles in targeting world goals in a coordinated World Plan.

There are, however, three important prerequisites to the success of such an approach. A major reduction of world tensions will allow the initiation of projects which would otherwise have been vetoed for their military implications—as was long the case with the on-again, off-again Channel Tunnel. Countries such as China which keep their national plans secret would presumably declassify their economic data.

The entire planning process must be permeated with concern for the ecological well-being of the planet. Environmental impact statements forecasting consequences on the hydrology, geodesy, atmosphere, and life forms of the impacted area are required. This is particularly important in developing areas with fragile ecosystems such as in the Arctic and Antarctica. Far more information is required before really useful models of climatic and food cycles can be constructed. But advancing computer technology and programming techniques can greatly improve the validity of future forecasts of probable impact.

Finally, there must be concern for all the human rights of the affected population. Failure of planners to consult the people most impacted has frequently been a cause of major planning fiascos. Acquisition of popular feedback should ideally continue throughout the planning cycle. Economic costs and benefits must be fairly measured and compensation provided to the injured. The rights of ethnic

groups and cultures must be safeguarded. This has *not* been the case with Brazil's Amazonian Indians nor in South Africa where rapid train lines are being built to bring black workers into "white" cities at dawn and zip them out at night.

In the great construction works of the Third World, efforts should be made to utilize labor intensive techniques so as to provide jobs for the under- and unemployed on an equal opportunity basis. Moreover, the listing herein of grandiose projects implies no disregard of development on the microscale. Too many governments lavish funds on their capitals and a few showy projects while neglecting the hinterland and its generally inefficient agricultural base. Thus the United Arab Emirates with its 700,000 population boasts three jetports while sizable numbers of its people still live in medieval squalor.

A hesitant start has been made but for all humanity to share fully the benefits of technology, free cooperation among all nations is required. The battle for planetary development must continue, in village hut, in laboratories, and, not least, in the council chambers of the world.

We must continue to listen to our men and women of vision, and, when warranted, make their dreams reality. Sheer magnificence of imagination ought not to hypnotize us. But an emerging world civilization ought to be capable of far more enduring works than its tribal predecessors with their meager resources.

The Asimovian nightmare of the great-grandmother planet of a future galactic civilization becoming a radiation-infested boondock need not come true. Given wit and imagination, the Earth can be made vastly more hospitable for its dominant species and congenial life forms. Small is beautiful but big isn't all that bad either.

References

Gernsback, Hugo. "The World in 2046: The Next Hundred Years of Atomics." Philadelphia: *Science Fiction* June 1953. (On atomic land-reclamation and other technological enthusiast themes.)

Ivanov, Konstantin & Batsanov, Boris. *What How and Why*. Moscow: Novosti Press Agency (Early '60s example of Soviet "gee-whiz" school of development.)

_____ *The Year 2017*. Moscow: Novosti Press Agency, 1968 (Late '60s version of above.)

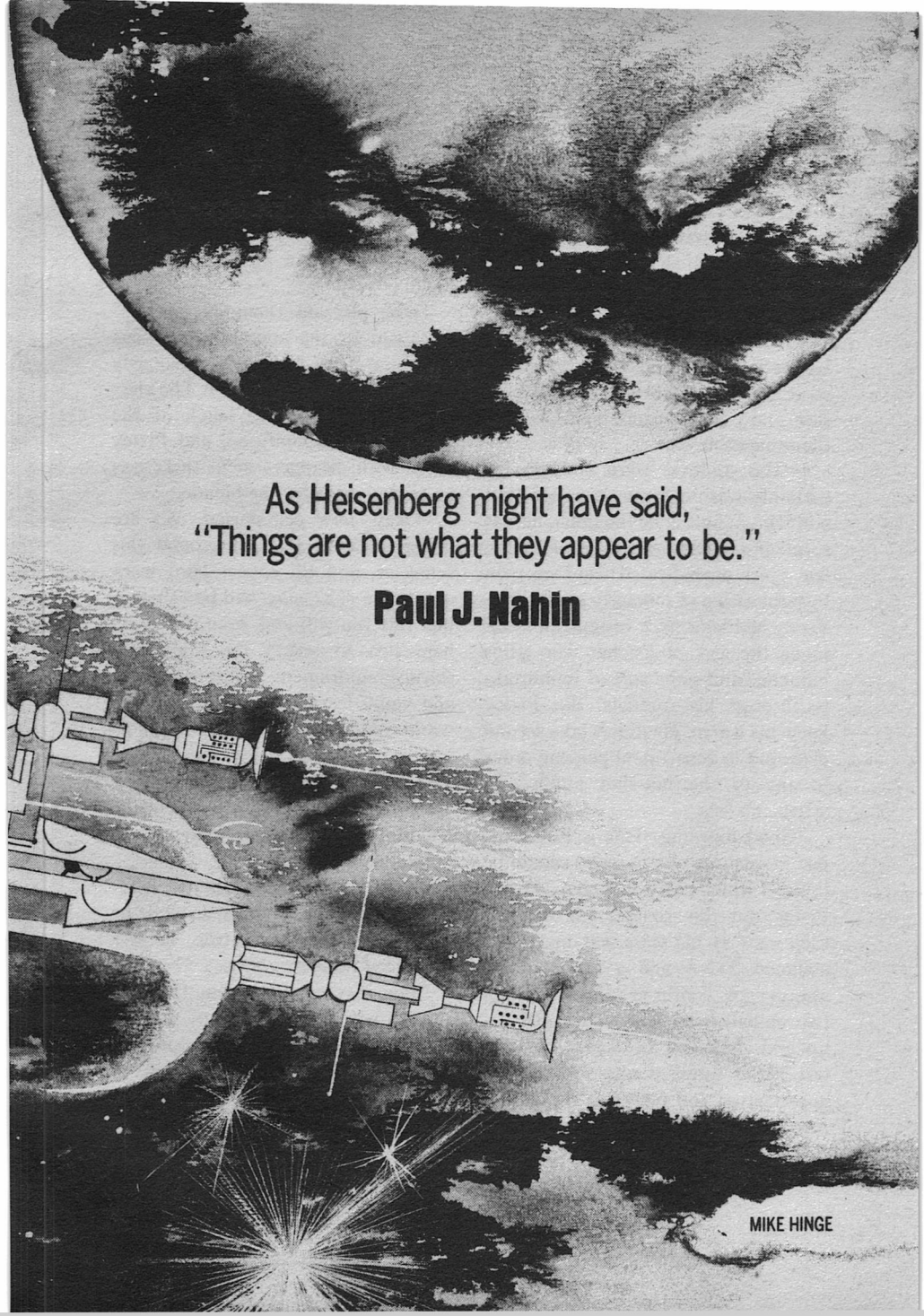
Ley, Willy. *Engineer's Dreams*. New York: Viking Press, 1954. (Still the best on planetary engineering.)

Markin, Arkady. *Power Galore: Soviet Power Industry: Past, Present, Future*. Moscow: Progress Publishers. (Early 1960s Soviet booklet.)

Rojas, Billy. "Laboratories of the Future." Bethesda: *The Futurist* October 1971. (The future of the polar regions.)

Taylor, Gordon Rattay. *The Doomsday Book: Can the World Survive?* New York: World Publishing Co. 1970. (A skeptical approach by an environmentalist.) ■

What really caused the energy crisis


As Heisenberg might have said,
"Things are not what they appear to be."
Paul J. Nahin
MIKE HINGE

Walking into his eight o'clock freshman physics class, Senior Full Professor Doctor John Pixley had the feeling the students looked familiar. But, of course, they weren't. It was the first class meeting of the fall semester, and all the students were new to the campus. Looking around at the hushed, awed class (Pixley knew *that* wouldn't last past the third meeting), he decided it must be the firm bodies, tanned skin, and youthful excitement that was the same each year.

If the students were new, Pixley certainly wasn't. Sixty years old (but still trim in figure, he thought), he was a full prof more by reason of thirty-five years of dedicated teaching than by publication of scholarly papers. No, Pixley had long since resigned himself to be the sort of teacher who gains influence and some sort of immortality through his students. But Pixley knew his worth. He didn't take second place in the department pecking order to any of the hot-shot publication artists, no sir.

"Good morning. This is Physics-I, just in case any of you really should be in Bio-I which meets in Room 241-B." Pixley did this routine introduction each year as his class was invariably assigned 241-A and a few students always got confused. Sure enough, two embarrassed boys and a girl got up and, followed by some giggling, left. Pixley watched with a mixture of appreciation and regret at the departure of the blonde in a form-fitting skirt. After all these years as a physicist the motion dynamics of a firm bottom still mystified him. He wondered if NSF would fund an experimental study of the phenomenon. Maybe, if he called it "The Resonance Modes of Two Balanced, Juxtaposed Hemispheres in a Uniform Gravity Field."

These pleasant thoughts were interrupted by the appearance of four new, red-faced students, obviously freshly emerged from Bio-I. The class got a new excuse to laugh at the expense of the confused, and Pixley noted with disappointment there was no replacement for the blonde.

"Okay, let's get started. We are going to cover a lot of ground this semester, and I'll expect hard work out of you. This class will be demanding. But you will find, even if you are here just to satisfy the University science requirement, that it can be fun and you'll learn a lot about how the world we live in works. Even if you go into a nontechnical career, a basic knowledge of physics will help differentiate you from the uneducated, the uncultured, and, if I may say so, the uninteresting."

Pixley was only momentarily hesitant with these last words, as while he wasn't sure they were true, he was convinced they *should* be.

"You may not have thought much about it before, but you really actually know quite a bit about this subject. Just to survive to the ripe old age of seventeen or eighteen, you've had to learn how a lot of things in nature work. Like if you jump off a porch you'll fall rather than float. So you

know something about gravity. You've learned to get out of the way of a bicycle, so you know something about kinetic energy and energy coupling between bodies undergoing collision. And so on."

Pixley stopped his pacing back and forth as he talked, and looked at the class. They looked back expectantly. No one showed the slightest intention of asking a question. "In fact," he went on, "you even know a lot of theoretical things, too, that go beyond mere experimental observations of everyday life.

"For example, is there a limit to how fast things can move?" Most of the students looked perplexed, but several put up their hands. Pointing at a red-haired young man in the back of the room, the boy responded. "Well, I guess you must mean the speed of light. I mean, nothing can go faster than light, right?"

Pixley nodded, happy to have been given a good line to follow. "Yes, that's pretty much true. It's not exactly right, because sometimes things *can* go faster than light if they're both moving in something other than empty space, like water. But you're essentially right—nothing can go faster than light does *in a vacuum.* Now, let's try something else." Reaching into his briefcase on the floor next to the lectern, Pixley extracted a dog-eared color photo and held it up to the class.

"This is an old aerial picture I picked up years ago when I did some consulting for the Navy. It's a shot of the old carrier, Enterprise, with her crew on deck in their dress whites. Anyone tell me what it means?" The red-haired boy spoke up again, drawing some resentful stares from the class. *That boy is going to learn what happens to students who speak up,* thought Pixley. That old school-boy rule of 'never show off your knowledge' was in operation, and Pixley made a mental note to learn his name. He looked promising.

"The crew is all lined up, spelling out '$E=mc^2$', so I'd guess that's an old nuclear-powered ship. Because isn't that Einstein's mass-energy law?"

"Right again," said Pixley, pleased. "Next to Maxwell's equations for the electromagnetic field, Einstein's result is probably the most beautiful creation of the human mind. And you already know of it, just as a part of growing up in our modern atomic powered society."

A young lady next to the red-haired boy spoke up at this. "But shouldn't you add, professor, some comments about the terrible social problems atomic energy has caused? The spread of reactors, with their radioactive waste, threatens everybody. And all just because it makes money for a special few, at the risk of ordinary people!" Pixley felt a cold wave of apprehension as he recognized the tone of a young idealist, speaking with all the fervor that being naive can muster. He replied carefully.

"Of course there are great difficulties of the kind you mention, but so far there haven't been any major prob-

lems, except for the partial core meltdown at Tulsa a few years ago. And with the Livermore fusion process—have all of you heard of that?—good—soon to be coupled into the national power grid, we will then only have the tritium disposal problem. A minor problem." The young lady looked unconvinced, as did many of her classmates. Pixley knew from sorry experience that he could loose the class, permanently, right here and now, if he didn't regain control. To be challenged in the first ten minutes of the first meeting, and not to persuasively counter would be fatal. He gained a few seconds to gather his thoughts by lighting his pipe.

"Look, I know what the prevailing ideas about the spread of nuclear power in the US are. That a bunch of capitalistic, money grubbing, public-be-damned utilities and rich corporate investors found it an attractive way to make huge profits in response to the world energy crisis that first started to be publicly understood in the early '70s. Well, that's wrong! There was some of that, of course, but alone it wouldn't have been sufficient to result in the massive energy conservation, new energy source development and nuclear reactor construction programs of the last three decades or so. Something else has been at work. And that something was national security! Sure, I know most of you are aware of how that excuse was abused in the infamous Nixon-Watergate scandal, and the Slaver Inquiry more recently, but in this case it's true." The class still looked skeptical, but now there was interest, too, on their faces and Pixley knew he had them back in his hands. Now to keep them there.

Pixley picked up his lecture notes and dramatically tossed them back into his briefcase. "To hell with today's lecture. I'm going to tell you a story you may not believe, a story that the powers-that-be in the White House, Pentagon, and State Department will deny, but is nevertheless true. It isn't classified because to classify it would be to admit it, and there's always someone who would leak it anyway. Like me.

"Today won't be a loss in any case—you'll learn some physics from this. How many of you have heard of our government agency called DARPA?" No response. "Just as I thought, and that's not strange. It keeps a low profile. DARPA, which stands for 'Defense Advanced Research Projects Agency' is part of the Directorate of Defense Research and Engineering, which in turn is part of the Department of Defense. DARPA was chartered decades ago with the basic mission of providing initial financial support for 'blue sky', even almost crazy ideas for basic research that just might lead to new weapons technology. The idea has been to avoid what military people call 'technological surprise' on the United States. That's where one of the potential enemies of the US comes up suddenly with a revolutionary new weapon that lets them get the upper hand in the military stalemate we presently have. And don't think this is

just paranoia. Such catastrophic weapons developments *have* happened in the past! Any of you think of some examples?" The red-haired boy in the back responded again, but now there was more interest by the class in what he had to say.

"How about the atomic bomb, professor. When the United States dropped it on Japan that must have caught them by surprise!"

"Yes, indeed, it certainly did," replied Pixley. "To the Japanese it was pure magic, although that may not be exactly the right word. They had no idea what had happened to them. Interestingly enough, captured German documents and interrogation of captured scientists indicated that the Third Reich knew what had happened, but even the Germans didn't know *how* it had happened. But that's pretty recent stuff. Actually, technological surprises have occurred all through history, to the sorrow of the surprised. For example, you might look into what happened to the flower of fourteenth century French Knighthood at Crecy when they ran into the armor penetrating arrows of the English longbow for the first time. Or even better, look into the tenth century battle for Constantinople where Russia's Prince Igor had his fleet of 10,000 ships burned to their water lines when the Byzantines zapped them with their 'Greek Fire'. And, of course, the classic case of technological surprise has to be David and Goliath.

"DARPA itself came into being because of a major surprise on the US, the launching of Sputnik by the Russians in 1957.

"But this is drifting away from what I really started out to tell you. In the early '70s DARPA was suddenly faced with a colossal technological surprise from the Soviets! Yes that's right—one that threatened to leave us wide open to them. The Russians were on the verge of developing a weapon system that would completely negate our ICBMs and SLBMs! The perfect antiballistic missile system. It was the directed energy beam, consisting either of spaced-based high energy lasers or subatomic particle accelerators. The Russians had made fantastic strides in such devices, and just because such weapons violated the then existing ABM and Outer Space Treaties didn't make any difference. Once they had such weapons actually deployed, there wouldn't be a damn thing we could do about it!"

"But professor, couldn't we just shoot their weapons down?" Pixley fixed a fatherly smile on the student who had spoken. "With what—their new weapon was *designed* to shoot our missiles! And that's all we had to shoot at their satellite-based energy beam projectors. No, once in orbit, they would have really had us by the neck."

The class was hanging on the edges of their seats now. Pixley relaxed a bit, and began to enjoy himself as he continued on with his tale.

"You can't believe the uproar that rolled through the corridors of the Pentagon. The careers of a lot of Generals, Admirals, and senior civilian intelligence officers came to an abrupt end once Congress got hold of the story. As it turned out, some isolated Air Force intelligence people had been warning the CIA about the Soviet advancements, but they were dismissed as alarmists. It was the old 'not invented here' syndrome. If the US couldn't build such weapons, why then how could mostly rural, peasant-like Mother Russia do it? Well, by God, they *did* it!"

A bespectacled, bright-looking young man in the front row, quiet up to now, raised his hand. Pixley gave a quick nod to him. "Professor, this all reminds me of that old cowboy and Indian joke, where the ancient Indian fighter is telling how, years before, he had been surrounded by attacking Indians and how he was down to his last bullet. When asked how it turned out, he replied, 'I got killed!' " The class roared, and Pixley glowed. A better entrance line he couldn't have written himself.

"Quite true, young man, quite true. Here we all sit, alive and healthy, America is still here and Russia is still there. And how do I explain *that*? Could it be that once Russia defeated us without a shot they just said 'Okay, we won but don't worry, everything stays the same. We just wanted to show you guys we could do it.' " A few snorts of laughter rippled through the class, and Pixley himself had to suppress a smile.

Pixley kept quiet for half a minute, just smoking his pipe and letting them think about it. Thirty-five years in the lecture room had taught him that to be a good teacher wasn't just knowing your subject. You had to know how to put on a show, too.

"Just because the CIA blew it doesn't mean we were totally defenseless. The boys at DARPA hadn't been sitting on their hands all those years. It seems they had been funding the research of a little known professor in a small New England university who had come to them with a wild idea in the late '60s. Remember Einstein's '$E=mc^2$'? The way we used that in the atomic bomb was to convert a small portion of uranium mass into a heck of a lot of energy. And, of course, that's what we do today in fission and fusion reactors. Except in fusion reactors it's hydrogen mass. What this professor wanted to do was *run the Einstein equation backwards*! Do you see what that means?" Pixley could see they didn't and here he didn't wait for any dramatic silence to help out.

"What the professor wanted to do was take electrical energy and literally compress it back into mass. The kicker in this was that his theoretical analyses predicted the end-mass didn't have to have any relation to the mass that might have been converted to produce the energy he started with! In fact, energy produced just from chemical reactions, like burning wood, was okay, too, although not very efficient. A wood burner doesn't put out much energy compared to a nuke plant. He claimed he could create any of the known elements, and other superheavy ones predicted by extending the periodic table that *weren't known* to science!"

Pixley puffed on his pipe to get it going again, and blew a smoke ring. He continued.

"One of these superheavy elements had the theoretically calculated property of making an ultra-hard, heat resistant alloy when mixed correctly with titanium. The result was called, appropriately enough, Impervium. Impervium, used to make the outer skin on our missiles, made them invulnerable to the Russian ABM energy beam projectors. So you see, we had what in the old days we used to call a Mexican standoff. The Russians could build an ABM system we didn't know how to build, but we could build missiles to penetrate their ABM defense, missiles *they* didn't know how to build. Counter-surprise!

"So, for the next ten years both sides worked like hell to catch up with the other's technology. In the end, both ended up with duplicate capabilities. As of right now, both sides have refrained from deploying ABM energy beams because both have Impervium-skinned missiles.

"But of course, this happy ending, happy so far at least, occurred only because of DARPA's excellent judgment in deciding to support the good professor's nutty idea. I might add, however, that he was handsomely rewarded, so don't worry about him, even though he didn't get the Nobel

Prize, at least not yet. He got a heck of a lot more money than the Prize carries, some might think a fortune, along with the Presidential Science Medal. All very private and hush-hush, of course."

"Professor," came the query from the red-haired boy Pixley had noticed earlier, "that's a very interesting story, but just what does it have to do with the energy crisis? I mean, that's what you started to tell us about, right? And why don't people talk about it today? It's all over, right? And *why* did the professor in your story have to keep quiet about his invention after the Russians had the Impervium technology, too? What would be the point to being secretive now, today?"

"Those, young man, are the crucial questions. And the answers are really very simple. To answer the first one, just calculate how *much* energy it takes to make a kilogram of the Impervium additive. In fact, I'll save you the trouble. Plug the value for the speed of light into Einstein's equation and it's not hard to calculate that it takes twenty-five billion kilowatt-hours of electrical energy to make a one kilogram mass of anything! That, my young friends, is just one hell of a lot of energy.

"One of the new Rebel fusion plants will run, full out, at a power level of 10,000 megawatts. You can work through the math yourself, but in one year the total energy from such an installation will be just enough, at 100% efficiency, to produce three and one-half kilos of Impervium additive. And, of course, at the power levels available in the '60s and '70s, a lot of those old-fashioned reactors were needed to produce the necessary amounts of Impervium to shield our missiles. Those reactors were built after much controversy, as you well know, and a portion of the power from each was diverted from the national power grid. The cover story for all this was, quite simply, the so-called energy crisis! And that also should explain the failure of Congress, in the face of what was purported to be imminent doom, to do anything about it."

The student who had started Pixley on his story had been squirming in her seat for several minutes. Finally she could stand it no longer.

"Look, professor, I don't mean to be disrespectful, but I just can't believe all this. How could everybody be fooled by that? How could it be hidden from the government regulatory agencies who look at the records of the utilities? Wouldn't *someone* have revealed it all to the public eventually?"

"My dear young lady, it was the *government* that made the decision to manufacture Impervium. Of course the regulatory agencies knew what was going on—they were in charge of running the whole operation! As to the secrecy involved, the CIA manages to keep its ten-billion-dollar budget secret, even from Congress. Bureaucracies can be very good at that sort of thing. During World War II the Manhattan project, involving billions of dollars and thousands of people, main-

tained absolute secrecy. One of the slogans of the early days of the 'crisis' was that it was the 'moral equivalent of war', only people then didn't really understand what was meant by that. It was for real!"

"Okay, professor, maybe you're not putting us on. But why is it still hushed up? You say the Russians and we both have Impervium missiles today, so what's the point in not telling people what happened?"

Pixley banged his pipe into the wastepaper basket near the door and began to ream out the stem with a pipe cleaner. "The reason is simple. *It's still happening*! Oh, not so much as in the early days of the 'crisis', and as the fusion plants come on line the truth will probably be revealed in the next few years. You see, like all the other superheavy elements, the Impervium additive is unstable, with a radiation half-life of only a few years. We have to keep on making the stuff, even with a fixed number of missiles, to replace the skins, as they lose their resistance to directed energy beams. The Russians have the same problem, of course, and that's why no one over there is talking either."

The class stared at Pixley as he repacked his pipe with tobacco. The boy in the front row finally spoke. "Professor, how do you happen to know all this? And how can the government be absolutely sure that professor who discovered Impervium will remain silent?"

Pixley looked pleased with himself as he replied. "Let me answer your first question by responding to your second one with a counter question. What makes you think he has? The government isn't worried about the professor talking, though, because who would believe such a crazy story? Do you? Of course you don't. But it *is* true.

"I certainly wish I could convince you. And maybe I can!" From the inside pocket of his expensively tailored coat, Pixley took out his wallet and extracted a wad of twenty dollar bills. Spreading them out for the class to see, he then wrapped them tightly into a tube along their long axes. Setting the tube on fire with his lighter, Pixley lit his freshly packed pipe with the flaming greenbacks.

"Believe me now?" ■

MIKE HINGE

Trying to exterminate a species *forces* its best members to hone their survival talents—and to fight back.

Kinsman to lizards

Jack Williamson

"Sometimes I wonder . . ."

My father used to say that and stop, as if overcome by bleak foreboding. A huge pink silent man, he was already far from the common human norm. Most of his associates feared him and my own devotion was mixed with awe. I think he was haunted by a sense of his own strangeness; once I heard him call himself a genetic experiment skating on the edge of failure.

Slow in body and even in mind, he made up with his inhuman routine. One hour for food, one for sleep, one for me. Twenty-one for genetic creation. The sleep came in four brief naps, after his simple meals. I always looked forward to the hour with me, which came precisely at midnight, when my own day was over and his next had just begun.

He would come into my lab section, moving with a soundless bearlike grace. Too intense to sit, he would roam with me about the room, sipping just one beer and listening while I spoke about my work. He was nearly always cheerful, and his brief comments were often brilliant hints for new research.

Sometimes, however, events had refused to fit his iron schedule. Expensive equipment had broken down, or an assistant had made some human blunder, or nature had thrown him some stunning surprise. He was more talkative then, sometimes moody. He asked for another beer. Now and then he even outstayed his hour.

"We can't be sure . . ."

I can see him now, frowning as he shook his head. Almost an albino, with long silky white hair and beard, he wore dark bubble-shaped glasses to guard his eyes. In such black moods, he was almost frightening.

"We're only pawns, boy. You and I. In a game we never asked to join. We can only guess the rules, and we'll never live to see the winners—or even see if anybody wins. I guess it's still exciting to you, but sometimes I wish we didn't have to play.

"I don't know, boy . . ."

At such times I felt terribly alone, terribly sad for him. He was already old—a creator must spend most of his life learning how to make a better being than himself. More than once my eyes stung with tears for him, but I never told him how deeply I loved him.

"Our job is building angels," he used to say. "Angels out of jungle stuff. That's our problem, boy. For all our skill with genetic engineering, we're still kin to the ape and the hawk and the lizard. Our best creations carry the taint of that ancestry. I'm afraid they always will."

When I tried to cheer him up, he cut me bluntly off.

"I know you're brighter than I am, boy. Your own son will be a new creation, abler still. But don't you get too cocky." His huge bubble eyes stared away into the gloomy space of the lab. "There were big lizards once, that thought they owned the Earth."

[From an unfinished essay, found in the papers of Darwin Smithwick.]

1.

The old preman town of Redrock was a tiny island now, its one crooked street sloping from the empty agency mansion down past the twin chapels and the jail to the ragged row of abandoned mud huts crumbling into the rising lake. An attack class Inquisition skimmer floated low over the weed-clotted plaza, watching the muman guards who watched the jail.

Inside, Davey Dunahoo sat up on a concrete bench. His head hurt and his dry mouth had a queer bitter taste. At first his sticky-feeling eyes were blurred, but he knew the stale foul reek and soon he could see the words of hope and lust and hate that other premen long ago had scratched into the rough concrete.

He knew the cell, because one winter a friendly preman jailor had let him and Buglet sleep here when snow had fallen on the reservation and they had nowhere else to go. But the other bench was empty now, and nobody answered when his swollen throat croaked her name.

A surge of panic swept him to the door. He rattled the bars and tried again to shout. When he stopped to listen, all he could hear was a hollow emptiness. He was alone in the jail.

Knees wobbling, he swayed around the narrow cell. Old concrete, patterned with the knots and grain of the planks in which it had been set. Yellowed whitewash and splattered grime. Three odd crosses scratched above a curve that looked like the crest of a hill.

The peeling whitewash felt cold and greasy to his testing fingers. Nothing yielded anywhere. He caught a sobbing breath and kicked the wall, slammed his fist against it. There was no way out, unless for a god.

If he were Pipkin, the wistful thought struck him, he could dissolve concrete and steel. Spin the atoms out of space, however it was done. Step through solid substance into freedom. But he wasn't Pipkin—and didn't really want to be.

With a grimace of pity for that small botched godlet, he shook off the useless thought. His head swam, and that sour bitterness was sharper in his mouth. Cold with sweat, he sank back to the bench and tried to think why he was here.

Memory came, at first in shreds. The god's decree that every preman must be shipped outside the universe to die on Andoranda Five. His own escape with Buglet from the reservation. The truman commune, its life too easy, too happy, too empty. The battle on the mesa, when the clone general tried to recapture them. The muman fighters lying sprawled on the desert where Buglet had killed them—or somehow used her half-known transvolutionary gifts to make them kill themselves.

"Bug!"

Her image was suddenly so sharp in his mind that he called her name. Dark hair flying. Lemon-colored eyes wide and bright. The sunlit dust blazing like a halo around her as she reached out one empty hand and

somehow toppled the general into the brush.

"Where are you, Bug?"

His hoarse shout rang and died in the dim-lit corridors. Bewildered and afraid, he groped again through the haze for all he could remember. His joy at her triumph over the red-scaled mumen. His awe at her unfolding power. His sick dismay when she decided to surrender.

For they had been free again, the armed skimmer theirs to fly. Her stunning victory was evidence enough that they were really latent ultimen, born with the hidden genes of the fabulous Fourth Creation, destined to challenge the gods.

Belthar, he had tried to warn her, would tolerate no challenger. His inquisitors would kill them. But she had refused to hear his protests. They were still premen, at least until their latent gifts emerged. They belonged with their own people. If surrender was dangerous, danger was what they needed to stimulate their awakening powers.

When the stunned clone revived, they told him they were giving up on condition of safe passage to Andoranda Five. He had refused to grant any conditions, had made them wait until a black-clad Inquisition prelate arrived.

Pale-faced, the Inquisitor stared in unbelief at the red sun-glitter on the scales of the dead mumen and cringed in dread from Buglet's eyes, shrinking back among the blue-robed sacristans who had followed him off the skimmer.

"You stand accused—accused of mortal heresy." Having trouble with his voice, he looked at Ironlaw as if for aid. The shaken general shrugged. Peering back at Buglet, the prelate gulped and wet his lips. "Belthar is merciful," he rasped. "We grant you his grace."

At his command, the nearest sacristan thrust an odd little gun at Buglet's temple. Davey sprang to snatch it away, but she waved him silently back.

"A godsgrace gun," the general said. "It will not kill."

It clicked and came away, leaving a black triangular patch where the muzzle had touched her skin. His nostrils stung from a whiff of sour bitterness. He saw Buglet turning white, falling into the arms of another sacristan. The gun jabbed his own cheek and he heard another click.

All that seemed only a moment ago. Sitting now on the naked concrete, he fingered his cheek and found the slick patch. When he peeled it off, its bitter reek burned his eyes. Shivering, he flung it through the bars.

"Bug?" he gasped again. "What has become of you?"

Most of the bold hope that nerved their rebellion had belonged to her; it was she, not he, who had defeated their captors and then chosen to risk surrender. If his own genes carried any latent talents, they were latent still. Without her, he was naked, and he felt a raw fear for her.

Goaded by it, he swayed half to his feet and sank limply back. His head

throbbed and spun when he moved, and the bitter scent of godsgrace seemed suffocating. Chilled with his own sweat, he pulled his trembling knees up against his cheek and tried to imagine where Buglet could have been taken.

To the transvolutionary ship, as the inquisitor had promised, for exile to Andoranda Five? The ship would be out in orbit, waiting for the shuttle to come from the new field beyond the Lord Quelf's castle. If it were the last ship, if the Inquisition had taken her and left him behind, they might never meet again.

He pictured that barren planet, as he had seen it on truman wallscreens. Naked granite cliff and peak where no life had ever been. Bright red mud-plains, turning orange as they dried. Dunes of dull brown dust. Wild rivers feeding blood-colored floods.

He recalled the abandoned terra-forming station as a truman gestalt book had showed it, the narrow shuttle strip blasted into the side of a dark granite knob, the tiny huddle of rusting huts. Nothing moved there. Nothing lived. No recent shuttle skids had cut the dust-stained snow, and he couldn't see where the premen had been landed.

The yellow sky was darker now than he recalled it from the wallscreens, and a long squall line was rolling down across the river bend, hiding the black blades of an old lava flow. Shifting winds stirred yellow sand. He heard thunder crashing in the boiling cloud, smelled salt dust, shivered in the sudden gusts that howled around the huts. In a moment all he could see was angry lightning stabbing through the dust.

How long could the exiles survive there?

If Buglet—

Startled, he pulled his mind away. A shock of awe took his breath. In some manner that he couldn't understand, his dim old images of that remote planet had become vivid actuality. The gods, he knew, claimed powers of parasensory perception. Belthar's priests were always warning that he could watch malfactors all around the Earth, though Davey had never been sure of that. He doubted now that Belthar himself could see Andoranda Five from Earth.

A wild elation swept him, and cold terror shook him. He needed Buglet desperately. She had promised him that their unfolding gifts would make them greater than the gods. This incredible perception was evidence of some new power, but he had no notion of its dimensions or its limits, no idea how to use it. Only one thing was certain; if the Inquisition knew he possessed it, he would never leave the jail.

Quivering with that conflict of fear and hope, he tried to get the vision back. Sitting in just the same position on the concrete shelf, he pulled his knees hard against his chest again, stared at the same obscenity scrawled on the wall, tried to imagine that dead waste-world again, exactly as he had before.

But he didn't know how. The gritty reality of that brief glimpse was gone, and no effort brought it back. He groped again for those snow-banked huts, for the choking odor of the yellow dust-cloud, for the chill of the wind and the crack of thunder, but nothing happened. His recollections swam and danced and dimmed, until at last he gave up.

The dull throb behind his forehead had become a crashing drum. He felt weak and giddy, exhausted by his effort. Leaning back against the cold concrete, he wondered for a moment if the vision had been only a dream induced by the godsgrace drug, but his sense of its truth was too strong to be denied.

What had turned it on? Buglet's notion came back, that danger was the key. He nodded uncertainly. Perhaps his own uncertain predicament and his fears for her had been the stimulus. And perhaps it had been his own elated emotion that had turned it off. Was that paradox—or simple contradiction? He had too much to learn.

He hoped for more control, when the drug wore off. It was still bitter on his crusted tongue, and his head still swam when he moved. He was leaning back against the concrete, sunk in his troubled apathy, when steel clanged. Heavy footfalls echoed along the corridor. The cell door clattered, and he looked up to see a muman guard at the wicket. A startled recognition brought him upright.

"Lenya!" The hoarse shout hurt his throat. "Lenya K."

Too huge for the preman building, the sleek-scaled warrior had crouched to see him through the bars. With savage talons awkward for the task, she was pushing a dish through the wicket. Her bright black seeing eyes watched him with emotionless alertness; her killing eye, immense in its dark-armored crest, glowed deadly red.

He stumbled toward her.

"I do know you." He peered at the long orange stripe across her frontal armor, where once a laser had slashed her and the scales had grown back paler. "We're old friends, remember? You used to guard the agent's house when he was afraid of preman riots, remember? Riots against the Lord Quelf's recreation lake, when it began to flood their fields. Remember?"

Her killing eye brightened, ready to fire.

"Bug and I used to live at the agent's house, remember?" He clutched the bars with his sweaty hands, begging desperately. "We used to bring you goodies out of the kitchen. One day you gave Bug a ride with your null-G belt. Don't you remember?"

She slammed the wicket shut.

"What have they done with Bug? Her name is Jondarc now—"

Nothing melted the frozen ferocity of the muman's facial armor. An unfeeling fighting machine, she turned and stalked away, leaving only her pinelike scent and the little dish inside the wicket.

Clinging weakly to the bars, he

listened to the receding thud of her footfalls. He heard the muffled clash of one steel door, then another. The echoes died. The jail was still. Again he was alone.

Yielding to the drug's aftermath, he sagged back to the bench and sat staring at a dull brown spatter where some forgotten prisoner must have bled against the wall. With no appetite for whatever the guard had left, he let his hazy brain drift back to Buglet.

To their flight from Redrock. The battle by the lake. The way she felt against him, so light and warm and wonderful, when they were flying on with the muman's null-G belt. Her bright courage, that helped them on to Pipkin's island after the belt had failed.

The islet would be even smaller now, he thought, with the lake still rising. A drowned sandstone butte, it looked desolate at dusk. The boulder beach where they had struggled ashore was now submerged, and dark waves broke against the cliff where the little god had come out through solid rock to meet them.

Something drew him to another oval spot, higher up the cliff, which had begun to glow. He watched rough stone swiftly dissolving to open a smooth-walled tunnel. A black-and-yellow blur, Pipkin came flying out, to hover and perch like a bird on a wave-splashed ledge. Both his big hands clutched it, his blighted feet hanging free.

"Dunahoo?" The waspish drone of his voice rose sharply, and his one-eyed stare became a frown. "How did you get here?"

"I don't—don't quite know." Davey hesitated, afraid to be glad, afraid of anything that might break this unexpected contact. "But you were good to us before. We need help again."

"You were not to come back." The lone green eye squinted forbiddingly. "I don't want you here."

"We—we couldn't stand the trumen." Too much feeling shook his voice, unbelieving hope mixed with fear of all he didn't understand. "The Inquisition caught us. I don't know what became of Bug, but I'm in the Redrock jail."

"The best place for you."

"You're our friend. Buglet's, anyhow." He paused, trying to quiet his disturbed emotion before it killed the vision. "You've just got to help me help her. Can't you—please!—teach me how to move through rocks and walls the way you do?"

"Can you learn?" The green eye blinked sardonically. "Can a frog learn to fly?"

2.

The young goddess threaded her transvolutionary vessel out of multispace and slid it into a low Earth orbit. The ship secure, jets quenched, she spread her nimbus to hail the god of Earth.

"Belthar of Sol!" Hiding a tiny tremor of dislike, she addressed him with full formality. "Lord of Love, Well of Wisdom, Pillar of Power, I beg an audience."

"Welcome, daughter of Zhey." His mellow voice came back at once through her extended aura, thinned by many thousand miles of space but still clear as actual sound. "Your unfortunate father was my ally in the reconquest of Earth a thousand years ago, and I owe his memory whatever you ask."

"What I want, you won't want to give," she warned him. "But I want it very much. I beg your time."

"Land at Redrock castle." His tone grew cooler. "I'll have you brought to me."

Her shuttle dropped her to the port on the mesa beside the Lord Quelf's castle. The half-god's chief ecclesiarch was waiting to greet her, bowing low, yet eyeing her covertly in his effort to guess what she wanted from Belthar.

With hushed apologies for his master's absence, he escorted her to the skipper ship that stood ready to take her to the African temple. A gift to the god from his faithful worshipers the ecclesiarch explained, the temple commemorated the millennial year of his arrival to liberate the mother planet from the follies of the aging Creators and the demoniac malevolence of their last Creation.

Aboard the skipper, he was long-windedly boastful about the temple and the ceremonies of its consecration. Its building had taken a hundred years, ten billion tons of granite, the prayer and toil of every godly truman. In divine gratitude, the Lord Belthar was granting his physical presence there.

The black-domed temple looked impressive enough, as the skipper dived to it through the stratosphere. It crowned an artificial mountain, a truncated pyramid of red-gray granite rising a full mile out of the palm groves that grow between the bare brown dunes of the Libyan desert and the long white dunes of salt removed from the Mediterranean water that now filled the old Qattara depression.

Belthar was impressive too, when the ecclesiarch brought her to him in the cavernous banquet hall. The throne where he sat high above his mortal guests was an immense emerald block towering above one end of the vast hollow triangular table, which was three levels high. For this occasion his nimbus was a cloud of scarlet sparks, thinning into a radiant halo around the power of his muscular shoulders and the splendor of his red-bearded head. He rose courteously enough to greet her, smiling almost too warmly as he waved her into the seat of honor just below him.

His other guests sat facing them across the brightly-lit arena inside the table. His gigantic sons lounged along the nearest, highest level—there were no daughters, because the offspring of mortal and god were all sterile males. The chief prelates of the Thearchy sat along the second level, hushed and uncomfortable in their jeweled vestments as if embarrassed by this unaccustomed nearness to divinity. Below were the laymen: the secular ministers, the row of identical clone generals, the athletes and actresses and

others who had somehow drawn his special favor, all leaning to look down into the central arena.

"Lord Belthar," the goddess began, "what I came to ask—"

"Watch!" He was turning from her to the triangular pit inside the table. "A pretty match."

Reluctantly, she looked down at two huge mumen flying to attack each other. Wearing null-G belts but armed only with the fangs and talons and killing eyes the genetic engineers had given them, they soared to the top of the barrier, paused and feinted, dived and struck. The arena lights burned on ruby scales, on sleek black crests and white dagger-fangs, on enormous claws. Pale pathseekers hissed from their armored lenses. When one of them found an opening, the crash of his blinding bolt echoed against the high vault.

She leaned to follow them, caught in spite of herself by a shocking incongruity. They were fearfully efficient machines of death, terrible but beautiful, lean and hard and bright, fighting without emotion. Yet, remotely, they were also human and divine. In the grace of their swift and merciless motion, she felt their kinship to the premen and to her. Appalled, she turned back to Belthar.

He was intent on the battle, blue eyes blazing through the nimbus with a joy that almost frightened her. Abruptly he rose, with one ringing clap of his great bronze hands, a signal that sent a wave of cheering around the table.

She caught a charred-flesh reek and saw the loser's body sprawled in the air, kicking convulsively as it toppled slowly toward the sand, still almost supported by the gravitic belt. The winner stabbed it with another cracking bolt and mounted proudly toward the throne, grinning in bright-fanged delight at the god's applause.

"A cruel thing!" she whispered. "Must they die?"

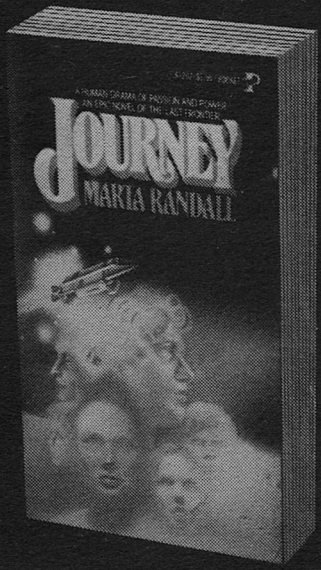
"They must." Belthar gave her a momentary glance. "Since we killed the Creators, we ourselves must restore the old creative way of selection and survival. It works well. One of my mumen could outmatch a dozen of those the Creators left us."

He sat again, watching the victor dive to drag the victim's body away. Truman serving girls came running to spread the table with gemstone and precious metal, with flagons and platters and sculptured ices. She watched Belthar's avid attack on a huge, red-oozing steak and turned suddenly away because it smelled too much like the beaten muman. He saw her aversion and waved a girl to remove her steak.

"Forgive me, goddess. I know our needs are minimal, but I enjoy the physical." He paused to spear another bleeding morsel. "I like to make the most of both my biosystems, the primitive and the transvolutionary. I enjoy levitating a ten-ton boulder out of the atmosphere. But I also enjoy wresting a muman amazon to the death in the gym, with brute force alone."

A journey. Like none you've ever taken.

Another time. Another place. And an uncommon family that triumphs over the intergalactic forces that would destroy it. By Nebula award nominee Marta Randall.



81207
$1.95

Now in paperback from
POCKET BOOKS

"I'm sure you do." Her voice had an edge, which she tried to blunt. "But I hope you'll listen—"

"Later, child." Tolerantly benign, he paused to beckon at a girl with a tray of luminous fruit. "But this is my day. The celebration of my first great millennium. Nothing must mar it."

Two more mumen had died in the pit, between courses of the banquet, before Belthar levitated himself with a careless wave to acknowledge the worship of his world and at last led Zhondra Zhey into an adjoining audience chamber.

"A more intimate place." The glow of his aura brightened to show a low plain throne at the end of a long conference table. "Designed for private talks with my highest churchmen. Shall we sit?"

They sat. Placing himself companionably near, down on her own level, he let his nimbus fade to reveal his massive maleness, but she kept the cover of her own aura, a cool blue shimmer.

"Sorry, my child, to delay you," he murmured easily. "But we've time enough now."

Before she could speak, however, he had reached with a long pink tongue of his nimbus to lift a golden flask and two slender goblets from behind the throne. Nimble fingers of the aura filled them and offered one to her. She sniffed the unfamiliar fragrance of a glittering mist rising from the liquid and took one cautious sip. Though she liked its odd hot tang, she set it firmly on the table.

"Try it," Belthar urged. "You'll find it something new. I've been training truman creators of my own to invent new food animals and plants, new chemistries to offer new delights. The old human food and drink was never good enough for divine tastes or divine metabolism—"

"I want to talk," she broke in resolutely. "About the premen."

"Premen?" Startlement winked and vanished in his mantle. "My dear, I've finally solved the preman problem. An idea of Quelf's. We're relocating them on a frontier planet—"

"I've seen it." Bitterness shadowed her nimbus. "My ship was chartered to land the first lot of them there. A dreadful, barren world, where Terran life can't reproduce—"

"Quelf's point." Inhaling the bright mist from his drink, Belthar nodded expansively. "The premen are disposed of forever, with no violence to our old treaty obligations—"

"Would you murder our creator race?"

"Our destiny." He beamed serenely through the dancing scarlet sparks. "The mortal races, like mortal individuals, are still subject to the laws of natural evolution. Through the old test of fitness, they are selected for survival—or sometimes not selected. We immortals are more fortunate."

"Need we be so cruel?" the goddess said.

"If you must look for cruelty, blame the Creators. Premen themselves. When they made the first trumen greater than they were, they were

condemning their kind to be replaced. Andoranda Five was already implied in their first efforts to unwind the double helix."

"I dislike your logic." Emotion brightened her blue halo. "I beg you to let me find some better planet—"

"There are gods enough to claim the better planets." He surveyed her shrewdly. "My dear child, you yourself are evidence that we have sometimes been too forgetful of our own immortality, breeding more deities than we could discover attractive home worlds for." He nodded persuasively at her fog-filled goblet. "Forget the premen, and let's enjoy your visit."

"I can't forget them." She darkened her aura against his boldly probing eyes. "There are two, especially, that I want to know about. Davey Dunahoo and the girl he called Buglet. Only children when I met them, years ago. I looked for them when I came for the first lot of their people, but they were off the reservation—"

"Demons!" Red violence flared through Belthar's mantle, but he let it cool before he went on. "So Quelf believes. They've been terrifying him." He chuckled heartily, golden sparks dancing through the scarlet. "He has just recaptured them. It seems they somehow tricked his muman guards into attacking one another. Four killed. Quelf is more than half-convinced they do belong to the demon breed. Actual survivors of the monstrous Fourth Creation, made to war against the gods. He can't wait for you to take them on to Andoranda—"

"I won't do that." Her halo flashed. "I remember them too well. Naked, grimy, hungry little urchins, but proud as you are. When Quelf's escorts killed their pet dog, they defied him—"

"You admire rebellion?"

"In them it was heroic."

Watching her keenly, Belthar sipped his golden goblet and slowly smiled. "For your sake, my dear, I'll spare them. Take the other stragglers on to Andoranda, along with your cargo of supplies for the lot you left there. And I'll find some kinder fate for your two favorites. Agreed?"

"A kinder fate?" Peering into his bright halo, she nodded at last. "Agreed!"

When she was gone, Belthar sent for his black son.

"You honor me, Sire." Quelf dropped to one knee, grinning to conceal a secret apprehension. "How may I serve?"

"Get back to Redrock." Belthar beckoned him upright. "Attend to the two recaptured premen, Dunahoo and Jondarc. Clone General Ironlaw reports that they are proven heretics. You will see to their atonement. In keeping with a promise I have given to our visiting goddess, that must be quick and painless."

"They are most dangerous heretics. But, Sire—" Quelf hesitated, blinking into the red-glinting nimbus. "Their atonement offers difficulty. Clone

General Ironlaw says the Inquisition promised them safe passage to Andoranda—"

"Inform Ironlaw that the Inquisition has been overruled."

"Your will, Sire." Quelf shuffled uncomfortably. "But I foresee another difficulty. The heretics were able to kill four attacking mumen before they decided to surrender. The atoner may have trouble—"

"You will be the atoner," Belthar boomed. "As Arch-Inquisitor, you'll kill them yourself."

Quelf shivered and stiffened.

"Forgiveness, Sire!" He squinted shrewdly into the halo. "Wouldn't my intervention seem to give the heretics the status of martyrs? Wouldn't it be wiser to send them quietly on to die with their kinsmen?"

"Too slow for them. I want them glorified at once."

"Surely, Sire, you aren't—"

"I take no chances." The nimbus darkened. "The premen have always cherished their legends of demons surviving from the Fourth Creation. Of multimen or ultimen who would return to chasten the gods. Pure myths, of course. Pitiful efforts at compensation for their own misfortunes. Yet I want no risk of any future struggle for survival. The Creators ended that old evolutionary game when they made us immortal, and I will not revive it."

"I respect your wisdom, Sire." Quelf bowed and paused to mop at his shining sweat. "But if these creatures have actually inherited demonic powers—"

"We'll take no chances." Belthar chuckled. "Here are your instructions."

Controlling a shudder, Quelf bent to listen.

"The female is the more dangerous—so Ironlaw reports. He suspects that she has received support from some unknown ally more powerful than the preman boy, and he wants time to set a trap. We have granted him one more day."

Quelf gasped and froze again.

"To avoid risk, you will keep our purpose secret. You will announce that we are gracing you with a physical visitation to Redrock, arriving tomorrow at dusk. Preparing a formal welcome, you will select the female to be my bride. Have her brought to the chapel of love. Inspecting the arrangements, you will glorify her with your demon-burner—with no warning that might alert any allies."

Quelf moved as if to protest.

"When she is safely exalted, you will reveal her heresy. To prove it, you will display the weapon found hidden on her person, meant for us." Belthar reached behind the throne with a red tendril of the nimbus to produce a black handgrip. "Here it is. A laser-dagger, one taken from an actual preman assassin."

Stiffly, Quelf reached for the weapon.

"Though the preman boy seems less dangerous, we'll handle him with equal caution. He will remain isolated in the Redrock jail until his Inquisition guards are informed of the girl's

atonement. At your signal, the jail will be attacked with force enough to make sure of him."

Quelf nodded reluctantly.

"You will then tell our story. Your discovery of the dagger on the female led the Inquisition to a nest of preman heretics and demonists hiding in the jail. They have all been glorified."

"A sound plan, Sire." Quelf grinned bleakly, his misgivings not quite gone. "Your will be done!"

3.

Suspended between powerful arms, the godlet's body was a gold furred triangle that tapered from muscular shoulders to useless doll-feet, the scowling face a second triangle, narrowed from bulging temples to pink baby-chin.

"I like you, Davey." The voice from the red-lipped doll-mouth was the whine of a trapped insect. "I admire your remarkable Buglet. I have taken foolish risks to aid you—more risks than I can afford. I can do no more."

"But I'm shut up in jail and desperate for Bug—"

"Sorry for yourself?" The annoyed whine cut him off. "Consider me. Misbegotten. The only creature of my kind, without parents or kin or hope of any lover. Forced to live forever in hiding from mortals who would fear me and gods who would destroy me."

A huge tear welled out of the lone green eye.

"Drowned now like a rat out of my last refuge, with nowhere to go." Supporting himself on one huge hand, he wiped at the tear with the other. "Can't you see that I've troubles enough, without your leading Belthar to me?"

"We're both in bad shape," Davey agreed. "We've been tricked. Belthar's inquisitors promised us passage to Andoranda—"

"Honesty was never his weakness." The green eye darted about as if in search of danger and stabbed back at Davey. "But that's your own problem. Really, you must go—"

"Help us, first. Show me—" Davey caught his breath. "Show me how you walk through stone."

Pipkin hopped closer, his green squint almost malicious. "If you must ask, you wouldn't understand the answer."

"Buglet says we have latent gifts—"

"In fact, you do." The baby-head nodded. "Or you wouldn't be here."

"You can help us learn to use them—please!" He was reaching out imploringly, but Pipkin hopped warily back. "I get visions like this one, but only sometimes. I've no control—"

"Your own misfortune. Perhaps you too are misbegotten." Pipkin's shrug tossed his body like a hanging banner. "What can I do?"

"Teach me. Help me break a barrier in my mind—the feeling that the powers we need are all impossible."

"For mortals, they are impossible."

"We've got to have them, anyhow. If you'll just tell me what we must learn—"

"To see." Pipkin opened that blind

white eye, and he shrank from its chilling stare. "To reach. To grasp the multiverse—"

"Can you explain the multiverse? In a way I can understand? There were books in the commune that we tried to read—"

"Truman books." Pipkin sniffed. "No truman understands the multiverse. The gods who do need no books."

"The gestalts we read never looked possible." Davey frowned. "If our own universe goes on forever, what can be outside it? That's the sort of thing I need to understand."

"I'll say what I can," Pipkin whined. "If you'll leave when I'm done. But I'm afraid you'll understand nothing. Nothing until you learn to see for yourself."

"Tell me!" Davey nodded eagerly. "I'll try hard to get it."

"Your preman forebears had a theory of a single universe. An explosion of energy and mass, creating space and time as it swells to its gravitational limits, erasing them as it falls back into the point of its beginning, recreating itself as it explodes again—"

"That isn't true?"

"True enough for premen. Or even for the stupid truman theologonists." Pipkin's shrug tossed his body. "But a bit too narrow for divinity. In fact the premen themselves were always inventing odd gods of their own, to explain more things than their reason could."

To Davey's relief, Pipkin had closed his wide blind eye.

"That theory is a fair enough fit for this one universe, which is all the premen and the trumen are able to sense, though it's only an atom in the greater reality. The actual multiverse holds an infinity of such universes, all held within a wider domain of order that the gods can perceive and mortals cannot."

"Infinities of universes?" Davey frowned, grappling with that awesome notion. "Side by side? Or following one another—"

"Stupid preman concepts." Pipkin's malicious shrilling cut him off. "Repetition implies time, as location implies space. But space and time exist within the universes, not between them. The laws and the nature of the multiverse are not expressible in your Terran language or your Terran math. They must wait for your parasenses—if you are going to have parasenses."

"We've got to have them now." Desperation shook his voice. "I've got to learn how they work." His emotion blurred Pipkin's image, and he paused to let it clear. "How is it possible for me to reach you here? Or to see Andoranda Five?"

Pipkin whistled a high bird-note of surprise.

"You can probe that far?" The green eye blinked and stared. "I can't. Even Belthar can't. The best of us can penetrate a single contact plane. Andoranda hangs beyond many of them, shifting so complexly that the most skillful pilot is taxed to take a ship there."

"So it is possible?" He nodded

slowly, trying to grasp that greater reality. "You can really see into other universes?"

"Only dimly," Pipkin squeaked. "Such abler gods as Belthar can see farther and more clearly—far enough to find the loci of paraspatial contact. They are strong enough to tap the universal energies they need to deflect a ship through the loci from universe to universe, or to power their auras, or to blast their enemies."

"But you yourself can reach—"

"Feebly." Pipkin sighed. "I can rotate a few atoms out of our own small space-time continuum for a very few minutes. Long enough, as you put it, to walk through a wall. If you and your Buglet hope to get away from Belthar's Inquisition, you must do much better."

"Can you tell me how—"

"Can you tell a stone how to hatch and fly?" Pipkin hopped impatiently on his perch. "It's eggs that do that, never asking how." The green eye squinted at him keenly. "If you can really see all the way to Andoranda, there's nothing I could tell you."

"But—"

"One word of warning." The piercing squeak cut him off. "If you ever find your way to another universe, enter it with caution. Half the early cosmic explorers never came back, because they weren't aware of a law of symmetry that rules the multiverse. Every alternate space-time expansion produces antimatter."

Davey stared, trying to recall those truman gestalts that he had never understood.

"There are two types of matter," Pipkin said. "In most ways identical, but opposite in electrical arrangement. On contact, the opposed charges cancel. Mass becomes pure energy, explosive enough to kill a god."

"Even Belthar?"

"He'll never risk himself." Pipkin's shrug flung him back toward the cliff from which he had emerged. "The

In times to come

You've become accustomed to Sam Nicholson's tales of Capt. Schuster, the hard-fisted ultrapragmatic merchant mariner. But in next month's lead novelette, "Starships in Whose Future?," Sam unveils a new scenario and a new character—Vardos Vayan, Bard Laureate of the Post-Melt world. Earth's glaciers have melted and drowned all the coastal cities, but a new civilization has risen out of the catastrophe and even established colonies on the worlds of Alpha Centauri. A fascinating new direction for Nicholson, matched by a strikingly beautiful cover painting by Dean Ellis.

We'll have a Guest Editorial in August, "Biological Ignorance," by Dr. Dean Lambe, and the science fact article that complements it will be on the new experiments in recombinant DNA.

The next installment of Jack Williamson's continuing saga, "Brother to Demons," will also grace our August issue, as will a new short story by Harlan Ellison, a hatful of other stories, and all our usual features.

parents of your goddess friend were explorers who never got back. But my warning was for you and your enchanting Buglet—if you ever get that far." An oval patch of the sandstone behind him had begun to glow and vanish. "I can tell you no more, and I hope not to see you again." Standing on one hand, he swung the other in dismissal. "You have stayed too long. Belthar's Inquisition is too near."

"Wait!" Davey gasped. "I don't even know how to begin—"

But the grinning image was gone. The old red rocks and the dusk-reddened lake faded after it, and his nostrils caught the stale stink of the Redrock jail. He sat up stiffly on his concrete bench, searching for what he had gained.

That was little enough. Though he had somehow sent out a speaking image of himself to bring back facts he hadn't known, he wasn't sure he could do it again. The use of the facts was not yet clear. He had not found Buglet, or any clue to her location.

He sucked stale water from the plastic dish to wash his bitter mouth and paced the cell until the godsgrace ache drummed again in his brain. Why was he alive? He lay back at last on his concrete bed, waiting for the drug to wane, wrestling with such answerless questions.

If the inquisitors had judged him too dangerous to be sent on to Andoranda Five, why hadn't they killed him at once? Or had they simply separated him and Buglet, to weaken them both? He tried to hope that she had been sent on alone, that he was being held for a later ship.

That feeble hope kept fading. His weary brain kept drifting back to Pipkin, to the baffling riddles and the far promise of the multiverse. A superworld, beyond all space and time, in which the stark impossible for men became possible for gods—and for the ultimen Buglet said they would become.

But how could a frog learn to fly—

4.

Something woke him.

In his vivid dream, he and Buglet had been homeless waifs again, as they were before the goddess came to Redrock. Bug was sick and hungry, lying on a pallet of empty grain sacks in El Yaqui's cowshed. He had been slipping into the kitchen, trying to steal good food for her, when La China caught him. Screaming, she had been about to throw a bloody cleaver at him.

He sat up, blinking at the grime-clotted wall. It looked strange, until his first gasping breath brought memory back along with the reek of the jail. He slid off the bench and stopped to listen for whatever had jarred him awake.

There was nothing he could hear. No movement from the muman guards. No stir from any other prisoner. The same dim blue light still burned in the corridor, but he knew that day had come.

The sun, in fact, had already risen, casting the long black shadow of

Quelf's castle far across the steel colored lake. The bright sky was cloudless, broken only by the dark blot of the Inquisition battle skimmer that hung above the islet. He could find no new menace.

Yet his vague alarm persisted, even though this clear perception seemed to show that his latent gifts were growing. He stretched himself and roved about the cell. The ache and fog were gone from his head. He felt a hunger pang and a sharper stab of new concern for Buglet.

Was it some dim sense of fresh danger to her that had brought him awake? He lay back on the bench to probe again for her, reaching at random—or trying to blindly to reach—for any hint, any hope, any friend.

San Seven? The truman youth had been their best friend. More than half in love with Buglet, he suspected. San had risked perhaps too much to aid their first flight from Redrock. Could he have found some way to help her again? Could she perhaps be safe at the agency now?

Trying not to try too hard, because he thought the very tension of effort might defeat him, he turned that faint hope to the mansion on the hill, their home for all the years since the goddess sent them there. On high ground, it should be still above the rising lake.

The drowned trees on the slopes beneath it were yellow and dying, and the wide doors stood open now—the bright image dimmed to his surge of elation, but it came back again when he made himself relax.

The doors were tall wood panels, carved by forgotten preman artisans with symbols that meant nothing now: a cross, a crescent, a star with six points, another with five. One panel had been charred and shattered, as if struck by a muman warrior's lightning, and the patio inside was rank with weeds and littered with soden junk that once had been the agent's precious preman antiques.

The office was a shocking ruin, a dusty clutter of torn paper and ripped-up books and dismembered chairs and desks and files. San's room, Bug's, his own, even the null-C gameroom, had been as thoroughly demolished. Why?

Understanding came, a jolt that shattered the whole perception. The inquisitors had been here. This devastation was left from the merciless search that had finally overtaken him and Buglet at the truman commune. His burning guilt raised another question: What had the Inquisition done to San and his parents?

Shivering, half-sick with fear for those old truman friends, he stumbled around the cell again, rattling the door, testing each steel bar, throwing his weight against the grimy walls, standing on the benches to test the concrete ceiling. There was no way out.

Not for him.

For a god, perhaps. Or for the ultiman that Buglet might help him become. But he knew no way to find her, no way to get beyond the ironic

fact that his own anxious emotion was an apparent limit on those half-known unfolding powers. He needed her, needed understanding of the multiverse that Pipkin said no man could understand, needed everything.

Announced by a clash of metal doors, the horn-footed muman guard came tramping down the corridor to open the wicket and gesture at the plastic dish. When he shoved it into her bright black talons, she slammed the wicket and thudded away, deaf to all he said.

The old jail was still again. Lying back on his hard bed, trying to smooth away every interference from emotion—from his haunting fears for Buglet, his nagging worry for the Sans, even from his own gnawing hunger—he probed again, trying now to reach Quelf's new castle.

He had never been near it—Quelf welcomed no preman guests—but long ago, with El Yaqui, he had hiked over the high mesa where it now stood. They had been looking for peyote cactus under the desert brush on a little hill when he found an odd object half-buried in the pale soil: chips of colored glass framed in blackened metal to make a picture of a man's head.

He wanted to know what it was.

"Throw it back." He remembered El Yaqui's sardonic tone and the pain on his old brown face. "No good for us. Bad trouble more likely, with Belthar's Inquisition."

Though the colors looked faded and some of the glass chips were gone, he could make out part of a yellow circle in the blue above the long-haired head. The face was lean and sad as El Yaqui's, and something about it troubled him.

"Why?" he asked. "What was it?"

"A god," the old man muttered. "A preman god." He nodded at the brush-clumped mound. "This white soil's adobe. A building once. I think the old Piedras Rojas mission. A house of worship for that humble preman god. He's dead now."

He remembered holding the broken thing up against the sun and peering at the glowing glass, trying to imagine how a preman could have been any sort of god.

"Throw it back," El Yaqui rasped again. "Forget it."

Unwillingly, he tossed it back on the mound. It must have struck something hard, because he heard a jangle and saw bright fragments flying. El Yaqui knelt for a moment, murmuring something he couldn't hear about *los pobres* and *dios* before they went on looking for the little blue-green buttons.

Later, growing up on the reservation, he had watched the castle rising where that dead god's house had caved to clay. A long new mountain on the skyline, broken rock from enormous excavations. Great dark granite walls, soaring higher year by year. Towers so tall that summer cumulus sometimes formed about them.

Those walls enclosed a vast triangle, a tower at each corner. The chapel of Thar looming on his right, domed with

sacred black. The Bel chapel on his left, all white marble. The landing stage at the south corner, behind them, not quite so high.

Down in the canyon between those enormous walls, Quelf had made his playground. A wide white beach and low green hills around a clean blue lake. Garden groves. Bowers built of shining gemstones. A fountain in the lake, catching a rainbow now in its diamond dazzle.

These were sights Davey had never seen or heard of, never guessed. The vivid perception elated him—nearly too much, for it began to fade. He stretched himself deliberately again on the hard bench, drew a long breath, lay limp until the vision cleared.

Machines were mowing the grass above the beach and workmen were busy on the north wall, swarming over the scaffolding around a black structure that had begun taking shape as a gigantic statue of the half-god himself. A black skimmer was lifting from the stage. He saw no other movement. No hint of Buglet.

He followed the Inquisition skimmer. Flying south, it climbed, leveled, glided toward the shuttleport. At first he expected it to land there, but it slid on above the orange-painted terminal buildings to touch down at last beyond a fence he had never seen.

Tall steel posts enclosed a wide rectangle of desert brush and naked sandstone. A single wire, stretched high between the posts, was beaded with winking red lights. The lights puzzled him, until he found the bones scattered under the wire, whitened skeletons of coyotes and hawks and men. He knew then that this must be the holding camp where the exiled premen had waited for shipment to Andoranda Five.

The sleek scout skimmer had landed on a pad inside the camp, safely far from the fence. A red-scaled muman stalked down the gangway, followed by a compact man in gray. Clone General Ironlaw—

Everything faded and flickered with Davey's surprise. Trying not even to hope that Ironlaw might lead him to Buglet, he turned away to watch a buzzard wheeling over the other end of the camp and drew a long slow breath before he dared look again.

The clone must have called some command, because a few half-naked premen were crawling into sight from brush-covered burrows they must have dug with rocks and sticks. Most of them stood staring, warily silent. One was a yellow-haired girl who had been at La China's. She came running until she stumbled, then waited on her knees, holding out her sunburnt, swollen arms, sobbing for the Lord Quelf's mercy.

Ignoring her, Ironlaw shouted again.

The prisoners turned to watch another man climbing stiffly out of his shelter pit. In muddy rags, he was lean and brown, gnarled from long toil. Pulling himself carefully straight, as if his back were painful, he came to face the muman, slow steps firm, blue eyes defiant.

"Halt!" Ironlaw stepped ahead of the guard. "Identify yourself."

He stopped and stood swaying.

"I have been interrogated." Pitched high, his old voice was cool and clear. "I am a truman, as I informed the sacred inquisitors. My life has been spent in the deepest mines of the Andes, where few except the muman miners can endure the heat. The past twelve years, I was foreman over my crew. My name is Florencio Tarazon—"

"Can you prove that?"

"Do you say I lie?" His pale stare was steady, sardonic, contemptuous. "My misfortunes are written in the records of the mine, as I told the inquisitors. There was a fire. I was able to save my muman crew, but my personal identification was destroyed—"

"The Inquisition says you lie," Ironlaw cut in. "We have evidence that the real Florencio died in that mine fire. The Inquisition charges that you are, in fact, a preman escapee from the Redrock reservation, once known as Dunahoo—"

The voices faded, and the desert sun-glare dimmed. Gasping with shocked emotion, Davey found his lungs filled with the foul jail stink. This battered but unbeaten little man was the father he had never even hoped to see.

An agony of sympathy swept him upright. Sick with his helpless rage at Quelf and Belthar, at the Inquisition and the whole Thearchy, he clutched the old iron bars as if to rip them out, punched his fist against the rough concrete.

But that was not the way to be greater than the gods. Rubbing bruised knuckles, he drove himself back to the bench. Breathing deep and slow, he tried to relax, to forget his fatal hate, to regain that lost perception.

At first he failed, his sweaty body still too tense, his hand too painful, his heart pounding too hard. Slowly, however, his animal anger faded into admiration for that worn little preman who could still defy the whole force of Belthar's Inquisition with an undefeated dignity.

The black skimmer was gone when he got his vision back. Most of the prisoners had crawled back into their pits to escape the savage sun Near the fence, the yellow-haired girl was raking with a stick at the body of a hawk that must have tried to light on that deadly wire. He saw her seize it, rip feathers off, tear with her teeth at its tough flesh.

He overtook the skimmer as it dipped toward the landing stage on the castle tower. The muman guard marched first down the gangway. His father followed, limping painfully yet still proudly straight. Ironlaw, behind him, signaled toward an elevator.

The cage dropped them out of the tower and deep into the rock beneath. Davey followed them, watched them emerge into a huge rectangular room with a high dais at each end. One was bare: the other held a tall black throne.

Muman, preman, and clone, they stood side by side to face the throne. Six more military mumen marched out of a dark passage to form a silent line facing them. All waited, stiff and mute. The little preman swayed and straightened again, biting his lip. Blood oozed down his muddy, dark-stubbled chin.

A gong boomed. Quelf strode out of another doorway and paused to eye the prisoner. More massive than a man, dark as his mortal mother and arrogant as his father god, he was clad in the somber splendor of his rank as Arch-Inquisitor: the ruby-jeweled black harness, the high black crown, the tall black staff.

The gong throbbed and the mumen knelt. Ironlaw bent his head. Only the haggard preman stood straight, pale eyes level with Quelf's black stare. For an instant they stood fixed. Then, with scowl of annoyance, the half-god took his throne.

Another gong-tone swelled and died.

Solemnly, speaking in the Old High Terran still preserved in the church, Ironlaw intoned the formal charges of the Inquisition. The prisoner, the preman male recorded on the Redrock reservation rolls as Devin Dunahoo, had fled his legal residence without divine sanction, had attempted to pass himself as a truman, had neglected to make full and frequent confessions to his lawful pastors.

"Prisoner, what is your plea?" Quelf's cold demand rang against the lofty walls. "Do you admit your guilt? Do you beg Belthar's mercy?"

The little preman folded his scarred arms.

"I admit nothing." His faint voice was firm. "I beg for nothing."

"Then prepare for atonement—"

Quelf's booming voice broke off, interrupted by Ironlaw.

"Sir, if you will. As an agent of the Holy Inquisition, I must present yet another charge against this prisoner. A charge of demonism—"

"No!" The half-god started as if with alarm, and the dark flesh beneath his gemmed harness shone with sudden sweat. "Is there proof?"

"Evidence to damn him." Ironlaw stepped warily away from the haggard preman. "Evidence that he carries the genes of the demon breed known as the Fourth Creation, the accursed seed of the evil being whose coming the heretics have been proclaiming, the monstrous enemy of Belthar and all the gods that they call the Multiman—"

"Enough!" Quelf shouted. "Enough for judgment." He paused as if to recover himself, glaring down at the little preman. "Prisoner, do you admit your demonism?"

"I never knew I was a demon." The preman drew himself painfully straight, grinning through the blood on his lips. "But if I am, we'll get you, Quelf. My son will—"

"Silence!" Quelf roared. "I order your atonement."

Breathing carefully, trying to cool his blaze of emotion, Davey clung to the tattered shreds of his perception.

When it began to clear again, he found two muman guards dragging his father across the high stage at the other end of that long room. Everything dimmed and blurred again, as he watched them shackle the preman's wrists to a high metal crate, so that he hung by his stretched arms. Pale with pain, he kept his eyes on Quelf, somehow still detached and defiant.

The gong had sung again, and two more gigantic mumen marched out of the passage below the black throne, herding two more prisoners, thin crippled creatures half-clad in foul rags. San Six and his wife—

Like a rock crashing into a mirror, the shock of that recognition splintered Davey's vision. When he got it clear again, the new prisoners stood where his father had been, before Quelf's throne.

"—three truman heretics." Ironlaw was intoning the Inquisition charges, framed in the archaic accents of Old High Terran. "They are suspected of demonistic sympathies, of idolatrous belief in the blasphemous myth of the Multiman, of treasonous complicity in preman plots against the sacred dominion of our Lord Belthar and against the public peace. Unfortunately, the son did not survive interrogation—"

An overwhelming wave of grief and pain washed out the whole perception. Davey sat up in the stuffy jail cell, sick at heart and shivering. San Seven—dead! Killed by the Inquisition, in a manner he couldn't bear to imagine.

When at last he had calmed himself enough to recover the perception, the Sans were kneeling side by side below the black throne. The woman was sobbing silently, gray head bent. The battered man stared up at Quelf, fleshless face flaccid and mouth hanging open in his abject terror.

"—investigation not yet complete," Ironlaw was droning. "I still suspect that other forces are involved, more powerful and dangerous. But these truman sacrilegists have confessed to the Inquisition that they did in fact render aid to premen demonists in flight from the reservation."

Bowing slightly, the clone stepped back.

"Prisoners," Quelf rapped, "how do you plead?"

"You—" The hollow voice of San Six quavered and stuck. "Your Benign Semi-Divinity—" He had to gasp again for breath. "We've sworn the truth many times. I knew nothing. My wife knew nothing. It was only our poor, impulsive son—"

Glazed eyes still on the black half-god, he reached blindly to touch the woman.

"A misguided child." His hoarse voice was suddenly clearer, racing. "If it's true that he did aid those young premen, he didn't know that they were demons. It was a goddess, remember, who had placed them in our home. With Your Divinity's approval. We were sanctioned to befriend them. If our poor son sinned, his sin was friendship—"

"What is your plea?"

San Six gulped and clutched the

woman's hand desperately.

"For myself," he whispered, "I accept the guilt. I was the Redrock agent. I was responsible. But, Your Divinity—" The whisper faded, and he gasped again for his breath. "For Lera, I beg mercy. She knew nothing. She meant no sin. She shares no blame—"

The woman raised her blighted face.

"Mercy!" A toneless croak. "Belthar's mercy, for both of us."

"I grant you my father's mercy."

The half-god smiled and turned his tall-crowned head, waiting for the gong. San Six gasped as if in disbelief, and Lera laughed wildly, hysterical with her momentary joy.

"You've nothing more to fear," Quelf told him. "The Holy Inquisition will release you now, for immediate atonement."

The perception was wavering again from Davey's own emotion, but he got blurred glimpses of the mumen dragging their two unresisting victims down that long room, to hang them by their wrists beside the pale preman.

In shattered fragments of sensation, he saw a whole side wall of the room rising like a curtain, to show a vast dim space beyond. A vast circular chamber, walled with prison cells five levels high—the dark and secret dungeon of Quelf's Inquisition.

The judgment room was now itself a stage, the prison cavern a high-domed theater. The great gong was thrumming again, and the pallid inmates began staggering to clutch their bars and peer down at the place of execution.

Buglet—was she here?

The icy shock of fear erased everything. Aware only of his own jail cell, of fetid air and hard concrete and the quivering tension of his own sweaty limbs, he had to calm his emotional storm before he could see anything. But he was learning to relax and reach and see. In a dozen heartbeats, he was able to get the vision back and scan the stricken faces.

None was Buglet's. Relieved, trying to hope that she had somehow escaped the Inquisition, he turned his mind back toward that high stone stage. Air had begun to roar, a cold wind whipping at the hanging victims and rushing somewhere away. Quelf had risen from the throne, black staff thrust level.

"Witness the infinite mercy of my ever-loving father." His brassy voice pealed against the arching dome. "Witness the ineffable grace of the Supreme Lord Belthar, granted in holy atonement!" The staff hummed faintly. Its beam was invisible. For an endless instant, however, the hanging victims shone, every limb and feature turned incandescent. His father's fixed grin burned itself into Davey's mind, defiantly impudent, unafraid and unforgettable.

In the next instant, before agony had time to change that glowing grin, the rags and hair and then the lean bodies exploded into crimson flame. If there was any outcry, the roaring wind tore the sound away.

Fighting the chill and sickness of his horror, Davey clung to the shreds of that perception until the dying flames had flickered out, until the curtain wall had dropped again and the ventilators had ceased to roar. Quelf had lowered his staff, leaning on it casually, leering with satisfaction at the black sticks, twisted and tiny, that hung from the shackles. The air in the room was suddenly hot, tainted with the bitter stench of burnt flesh.

He had to let the perception fade. Alone in his cell, he felt the old walls closing in, harder and grimier and colder, until his breath was gone. The afterache of godsgrace was throbbing in his brain again, and nausea overwhelmed him.

5.

He endured a dismal day. For a long time, he had no heart for anything. When at last he nerved himself to reach for the castle again, to search for Buglet there, his shock and grief and helpless rage rose in a storm of feeling that prevented any perception.

Now and then he roused himself to look about the cell again for any possible weapon or tool or way of escape, but he found no opening, no hope, no object he could move. The toilet was only a malodorous hollow in the floor. His own clothing had been changed for a frayed and shapeless garment without button or buckle or pocket. He found no comfort anywhere, and the despair of past preman inmates mocked him from the obscene graffiti on the windowless walls.

When the wicket rattled, he took the soft plastic dish from the talons of the unspeaking muman and sucked tepid water to ease his bitter thirst. The odor of the slimy yellow mush made his stomach churn again.

With each new effort to probe for anything outside the jail, the thin needle of pain at the back of his head grew keener, until he decided that it must be a warning that he was exhausting the obscure new energies that he couldn't yet understand or control. At last he slept.

Hunger woke him, but the yellow mush was still offensive. Spurred by a new unease, he lay back again to test his perceptions and found two more Inquisition battle skimmers on guard above the jail, black and sleek against a blood-colored sunset.

That discovery numbed him with a troubled wonder. If the inquisitors felt that he was worth three battlecraft, what sort of force had they set against Buglet? His disturbed emotions had darkened everything, and he drew back to recover. Able at last to probe again, he turned toward the castle in time to see a small church skimmer leaving the landing tower, sloping toward the shuttleport.

The tall shuttle stood there at the terminal dock, its mirror-bright hull red-splashed with sunset, crates and bales and drums climbing its gangways. Supplies, he supposed, for the preman exiles on Andoranda Five, where no food grew.

The skimmer came down to the dock and mumen emerged to guard

the path of a smaller, brighter figure moving swiftly past them into the shuttle. His breath caught. It was the goddess, Zhondra Zhey.

Once their friend, would she aid them again? That brief hope glowed and faded. She was already aboard, leaving Earth. The cargo booms and gangways had begun to swing away. The hatches closed. The dockhands took shelter. Roaring steam gushing from the jets, the shuttle lifted.

Yet he followed that dying spark of hope. Reaching inside the rising craft, he found her sitting beside the muman pilot, and the grotesque strangeness of that being caught him for a moment. The huge head, dark and bald and leather-skinned. The immense black telescopic eyes. The wide, wing-shaped lobes of the radar ears. The long, pliant sensapods spread like clinging vines across the controls.

Though the staring muman seemed unaware, Zhondra Zhey turned at once to face Davey with a look of cool inquiry. Hardly larger than the gnomelike pilot, she still seemed a child, no older than when she had made Quelf find a home for them, so long ago.

"Goddess—" He faltered. "Goddess—" Very fair in her aura's pale glow, she looked as lovely as Buglet, so tenderly defenseless that he saw no hope of aid from her. "Do you remember me?"

"Davey Dunahoo." Surprise had widened her eyes. "Your ancestral gifts must be greater than anybody thought, if you can make an image here. Yet you seem distressed."

"We're in trouble. I'm locked up, and I can't find Buglet. If—if you could help—"

"I've done all I can." Her face turned grave. "I've appealed to Belthar, for you and all the premen. Begging for a chance to search out a better planet for you. He's the ruler here, remember. He yielded very little, but he gave me one concession, for Buglet and yourself. A kinder fate than Andoranda Five."

"What kinder fate?" Terror touched him. "Why am I in the Redrock jail. With three battlecraft to guard me? Does that look like kindness? And Buglet—where is she?"

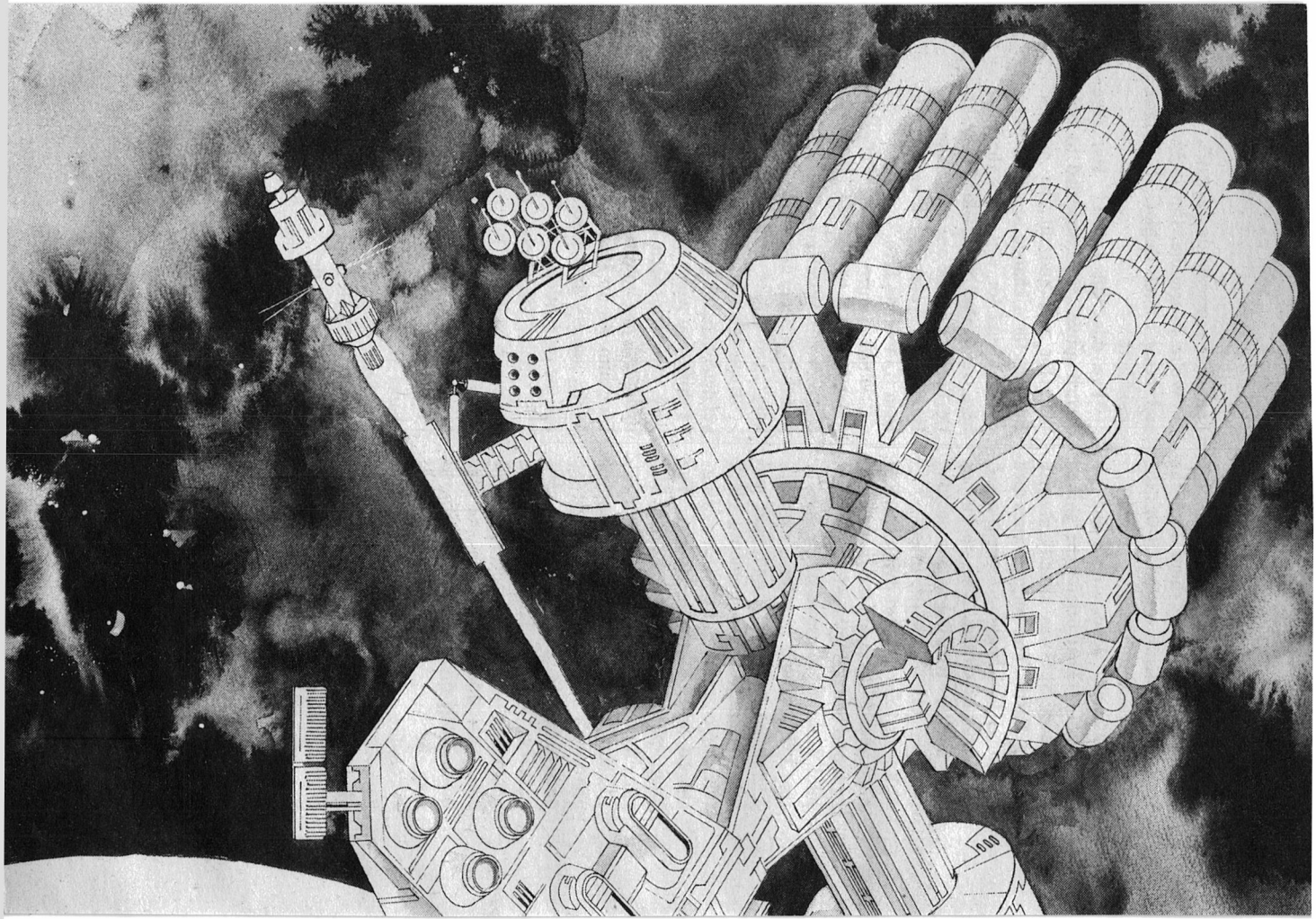
"I can tell you." Sympathetic, but yet detached, the goddess studied him. "I think you won't be pleased—that's why you have been detained. Quelf told me so just now, as I took my leave from him. As for Buglet—"

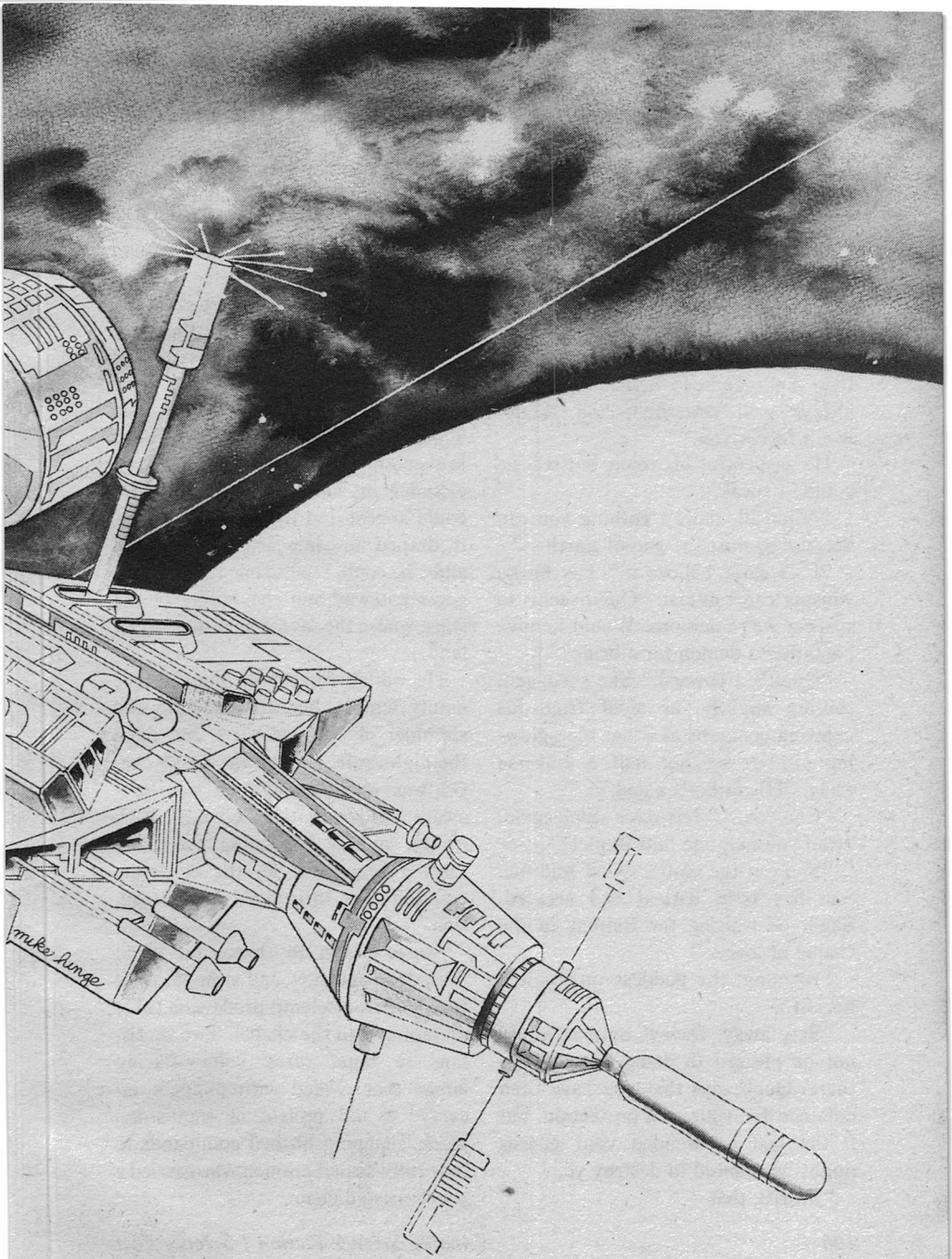
His anxiety and eagerness washed out the perception.

"—divine visitation," she was saying when he found her again. "He's arriving at Redrock castle tonight, and the Inquisition battlecraft are waiting to escort his sacred skimmer to the chapel stage. Quelf is gathering the sacrificial offerings. One of those is Buglet, to be his bride."

"Belthar's bride?" He strove to hold the slipping vision. "That would kill Bug—"

"I'm sure you're jealous." Nodding, she made a face. "I myself shouldn't care to share Belthar's bed. Yet this is an honor that premen have seldom




mike Runge

received—intended, Quelf told me, to compensate your people for their exile from Earth."

Speechless and trembling with dismay, he could only shake his head.

"I know you're not entirely happy," she chided him. "I doubt that Buglet is. But you must both accept the situation with what grace you can. The chapel of Bel is certainly a better place than Andoranda Five. The brides are always well rewarded, and Buglet won't forget you."

He gasped for his voice, but still he couldn't speak.

"After all, there's nothing you can do. Not against the god of Earth—"

"I—I can't believe it." His husky whisper came at last. "Quelf seems to suspect we're demons. Would he give his father a demon for a bride?"

"Quelf's a coward." She shrugged, smiling slightly, as aloof from his gnawing concerns as if her blue-glowing nimbus set her half a universe away. "His father's a god."

"Can you—" His voice stuck again. "Can you help me find Buglet?"

"She's at the castle, Quelf told me. She has been bathed and arrayed. She'll be waiting for Belthar in the chapel of love—"

Frowning, the goddess interrupted herself.

"Stay away, Davey! Belthar would not be pleased to detect your image there. Quelf says that you have been detained for your own protection, but if the god is offended your guards might be ordered to destroy you."

"I'll risk that—"

"Davey, don't!" Her nimbus had paled, and her widened eyes looked darker. "You don't know—"

He let the perception fade.

Beyond the red-stained lake, beyond Quelf's new roads and groves and gardens, the castle loomed immense against the sunset sky. The Bel chapel towered above the dark granite walls, white columns soaring to the high white dome.

Within the circle of columns, the white marble floor was vacant now, broken only by the great black crystal cylinder in which the sacred image could appear and the low altar before it, draped now in scarlet. Beyond the altar, he could see the open arch of the god's gateway and the railing of the stage where the sacred skimmer would land.

He waited for Buglet there in the empty temple, beneath the flash and shimmer of the starcharts that lined the high vault. Though the dusky chapel was warm enough he was half-aware of his sweat-chilled body back in the jail, of his racing heart and rasping breath, of all the desperate emotion that threatened his perception.

Music began to throb, far-off at first, deep and slow and strange. As it rose louder, a solemn procession came marching into the chapel. Two sacristans in blue, carry yellow-flaring lamps that reeked with pungent incense. A tall prelate in Inquisition black, snapping hushed commands to four ruby-scaled mumen who carried a jewel-crusted chair.

In the chair—Buglet!

Gowned in lacy white, she sat far back, drowsily relaxed, lemon-colored eyes half-shut. Jeweled combs shone in her dark hair, and heavy gemstone bracelets fettered her wrists. Her empty hands were folded peacefully.

"Bug—" His voice shook. "Bug!"

Her sleepy eyes were dilated, blank, blind to him. He caught an unfamiliar scent, a heavy sweetness that repelled him. As they brought her nearer, he saw two black triangular patches on her vacant face, one on each white temple. Beneath that sickly-sweet perfume, he got a sour whiff of gods-grace.

"Bug! Can you hear me?"

He thought her face drained even whiter, thought her eyes dilated wider. But she gave him no sign. The mumen marched on. At a word from the inquisitor, they knelt with the chair before the scarlet altar.

Bowing, the prelate caught her hand. She started, shrank a little from his touch, rose slowly from the chair. Passive as an unstrung puppet, she let him guide her to the red altar. Limp again, she lay back upon it, lips half-open, eyes half-closed, seeming unaware of anything.

"Bug! If you can hear, move your hand."

The inquisitor was arranging her gauzy gown, adjusting a diamond comb, straightening her arms. He knelt to touch his lips to the altar cloth, rose and turned. Behind him, her lax white hand lay motionless.

The sacramental music had paused, but now it swelled again. Keeping time to its solemn beat, Quelf strode into the chapel, still wearing the red-jeweled harness and the tall black crown from his dungeon judgment chamber, still carrying the deadly staff of his office as Arch-Inquisitor.

As the gigantic half-god tramped toward the altar, the black prelate moved out of his path and knelt again. The mumen picked up the chair and marched away. The two blue sacristans stationed themselves at the ends of the altar, swinging their flaring lamps in yellow clouds of incense.

Quelf paused before the altar. Gripping the black staff, he fell into a crouch, eyes rolling warily as if to search for danger. Nostrils flared, he was breathing fast. Bright sweat filmed his limbs. When he looked back at Buglet, his dark face set and a shudder shook him.

Abruptly, he dropped to his knees, bent to kiss the marble floor, came stiffly back to his feet. Face lifted to the crystal column beyond the altar, he began intoning a ritual chant that returned in dull thunder from the star-patterned vault.

As his great arms lifted toward the column, Davey glimpsed a second weapon. A slim laser dagger like one he had seen long ago, when the agent took it from La China after she had snatched it from between her bulging breasts to confront a drunken patron. Quelf carried it hidden beneath the wide black belt of his official harness, only half the hilt in sight.

Why? The image of it shivered and

dimmed to Davey's alarm. Why would the half-god bring such a weapon to the sacrificial ceremony? Why hidden?

The invocation had ended. Quelf stood silent, bleak face lifted to the crystal column. The black inquisitor took up the prayer, his voice a cracked and quavering mockery of Quelf's resounding boom, begging Belthar to manifest his all-forgiving love. The sacristans raised their fuming lamps. All waited.

"Holy father," Quelf's great voice drummed again, "we consecrate our humble gift—"

The black staff had clicked in his fingers. Humming softly, it swung level with the scarlet altar, level with Buglet's head. He bent, tensed. His dark features twitched and froze into a mask of frightened triumph.

The stark and sudden truth chilled Davey's body in the jail. His breath stopped. His throat hurt. His fists knotted, uselessly. At last he understood. The whole ceremony was a sham, arranged perhaps for Zhondra Zhey. Now that she was gone, the half-god was about to murder Buglet.

With all his will, with no time to think about the impossible, he reached again into the chapel. With no plan at all, too desperate to recall that he wasn't really there, without stopping to wonder what transvolutionary sources might be drawn upon to energize his image, he snatched for Quelf's hidden dagger.

The hilt felt cool and solid, real in his fingers. Caught between the wide belt and Quelf's belly, slippery with the half-god's sweat, it resisted when he hauled on it. Somehow, he almost lost his balance. The jail-cell tipped and the white chapel whirled and somehow they spun together. He got a fresh grip, pulled again—and suddenly fell.

A sharp report cracked in his ears. The stifling stink of his cell was gone. Gasping for breath, he got a suffocating lungful of incense smoke. Quelf was recoiling from him, quaking with terror, bawling for the mumen, swinging at him with the demon-burner.

With jarring force, he came down on the polished marble. Coughing, half-blind with the acrid yellow smoke, he groped for his senses. Somehow, with no help from Pipkin, he had come through the walls of the jail and many miles of space. He was really here, still dazed with that impossible fact.

Quelf was howling for the mumen, backing away, trying to get him at the killing end of the staff. He lurched forward, clutching a strap of the gemmed harness with one hand while he gripped the dagger with the other, squeezing to activate the laser blade.

Nothing happened. The trigger wouldn't pull. Desperately he groped for recollection of that time so long ago when the agent had let San Seven try La China's dagger on the weeds in the alley before they locked it up in the vault. He hadn't been allowed to touch it, but San Six had showed them how to disengage the safety—

"Demons!" Quelf was yelling. "Pre-

man demons! Burn 'em both!"

The mumen let the chair crash to the floor and came pounding toward the altar, crested killer eyes burning crimson. Pale violet pathseeker rays began stabbing around him, but no bolts struck. Perhaps, he thought, they were afraid of striking Quelf.

In a fleeting fragment of awareness, he saw Buglet moving drowsily to sit up on the red altar. Dark with dilation, her yellow eyes were on him, and her black-patched face had a look of dim alarm. Her pale lips murmured something he had no time to hear.

Too close to use the burner beam, Quelf swung the staff at him like a club. It grazed his head, dazed him with pain. Everything was blurred, until he was chilled with fear that he might find himself back in the cell. But he clung to the harness, jabbed the dagger back into the half-god's belly, felt for the safety slide.

"Burn!" Quelf was bellowing. "Burn the female—"

He felt the slide click, squeezed again. The laser blade hissed and blazed. Choking smoke exploded, veiling hot blue fire. The bellow was choked off. Pulled by the strap, Quelf toppled toward him.

"Davey?" In a sudden stillness he heard Buglet's troubled whisper. "Davey—"

Beyond her, a spot of blinding light was flashing across the marble columns. The burner beam, he saw, from the humming staff, that now had spun out of Quelf's dead hand. Ducking from beneath the falling half-god, he snatched the staff, swung it toward the charging mumen.

They had paused, paralyzed by their master's fall. He heard a hoarse command, saw the pathseekers stabbing around him again, felt a searing sting.

But he had caught them with the staff. Tiny at this close range, its hot spot lashed across them, exploding red scales into white fire and blinding smoke. The deadly redness dying in their crested eyes, the mumen moaned and staggered and fled. The yellow lamps still flared where the sacristans had dropped them, spilled oil frying on the marble, their incense mixed with the reek of seared flesh.

He twisted at the butt of the staff until he found how to turn off the humming beam and then stood leaning on it, gasping for breath, blinking his smarting eyes. Bitter smoke veiled everything. His head throbbed, where Quelf's blow had struck. Groping for himself, he had to fight a dazed disbelief.

Moments ago, he had been a hopeless prisoner—he still wore the faded, shapeless garment of the jail. Somehow—only Pipkin could explain the metaphysics of it—he had slipped out of his cell, flashed twenty miles across the lake, killed Belthar's favored son.

Such a leap was impossible, he knew, even for a god. Though Belthar could send a speaking image into the crystal cylinder above the altar, even he used a skimmer for an actual visitation, like any mortal being.

Yet here he was—

He heard shouts outside the chapel. The fleeing churchmen had carried the news. Ironlaw would be warned. The whole Inquisition would be armed against him. Belthar himself would move fast to kill the demons who had killed his son.

"Dav—" He heard Buglet sneeze, heard her plaintive murmur through the smoke. "Take me, Davey!"

She sat on the edge of the altar, tears streaming from her unseeing eyes, holding out her arms. He ran to her, pulled the godsgrace patches off her face and flung them away. She clung to him, sighing in sleepy relief.

Where could he carry her? Where was any refuge? The yellow smoke had begun to lift, but all he could see in the flare of the broken lamps was the sprawled bodies of the dead half-god and the defeated mumen. The castle beyond them was alive with danger—the whole Earth would be the instrument of Belthar's wrath—and he knew no way to safety.

"So afraid—" Her lips moved lightly against his ear. "So glad you came—"

A savage light flashed through the columns, turning the rising smoke to a canopy of fire. He had to duck and cover his eyes. When he could see again, he found a strange day still blazing outside the chapel. Its light came from a terrible cloud rising over the lake. Swelling incredibly, climbing unbelievably, the cloud became a storm of shifting color, slowly fading. It stood where the Redrock jail had been.

Understanding hit him, a shock that rocked him. Quelf had meant to take no chance at all. The Inquisition battlecraft must have been ordered to attack the jail at the instant planned for Buglet's murder.

Now, when Belthar learned that his son was dead, their appalling weaponry would no doubt be turned against the castle. Gazing up at the fading colors of that awful cloud, he longed for the power to leap again—but where?

Belthar ruled the Earth, his Inquisition an efficient instrument. His brother gods and sister goddesses, no more anxious to be supplanted, reigned with equal power over every discovered planet fit for settlement. Of all the worlds Davey knew about, that left only Andoranda Five.

No god had ever claimed that place of exile. No god could see or sense it from Earth, or reach it save by the long and difficult flight through the shifting loci between universes. No god would want a world that killed all dryland life.

If he knew how, he thought, he would take Buglet to join the premen Zhondra Zhey had ferried there. That was what she had wanted when they surrendered to the Inquisition. For all its grim hostility, it might give them time to grow.

He didn't know how—

But Pipkin had said that he didn't need to be told. It was no understanding of multiversal energies that had brought him here from the jail, but only his unfolding gifts and an urgen-

cy so desperate that he had forgotten what he couldn't do.

Perhaps—his breath caught with the thought—perhaps, if he recalled his image of the terraforming station as he had seen it in that first dazzling vision, if he could escape his crippling sense of impossibility, if he could find confidence enough in their ancestral powers—

He drew Buglet closer, and had to hold his breath against the evil mixture of that stifling bridal scent and the sour reek of godsgrace. She snuggled drowsily against him, with a tiny murmur of pleasure. Desperately, he probed for the abandoned station.

Beyond the columns, that dreadful fire had died. Returning night had swallowed the mushroom cloud. Thunder had begun to rumble. Something jolted the marble floor. A cold gust of dusty wind blew through the columns. Ignoring everything, he clung to his image of Andoranda Five.

The loom of that bare granite knob against the yellow sky. The red mudplain in the river bend and the lines of lifeless orange dunes. The huddle of rusting huts. the narrow shuttle strip, the drifts of dirty snow. An ugly place perhaps, but kinder than the gods—

The chapel quivered to a stronger shock. Toppling masonry crashed. He heard sharp truman shouts, muffled muman booms, the scream of a low-flying skimmer. A bullet ricocheted through the chapel, its wine reverberating in the dome. Laser lightning flickered. Drumming footfalls drew nearer. There was no escape.

"Davey?" Buglet stirred in sleepy unease. "Is something bad—"

He strove with all his will to sweep them out of the chapel, to carry them across the complex multiverse to that wind-carved rock. But stark impossibility stopped him. He didn't know how to make such a leap. Nobody did. Not even the greatest god could reach Andoranda without a ship. After all, no frog could fly—

A brazen bong rang through the chapel and echoed from the vault. Beyond the red altar, the tall crystal cylinder was dissolving into glittering mist. That bright fog swiftly faded to reveal Belthar's gigantic image, glaring through the red-streaked wrath of his nimbus.

"Demons!" His voice was wild thunder. "So here you are—"

Suddenly, Belthar was gone.

Night and smoke and chapel dome were gone. The open sky was a yellow blaze, blinding for a moment. The wind felt cold and smelled of bitter dust. Davey stumbled with Buglet in his arms and had to scramble to get his balance on the sand-scoured rock. Below them, banked with drifted snow, he found the rust-reddened huts of the terraforming station.

"Davey?" She clung to him, her drowsiness disturbed. "Is anything bad?"

"We're all right." He held her close, whispering. "We've escaped the Inquisition and outrun Belthar. We're here with our own folk, where the gods may never find us." ■

In the Wilderness

Lies are a form of communication.

Jack L. Chalker

It is not everyday that the demon hordes of hell materialize in your backyard.

It took the Watch Officer a few seconds to comprehend his vision; great ships, huge and black against the darkness of the universe, yet sharp and clear to the watchman through his augmented senses.

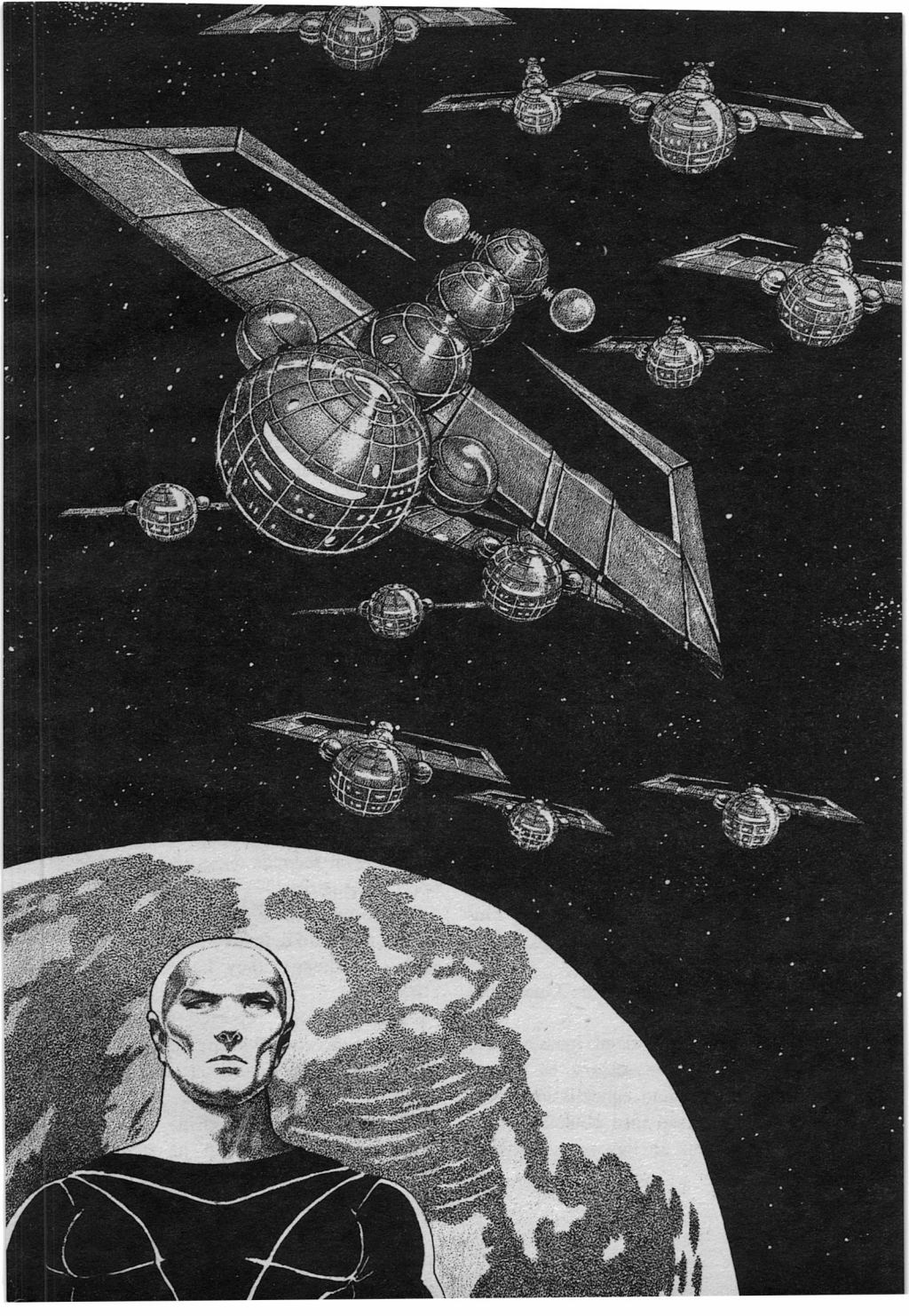
They were Guara ships—thousands of them, perhaps their whole main fleet, winking in suddenly along almost two parsecs of sky, globules of metal framed by two enormous, stylized "wings" like those of a monstrous, frozen gull, curving around and almost, but not quite, touching the main body of the ship again at their tips.

The Watch Officer did not need to sound an alarm; he and several others were cybernetically linked to their control ships, and could communicate in real space at the speed of thought.

The little timer by the right hand of his comatose, helmeted body clicked and set in both modes. Within less than one minute the initial interceptor squadron was away; within two minutes nine squadrons totaling over five hundred ships were out in pursuit.

The Watch Officer felt control switch from his own com to that of a

JANET AULISIO



flag officer; now he launched his own squadron.

No person on the intercept ships allowed himself the luxury of spurious thoughts; the cybernetic link provided pinpoint concentration on but the single objective of destroying the enemy.

And yet, deep down in that unreachable recess of every thinking person was a single thought: *At last! The Guara have decided to fight at last!* Even this was tempered by a realization that swept away the anticipation, for the main fleet was on leave and undermanned. Mobilization would be impossible in the subjective time of the battle.

The Guara outnumbered the defenders fifteen to one.

Both sides used different methods to power their ships, yet both types involved inducing negative half-spins in their tachyonic drives. In effect, real time was slowed, even reversed, although usually only for a few seconds under full power. Time negated distance, but it meant fighting on a multitude of different temporal levels separated by milliseconds. Fleets on the defender's side were controlled by crews cybernetically amplified and linked to their ships, and to each other.

Nobody knew how the Guara did it.

But when fleet-sized masses were moved, it was necessary to spread them out to avoid cancellation when the ships phased into objective time, and there was an inconstant braking factor. Fleets tended to come out scrambled up and spread all over creation, like the Guara had; in the precious few minutes of objective time it took them to regroup, they were vulnerable.

A star-shaped unit of nine ships, surrounding the controlling officer's com ship in its center, broke off and started after two isolated Guara vessels that had materialized nearby only moments before.

Bolts of searing energy, visible only to the people on the ships, lashed out at the two black gulls, and struck full amidships. The captains of the invaders applied full power, and both vanished.

Suddenly, it was over—just like that.

The first strike had told the Guara force where they were, and they hadn't even waited to see what was hitting them.

The entire Guara fleet had done a scatter run.

"No use chasin' them," the field officer commented, a trace of disappointment in his mental tone. "They have several seconds on us in lag and speed. Casualties?"

There were none. Not one of the Guara ships had defended itself. Faced with a challenge, they had run—as always.

"Energy trail!" reported the com from the one unit to get in a strike at the enemy. "We got one—maybe both!"

The field officer trained his sophisticated tracking devices in the area of

the strike and saw it.

Almost anyone, even with the best sensors, could have missed it, *should* have missed it—but the unit com had *felt* the hit with the intuition that only a veteran combat pilot could have. He'd searched for it—and found it.

A tiny, thin wisp of a trail, as nebulous as a single strand of a spider's web, went off into the deep of space.

Instantly ordering most of the force back to station in case the black ships realized their folly and returned, the field officer took one squadron spearheaded by the strike unit and started to follow the already dissipating trail.

Several times in the lengthy track they lost it, but had enough regression time to recapture the wisp and proceed at flank to where it was stronger.

After a great distance, it became easier to track. Whatever had been hit had been hit bad. The pilot was good; he—or it—was holding the engines together with spit and prayer.

There was a sudden, localized energy burst, and the squadron emerged into normal space-time.

An aged red dwarf glowed dimly, far off. The nova, perhaps a million years before, must have been spectacular; the star's collapse had also torn its solar system apart. And yet, circling the eerily glowing center, were that system's remains: millions, perhaps billions of chunks of matter, from microscopic size to over a thousand kilometers in diameter, continued their vigilant orbits around their diminished but still supreme master.

The strike unit broke off, heading for the medium-sized chunk of matter about three hundred kilometers in irregular, jagged diameter.

The one with the spot that glowed on their sensor plates.

The nine ships edged ever closer, until they were only a few thousand kilometers from the planetoid.

Suddenly the tiny energy spark below flickered, changed hues, and reached out at them.

The nine ships vanished, and the energy arm that clutched and crushed them withdrew.

The field officer's fury was so strong that it almost, but not quite, broke the programmed controls. He wanted to bomb the son of a bitch into a nebulous mass.

Instead, he pulled back his forces to the minimum distance experience and his computers felt was safe, and ordered a photo probe.

A jagged, craggy landscape, reminding the observers of microscopic views of rust crystals, passed slowly before them. Eerie pinnacles, weird spires and twisted shapes of deep red and dull gold forever in deep shadow showed the little world's ugly sterility.

"We're coming up on it in a moment," a deep voice commented in the darkness of the viewing room. "There! See?"

Suddenly there was a blinding flash that obscured all vision, yet it radiated from a sparkling, seemingly solid core of energy that was curiously shining

and alive. Then, just as suddenly, it was gone, replaced with more of the reddish landscape.

The screen flickered, and the approach was repeated from just before the appearance of the brightness. This time it was frame-by-frame, very slow and methodical. The glare started, but didn't quite overtake the view. They blew it up, focused it, played with its spectrum and microdot composition, trying to clear it.

"Look how the terrain's torn up," a voice commented. "The ship came in hard and fast. It's incredible that he survived—I'm pretty sure none of us would have."

"He's still alive, all right, or a machine," the first voice responded. "And he's got teeth." The tone turned bitter. "Thirty-two lost."

The picture changed again, the computer playing now with the shot of the exact center of the energy burst, toning, warping, shielding and filtering the picture, focusing on the living brightness in the center of the mass.

A fuzzy shape, the best that could be done, emerged. It was a Guara ship, all right—flickering, indistinct, but unmistakable—one of its strange curved "wings" had been clipped off, the other twisted. Part of the bow seemed crumpled and distorted.

The second man sighed and flipped off the wall-sized picture. The lights flickered and winked on.

It was an odd assortment that sat in the room; a collection of three dozen different life forms with shapes ranging from centauroid to anthropomorphic. Many others, unable to share the biosphere the others mutually tolerated, watched on remotes.

This was the Board of Advisors, a collection of dominant races who were still struggling to pick up the pieces from the great civil war less than a dozen years before.

"So one is down at last," came a voice from what looked like a huge, tentacled housefly, amplified and translated by devices hidden in the walls and transmitted to each member's hearing-piece. "Now what do we do?"

At the head of the table sat a Terran; his body was young and muscular, yet he had short-cropped white hair and a hook for a left hand.

And the oldest eyes of anyone in the room.

"I needn't tell you that the Guara is the greatest threat to reconstruction we have faced—and perhaps the greatest threat to us all in our history, not excepting the late war," he said gravely.

"Why not just let it be?" a creature that resembled a four-legged turnip asked. "It can't get off, and we can't get to it without losing people. Besides, doing nothing further to provoke it might show our peaceful intent and nature."

"Do *nothing?"* roared the Terran, emotionally upset. *"Provoke* it? What the *hell* do you mean by that—no, don't bother with the translation! How can you suggest such a course?"

"We have over eleven hundred worlds wrecked and ruined in the late

war," the creature reminded him. "Our reconstruction will take centuries as it is."

Paul Carleton Savage, the Terran Chairman, stood up and faced them all. "And *I* have four dead planets," he snarled. "Dead. About thirty billion people gone. Two of them among the gentlest, most peaceful people this galaxy has ever produced. Killed. Wiped out in a single, concentrated attack—a few minutes, no more. A few more of those and we'll equal the casualty rate of the entire Civil War! And by who? A mysterious group who's never communicated with us, never given any motivation, never even shown its face. Only one word—one word from Grumiad as they were igniting its atmosphere. One scream from the victims we can't even translate—'Guara'!"

"But they are not totally destructive," a satyrlike creature noted. "Eleven other planets received sudden visits, too. Telikial—its dehydration miraculously reversed. Basiodl—the depleted ozone reinstated in moments, beyond our wildest technology. These people think the Guara are gods!"

A creature that resembled a great grizzly bear raised its head. Being telepathic, it needed no translator.

"One moment!" the bear called forcefully into the shouting match. "It seems that both of you are talking of the same things. What we have here is not a friend, not an enemy, but something alien. No matter how strange we are in form, no matter how wildly different our worlds and cultures, there is a basic commonality among us. We are the products of a consistent evolution that, when stripped of physical and cultural differences, reveals basic similarities in our deepest natures. That is how we can assemble here.

"But for the Guara we have none—their actions are apparently psychopathic, motiveless. Great power applied in what seems to be a random, capricious manner. And yet, races that build such ships as theirs and possess technological skills far in advance of any of ours, don't act randomly. What we are operating from is a lack of knowledge—of knowing who and what they are, where they're from, and why they're here doing what they are doing. We need *facts,* not guesses. I don't want my world to be the next one they decide to eliminate—nor yours, either. I want to *know,* now, while I can still do something."

Savage nodded. "That's really it. This is our first opportunity to learn something about them, to perhaps contact them, to begin to understand them."

"Perhaps if we hadn't attacked them we'd already know," the turnip chided. "Our first face-to-face meeting, and we fired on them!"

"Beside the point," the bear responded brusquely. "We *did* shoot, and the situation is as it is and that's that. Savage, how *do* you think this should be handled? After all, it zapped our ships."

"But not our photo probe," Savage pointed out. "Warships—no. But a small ship, a single passenger, a single

landing. One to one. And wired, of course."

They were all silent for a few moments, digesting the idea, imagining themselves down there, on that jagged speck, alone with the unknown. Finally it was the pacifistic turnip that broke the silence.

"Where in the vast galaxy are you going to get someone dumb enough to volunteer for *that*?" it asked.

Following is the official edited transcript of Project Shepherd. The actual elapsed time was 37 hours, 22 minutes, 13 seconds to EOM. The mikes ran continuously for this period, and involve a great deal of technical and routine commentary as well as the expected random comments and long silences, and only those parts directly bearing on the subject Mandeus and the mission are included here. Tapes and complete transcripts are available through the Exchange. All commentary is as recorded via relay at the Base Station, established in stationary orbit approximately sixty million kilometers from the target asteroid, this being about ten million kilometers beyond the minimum known safety range from Guara surface weapons. For annotations, and interpolations see Board Minutes PS-345762397, 399, 412, and 436.

MANDEUS: . . . Forty thousand and closing. No sign of any actions toward me or the ship as yet. . . . Thirty-five thousand. Looks like a tiny blood clot on the screens; still too far to see it without aid. Thirty thousand. God! That's a weird looking place! Twenty-five. Systems look green and no sign I'm noticed. Twenty. There go the brakes. Readout looks fine here. Fifteen thousand. Doesn't seem any slower but I know it must be. Yes, the dials are starting to become reasonable. Ten thousand. It really *is* a tiny speck—I guess I'll be on it before I see it without magnification. Sure this thing's there? . . . Seven thousand. Sure is dark out there—a dead place to die—no, hell, that doesn't make any sense, but what does? . . . Five thousand. The galaxy's asshole. . . . Nothing there but the dark. *Whump!* Little bumpy here, I guess we must be gliding in. What a nightmarish place. The Guara sure can pick them. Wonder if they think this is a resort? . . . One thousand and I still can't see the damned thing. Oh, yes . . . wait a minute. Little nothing about like the head of a pin.

SAVAGE: How's my transmission to you? You're coming in beautifully here.

MANDEUS: Perfect. Wow! Just got a flash like somebody shined a light in the nose camera! That must be our baby.

SAVAGE: Our video signal's getting strong interference. I don't like it. Doesn't show up on audio, though.

MANDEUS: Cheerful thought. Maybe I'm expected. *Whups!* I've been talking too much. The thing's huge out there now, distance . . . let's see . . . *fifteen* kilometers! Looks even uglier

up close, but the shadows and dim light make it even worse. Good setting for a ghost story. Making the swing. How's the picture now? I'm trying to straighten it out.

SAVAGE: Real bad, but forget the adjustments now. I want to know what you're seeing. The energy field shouldn't cloud your direct sight.

MANDEUS: Coming up on it. Funny—it really *does* put out a golden glow. Just over the next range. Here we go—*ow! Ah!* The hell with your theories! It was just like looking directly into a star! Damn near burned my eyeballs out!

SAVAGE: It burned our cameras, anyway. Any permanent damage to you?

MANDEUS: No, no. Things are starting to come back in now, eyes readjusting. I see from the screens it's the same story. Burned out. Think the old boy did it deliberately?

SAVAGE: Remains to be seen. We're putting you down about fifteen hundred meters southeast of him, so that mountain range as you call it will be in the way. All sensors except vision are perfectly normal—interesting. Should have at least generated static or pulses. I'd have to guess he knows you're there and did it deliberately because he knows *I'm* here. You're the eyes of the project now, boy! Make it count!

MANDEUS: Here we go. . . . Into the valley of death and all that. *Umph!* A rotten touchdown, damn near jarred my teeth out. Here, I'm going to undo the straps. Any visuals yet? How about the internal cameras? *They* should be working. See me?

SAVAGE: Negative. They're all out. Apparently the damage is to the antenna or relay amplifier. I don't like this. You'll have to be our eyes now. Just remember we're blind when you see something.

MANDEUS: (*sighs*). I'm not sure I like this, makes me feel even more alone than ever. I wonder what he doesn't want you to see?

SAVAGE: Just remember that *you* will see it! That may have sinister implications.

MANDEUS: I'll remember. Doesn't matter much, does it? (*grimly*) You and I both know why I'm the one that's down here.

SAVAGE: Now stop that! I want you back alive! If you dwell on that sort of thing you won't be any good to any-

body. We've been over this ground before.

MANDEUS: All right, all right, mother. Let me straighten up the housekeeping here. A lot of stuff got banged up all over the place when we landed hard. *Humph!* No gravity to speak of—that's to be expected, of course. Speck like this wouldn't have much anyway. Just lightly tossed a pencil and at the rate it's going it'll hit the floor in about a day and a half. I'm going to have to be careful of quick motions.

SAVAGE: Just be careful, period. The fact that you're there is important—it means that he didn't want to zap you. He's almost certainly got our number and is listening in. If so, he knows you're unarmed, alone, and that we only want to talk.

MANDEUS: I'm sure he's a bright enough boy for you not to have to draw pictures. So now we wait, I guess. How long?

SAVAGE: Give him some time. Right now it looks like he's running the show. If we don't get anything from him in a day or so, you'll have to go calling on him

MANDEUS: Well, it's been some time now. What's the old saying? Minutes creep like hours or something. I keep looking out at the dead landscape, and the more time I do the more I start dwelling on the dead. Funny. You'd think I could look back on it more dispassionately now, but I can't.

What did the last dodo bird think about?

Other dodo birds, of course. . . .

Hell, I'm not an explorer, an adventurer. I'm a perfume salesman. How and why did I get here, doing this? . . .

. . . No change in that glow. Damn! Almost a full day now, and this little chunk is haunted with ghosts. There's five billion ghosts staring at that glow with me. I can feel them, feel their presence, feel them asking what I ask, pleading for the answer we crave.

Why?

Do any of you up there *really* know what it is to be lonely? Can you imagine yourself in a zoo, among nothing but alien life forms, seeing nothing familiar? Can you understand what it's like to know it'll always be that way? That your home's a burnt-out cinder, that not only your world and your civilization but your *kind* is gone?

Oh, we think similarly, most of us. If your race pulls itself up from the slime it shares a kinship with all others who do the same. Universal constants, I guess. 'Nobody's *really* alien,' those glib psychologists tell you. But that's even worse—a disembodied spirit, still roaming the worlds, witnessing happiness it cannot share, seeing love it cannot join, watching children that can never be his children. . . .

. . . . The glow has changed. I can't really describe it, but the color's different, and the intensity. I wonder if it really is the power pile? Maybe they're over there making repairs. Welding torches? Maybe they're building something. . . .

. . . What universal constants do we share with them, I wonder? A body, certainly—they use ships. But—*inside*? What sort of thing could do what they did and have a reason? Is their whole race insane? I swear I can hear Jewell and the twins behind me. More ghosts. . . . Sad ghosts? They seem to be pleading. . . . Why? Why? . . . .

Oh, my God! If they don't come soon I shall have to go ask them. I shall have to look them in the eye or whatever they have and scream it at them. Why? Why did you do such wonderful things for all those planets, some of whom are violent, nasty people? Why did you choose my people to murder? We who outgrew war, tamed our world, lived in happiness without hurting ourselves or others? What harm could we have done? Whom did we wrong? [*A crashing sound*]. Why? God damn you to all nine Hells, *why?* . . . .

. . . I'm going out there. It's been almost forty standard hours, and if I don't get out there I'll kill myself. Might as well go over and scream that they have to complete the set—they missed one who was off-planet. One without the guts to join his friends. . . . I'm suiting up. Looks like a nice day for a walk. . . .

. . . Pressure down to zero. Lock clear. All secure. I'm pressing the outer lock control now. There she goes! Lord! This crummy speck looks even worse in person!

. . . Grainy red dust all over. I'll have to walk through a mound of it kicked up by the landing. Seems to be about thirty centimeters deep. I'm in almost to my knee. This'll be tough going. Say, now! That's interesting. I haven't been as ignored as I thought! There are some tracks out here!

SAVAGE: What sort of tracks?

MANDEUS: Looks kind of like a three-runner sled. Long, continuous grooves, very thin and evenly spaced. They sunk all the way in but didn't churn up any dust. Almost like the thing was built for this little pisshole. Wonder why I didn't see them? Are the bastards invisible?

Well, I—what the hell? I've got a suit malfunction! Pressure's going down very slowly!

SAVAGE: Get back in the ship quickly! We're too close to end it like this. There's patching material and such to build a whole new suit in there if we need to.

MANDEUS: Funny. . . . Checked everything. Well, I'm already back in. Door closed, pressure starting to go up. I'll match it to the suit and then remove the thing. Hmmm. . . . Wonder if I'm not permitted to go out? What if I were to try a takeoff right now? How close are they?

. . . Looking out the window here, and I can't see the tracks. Guess the angle's wrong. If they were reddish and low to the ground they could be zipping all around and I wouldn't hear them. [*loud thump*].

My God! Something's at the airlock!

VOICE: Man! [*The voice is a deep baritone, but sounds strangely altered, as*

if dozens of identically-voiced men were speaking at the same time. It is vocal, not telepathic—the microphone picked it up, and it records.]

VOICE: [*again, same patient tone*]: Man!

MANDEUS [*nervously*]: I am here. Can you hear me? Are you the Guara?

VOICE: I am of the Guara. As such I answer to the need.

MANDEUS: You—you what to the who? I don't understand.

VOICE: You have an injury to the soul. I must minister to that need.

MANDEUS: You are a missionary?

VOICE: I am a physician.

[*Long pause, no sound except automated equipment*].

MANDEUS: A physician? How can this be? Did we, then, shoot down a hospital ship?

VOICE: We are all physicians. It is our purpose and our mission. It is our destiny. We minister to those in need.

MANDEUS [*bitterly*]: You kill.

VOICE: We save.

MANDEUS: Then why do you destroy whole worlds? Why?

VOICE: We must maintain the order and the balance. We are mandated to provide to those seekers who require, to cure those diseases which you might not even recognize as such.

MANDEUS: Do you cure by mass murder? Surely those you cure in such a manner are cured indeed!

VOICE: We cleanse. Pretenders must be removed lest their cancer spread and infect the whole of the social body. Only disease is excised, so the whole may grow. As physicians, we must ethically remove the disease.

MANDEUS [*highly emotional*]: But you have destroyed whole civilizations! Billions of innocents! My own . . . [*sobs*].

VOICE: Is a virus guilty? It seeks only to feed, to reproduce. Is there evil intent in the cell of the body that malfunctions and grows cancerously throughout the system? Are such terms as good and evil relevant in such a case? We do not presume to judge. We diagnose. As for your own people—I recall them not, yet there are so many, our operations so far-flung, that it is not impossible that I overlooked it. Still, I must confess, it puzzles me greatly, as I can detect no abnormality within your mind. You require service, not surgery. I confess to being too lowly for such decisions, yet you I must aid, for you are suffering. What is done may be undone. All that is done is yet to be done. I shall help—and, if possible, should I survive this ordeal, plead your greater cause, as what I can do on my own, with my damaged equipment, is unhappily limited.

MANDEUS [*incredulous*]: You can—you can restore my people?

VOICE: As I say, my own powers are quite limited. Yet does not she whom you love live yet within you? Can I not restore at least what was yours alone to you?

MANDEUS: What? Wha—?

VOICE [*fading away*]: Will you be my prophet when I come? Will you bear witness to the others? Shall you give

testimony that our cause is to the greater good? [*The voice is far away now, and fades. There are only echoes of its eerie tones*].

SAVAGE: Mandeus?

MANDEUS [*distantly*]: Yes?

SAVAGE: Was it there or some sort of projection?

MANDEUS: I can't tell. There was definitely something attached to the airlock. That's obviously how the voice came through.

SAVAGE: Check the windows, man! See what you can see! Quickly!

MANDEUS: Yes, of course, you're right—oh! My God!

SAVAGE [*anxiously*]: What is it? Can you see it?

MANDEUS: Savage! The scene's changed! Either I have been moved, or it has changed things! You—I can't believe it! I must be mad! I must be insane, or dead! My God!

SAVAGE: You're still where you were. What do you see? Damn this vision blackout!

MANDEUS: It's—it's like home, Savage! Rich, green foliage native to my own world, just as I remember it! Bright flowers of purple and gold, swaying in a soft breeze! And—a path! A path of rough stones! I cut and hauled those stones, Savage! It is my own land that I see! I must go out to it!

SAVAGE: Your suit's broken! Don't go out there! It's creating the illusion to get at you!

MANDEUS: The hell with you! If it's illusion, it's the way I want to die! It got our ships, anyway. It could get me easier in a thousand ways. As for my suit—I shall not need it. I'm going out. [*An alarm rings. Mandeus has pressed the inner lock switch without depressurization. A second alarm as he presses the outer lock switch. There is a humming sound as the door slides open.*]

SAVAGE: Mandeus!

MANDEUS: I'm here! There's air! It *is* my home, Savage! I'm going up that path! My house—my family—lies at the other end.

SAVAGE: Keep talking! Tell us what you see!

MANDEUS: There it is! The house! And—in the courtyard. . . . [*voice breaks*]. The children! My precious Jewell! [*Shouts*] Jewell! My love! She hears—she turns joyfully! She—my God! What's wrong? That look on her face! The children, screaming, running away. No, no, don't! Come back! It is Mandeus! Jewell! Do not recoil! I—I . . . What in God's name is wrong here? There's a noise behind me! The Guara! I—Oh, my God! I remember! *I know!* It's—

There was a sound like none of the listeners could ever imagine, a feeling of immense pain and sadness that went through them, though it had no substance. It reached out to them in its agony from that tiny little asteroid, reached out to their distances and rolled past, until it was lost to space.

Savage and the others sat stunned for a few moments. Suddenly the Terran said, "We're going down."

Slugodium, the science officer,

shook its massive, elephantine body from its stupor. "Big energy flare-up, two locations," it reported. "Whatever was giving off those Guara radiations just exploded."

"Let's go!" Savage urged.

They approached cautiously, and all nine members of the monitor team breathed collective sighs of relief when they passed the point where the fighters had been blown apart. Quickly now they neared the dark planetoid.

A brief survey showed that the area of intense radiation was now just that—a bubbling, seething mass without form or substance. They held their breaths again as they slowly came over the jagged outcropping Mandeus called a mountain, and saw the area around the ship.

"Oh, by the gods!" someone swore.

The land, for two or three square kilometers around the ship, was as Mandeus had described. It was green, lush, even close in to the little survey ship whose shiny, rounded nose stuck out from the center of the growth. There was a shimmery bubble of atmosphere around the area which offered no resistance to their landing.

The atmosphere, although a bit rich in oxygen for what the oddest of them were used to, was pronounced fit to breathe, and there was no trace of airborne microorganisms.

They grabbed pistols and disembarked.

The air temperature was about 26°C, and somewhat humid.

Savage shook his head in awe and wonder. "This powerful!" he muttered over and over to himself. "My god! This powerful!"

Slugodium kept looking around. "Stable, too. Incredible. It outlasted its makers. Where does the light come from, I wonder? Phosphorous in the upper air bubble? But, then, where's the heat from?"

A young communications specialist who looked like a tiny, red-furred cross between a monkey and a fox, commented, "If this is what one could do with damaged equipment, no wonder the whole bunch can change a planet! They should be able to create one!"

Savage nodded grimly. "I think they can. Remember, this one said that Mandeus's world could be rebuilt."

"Over here!" Slugodium called urgently. "This burnt-out area! Look!"

They hurried over. The blast had been intense. There was little left of anything.

"Damn!" Slugodium muttered to himself. "Used too much tititherite."

"Can you get anything?" Savage asked.

"Oh, probably, with months of lab work," the science officer replied. "I had no idea that the two would be practically together when and if Mandeus blew himself up. I erred on the side of too much explosive—better, I thought, to overdo than underdo."

"Don't blame yourself," Savage consoled. "You were right. We never expected anything like this. Obviously

when the wife-simulacrum saw Mandeus and recoiled in horror, the truth hit him and he turned and ran straight into the thing. With his dreams restored, then abruptly and absolutely snatched from him, it was the only thing left to do."

"Well," interjected Goreath, the psychologist, "at least we know a lot more about them now."

"Do we?" Savage retorted, eyebrows up in surprise, a humorless grin on his face. "Do we, really? Physicians? To what? For what? Why do they destroy those worlds? Do we truly understand anything?"

Goreath nodded grimly. "Of course. Imagine being able to do all this—and be able to die. It must be horrible, much more so than for us. They must live in constant terror. Imagine such godlike power—and mortality. I suspect it's behind everything they do."

Savage shrugged. "At least it explains why they never fight."

They continued on the path, and reached the house.

They stopped short. Fear crept through them, and Savage felt it most of all.

"Lord!" he breathed. "We forgot about that!"

Huddling behind a far wall of the courtyard, hunched down, protecting her two children and trembling violently, was Jewell, wife of Mandeus.

Slowly, Savage walked toward them. "Don't be afraid," he said gently. "You've had a lot of pain, but it's over now. It's all over. We won't let anyone hurt you again."

The woman trembled slightly, but summoned a reserve of courage and stood up, facing the strange man.

She looked like an incredibly beautiful Terran woman, small but lean and muscular, like a dancer. Auburn hair fell across her exposed breasts, her skin a golden brown, her eyes sparkling like jewels—and down her back two great, frail-looking faery-wings, transparent and folded like a butterfly's. She seemed to stand poised on tiptoe, like a ballet dancer, and looked with a mixture of puzzlement and caution on Paul Carleton Savage.

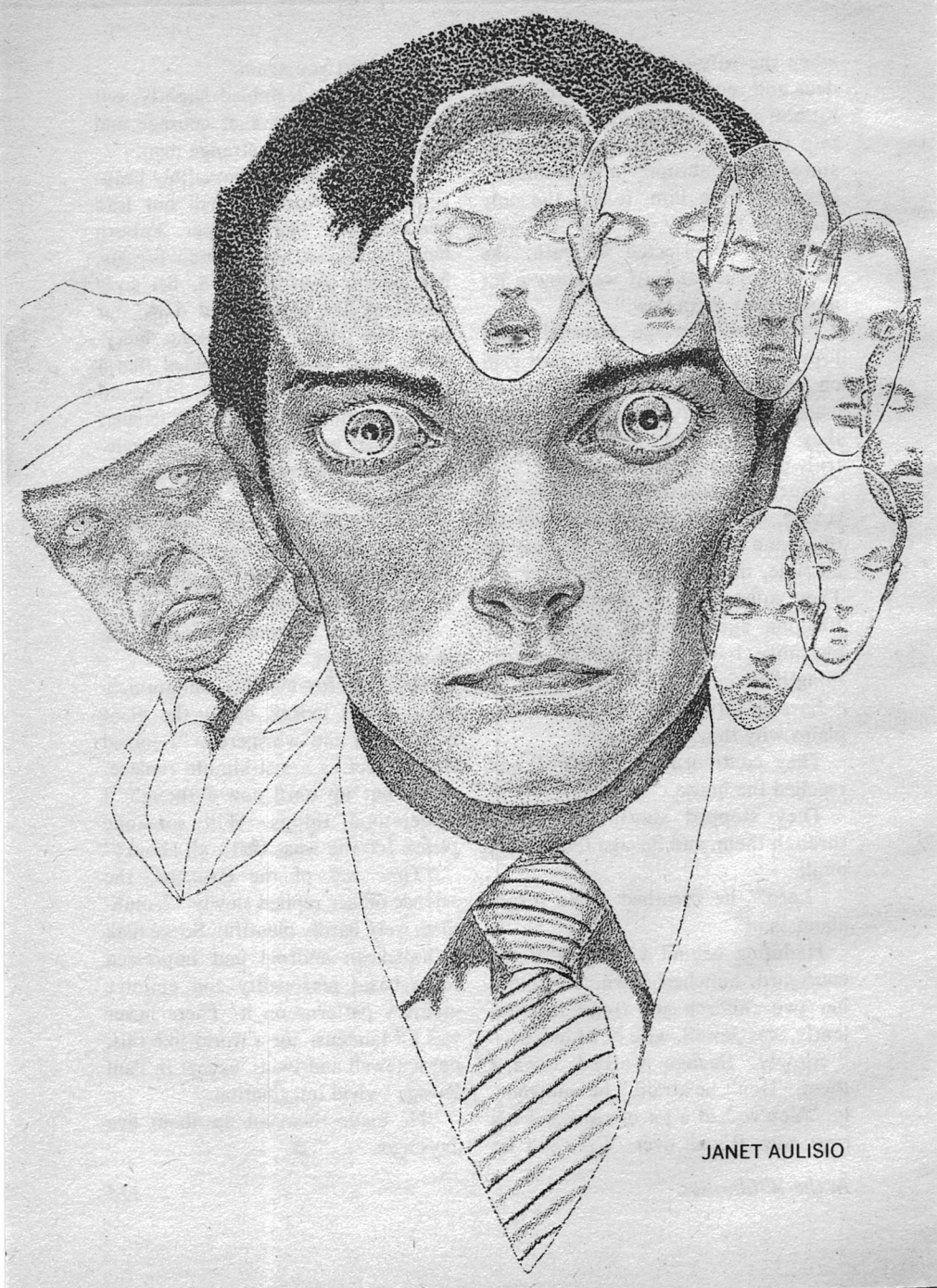
"You are like Mandeus," she said at last, her voice sounding like it was made of musical bells. "And yet you are not of our people."

"Yes, like Mandeus," Savage responded softly.

The little fox-monkey communications officer looked up at the giant Slugodium and whispered, "I joined this project as a last-minute replacement, but up until now I thought I understood things. Will someone please tell me what that's all about?"

"Time was of the essence," the science officer replied slowly. "Volunteers were hardly plentiful. So we took a Valiakean android and impressed some basic personality and emotive memory patterns on it. There never was a Mandeus, nor a world like this, nor a Jewell and twins, except in Paul Savage's vivid imagination.

"He made them all up about five days ago. . . ." ■



JANET AULISIO

bound and nutshell

Charles Sheffield

Telepathy is: (a) an extrasensory power; (b) a technological breakthrough; (c) a new business opportunity; (d) a curse; (e) all of the above.

The books were piled high on the desk and overflowed into a heap on the floor. Merle Walters paused, dropped his shapeless hat onto a chair and picked up one of the books. It was heavy and blue-jacketed, and entitled *Advances In Parapsychology*. He looked in surprise at the secretary, half-hidden behind the piles of volumes.

"What's going on here, Franny? Has Tolly started seances in there?"

"Good morning, Mr. Walters. Go right on in, Mr. Suomi's expecting you."

Walters shrugged and limped through into the inner office. Tolly Suomi, neatly groomed as always, looked up at his entrance and pushed a pile of yellow file cards away from him on the desk. He shook his head, a fraction of an inch left and right, and sat tapping one remaining card held between thumb and forefinger.

"That was quick action, Merle. I thought it might take you a while to break loose after Franny called you."

Merle Walters sat down, favoring his left leg. "Loose, from nothing. There's a special Hell for people put

out to pasture, and I'm in it."

Suomi looked at him keenly, assessing the eyes, complexion, and posture. "Maybe, Merle, but it seems to agree with you. You look a good deal healthier than you did six months ago. Healthy enough for you to get a bit more trouble from me." He leaned back in his chair. "You know, there's another special Hell for company presidents who don't believe the reports they get from their purchasing departments. Merle, what are your views on telepathy?"

Walters looked perplexed. He leaned back also, the fingers of his right hand automatically reaching over in a habitual gesture to massage the shoulder of his empty left sleeve. After a few moments he shook his head.

"Telepathy? It's bunk, Tolly. Now, if you'd asked me that forty years ago, I'd have said it was the most exciting thing in the world. Back when Rhine started his work, I thought there was really something there. Since then, it's gone nowhere. Christ, there's been any amount of talk, lots of horseshit, no real evidence, and nothing for progress. So now, I say it's bunk—or else we've been going about it all wrong. What's it got to do with WAWD Corporation?"

Suomi sighed. "An unfavorable review. That's just about what I thought you'd say. I would have expressed it differently, but after looking at that lot—" He jerked his thumb at the stack of books on the credenza behind him. "—I tend to the same view. I was hoping you might feel otherwise, and persuade me. You see, we've got a problem." He pushed the pile of purchasing file cards toward Walters."What do you do if your head of purchasing comes in and says that the competition is using telepathy on Government surplus buys?"

"Depends who it is. Either you send him to have his head examined, or you send somebody out to the sales with him to get a second opinion."

"Right. You send somebody really solid with him, like Jack Tukey, right? Somebody who has his head screwed on the right way around. I agree, that's exactly what you do. So now take a look at these. Jack's comments are on top, the others are underneath."

Merle Walters rubbed his finger across the bridge of his broad, blunt nose, and scowled. "You're a bastard, Tolly. I should know you better by now. I let you set me up for that. What's the story, then, as you see it?" He leaned forward and pulled the cards toward him. "Is it worth getting my glasses out to read these damned things, or can you summarize for me?"

"Take them away with you and read them over later. They flesh out the details, but I can give you a summary easily enough." Suomi reached across his desk and pushed the intercom button. "Franny, bring me the file on Kirkwood Research, will you?" He looked at Walters. "No, you never heard of them. They are only an eight-man outfit, based in Arlington. Four

years old, privately owned. I've had trouble getting information on them, but I can show you a copy of their 129 for DOD procurements. Maybe I should back up a bit. Did you know the Government has been holding a bunch of simultaneous auctions on the sale of war surplus equipment?"

Walters nodded. "I heard about that through the CBD. Four auctions in four different places. I suppose the idea is to stop price fixing and get better prices. It sounded half-assed to me when I first heard about it."

"Maybe. Anyway, it's not working very well—but not for the reasons you might think. We've been to six of those sales in the past two months, and we've bought a fair amount of surplus electronics equipment. Prices were good—but Jim Spurling noticed that the reps from Kirkwood Research were using a curious bid pattern."

"How do you mean, curious?"

"Well, sometimes they would bid hard, and sometimes they'd start strong and then stop suddenly. When Jim got back here he looked up the complete list of final sales prices, from all four auction centers. He found Kirkwood had a rep at each one, and had bought at all of them."

"Nothing strange in that, Tolly. Didn't you do the same? You get your bargains that way, if you happen to be the only ones interested in making a bid on something."

"Sure we did. That's not the odd part. When Jim analyzed Kirkwood's bidding, he noticed something he couldn't explain. Kirkwood seemed to know exactly what was happening, all the time at *all* the auctions."

"That's hard for me to swallow, Tolly. Why did Jim happen to pick out Kirkwood—why didn't he have his eye on Lectron, or Ajax, or one of the other big specialists in surplus equipment?"

"According to Jim they drew attention to themselves. He sat next to one of the Kirkwood men at the first sale, and at first he thought the man was stoned or sick. He sat there, spaced out, and he only seemed in touch with things about half the time. But he bid exactly right, and he *stopped* bidding—this is the heart of it—when Kirkwood had bought similar equipment, at very good prices, *at one of the other auctions*."

"Was Jim able to compare the times at each sale?"

"He tried to, afterwards, and he decided that it had to match within a few minutes, at the most. You see the pattern? A buy in one place, a stopped bid everywhere else consistently."

"How about two-way radios? That would do it."

"That was Jack Tukey's first thought, when he took a look at what Jim had found. Two-way radios are banned at the auctions, but it seemed like a good guess. Next time, he went to one auction and Jim went to another. They both watched the Kirkwood men, and they swear there was no sign of a radio—not even of something small, like a throat mike. How does it sound, Merle?"

Walters was hunched in his seat,

bald brow furrowed and eyes far away. "Interesting. And fishy. But not tied down. How close were those times you talked about?"

"Jim Spurling and Jack synchronized watches before the sales and compared notes afterwards. Kirkwood stopped bidding at each auction *exactly* when they had bought what they wanted at one of the others—only then.

"There's one other thing, Merle. Jim claims that it's not just telepathy—there are other mysteries, too."

Walters grimaced. "One thing at a time, Tolly. Did Jim or Jack get a good look at several different Kirkwood reps?"

"Yes. They all have the same, spaced-out expression, and they all seem to cut in and out—like turning themselves on and off."

"That doesn't mean supernatural powers, Tolly."

"No, but how about this, then. Some of the auctioned equipment was made up into mixed lots. The Government does it to get rid of some of the junky stuff."

"I've been through that. To get one or two things that you really want, you have to buy a great random mass of stuff, sometimes."

"So everybody sat there with their pocket calculators, trying to estimate the value of the mixture of items on the block, and it can get very hairy, because you need to know the quantity and value of each item, and some of the lots aren't advertised in advance. The Kirkwood reps didn't have any calculators."

"But they bought anyway?"

"Right. They just sat there, bidding as though they were half-asleep—or not bidding, when it suited them. Jim went over the lists afterwards, and calculated how well Kirkwood had done. In every case, even on the most complex mixed lots, they bid only on the right side of the value. You see what that means?"

"Supermen. Lightning calculators, as well as telepaths. I don't like that one either, Tolly." Walters drummed his fingers on the desk top and stared at the Flower of Repose hanging behind Suomi. "Mind you, I've not heard anything yet that suggests this whole thing is hurting WAWD's business."

"True enough. We're still doing all right. But I'm getting awfully curious, and you suggested you've been going to seed, away from the office. Jack's up to his neck in other things, and I feel there must be—at the least—a valuable business angle."

"And at a maximum, Tolly, we've been replaced by the successor to Homo sapiens."

"Now you're getting a bit too fancy for my taste. But I wondered if you, as President Emeritus and Special Consultant to WAWD, would like to have a look and tell us what's going on."

"You couldn't stop me, Tolly. Is there a bit of hurt ego in it for you, too? I know you can't stand to have anybody get ahead of you on a business deal."

"Maybe there is, Merle. Getting one-upped by you last year was bad

enough. One more thing for you, before you run out of here."

"Final customers? I've been wondering what an eight-man company would be doing with a mass of equipment."

"That's right, Merle. We've been talking all the time about the Kirkwood people, but Kirkwood Research has an agreement with Lectron. Kirkwood handles all the surplus auction work, and sells it to Lectron for a fixed percentage commission. Lectron must be delighted with the results—they've saved millions in the past few months."

Merle Walters levered himself to his feet and picked up the pile of purchasing record cards. "Let me take these away and sleep on the whole thing. I'll drop in on Jack Tukey on the way out and get his comments. See you tomorrow, Tolly. You're a damned nuisance, you know. My evening's going to be ruined."

He limped out. Suomi smiled slightly—a fraction of an inch elevation of the corners of his mouth. Was it imagination, or was there a little more spring in the old man's step than when he arrived?

"I want to see it for myself, Tolly. And I want to have a bit of equipment made up for me by the machine shop."

"Fine. Keep it as cheap as you can, Merle. Though I know you'll do that by natural instinct. What is it you need?"

"A tunable detector. I still have great faith in the electromagnetic spectrum, and I haven't given up on the idea of two-way radios. I want a detector that will let me run over a big range of frequencies, from about five hundred kilohertz right up to a couple of hundred megahertz. I want to be able to test for signals in the range from AM up to UHF, so I cover all the usual radio and TV frequencies. I want it strongly directional, so I can point it at the Kirkwood men. I want it small enough to fit in my briefcase; and I want it with controls that I can operate from outside the briefcase, including the displays of the received signals."

"Made of solid gold, I suppose. Anything else?"

"Yes, one other thing. I want a tape recorder attached to it, so I can record any signals that I come across. And I need it in time for the next auction, on the seventeenth."

"That's a couple of thousand dollars, throwing in labor and overhead."

"I estimated seventeen hundred. Put it on your R&D budget, or knock it off my consulting fees. Now, one final thing, I read the poop that Franny gave me about Kirkwood, but it's not very good. Can you get Vince to put feelers out through the sales staff, and see who knows Kirkwood himself? Where he came from, what he's like. I might need to meet him before we go much further."

"Consider it done. You know Vince, he could get the details on the Pope's love life if he spent an hour or

two on the telephone. Who do you want with you at the auction, when the equipment is ready for you?"

"Nobody. Jim Spurling should plan to go to one of the other auction rooms, so we can compare notes afterwards. A week from now, we might know a bit more about this thing."

The nearest auction room to the WAWD offices was a big, echoing old warehouse off Maine Avenue. The bidders present were the usual mix of amateurs, looking for some particular amplifier, light table, or sensor for their own use, and professional buyers, who bought widely and never under any circumstances bid against the amateurs. Merle looked over the group with a practiced eye, separating the sheep from the goats. He moved forward at last and stood about six feet behind the Kirkwood rep. A row of heavy steel pillars running the length of the warehouse and set every twenty feet divided the fifty bidders into four smaller groups. Merle held his briefcase in front of him, switched on and began the frequency sweep as the first lot came up for bid. Twin meters set into the top of the briefcase showed signal strength, direction, and frequency.

The Kirkwood man was standing there in silence, watching the lots as they were produced. Merle began to sweep up the spectrum, beginning at AM frequencies and moving slowly to shorter wavelengths. Each time the receiver showed a significant signal, he turned the briefcase through about thirty degrees. The receiver was strongly directional and it was easy to determine if the man from Kirkwood was the source. It took time. Merle moved steadily through the spectrum, discarding numerous peaks in the power dial indicator when their directionality proved incorrect.

At last, in the CB band, he found a strong peak in the received signal that fell away sharply in strength as he turned the case away from the man standing in front of him. He moved quietly to his left, turned the case, and looked again. The signal direction had turned with him. The Kirkwood rep was the source of a strong signal. Merle noted the frequency, and went on, painstakingly exploring the higher frequencies for more signals. There were no others with the correct dependence on direction. Merle returned to the frequency he had noted, and switched on the tape recorder.

He watched closely. There was no sign of a throat mike, and both of the man's hands were in full view. Apart from occasional bids, always delivered clearly and precisely, the man was motionless. It was easy to see what Jim Spurling had been getting at. There was a distant, unfocused look on the man's face, and his body seemed to stand there wooden and unmoving.

The signals came in bursts. There was about one second of power in every fifteen, then the signal dropped away to zero—or to a level too low to measure. Merle switched detector sensitivity several times, but he still could pick up nothing during the silent peri-

ods, even at the most sensitive setting of the receiver. The power peaks came regularly, whether the Kirkwood rep was bidding or not.

The tape capacity permitted only thirty minutes of continuous recording. When the warning light for tape-end blinked on, Merle switched off and remained watching. The Kirkwood man bought five lots—and broke off bids on three others, almost in mid-word. Unlike the other bidders, hard at work with their calculators, he did not move when a new mixed lot was produced. Finally, although the auction was only two-thirds over, he turned suddenly and walked out of the building. Merle waited for a few seconds, then followed him into the muggy and sweltering August overcast.

The man walked fifty yards along Maine Avenue, climbed into a blue VW with a tall CB aerial, and drove away. Merle, very thoughtful, didn't bother with a cab. Instead, he limped a few blocks to Hogates, for a seafood lunch and a spell of concentrated head work. What he had seen suggested several possibilities, all of them uncomfortably wild.

"Well, there's your analysis, Merle. I hope it tells you more than it tells me."

Tolly Suomi pushed the listings across the desk and looked inquiringly at Walters. A tiny crease in the middle of his smooth, unlined forehead testified to his perplexity. "I don't know if you were expecting English language signals to come off that tape, but the lab hasn't been able to get anything like that."

"I didn't expect any language we'd be able to transcribe." Merle Walters looked at the analysis of the tape recorded signals with every sign of satisfaction. "In fact, after I'd had a couple of martinis at Hogates yesterday, I decided what ought to be on that tape. I'll make a bet that I was right. It's Pulse Code Modulated Signals, and it's all digital, right?"

"That's how it looks to everybody here. It's PCM, Merle, and it proves one thing conclusively: the Kirkwood people have been sending messages from the auctions, just the way that Jim deduced from the bidding patterns."

"Sending, and receiving too, Tolly. I didn't get anything on incoming signals, because we were fine-tuned on direction and I was concentrating on the Kirkwood rep. But I'll bet you we'd have picked up incoming signals on the same frequency if I'd done a thorough 360-degree sweep at the auction. There was a two-way transfer of information going on there, or I'm a Dutchman."

"So it is a system for beating the simultaneous auction system, Merle. And it's a two-way radio system, the way that Jack Tukey suspected. The problem is, how are they doing it?"

"It's more than that, Tolly, a hell of a lot more. I think we're in at the beginning of something tremendous. Not only that, I think we are the only people who really know what's hap-

pening. Did Vince have any luck, getting more background on Kirkwood Research?"

"A fair amount, but not as much as we'd like. Kirkwood—Charles Kirkwood—started it, and owns it. Until last year, they made electronics specialty equipment on a single-shot, sole-source basis for places like the Naval Research Lab and the Defense Intelligence Agency. Recently, they've cut down on that and offered commission services like the one they give to Lectron."

"Good reputation?"

"First-rate, technically. Kirkwood's a bright boy, all right. Biochemistry degree from Stanford, PhD in Information Theory from Princeton, then three years at IBM's Watson Research Center in Yorktown. Fired from there four years ago, then he moved here to set up his own shop in Washington."

"Fired? By IBM? That's unusual if you're really bright, Tolly. What was he doing, screwing his secretary on company time?"

"Worse than that. Moonlighting—for the competition. More facts: Kirkwood Research rents about five thousand square feet over in Arlington, and apparently they have a pretty well-equipped lab."

"How's their financial situation?"

"Solid. According to one of Vince's friends in DCAA, they've had clean audits and they now do about half a million a year. Growth rate has been good, but not spectacular. There seems to be no interest in selling out, or in going public. No problems in cash flow, and their credit around town is excellent."

"Pity Kirkwood Research isn't for sale. But if I'm right, Tolly, we have to try and buy it—even if it means offering ten times what their books would seem to justify.

"Do you think Vince can get me a meeting with Charles Kirkwood himself? It doesn't matter what the official reason is, but it would be much better if it can be arranged through a mutual acquaintance."

"I'm sure he can. Where?"

"At the Kirkwood plant, for preference. But I don't want to do it until I've done a couple of other things in preparation. I need to have another piece of equipment made here, and I need a special simulation done, out in Redondo Beach. I'd like to steal a week of Alex Burns's time, to work on it. It's something different from anything he's tried before, but he should enjoy it."

Suomi sighed. "Merle, if you weren't naturally stingy—and a major stockholder in WAWD—I'd think you were trying to blow the year's profits. Do you need both things done?"

"I'm not sure. I hope I'll only need the simulation, but I want the other equipment to be on the safe side."

"Then what will it cost, Merle? And how much are you saying you want us to offer to buy Kirkwood Research, if it's available? I have to answer to the Board, you know."

"I know. And I know that we

control them between us." Merle Walters leaned forward, his gray eyes alive beneath his bushy brows. "I'll tell you what I think is going on, Tolly. But then if you don't agree with me, and won't back this, I'll go ahead with my own money."

Tolly Suomi looked at him quizzically across the desk. "That important, is it? Merle, I have to go over to Riggs in two hours and talk lines of credit. If you can't persuade me in half that, you've lost your touch."

Franny, coming into the office five minutes after, found the two men deep in conversation and tiptoed out again without speaking. Six months before, Merle Walters had retired, an old and tired man under a death sentence from the doctors. There was certainly no sign of it today, judging from the alert voice and incisive gestures.

The offices and plant of Kirkwood Research occupied a two-story brick building in the unfashionable part of Arlington. Double gates led through an archway in the building to an enclosed stone quadrangle and loading bay. Merle Walters limped through the gates, looking around him curiously. The original building had obviously been intended for a quite different type of business. Perhaps for a repair shop or for outside construction work. The quadrangle was completely enclosed, and once inside there was only one way out, back through the archway. The building had no doors that led onto the main street—a good, tight arrangement for industrial security, but one that probably led to considerable hassles with the Building Inspection Department. No signs of emergency exits.

Five blue VWs were parked in the inner courtyard, each carrying a CB antenna. Two men lounged against one of the automobiles, silent and absorbed. Merle noticed again the dreamy, introspective expressions that had first caught Jim Spurling's attention at the auctions. The men apparently paid no attention to Merle as he walked past them and into the building.

Charles Kirkwood had much the same look, overlaid on an intense, dark countenance. He was thin, quick in movements, and he shook Merle's hand with a nervous, energetic grip. He looked a lot younger than Merle had expected—still in his twenties. If that was true, he must have been something of a prodigy in his grade school and college years. Merle had hoped for a more mature, older man. He thought of the materials in his briefcase, and suspected that one of them had been a waste of time and money. He sat down heavily in the proferred chair, a small coffee table between him and Kirkwood, and kept his briefcase on his knee.

"Vince Menoudakis told me that WAWD would like some work done for you on one of your Navy contracts," began Kirkwood. "We've done a lot of specialist electronics work over the past four years, but we've almost given up on that recently. What's the job? If it's really

advanced and challenging, we might still be interested."

"We need some microminiaturized circuitry—logic and storage. What we need has to have 16K or more bytes of storage, be fully programmable, have a fair number of hardware special functions built in, and still weigh less than half an ounce. Does it sound possible?"

Kirkwood didn't hesitate. "A snip. That's not even state-of-the-art, you can buy it off the shelf. Surely that's not the whole thing?"

"No. We also want a compact telemetry system, one that can interface with the computer, to let it receive and transmit programs and data in real time. That system should only weigh a couple of ounces too, including the power supply. Still think you can do it?"

This time there was a perceptible pause. Kirkwood went into deep concentration for a few seconds. When he emerged from it, his expression was guarded and suspicious.

"Mr. Walters, before we go any further, I'd like to know just what this Navy job of yours is. Who's your customer, and what's the task description?"

Merle lifted his hand. "Let me finish describing it to you. I admit, what we want goes well beyond the scope of our Navy contract—but I sincerely assure you that we do want to buy from you, and we'll pay a hell of a lot to get it."

Charles Kirkwood was frowning, his eyes cold and hostile. Merle felt a strengthening of his first impression. One of the things he had brought with him was going to be useless.

"This is the rest of it," he hurried on. "Here's what we want, and we are willing to pay you five million dollars—in cash—for full rights to it." Merle paused. That had slowed Kirkwood and caught his attention again. Money might be the best lever. "We want all the computer and telemetry capability, just as I described it. But it has to be in a special form. We want it

in the form of an implant, that can be surgically placed inside a man's head, and then activated and interrogated *directly*, by impulses from the central nervous system. Just the way we control our eyes or hands. Now, we know that a primitive input/output system has already been developed, for use in prosthetics. We want something that's a couple of generations beyond that."

Merle paused, measuring his next words. "Mr. Kirkwood, I believe that you have already done all the development that I've mentioned, and carried it beyond experiment, to *operational* form. Now, would you care to discuss my offer?"

Expressions were chasing themselves across Kirkwood's face. Sudden and total introspection, then fury and alarm. Merle looked for greed, but it had been blotted out by other, stronger emotions. He pulled his briefcase a littler closer and placed his hand on a metal boss on top of it.

"Mr. Walters." Kirkwood's voice was cold. "I don't know where you learned all this, or when. But I assure you, I must have that information, and soon."

Merle heard footsteps on the stairs behind him, and turned as three men moved into the room and blocked the doorway.

"You are an old man, Mr. Walters, and you are crippled," Kirkwood went on. "From the look of your complexion, your heart isn't in good shape. I think you should be sensible, and tell me all you know about this. I have no liking for violent methods, and I hope we won't have to use them. Just to avoid any silly idea, I should mention that there are four other men in the courtyard. We are all in total and continuous communication with each other."

Kirkwood's face was pale, and his hands were trembling. Merle turned again to look at the other men and saw no pity or assistance there. At least it made the next step a little less distasteful. With an inward sigh, he turned the metal boss on his briefcase.

There was no sound, and no visible result of his action. Except that suddenly Kirkwood shuddered, raised his hands to his head, and sank blindly to his knees with eyes unfocused and mouth gaping. Behind him, Merle heard scraping and gasping, as the other men groped at the wall, hands held in agony against their heads.

Merle opened his briefcase, took a sealed envelope from it, and placed it on the coffee table in front of him. Unhurriedly, he stood up, picked up his briefcase and walked out of the room, past the blind, immobilized Kirkwood men and on down the stairs. In the courtyard were four others, white-faced and hesitant until Merle came closer to them. Then they too lost all control and held their heads in agony, as Merle passed them and went on across the courtyard. He limped steadily through the archway, heavy shoulders butting through the summer heat, and went on into the street.

The afternoon weather seemed ready to break, and there was a thun-

derstorm on the way. He flagged a cab and rode through the gathering gloom back to WAWD's offices on Wisconsin Avenue. As they drove over Key Bridge, his own mood matched the turbulence of the heavy clouds rolling above him.

He arrived just before the storm broke. There was sheet lightning to the west, over the Potomac, and fat drops of warm rain were spattering the sidewalk as he made his way into the building and took the elevator up to the WAWD office.

Dear Mr. Kirkwood,

Enclosed with this letter you will find a formal offer from WAWD Corporation to acquire the assets, in total, of Kirkwood Research Corporation. I prepared such a document in anticipation of our meeting, and developed this letter in case our discussions were terminated for some reason before I had presented all the relevant factors for your consideration.

Although the formal offer gives full details, I wish to stress two elements of our offer. First, should you accept you will be constrained from working on computerized biological implants, *except* for and on behalf of WAWD Corporation, for a period of seven years. Second, you will be given full and complete facilities to pursue such researches, upon acceptance, within WAWD. We neither wish to inhibit your creativity, nor to minimize the value of the development work you have done in the past four years.

I strongly urge you to accept this offer. If you do, WAWD has a powerful incentive to preserve the secrecy and value of your work. If you do not, we would have no reason to keep the existence of your work a secret. How long would it take Texas Instruments or Hewlett-Packard to catch up with and pass you, given their resources and the information that we could provide to them on the feasibility of programmable implants?

I believe you need a group like us to help you. There are elementary precautions that you should have taken and did not. For example, the cut-out circuit that you used to protect against overload from incoming signals was hopelessly inadequate. I suspect that you are reading this with a splitting headache. I have no doubt you will change the system quickly, but there are many other, less obvious, problems that you will run into as soon as big money gets involved. You have technical ingenuity, but you lack our business know-how. Both ingredients are necessary to realize the business potential of your work.

Finally, do not let prior events influence your decision too much. Business makes strange bedfellows. I am sure we will readily develop a good working relationship should you accept our offer. Since we will undoubtedly need to discuss this further, I suggest that you call me at WAWD Corporation to arrange for the next steps.

Yours sincerely, Merle Walters

"Any reply yet from Kirkwood?"

"Not yet. Give him a few hours, Tolly. He must be feeling as though

his brains have been fried. That signal generator really pushed out a lot of power, and all at the right frequency."

"You think he will take the offer, Merle?"

"When he's had time to think about it. I'm sure he'll try and find a way out for a while. He's not a very likable man—big streak of greed, and quite sneaky. You'll have your hands full if he does accept. I think my letter will make him realize he doesn't have much choice if he wants to see his money dreams come true."

Suomi grimaced a little. "A nice gesture on your part, Merle. You get the tiger to run after you, then stand carefully out of the way so I can tame him. If you had a business motto, it would be something like *'Quaerete Pessimum'*—See the Worst. Then buy it, and work at it until it can show a profit."

"Not a bad motto, at that. All the big advances come out of some kind of trouble—war, or disease, or plain necessity."

Merle was sitting in Tolly Suomi's office, clearly enjoying himself. His gray jacket was off, and a hefty bourbon and soda was sitting in easy reach.

"Anyway Tolly, I really owe you one on this Kirkwood deal. Come on, you might as well admit it. You set me up, didn't you?"

"Set you up, Merle?" Suomi's face, as always, was impassive and unreadable.

"That's right. You didn't tell me that you had been to one of the auctions, *yourself*, after Jack and Jim made their reports. I dug that out of an office memo, when Franny wasn't paying much attention." Merle sipped his drink and let it sit for a second on his tongue. "Now Tolly, I know very well how your mind works. I believe that you had a suspicion that you might be seeing some kind of implanted communication equipment, before you ever called me in. You were getting worried about me, knowing I was feeling useless away from the office. Dying from the top, like a tree, as old Swift put it. So you decided, let's turn the poor old devil on to this. It can't do any harm, and it might be interesting for him." Merle sniffed. "Well, maybe you were right. I do feel a hell of a lot better than I did two weeks ago. Come on Tolly, true or false?"

Suomi gave the imperceptible Tolly smile. "An interesting, if improbable conjecture, Merle. I can swear one thing to you, in all honesty: I never realized where this might lead—and I never, for one moment, considered that you might twist my arm, and the Board's arm, into offering a ridiculously high sum of money for a small, eight-man company doing half a million a year. I still say it was far too much."

"I know you do, Tolly. But I'm right, all the same. You'll see it in the next year, when I convince you what Kirkwood Research *really* is. Even Charles Kirkwood himself doesn't know it, yet. You see—"

He was interrupted by the buzz of the intercom, Franny was on the line. "Mr. Walters, we just had a message from Mr. Kirkwood. He would like to meet with you here tomorrow morning to discuss your letter. I said we'd call back if you couldn't make it."

"That's fine, Franny." Walters turned again to Suomi. "So, it's getting ready to begin, Tolly. I'm telling you, we're in on the ground floor of the most important human development in the last million years."

Suomi raised his eyebrows half a millimeter. "More important than fire, Merle? More important than the printing press, or the wheel?"

"I'll stand by my statement. You see, you've never had the chance to observe the *level* of communication among those people at Kirkwood Research. It's breathtaking—almost terrifying. They all have programmable implants, and built-in telemetry units, and they can swap data with each other—and programs—in real-time, and they can do the same thing with their central computer and central data banks. They do it directly, or over long distances they use the relays they have in the VWs."

"But aren't they still just exchanging numbers and logic sequences, Merle? It sounds to me like hard, slow work—not my idea of rapid information swapping."

"I'm sure it was that to begin with. They had to think in sequences of numbers and instructions, slowly and carefully, just the way we use manual key strokes to operate programmable calculators. But after a while it must get to be an unconscious operation."

Suomi was thoughtful. "You mean, it goes on automatically, the way we adjust the focus of our eyes, or pick up a glass? Help yourself to a refill, by the way. We don't have to think about it, and we can do it at the same time as we do other things."

"I don't really know the details, or how it feels. I do know for a fact that Charles Kirkwood could give detailed instructions to the other men, with a small fraction of his attention, at the same time as he was talking to me. You can't imagine the degree of communication they achieve, unless you see it—and perhaps not even then."

Walters was silent for a moment, absorbed in his own thoughts. At last he spoke again. "Tolly, I told you a couple of weeks ago that telepathy was bunk."

"—and I agreed with you."

"I know you did. But we were both wrong. It didn't come the way we expected it, but we have telepathy, here and now."

"Not really, Merle. It's just computers and two-way radios, the way the Kirkwood people are operating."

"So what? The results are the same. It uses the technology we've already developed, and it uses the electromagnetic spectrum, not some new thing we've never heard of. But that's the way we do it: we build on what we have.

"Tolly, it's here. Direct mind-to-mind transfer of information. Now perhaps you understand why I'm will-

ing to spend ten times as much as you might think, to be in on the leading edge of it."

Suomi was silent, performing his own assessment of the potential and the problems. Finally, he shook his head, a dissatisfied expression on his face. "Merle, if I read you right, you are telling me that your money-hungry friends over at Kirkwood Research are the first step to *Homo gestalt*."

Walters grinned. "Depressing thought, eh? But it's true enough. We shouldn't be too surprised. Look at it this way: we've wanted to travel as fast as the wind for thousands of years. Now, you drove in this morning. How long did it take you to get from Potomac to Wisconsin Avenue?"

"Three-quarters of an hour, give or take five minutes."

"So you averaged maybe ten miles an hour. Remember the old elephant joke? 'I saw an elephant on the Long Island Expressway this morning.' "

Tolly Suomi nodded. "Sure. 'What was he doing there?' "

" 'Same as everybody else, about three miles an hour.' "

"I see what you're getting at. Last week, I flew the Eastern Shuttle up to New York. Flying like a bird—in a tin box, eating plastic food."

"That's progress. We can communicate our thoughts directly to others, but we'll have to do it *numerically*, using electronic implants and radio communication."

Suomi shook his head thoughtfully. "You're probably right, Merle. We need a better word than telepathy—a more precise one. It's one thing to transfer *data*, but the real trick would be to transfer *emotions* directly."

"Maybe we'll do that, too, with the implants. Think about it, Tolly. It shouldn't be too hard to monitor and telemeter the basic body functions—chemical balances, temperatures, ion concentrations. It's only a short step from there to emotional states."

Suomi was staring at the wall before him, as though seeing the future spread out there. Finally, he looked over at Walters' empty glass. "Maybe we should call it a day, Merle. You've been through quite a bit, these last few hours."

"One more thing." Merle Walters rattled the ice cubes in the empty tumbler. "We've taken it a long way, but there's a big step left. I said I'd given you *one* reason why I wanted to buy Kirkwood. There was a second one."

He picked up his briefcase, opened it and fished out a projector cube. "Remember I had Alex Burns make me a simulation, before I went over to Kirkwood?"

"I certainly do. It cost four thousand dollars. I'd been wondering what you did with that—you haven't mentioned it since Alex delivered it."

"It's here. I thought that if Kirkwood were a real visionary—he's not—this might persuade him directly that the implants have to be handled with real care. I never had a chance to use it. You might want to play it through tonight, and you'll see what a

great job Alex did—sound, vision, and special effects."

Suomi looked at the gray cube sitting in front of him. "For four thousand dollars, it had better be a masterpiece. What's it about?"

Merle Walters rubbed his bald head reflectively. "Well, it just takes the implants the logical next step. What do you think it would be like if everybody had an implant—got one when they were a child?"

"Everybody?" Suomi pursed his lips. "Well, if it goes the way you painted it, they'd have fantastic communication with each other—and with the central data banks too. It would be instant access to any information, anywhere. Things like ordinary libraries would disappear."

"Right. So if you didn't have an implant you'd be a *real* outsider. You'd be outside the shared data base, and outside the group-awareness. Do you see where that leads?"

"I can see some of it, Merle. It's pretty obvious that the worst punishment you could inflict would be to disable a man's implant. Like being in solitary confinement, but probably a lot worse. And there's no doubt we'd develop complete dependence on the big data banks—but we're not far from that already."

Walters leaned forward, his lined face earnest. "So now take the last step. Tolly, can you imagine how men with implants would react if they were taken to a place where they were light-years, or light-hours—or even light-minutes—away from the supporting memory banks, and the shared data? I don't think they could take it. They'd go insane."

"You are suggesting that the implants will prevent us from traveling more than a few light-seconds from Earth?"

"That's it. Unless we're careful, we'll find we've chained ourselves to a region that doesn't go much past the Moon. We're getting low on resources here. We can't afford to be shackled like that. That's what Alex Burns shows on the simulation. It's so well-done, it depressed the hell out of me, and I was expecting it. Of course, it won't come in our time, Tolly. But I don't want to see it come at all. We have to keep moving out." He crammed his hat on his bald, furrowed head. "Take a look at it, and form your own opinions.

"I'll see you tomorrow, Tolly. Seek the worst. We'll have to work out terms with Kirkwood, then we'll get ready to tame the real tiger."

He limped out. Tolly Suomi, thoughtfully stroking his neat gray beard, watched him go. That was the trouble with setting Merle up for anything. He was always more than you could ever anticipate, never less. Tolly picked up the gray projector cube, stood up from his desk and went over to the window. Dusk was gathering on the late August evening, and the earlier thunderstorm had cleared the air. The first stars were coming out, twinkling softly through the mellow haze. Somehow they looked a little dimmer and farther away than before. ■

Announcing

The first two books from ANALOG'S new series

ANALOG YEARBOOK

An original collection of new stories that will send you out of this world. Ben Bova, award-winning ANALOG editor, has assembled an exciting collection of stories and features, including . . . .

"Julian" by Kate Wilhelm
"Too Soon We Grow Old" by Spider Robinson
"Oh Say Can You See" by Robert Bloch
"Kingsmeat" by Orson Scott Card
"Guzman's Gardener" by Stephen Robinett
"More Deadly Than the Male" by Sam Nicholson

Plus a guest editorial by Greg Benford and fascinating features on immunization against cancer, science fiction on film, etc. In short, a fully illustrated collection of winners you won't want to miss.

Paper bound • $5.95

THE BEST OF ASTOUNDING

Edited by Tony Lewis

Science fiction's golden age returns. It was a time when the field of science fiction came into its own, guided by the imaginative John W. Campbell, Jr., who tapped the most fertile minds in the field. Here are classic stories by Clifford D. Simak, Theodore Sturgeon, Frederick Brown, and many more, all republished with their original illustrations. Hours of fascinating reading and a valuable addition to any serious science fiction collection.

Paper bound • $5.95.

Condé Nast Books, P.O. Box 3308, Grand Central Station, New York, N.Y. 10017

Yes, please send me:

_____ copies of ANALOG YEARBOOK
@ $5.95 plus 65¢ postage and handling—total $6.60

_____ copies of THE BEST OF ASTOUNDING
@ $5.95 plus 65¢ postage and handling—total $6.60

I enclose my ☐ check or ☐ money order for $ _____. If for any reason I am not delighted, I may return the book(s) within 10 days for a complete refund. Please make your check payable to **CONDÉ NAST BOOKS.**

Name _____

Address _____

City _____ State _____ Zip _____

Please bill my ☐ American Express ☐ Visa ☐ Master Charge

Card number _____ Expires _____

Signature _____

the paradigmatic dragon-slayers

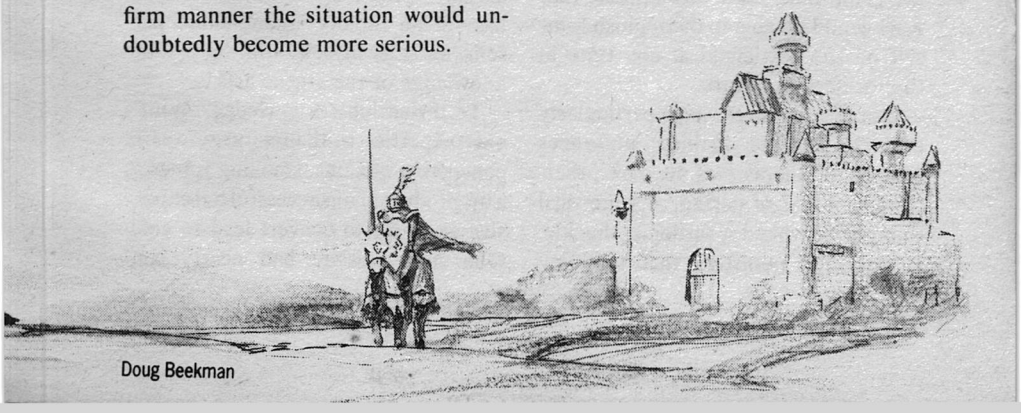
James O. Farlow

Research is a necessity in many professions.

A middle-aged nobleman watched from his tower window as the sun set behind the hills to the west. This room, and this time of day, constituted his favorite place and time for serious thinking, and such thought was clearly called for at this moment.

Lord Friedrich was extremely depressed. His little fiefdom hadn't fared very well recently; the last harvest had been well below both expectations and the harvests of previous years, and the present planting was going none too well. The manor's herds of cattle, sheep, and swine were diminished by disease and an inexplicable failure of the animals to foal.

Worst of all, Hermann, Friedrich's chief rival and the lord of a neighboring manor, was interpreting Friedrich's bad luck as indicating weakness (which to a certain extent, of course, it did) and had just made a provocative foray across their disputed common border. The adventure was confined to some minor poaching, but unless Friedrich responded soon in a firm manner the situation would undoubtedly become more serious.



Doug Beekman

What he needed, Friedrich told himself for the thousandth time, was a firm alliance with Roland, an unusually powerful nobleman whose estates lay some distance to the north. Such an alliance would shore up Friedrich's sagging defenses and make Hermann think twice before starting trouble. Friedrich had also thought of a way that such a treaty could be consummated: His son, Karl, was now old enough to marry, and Roland had a daughter, Gertrude, whose famed lack of beauty was more than compensated for by the wealth of her father.

Unfortunately, Roland viewed Friedrich's fallen estate with open contempt, and had stated that his daughter would be given in marriage only to a warrior of truly heroic reputation—a cruel dig at Friedrich. Oh, Karl was courageous enough, but there just weren't that many heroic deeds waiting to be done at the present. There was no common enemy for the local noblemen to unite against, and Friedrich certainly lacked the strength of men and arms to challenge any of his neighbors—why, he wasn't even strong enough to deliver Hermann the reprimand he so richly deserved, Hellfire claim him! So it was unlikely that Karl would be able to distinguish himself on the battlefield at any time in the foreseeable future.

Nor were there any particularly dashing bandits making nuisances enough of themselves to make their capture a feat of daring. A whimsical thought provoked a sardonic chuckle: If only the monsters that traveling minstrels sang about were still around! The slaying of a dragon or giant, or even a troll, might impress Roland enough into agreeing to a marriage between Karl and Gertrude.

The nobleman's melancholy was interrupted by the entrance of his chief adviser, Wulf the Wise, who genuflected and stated his business. "Sire," he began, "your humble servant may have found an answer to our problems."

Whenever Wulf spoke, and on whatever subject, his voice always seemed to reek of dark confidences. Friedrich wondered again why he hadn't had the tiresome man executed long ago. Well, he was clever, it had to be said.

"Go on," Friedrich sighed.

"I have learned of a great and powerful wizard who has performed many wonders in lands to the west," Wulf revealed.

"And how will a magician help us?" interrupted Friedrich impatiently.

"That, sire, is the beauty of my plan," tittered the counselor. "Few men have heard of him, for he has only recently appeared in this region—some say in the world itself," he added darkly. "However, word of his feats has spread rapidly among those persons, such as myself, who have some knowledge of the arcane arts."

To Friedrich's knowledge, Wulf's only expertise in thaumaturgy was in concocting noxious, smoking fumes as a by-product of unsuccessful but expensive attempts to convert lead to gold. One such episode had nearly con-

vinced Friedrich to do away with the man. If Wulf didn't come to the point quickly, Friedrich decided that he might put that happy plan into effect yet.

"One of the wizard's tricks is to conjure up strange and fearsome creatures—why, on one occasion he produced a very demon from Hell with his magic, or so a brother sorcerer tells me. And mind you, this was no illusion. The demon ate a courtier."

Friedrich was getting a glimmer of what Wulf had in mind. "Go on," he said.

"Ah, sire, it is rumored among my colleagues that for a price this wizard could produce even more spectacular wonders . . ."

"Such as a gigantic dragon?" Friedrich demanded, becoming rather excited. "If this is true, I shall make you, and he, rich men! But if this is just a story," he growled, "your head and shoulders will part company. Bring me this magician!"

Wulf winced, bowed, and exited the room.

Friedrich stared at the man standing before him. He was certainly one of the most peculiar persons the nobleman had ever met. The magician was at least a foot taller than any other man in the room, but he was thin, almost frail in build. However, there was much about the man that inspired respect or even fear.

Part of it was his garb, a shimmering blackness that was not robe, cape, hood, or mask but yet seemed at any given instant to be any one or all of these, so that an observer could never get more than an impression of the wizard's appearance. Even more impressive, however, had been the man's first demonstration of his talent as a sorcerer. He had not entered the council chamber with Wulf and the rest of Friedrich's advisers, but had suddenly materialized before the throne, causing a brief panic. Even now Friedrich was more awestruck than he cared to show. How should he open bargaining with the sorcerer?

"Word of your prowess in the magical arts has not escaped our ears," Friedrich began diplomatically, "and your appearance before us confirms these rumors. Nevertheless, we would like some small demonstrations of your ability to deal with our immediate problem . . ."

"Child's play," interrupted the sorcerer in a calm voice. His hands danced, blurred, and a chicken-sized dragon crouched on its hind legs before the throne, a rather discomfitted expression on its toothy face. It regained its wits quickly enough, though, and scurried around the room causing general consternation before the wizard banished it to the oblivion whence it had come.

Friedrich was more impressed than ever. "What price do you ask for producing a full-sized dragon?"

A sum was named, the sorcerer stating that he would accept payment only in gold and jewelry.

Friedrich scowled. Such an amount would dangerously deplete his already

dwindling resources. Still, a treaty with Roland—one including Gertrude's dowry—would, if skillfully negotiated, more than pay for the expense.

"I will give you what you ask," Friedrich told the magician.

The heat of the day was approaching as one of Roland's serfs guided a team of oxen across a field, turning the sod and preparing the ground for planting. The man was sleepy and content to use only half his consciousness to guide his animals, allowing the other half to merely float along in somnolence.

A dragon is a pretty impressive sight under any circumstances, but to have one suddenly materialize in the middle of your field and devour your team of oxen is downright devastating. It is a tribute to the courage of medieval man that the peasant did not die from terror on the spot, but ran bawling for help to the castle of his lord.

News of the dragon spread rapidly, as did reports of the way it had annihilated those forces sent by Roland to deal with it. Before long the nobleman and his people were forced to withdraw behind the walls of his castle, leaving the monster to plunder the kingdom's herds at will.

Friedrich managed, after a couple tries, to get a messenger past the dragon, into Roland's castle, and back again in safety with the news that Roland would give his daughter and half his kingdom to the man heroic enough to slay the dragon. Friedrich was inclined to hold out for two-thirds, but Wulf correctly pointed out that if he waited too long the dragon would have eaten most of the assets. Once again Friedrich thanked the Virgin that he had not yielded to his baser feelings and had the man executed during earlier fits of pique.

So it was that a troop of men rode out from Friedrich's castle, heading north. Leading them was young Karl, looking magnificently heroic on his snorting charger, his courage fortified by the thought of the wealth soon to be his, if not by the prospect of the lady he would win. Behind him was his father, riding side by side with the mysterious sorcerer, who had agreed to accompany them on this day of glory. Then came Wulf and several other advisers, a priest, and miscellaneous squires and members of the court hoping to see a show.

Late in the afternoon they crested the bluff overlooking Roland's holdings, leaving behind them the gloom of the forest for the golden light of sunset. Below them lay open fields and a small village surrounding the walls and spires of the castle. Pacing across their field of view came the dragon.

It was, indeed, a fearsome sight, and a chill spirit settled upon the hearts of the company (all save the magician); the priest began chanting a Rosary. Had ten tall men been laid head to foot in a line, their combined length would not have matched that from the snout to the tailtip of the dragon. Tree-thick hind legs supported the

beast's weight; the monster's relatively tiny forelimbs could at best serve only as arms. Its body was carried parallel to the ground, with the long tail stiffly held nearly as high off the ground as the huge reptilian head on its short, curved neck. As the creature stalked across the field its head bobbed forward and back like that of a strolling pigeon.

The dragon's attention was fixed, not on Karl's party, but rather on a band of seven mounted knights that rode from the other side of the field. Friedrich cursed as he recognized the pennant flying from a lance carried by one of the troop: Hermann's elite guard! Somehow Hermann must have learned of Roland's offer; too late Friedrich remembered that his enemy was a bachelor.

The dragon, nonplussed by the advance of the riders, halted to consider their approach. Its head bobbed up and down several times, and then it opened its jaws, revealing a formidable dentition, and voiced a threatening hiss. The knights continued their approach. The dragon bellowed and again stalked toward them.

Lances were lowered; the advancing troop broke into a gallop. A cheer rose from the walls of the castle. The leader of the troop spurred his stallion and leaned into the impending impact of his lance with the dragon's center. The beast, however, unexpectedly lurched to the side, avoiding the lance, and as the rider swept past spun around and plucked knight and horse from the ground in its jaws; the screams of man and animal could be heard even by Karl's band. By now three of the rest of the troop had reached the titan; their lances punched into its legs and the base of its tail, the impact nearly knocking the animal off its feet. It dropped its victims and turned to face the new threat.

The dragon had been hurt, but not seriously so, and the three forward knights now lacked the momentum that made their lances effective. Furthermore, the steeds of the knights who had yet to close with the monster panicked as the creature pivoted about to confront them; they shrieked and reared, completely out of control. The standard-bearer toppled from his mount and crashed heavily to the ground.

As the men struggled to turn their horses about to retreat and regroup for another attack, the monster charged among them. Its teeth closed about one rider, crushing his armor and leaving his terrified mount to flee on its own. Three of the remaining horsemen managed to regain a semblance of command over their animals and sped away from the beast. The fourth knight, however, found his efforts to control his stallion to no avail; the horse kicked and thrashed, straining madly against the bit. A huge, three-taloned foot reached forward to pin the rider and his steed against the ground. They struggled desperately against the dragon's grip until the creature stooped over and ended the encounter with two quick bites.

The men on the ridge had watched

the fight in silent horror; for the first time Friedrich doubted that his plan would work. He turned to the magician, who alone seemed unperturbed. "He is my only son," Friedrich whispered. The magician said nothing. "How can a single, poorly-trained man hope to kill the dragon that has routed Hermann's best men?" cried the nobleman.

"Bring your son to me," said the sorcerer calmly. The order was carried out, and an ashen-faced Karl sat on his horse before the magician, who handed him a gold amulet. "You must wear this. It will protect you and guide your lance to a spot that will mortally injure the dragon."

Karl stared dubiously at both the magician and the talisman, but finally sighed and placed the amulet around his neck. Though he considered his death a certainty, he lowered the visor of his helmet, took his lance from a squire, and began riding slowly down the hill. The entire party crowded to the edge of the ridge to watch him go, some praying aloud. After a few moments the magician discreetly drew his horse away from the others behind a thick shrub.

The dragon was quietly feeding, but raised its head and hissed a warning as Karl approached. The lone knight lowered his lance and charged, and the monster rose to its feet to face him. An instant before they made contact the sorcerer raised a metal tube and an invisible, narrowly-focused beam hit the breast of the dragon with the heat of the sun. Death was instantaneous, and the monster was already crumpling to the ground as Karl's lance plunged deep into its body. Karl only narrowly escaped being crushed by the falling titan.

For a moment the onlookers sat in stunned silence, but then Friedrich's men joyfully urged their horses over the ridge as they rode to meet their hero; a similar throng of shouting people poured from the gates of the castle. Karl himself sat motionless on his mount and stared stupidly at the immense corpse of his adversary.

A cynical grin flashed across the face of the wizard, who alone remained on the crest of the hill. He touched a button on a device strapped to his wrist, and to the wonder of the crowd the monster's carcass vanished.

"Now there won't be any anachronistic skull left to moulder in some feudal trophy room and trouble the thoughts of the Temporal Police," mused the sorcerer to himself.

Rolling aside as he fell, the warrior dodged the flailing limbs of his stricken horse. The acrid smell of the animal's burning flesh was overpowering; the warrior tore off his helmet and gulped for fresher air.

The dragon was returning, its long neck weaving a hypnotic dance of death. The knight scrambled for his shield, snatching it up only seconds before another fiery blast splattered against it and drowned him in heat. Ignoring the choking smoke, he dashed beneath the legs of the slow, ponderous monster; he braced his feet

apart and, sinews bulging, plunged his sword into the thinly-armored underbelly of his titanic adversary. An ear-splitting shriek rent the heavens, and the warrior dived away as the dragon sank to its knees, taloned hands clawing at its abdomen. A gigantic, rattlesnake-fanged head stabbed toward the man; flames burst around him. Cursing at the searing pain, the knight slashed at catlike eyes, and the stroke found its mark: The dragon's head crunched to the earth and its serpentine neck whipped crazily about, spurting blood from horizon to horizon until the mammoth carcass subsided into ever-slighter twitchings.

The knight wiped gore from his face, breathing deeply and evenly. He strode to the sacred oak against which the Druid priests had bound the comely maiden. Her eyes worshiped him. A single swordstroke parted her bonds, and she fell into his arms.

Cradling her against his body with one arm and raising his sword to the sky with the other, the warrior sang his victory, beginning quietly and with great humility but building in a martial crescendo to a joyous celebration of the strength of his arm and the matchless courage of his heart.

The audience exploded with applause.

The playwright rose from his box to acknowledge their approval, his energy cloak gleaming to match his mood. He raised his cup, an ancient, jewel-encrusted relic, in a reciprocating salute that left the audience roaring even louder. "You see my power!" he exulted to his companion. "They feel that I have presented them with the story of a real hero!"

A sudden twinge of conscience chilled his mood. In all honesty, he had to admit that much of his creativity was purely descriptive in nature. All he really did was use a Spatio-Temporal Translocator to pull the dramatic elements of his stories together so that he could observe and record their interactions. Strictly illegal, of course, and the Temporal Police theoretically kept such devices away from everyone except scientists. They claimed to fear the possibility that time travel could alter the course of history.

The playwright finished his drink, and felt its warmth restore his spirits. He watched the actors take their bows. The artist is morally bound to transcend such petty, craven fears, he mused. One must take chances to experience art to the fullest. A bribe to a venal official, and the whole of history becomes fodder for the creative mind! His own genius lay in knowing which elements, from which eras, to juxtapose, and how to convincingly accentuate the heroic dimensions of his paradigms while downplaying their dull, often cowardly reactions to the situations he created.

As the technicians hauled the cybernetic dragon away for repairs a final burst of applause shook the theater, and the playwright and cast were borne off to a celebration.

The Passion of Saint George was a success. ■

L.E. Modesitt, Jr.

viewpoint critical

Oh wad some power the giftie gie us
To see oursels as others see us!
It wad frae monie a blunder free us,
An' foolish notion.

TO A LOUSE, Robert Burns

Mike Hinge

Tenth Forest West
Clan Logroller
North Continent
7:20: 1789 EU

H. Silvertip Highwind
Editor
ARCHEOLOGY/URSINOLOGY QUARTERLY
Fifth Forest North
Clan Windbreak
North Continent

Honored Silvertip:

With due reverence for the deserved reputation of the honored Professor Upenlock, I nonetheless feel required to post a protest about the uncritical and noncognitive acceptance of his analysis (Vol. 36, #5) of the linguistic properties of residual artifact tracings found exterior to artificial hive structures of a commercial(?) nature at his East Forest diggings.

The distinguished Professor Upenlock has based the substance of his derivations upon a presumptive hypothesis that the pre-ursinoids possessed hemispherical brain dominance patterns similar to those of present ursinoids.

To offer such a hypothesis without a scintilla of cross-verifiable scientific evidence should at least invite some skeptical commentary, and this I will attempt to provide in this brief epistle.

One cites any cultural/physiological similarities at great risk when evaluating a species which aridified three entire continents, particularly when that species also orchestrated a planetary ecological spasm the magnitude of which we can only estimate, and poorly at that.

Since it is not the purpose of this correspondent to provide a complete, scholarly, statistically, and semantically based refutation, I will only cite one of Professor Upenlock's own cases, although a number are susceptible to the argument for reversed cerebral hemispherical dominance or cultural tracings inversion by the pre-ursinoids (this term is indeed also misleading, as I will discuss later).

Upenlock cites a ceramic-backed tracing found in vitrified clay exterior to a preserved structure (his location 12 U). The presence of ceramic containers caused him to conclude that the structure had been an artificial hive containing a commercial(?) comestible establishment. Disregarding the obvious paradox of how the pre-ursinoid hive culture could possibly support such commercial establishments, other variables should also be evaluated with some skepticism.

The tracing has the imprint "ZEBRA PIZZA," according to Upenlock. He infers from the position of the ceramic letters that the tracing referred to the proper name of the individual operating the establishment.

A dubious proposition indeed! Given the remains of a species which built enormous hives across much of the surface of the planet, yet left few artifacts, the idea of a commercial food establishment is rank beartale. To stretch the argument even further and state that the tracing refers to an individual name is absurd. One must consider that the pre-ursinoid culture (I cannot bear the thought of calling it a civilization) obviously operated on a mass basis with little concern for individual privacy, space, or identity.

Upenlock's colleague Downstruck offers an alternative hypothesis (Vol. 36, #7) and asserts that the tracing was some sort of clan totem and that the section of the tracing ("ZEBRA") is symbolic for a pre-ecollapse animal. He cites a small ceramic quadruped found inside the hive structure as proof.

I submit that both of these otherwise distinguished scholars have ignored the question of perspective, both physical and cognitive, and succumbed to ursinoid cultural bias.

Since the tracing was not attached to the structure, one cannot say with any certainty from which side it was to be viewed. If the image were reversed . . . viewed from the obverse, as it were . . . the tracing would read "ASSIP ARBES" or possibly "ASSIS ARBES."

Fragmentary remains from the Ornian Plateau indicate that the pre-ursinoid word(?), concept(?) "assis" refers to being seated. Likewise, the word/concept for trees is "arbres" or "arbes."

Whether the Upenlock/Downstruck digging uncovered a commercial establishment or not, the term "sitting trees" certainly would apply more to a woodworking establishment than to a commercial comestible hive. Yet Upenlock dismisses the vitrified wood and sawdust as irrelevant, totally disregarding the importance of trees in the pre-ursinoid culture.

The work of Longclaw and Silverpelt has definitely established that the pre-ursinoids were silval consumers and virtually denuded entire continents, which action led inevitably to the ecollapse and their demise. This was further documented by Tailshort in his precise exploration of pre-ursinoid climatic and vegetative interactions.

A second hypothesis, equally ignored by Upenlock, is that the pre-ursinoids may have been reverse hemispherically dominated and thus perceived the tracing from right to left.

In which case, the meaningless term "ZEBRA PIZZA" becomes "ASSIS ARBES."

Thus, out of three possible interpretations, two have logical linguistic

bases, whereas Upenlock's "solution" merely attempts to assign an arbitrary cultural meaning rather than applying what little we do know to the few meaningful remains. Even on a purely statistical basis, a wood oriented hive occupies two-thirds of the probabilities. Thus, Upenlock's hypothesis stands only one chance in three of being correct . . . even on the basis of his own presumptions.

But the entire foundation of Professor Upenlock's dissertation rests upon an even more interrogative assumption – that the "pre-ursinoids" were indeed "pre-ursinoids."

While an epistle of protest is scarcely the vehicle for an extensive and documented revision of long-accepted truisms and professional cliches, and here I only note that a more expansive and intensive extension of what follows will be published in the third period succeeding, I am impelled to question, albeit briefly, the basic "pre-ursinoid" hypothesis.

According to Upenlock, Downstruck, and even Silverclaw, the curved character tracings symbolize sibilants, whereas the straight or crossed tracings tend toward gutterals.

H. Tipgray, in his critically acclaimed PALEONTOLOGY OF PRE-HISTORY, noted that the fragmentary and fossilized remains at both the dry mountain sites and the East Forest diggings presuppose a jaw structure designed primarily for sibilants, unlike the more balanced ursinoid jaw.

In addition, a historic survey of ursinoid dialects (Vol. 27, #3) indicates that only in the last 1,000 years has the sibilant played more than a minor role . . . yet Upenlock's own research states the "pre-ursinoids" employed sibilants extensively.

In a discovery almost bypassed in critical ursinology (NOTES, Vol. 13), the ursinoid *remnants discovered on the Ornian Plateau have been stage isotope-dated by the Society to a period* preceding *the stage-dates of both the East Forest and dry mountain site "pre-ursinoid" remains.*

The work of the late Professor Hidebound in his analysis of early ursinoid myths, particularly "The Monkey King" and "The Wall of Flame," should also be called to the attention of both the serious ursinologist and the eclectic theorist. Since this study has been confined to dissemination primarily among mythologists, one should note the following:

In all the stories dealing with ecollapse and pre-ecollapse periods, the ape or monkey rules the forest. Even today, the great hairless ape carries the appellation "King of Beasts."

In "The Monkey King," the emperor of the apes rules the world by destroying forests. This sovereign is so preoccupied with self-importance that in his attempts to burn his enemies out of the last remaining forest he sets himself on fire. The other apes unthinkingly rush to his assistance and

in turn are scorched (thus . . . the source of the great hairless ape). While all the simians are so spreading the fire from one to another in non-cognitive attempts to escape their pyrogenic demise, the Great Bear steps from the sky to assume dominance over and domicile in the Palace of the Monkey King.

In "The Wall of Flame," a similar theme is recited. All the animals are mute except the monkeys. But the ennui-struck monkey king momentarily forsakes his play with fire to teach the Prince of Bears to speak. The Prince of Bears warns of fire-play, and the simian sovereign is so enraged he attempts to flame the Ursinoid Prince. Again the carelessness of the simians results in their being scorched, and the Prince of Bears parades to puissance.

While this general mythologic pattern varies minutely from forest to forest and clan to clan, one notable exception is the folk story cited by Hidebound's disciple Shortclaw.

Herein, the monkeys are a feeble group, sustained only by their magic. Unfortunately, the monkey magic, or monkey-business, as it is termed in the older versions, was grounded in deciduous trees. But the thoughtless simians were as noncognitive as ever and continued their deforestation to the last leaf, at which point their magic disappeared. Then the Great Bear perorated and hastened the unrepentant simians into desert caves. When the trees regenerated, the Great Bear prohibited silvaculture by the simians and instead bequeathed the forests to the ursinoids.

This vast store of lore, legend, and verifiable scientific observation, however, is blithely ignored by Upenlock in his efforts to assign the so-called "pre-ursinoids" that convenient slot as our predecessors.

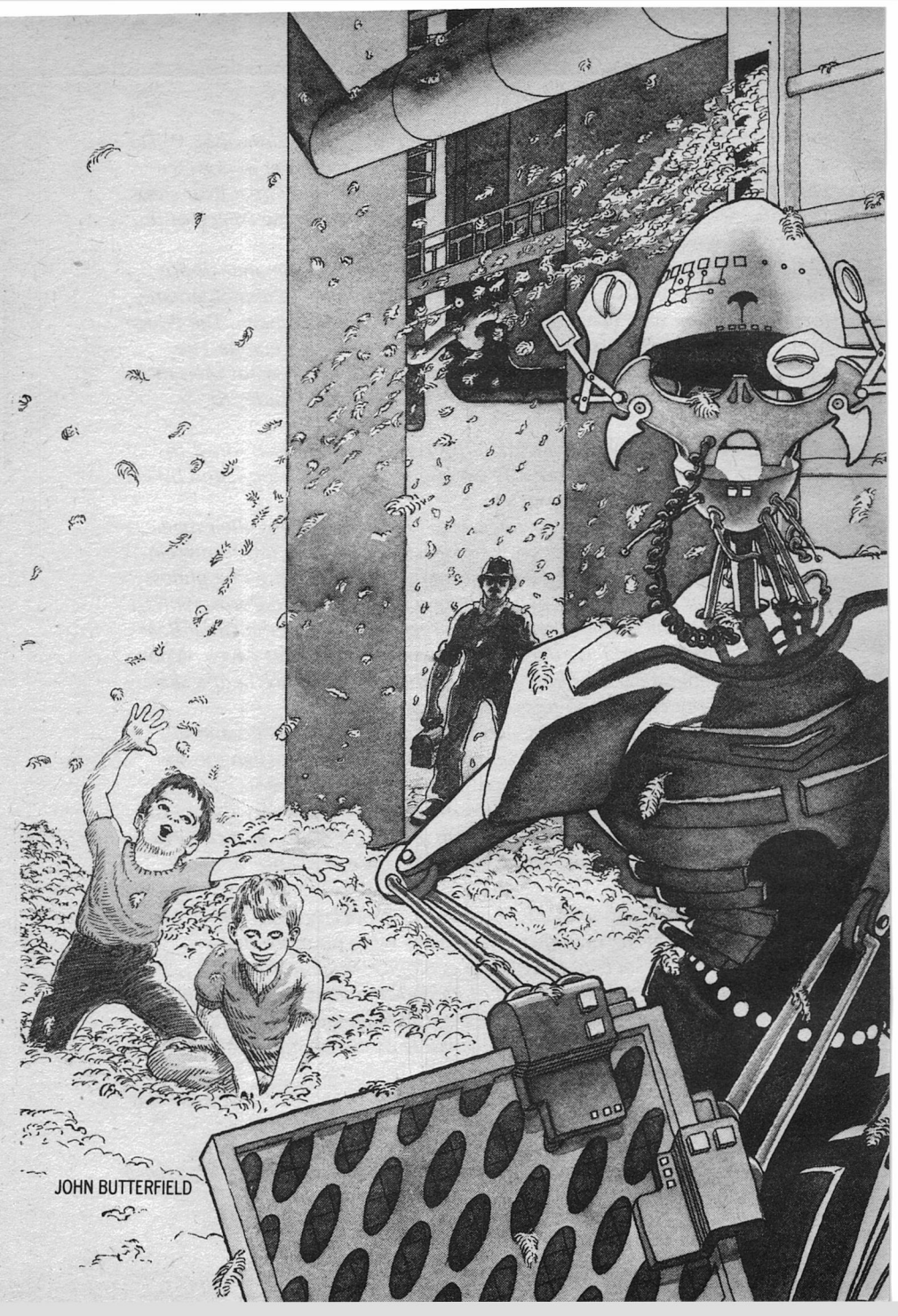
Conveniently discarded, also, is the concurrent evolutionary theory of Professor Hairthick, suggesting that simian and true pre-ursinoid cultures existed simultaneously, albeit briefly, in either a pre-ecollapse or short post-ecollapse period.

And in closing, one should always cite H. Curvedclaw, with her amusing notion that the hive-dwelling simians were no more than mammalian social insects occupying an ecological void in planetary development prior to the evolution of individual mammalian intelligence.

But whatever is cited, I submit the Honored Professor Upenlock should re-evaluate his terminology of the inhabitants of the dry mountain and East Forest sites as "pre-ursinoids."

Respectfully,

G. PELTSHINE


JOHN BUTTERFIELD

the man who drove to work

Arsen Darnay

Buried deep inside the Work Ethic is the concept of Survival of the Fittest.

John Dearing had turned forty this February last; now he marched relentlessly toward his forty-first. The company's Psychology Department had sent him a notice more than five years ago—a paper note to get his full attention! *Dear John*, the message had begun. *You are about to enter the period of your mid-life transition. Your profile tells us that your passage into maturity won't turn critical immediately, but like all employees of Totempohl Foods, you are welcome to join—and urged to participate in—the T. F. Passage Club. Should you decide to join . . .*

Dearing hadn't joined the club. He had sent a message pleading the press of business.

He had just been named general manager of the Beef Extract Division in those days. His least concern was "passage" into middle age. Nor did he have much time to spare. The division had been in the doldrums, and his assignment the great chance to show what he could do. His passage could afford to wait . . .

But now it was a little later, five years later. And times had changed. John Dearing sat alone in the sunny breakfast room of his house slowly chewing, chewing, chewing the last

spoonful of a special Totempohl cereal mix. He sat in swimming trunks on a folded towel having just dipped in the pool. A corner of the pool gleamed green beneath the raised deck. Clarissa lay there soaking up the morning sun with goggles over her eyes. She read the *Peking People's Inquirer* in preparation for a lecture over the Kansas University channel scheduled for later.

Dearing had told the kitchen clock to read out time in intervals of three minutes. The clock now said that it was seven-fifty.

Dearing chewed, swallowed, mused. Ten minutes remained before he had to go to work. The clock made him wonder. He should have joined the T. F. Club five years ago . . .

The Beef Extract Division had done well enough by any measure. But BED had failed to set the company on fire. The dream of top spot in the market had faded some time back. Dearing had been competent, better by far than average. But while he had risked and ventured plenty, luck had failed him in the end. The acquisition of a Vladivostok beef combine (all set, negotiated, and approved) had been nixed by the UN Commission on Industrial Health. And Dearing's hopes had sagged. Not for him the star rank of those meteoric risers.

He pushed the bowl aside and called "Dish-dish." Servo-arms came from the ceiling to clear the table.

Dearing sat brooding. Since the Vladivostok setback, Totempohl's senior management had turned unnaturally quiet. Dearing's once voluminous traffic from that direction had turned to a trickle of routine. As for the Old Man himself . . .

The kitchen clock announced the time again.

Dearing rose. He tried to remember the last time the Old Man had called, and it seemed it had been better than a year ago.

Carrying his towel, he walked down a hall. Two vacuum cleaners the size of cats scurried from his path as they sensed his body heat. He ran down a set of stairs and entered his office with minutes to spare.

He put the towel on his chair and fell into its cup. His body felt like twenty-five—his spirit weighed a ton.

He hesitated for a moment before turning off his privacy guard. With the switch open, his superiors could observe him if they wished—being unobserved in turn. Division chiefs could work behind a screen—and most of them did. But Dearing was still trying. Twice a week he told Clarissa that he didn't give a damn about the rat race any more. And he lavished too much love on a sailboat he kept on Lake Minnetonka up the road—as if ready for retirement. Nonetheless, dammit all, John Dearing was still striving, still bucking for promotion. If his bosses wanted to observe him, let them. Let 'em see that Dearing manned his switchboard. Let 'em see him move the data and decisions with the same zeal, enthusiasm, verve, and energy as ever . . .

Only it wasn't true. Dearing felt

flat. He told the office servo to brighten up the room. The crystal structure of his windows changed to show the crowns of oaks and above them, blue and white, the marvel of the cloud-flecked Minnesota sky.

Dearing still felt flat. Bloody damn. He lacked the zeal and vigor of his past. Beef broth bored him. Nausea gripped him at the mere thought of another day of data rain and holographic images. Tweaking consoles no longer pleased him. He could play veritable symphonies with people and with data, but the music no longer sang.

He peered with hatred at the banks of still silent, still dark, still greenish-shadowy screens arranged around him. Then, sighing, he placed sensitized fingertips on keyboards to his left and right and filled those squares of glass with the nervous pulsings and imagery of Totempohl Foods' Beef Extract Division.

He immersed himself in numbers and in graphs. They flashed across his screens in regimented order—faint green symbols rushing, throbbing, pulsing, vanishing. Production results achieved in the eighteen hours since he had turned off these machines. Margins, sales results, backlog fluctuations. Capital consumption rate trends in Argentina (a place he had to watch). Rising maintenance expenditures in China! A healthy return on investments in Brazil (a place where it counted).

Meanwhile calls began arriving, but he stacked them into holding patterns. He didn't want to talk or make decisions. Later. Perhaps at nine o'clock. Time enough for all those leeches later!

Leeches? What's the matter with you, man? he thought. Are you losing your connections?

John Dearing loved people. "People are my favorite people," he used to say back when in marketing. That always got a smile. Or *did* he? Did he still love people? Today?

Yes and no. He loved the people, but they had turned into a burden. They assaulted and besieged him.

They wanted . . . answers, blessings, consolations, directions, encouragement, felicitations, go-aheads, hints, instructions, jogs, kudos, love, massaging, nurturing, orders, pontifications, queries, redirection, sympathy, tenderness, urging, verifications, warmth, x-hortations . . .?

They wanted, needed, and bombarded him.

He still loved them—but he no longer loved the context of their need. He hated his role of boss, coordinator, and cutter-through of tangles.

Then came a call demanding to be answered. Phillis Reed ran Marketing for BED; she had to talk to Dearing, said the Computer. Dearing put his goggles on and stroked the keyboard.

The lenses crackled before his eyes—infinitesimal stars against a pitch-black background. Then the field of Dearing's vision expanded, and he saw Reed from the vantage point of the head of the pony she was riding. The data lens through which he saw

her hung on the pony's bridle, and the vision bobbed up and down as the animal moved.

Cliffs rose to the left. On the right ocean foamed against a rocky Scottish coast. Reed had fresh color in her youthful, freckled face.

"John," she said, huffing a little, "sorry to barge in on you so early your time, but I just had to call you. The Airfreight Complex in Addis Ababa."

"It's down," Dearing said. "It's been down for a week. Globe can't spare a Vice President just now. They say."

"Well," she said, "be that as it may, we have to drop-ship a thousand kilos of GO cubes to Subotica to the Yugos. By eight tonight, European time. And it's three PM here in Scotland."

"Why are you telling me? You should call Brooklyn."

Seagulls rose screeching over the crashing surf as Reed passed.

She nodded. "I did. I talked to Fred in Expediting."

"And?"

"He said he can't authorize a charter flight without your go-ahead."

"Bunk," Dearing said. "Of course he can."

She made a face. "I'm just telling you what he said."

Dearing sighed. "All right. I'll call him. But listen, Phillis. You simply have to make your peace with Fred. The two of you feuding . . ."

"I've done *my* bit," she said. She tossed her head.

"Try a little harder," Dearing said. "I'm much too busy to do your coordinating for you. Fred is old-fashioned. Try to call him from an office the next time—not from a horse . . . or a glider, or from an underwater bubble."

"But I'm in sales, John. Why should I tie myself down . . ."

Dearing waved a hand and then signed off.

He called Fred Rosenkrantz and then Abdul Hakim. He rang Carlos Oreal next. Then Jimmy Felton, Mary Russel . . . They had caught up with him. The problems multiplied. The weight grew heavier. His swimming trunks were dry. The office servo told him it was nine o'clock. Five more turbulent hours lay ahead. He felt flat and weary. Eight people were holding in the queue. John Dearing took the still moist towel from beneath his rumps, wiped his face, wiped under his arms. He was doing his duty. The outer form was perfect. He said the right things in the right tone, but inside him the voice reverberated in hollow space.

My heart's not in it any more . . .

He was resting a little later, half-reclined, eyes closed, and sure that his face was pale beneath the tan.

Faint shuddering noises, three in succession, told him that his teenage children had just left the house without regard to the defective electrostatics of the downstairs patio door.

Denise, his youngest, had come into the office about a month ago. She had

thrown her long limbs into a chair and had watched him as he worked—her face a sullen, closed, mysterious thirteen-year-old mask. She refused to voice her secret sorrow. But she rose abruptly after fifteen minutes, suddenly cheery and bright. She paused at the door, turned, and looked at him wonderingly.

"Is this all you do?" She gestured vaguely at the screens.

Dearing felt a momentary shock. The feeling discharged itself into a forced laugh. "I guess so," he said.

She had raised her eyebrows in thirteen-year-old fashion. Then was gone.

A sharp tone jerked Dearing from his reverie. The red light flashing by the keyboard told him that a superior had rung. He gathered his body into an alert, businesslike, executive posture. Inwardly he cursed his momentary lapse into fatigue and wondered whether he had been observed. Then he reached for his communications goggles.

Darkness and ion sparks turned into the view of a large room. Bearskin carpets, wood paneling, a fireplace, floating servo mechanisms. The wall to Dearing's right, a glass expanse, showed the tips of crowded pines beyond a deck with railings; far in the distance Dearing saw the orange-bluish sawteeth of a Colorado mountain range.

A man in blue jeans, checkered shirt, and workman's boots leaned over a table, his back to Dearing. The crown of white hair around the bald skull—and the Colorado setting—told Dearing that the Old Man himself was on the line.

Dearing felt a wave of heat. The hour of reckoning had come, the hour he had been dreading. *John, you've done a great job, a really great job.* Then would come a pregnant pause. *We've been discussing the most natural evolution of your career from this point forward, John, and . . .*

The Old Man stood looking at the table, still seemingly unaware of Dearing's arrival. Dearing's flash of heat turned into clammy sweat. They would offer him a staff assignment—and his career would end at forty . . . going on to forty-one.

At last the Old Man turned. He wore his goggles pushed up over a tanned forehead. He pulled them down, smiled, waved to Dearing, and then sat down on a giant hassock.

Clarissa heard her husband running. He bounded down the hall, rushed across the kitchen, burst through the door. The levitating deck wobbled as he came.

She turned toward him even before she pushed up her goggles and thus extinguished the page of the *Peking People's Inquirer* she had been reading.

"It's happened," he cried. "It finally happened."

Clarissa blinked. The sky was bright. She saw her husband's face—gray with tension despite his tan. Had John been pushed aside? Assigned to Administration? No. He wouldn't

have rushed out to give her such bad news.

"Oh, darling!" She rose. He embraced her, nodding his head, his eyes bright with excitement but his face still grim and almost sad.

"They're giving me a chance," he said. He sounded anxious. "I'm starting right now, this morning. I'm going to drive to work." Then he repeated the statement in a wondering tone. "I'm going to drive to work." He paused. "The car is already on its way. Of course, you realize, this is just a test. If I succeed, they might make it permanent, but it's still only a chance."

"You'll do fine," she told him.

"God," he said. "God, I hope so."

"Don't worry," she said. "Don't—worry!"

Twenty minutes later he sat in the car wearing stiff, new canvas overalls. On the seat beside him gleamed a black lunch bucket. On the floor sat a long, red tool kit. Draped over it lay a pair of brand-new working gloves.

All of these items had come from a thing that he had called his "hope chest"—actually the top shelf of the small closet off the master bedroom's bath. He had bought these implements back when promotion had still beckoned, before the Vladivostok deal had fallen through.

And now . . .?

John Dearing could still not quite believe it. On automatic pilot, the car had just crossed the hermetic border of the Lake Region; for the first time in fifteen years he moved through the world on wheels along a busy highway toward the mythical, the unattainable, the much-dreamed-about Physical Plant.

Magnificent. Oh, God, how lovely.

John Dearing marveled at the world, the Real World. The haven of habitation dropped away behind him with its lush greens, its forests of stately oaks, its residences, waters, walks, gardens, fragrances, and so-called beauty.

Like coiling noodles made of flat concrete, a road system of grandiose dimensions—stark, bare, and brutally functional—seemed to envelop what in his youth had been the cities of Minneapolis-St. Paul.

He saw structures everywhere—flat, multistoried, massive. Airships made a line against the blue sky to the south; they held in the air, waiting to land. Beneath him he glimpsed from time to time acres of freight trains waiting or slowly moving. On the roads driverless trucks roared past him moving goods under the invisible command of computers. Nowhere a tree, nowhere a shred of green.

Dearing felt a humming and a throbbing, an all-pervasive, exhilarating noise, a roar, a life he hadn't felt for fifteen years—back when a tornado had ripped through the Physical Plant and for an intoxicating, unforgettable week every able-bodied man and woman had been a temporary Vice President.

Then he glimpsed ahead and below him—people. They might have been

men or women: he couldn't say. They wore helmets against the potential of some toxic fume and were engaged in righting a derailed tanker using portable levitron hoists. Alerted by a regional computer, they stopped their work lest something spill. They turned and waved to Dearing.

Dearing waved back. He felt a surge of pride, of comradeship, and of exhilaration. One Vice President waved to others. Persons of distinction, we few, we the fortunate few . . .

The car took him into the center passing over Lake Calhoun by way of an arching bridge. Next to the Mississippi river lay a Totempohl production plant of the Poultry Division. The plant shipped a dozen meat products and a hundred industrial chemicals derived from feathers and manure.

Construction machines the size of giants—most of them on wheels, a few on legs—cleared land to Dearing's right with the sound of dinosaurs. Several were crunching buildings, a few sat digesting rubble and laying cone-shaped eggs of various materials; yet others carved a network of neat ditches in preparation for the new that would replace the old. Above them hung a flat, circular solar converter powering the intense activity.

Dearing turned away. He had to think about the work ahead.

The Old Man had described this as a "fire fight"—not meaning a real fire, of course. He had called John a "troubleshooter"—not meaning real shooting either. These hallowed phrases from the Executive Suite had a pleasant ring.

Moments before the Old Man had called, reports of an odd disturbance had reached Totempohl's computers from the poultry complex just ahead. Something had zapped visual contact. The Old Man had called it a "plague of feathers." Most of the plant was operational, but Wing 305—the chemical production module—had been knocked out. Something odd played havoc with the visual sensors and with the process. Safety mechanisms had shut everything down, yet the trouble had continued. The Old Man had raised his hands in wonderment. Some animal might have erred from the vast conservation spaces of the Northland into the Physical Plant. "Or it could be one of those damned-nuisance human robots I told R&D that they could play with—to my regret," the Old Man had said. "At any rate, Dearing, it's just the kind of problem for a newly appointed Vice President—you. Go and fix it. Then get back to me. And try to make it fast."

Fast. Because this poultry complex was a super profit-maker. It produced fifty-thousand dollars of net income every hour. Failure of the chemical module had caused production backups. Thousands of chickens would be overfed at hundreds of thousands of dollars of cost. Logistics systems would be wrenched all out of shape to meet fixed contracts with stiff penalties. Some luckless bastard of a general manager would be thrashing his

console trying to make it all come out all right—and not a prayer. Not a prayer, Dearing thought, not until a Vice President has set it right, not until the "fireman" has doused the "fire" . . .

The car slowed down and took an off ramp to Dearing's left. Amidst the exhilarating grays and browns of the Physical Plant, Dearing saw a patch of color near the river—the bright tents of a children's cohort on its annual Physical Plant tour. Small children stood in an open space around a flagpole.

Poor things. Now they were admiring all this—the rugged and stark beauty of the Physical Plant, the Real World, the guts and muscles of Economy. Soon they would see no more. They would enter training in the human side of enterprise and live in paradisical ghettos in midst of forests, lakes, and natural ecologies. Only a few would ever achieve the honor of physical labor, a precious few . . .

I hope I make it, Dearing thought.

The car stopped before a gate while invisible ID codes pulsed over the ether. Then the poultry plant opened its portals to the Vice President.

Dearing felt eerie now. He had begun to sweat. Many years had passed since he had been so utterly alone. He walked between acres of chickens in tiers upon tiers of stalls enclosed by wire. The animals had never seen a human and were panicking. Nozzles sprayed tranquilizing hormones on these white, feathered, and ill-smelling armies, and they calmed to peaceful cackling as he passed—even as those ahead of him sounded frantic alarms, tried to fly with genetically stunted wings, and crowded toward the center of the stalls—thus triggering the sprayers.

No humans anywhere—not even in holographic representation.

I am on my own now, Dearing thought. His tool kit and his lunch bucket were growing heavy, his palms moist in his brand-new worker's gloves.

He came at last to the entrance of Wing 305 and found that the door had jammed. With trembling hands he lifted new power tools and set to work removing the door's master control. The skills learned in advanced executive proficiency courses—part of whose costs Totempohl had shared—had not deserted him. He detached the door from its automatic linkage and pushed it open slowly using a tiny but powerful hydraulic jack which he had tapped into a nearby water-lock using a length of slender hose.

The door opened with a rumble. Immediately feathers billowed through the opening, a torrent of fussy, fibrous rain. Dearing coughed, beat the air with his gloves, and retreated from this "plague of feathers."

What on Earth was going on?

In his tool kit Dearing found a welding mask compressed into a small cube. He broke the seal and watched the mask unfold and stiffen; then he put it on. Thus protected he ventured

into the storm of feathers slowly.

He heard the high and whining sound of the overworked and overheated ventilation system. And yet he sensed a listening silence below the level of that noise—a silence which could never be "heard" over an audio channel. He guessed that his loud entry had interrupted something. That Something now waited.

Dearing moved with minimum sound. Fears touched his guts.

Damn that stupid ventilation system. Its smartness circuits had been unprepared for this eventuality. The system sensed excessive dusting and so it worked overtime. But the more it worked, the more the feathers whirled.

Dearing smelled the delightfully acrid reek of raw polymers made of the horny proteins of these very feathers. It was hot in there.

He had moved slowly forward for perhaps three minutes before he heard what sounded like a giggle.

A giggle? Yes, very much a giggle indeed.

Then came a snort, a sneeze, and uncontrolled, explosive laughter—the snort, sneeze, and laughter of a child.

And then he heard commotion, banging, stomping, and more laughter. The feathers thickened in the air around him. The whine of the ventilation system grew hysterical.

Dearing advanced toward the sound still unable to see what caused it. He walked in relative darkness in the very poorly lighted space. Wing 305 was not equipped for humans. Dearing carried his own light but didn't want to use it.

At last he paused. The thick swirl of feathers was thinning out. He could vaguely see a light ahead, movement in the light. The giggling came from the movement.

A few more cautious steps and then his vision cleared. He beheld a curious scene.

Next to five gigantic silver silos, two little boys were madly tossing mounds of feathers up into the air. The feathers were replenished from the open bottom of one of the silos. The tossed feathers were caught by a strong suction stream from a ventilating duct high on the wall and streamed into the exhaust system like a comet's tail.

The little boys, evidently, delighted to see the feathers disappear. They tossed more and more of it, competing with each other; they coughed, sneezed, and were lost in laughter. They were unaware of Dearing.

Next to the ventilation duct stood a ladder. On the ladder stood a robot, a silvery, clumsy tin woodman from Totempohl's research labs. The robot held a rectangular filter in its awkward metal hands. But it stood in arrested motion, frozen in the middle of an act. Its circuits, no doubt, had been jammed just at the crucial moment. It had failed to seal the hole through which the feathers streamed.

"Good morning, boys," Dearing called.

The boys froze, then scurried. They streaked away and hid behind the

silos. They were small boys, under five. Dearing guessed that they were playing hooky from the cohort camp that he had seen nearby.

"The fun is over," Dearing called. "Out you come and back to camp. It's time you had some breakfast."

The boys didn't stir.

"All right," Dearing called, "in that case I will send my robots after you. You want me to do that? Here Gulch! Here Trencher!"

The boys didn't like the sound of that. First one and then the other slunk forward with guilty expressions; they looked down at the feather-covered concrete floor and peered up at Dearing furtively.

"Come here, boys." Dearing squatted down and gestured. "Come here and tell me your names."

Then came work. Little Scott and little Glen had been handed over to camp counselors—who tried to hide their immense relief behind masks of severity. The boys had been missing for two hours. Thank God they had been found again—a little tarred, a little feathered, but undamaged all in all. Dearing waved good-bye to them. Then came work.

He purged the ventilation system and replaced three nearly burned-out motors. He organized a squad of vacuum machines; they moved across Wing 305 and sucked up a layer of settled feathers five centimeters thick. Dearing replaced the lock whose failure had let the boys get in. Then he began the slow and systematic task of bringing the chemical plant back on stream again.

He clambered over tanks, skimmed feathers from oily slurries, steam-hosed vessels, cleared plugged valves, reset instruments, lubricated fittings, circulated solvents, regenerated catalysts, tightened screws, wiped dusty sensor lenses . . .

He talked to plug-in computers now and then. He asked for technical advice from Tokyo, Japan, from Fairfax, Minnesota, from Gernsbach, Germany. But all such communications were incidental. The glory lay elsewhere. *His* hands did the work, *his* muscles lifted, *his* eyes adjudged the situation. He was the Vice President. He did the work.

Hours passed. He forgot to eat. The sandwiches Clarissa had packed lay forgotten in the recently new but already scratched lunch bucket. Dearing's overalls were creased, soiled, and oily. And his hands, despite the gloves, had turned delightfully rough; they had become wonderfully dark with the sweaty grime of the Physical Plant.

Darkness gathered outside when Dearing was finished. He made a final tour of the place. He inspected it in the light of the beam issuing from the lamp-band across his smudged forehead. Wing 305 was up and running. Steam hissed. Product rushed through pipe. Compressors throbbed. Panels pulsed. Computers picked up the symbols and flashed them all over the world—wherever Totempohl's scattered people lived and worked their

consoles. The Old Man had called some time ago to say Congratulations. And Clarissa too had found him to say she loved him and good luck. Dearing felt new confidence, new power. He had made his passage—and without any help from the T. F. Passage Club. Now he wanted a last look at his latest handiwork.

As he toured the module, his light beam fell on the research robot. The creature still stood on the ladder, its mechanical hands far apart as if they still held the screen. But Dearing had eased the screen from that lifeless grip and had mounted it over the duct hours ago. He hadn't tried to fix the robot. The robot belonged to another department.

He gave the tin man a suspicious, unfriendly look. He recognized the rival of the future. The robot threatened—threatened all those few, fortunate people who could still work with their hands in the bowels of the real, the Physical Plant.

Passing the ladder, Dearing bumped it—accidentally? The robot fell headlong and crashed with a resounding metal sound. Its head split open and spilled a satisfying mess of circuitry over the concrete floor. ■

Lester del Rey

the reference library

ENDURANCE:

There are times when the reprints (or properly, reissues) of science fiction books are far more interesting than the originals. I have a personal interest in such books, since quite a bit of my library was destroyed in a fire some years ago, and I'm always delighted when I can replace a volume I lost then. But I think such books are important beyond my specialized joy in them.

Generally, such reissues are a better bet for the reader than most originals, too. These are usually the books that have endured—and they have endured because they were the ones that pleased the readers when they first appeared. They've stood the test of time—and in some cases, a lot of time. (Not long ago, a novel from 1933 proved that even that rather unliterary period of our beginnings could yield a few gems that would please the modern reader.)

Recently, I received a box from Ace Books containing six reissues by one writer, and I was happy to add three more volumes to my Poul Anderson collection. (I'll review them briefly later on.) One of them was originally copyrighted in 1953—a quarter of a century ago, which is far longer than most books can hope to endure in the modern mass-market publishing field.

Then it occurred to me that Anderson was first published in 1947, which means that he has been busy writing science fiction for more than thirty years and is still going strong. And I tend to regard him in the back of my head as one of the latecomers to the field! In science fiction, apparently, it isn't just books that endure, but writers also do so.

There aren't too many from the first period—the one that may be said to center around 1930. It wasn't a time when many writers in the field were very skillful at their craft. There were a lot of ideas, some rather bad, some that are still being mined by writers today. But most of the authors really couldn't write well enough to satisfy our current tastes. (E. E. Smith, for instance, still gives a lot of pleasure to many young readers on first exposure; but he certainly isn't read for style or characterization.)

Still, there are a few names that must win respect—writers who can still sell their works to editors and please the readers. Edmond Hamilton began his writing the same year as *Amazing Stories* first appeared, in 1926, and he was still working at his craft up until his death last year; certainly some of his work has stood the test of time very well.

Jack Williamson first appeared in print fifty years ago, and he's going strong today. Currently, he and Frederik Pohl are collaborating on a trilogy about a strange Dyson sphere. Two other trilogies have previously been published, and the second of those is now printed in one volume by Pocket Books. This is **The Starchild Trilogy,** and it's a bargain at $1.95 for 442 close-set pages. It's too complicated for any brief summary to suggest what it's about, but it is far better reading in

one handy volume than when it first appeared with long time lapses between books. For Williamson without a collaborator, there is **The Legion of Space** (Pocket Books, 191 pp., $1.50), first published in 1935. This is a classic adventure story of three men who set out on a seemingly impossible quest through unknown space and across a horrible planet to rescue a girl who possesses the secret that can save mankind from a dread alien menace. Giles Habibula, one of the three, is a marvelous comic figure. Even today, the suspense works. If you've never read it, you've missed a fine story.

Clifford D. Simak's first story appeared in 1931. Today, now retired from his regular job, he's writing more than ever. His **Mastodonia** (Del Rey Books, 251 pp., $7.95) has recently appeared in hardcover, and his first novel of pure fantasy has just been completed. He's now hard at work on another book. For earlier work, try his **Time and Again** (Ace Books, 303 pp., $1.75), the story of a man who has a theory of Destiny which will change the lives of men and suffering robots. Trouble is, he already has a copy of the book which he is supposed to write in the future, though he doesn't know how he came by it. Strange forces seem to be at work, hounding him from pillar to post. And everyone seems to know exactly what he must do for the future. There's a girl who knows far more about it than he does, with some mysterious enemies bitterly determined to prevent his ever writing the book.

And one must never forget C. L. Moore, who began in 1933 as a fully developed talent, and whose work still is marvelously readable. Don Grant (West Kingston, Rhode Island, 20892) has published **The Black God's Shadow** in a beautiful edition, with five color illustrations by Alicia Austin, price $15. This contains the Jirel of Joiry stories—some of the best written sword-and-sorcery fiction of all time.

From 1937 to about 1943, there was a great influx of new authors into the field. (Slightly outside the field, J. R. R. Tolkien's *The Hobbit* appeared.) Except for Henry Kuttner, who died much too young, almost all of these top-name writers are still active after forty years, or thereabouts.

Isaac Asimov's novels and collections are always in print. And while he does very little novel writing nowadays, he's still doing shorter works of science fiction along with his flood of fact books. Last year, his "The Bicentennial Man" won him another Hugo, despite his advanced age—which age he denies, of course. One need hardly mention that Robert A. Heinlein's works never go out of print. His so-called juvenile novels are currently being issued by Del Rey Books and are still best-sellers in the field.

A. E. van Vogt did little writing for several years, but he is now again turning out novels. And his older books are continually being reissued. **Slan,** the classic superman novel, is still being issued by Berkley, apparently; I don't know what printing it is in now, or it's current price—which it's well worth, whatever that may be. And Ace Books has reissued **The War Against the Rull** (221 pp., $1.50), one of van Vogt's better books, though less well known than some others. This deals on the surface with a horrible invading race, the Rull, and man's

desperate efforts to overcome that menace. The strength of the book, however, comes from the realization that man and ezwal—a seemingly totally hostile race of sentient beings—must learn to cooperate to save both from the Rull. I somewhat prefer the original novelettes to the novelized form, but I'll settle happily for the book.

L. Sprague de Camp entered science fiction in 1937 with "The Isolinguals," a story which he seems to forget in an introduction he has done for a forthcoming collection. Few of those early stories were forgettable, however, and many of the novels are still in print. Also back in print are the Conan novels, on many of which he collaborated; I understand that he and Lin Carter have another Conan adventure coming from Ace Books shortly. And meantime, de Camp continues a series of fantasies that promises to go on for years still. Of the stories he did with Fletcher Pratt, **The Compleat Enchanter** (Del Rey Books, 420 pp., $2.25) is my favorite set of novels; actually, it's a trilogy in one volume, dealing with the magical adventures of Harold Shea in three legendary worlds. It's a marvelous romp, still fresh today, and one that has inspired a lot of later fantasy books.

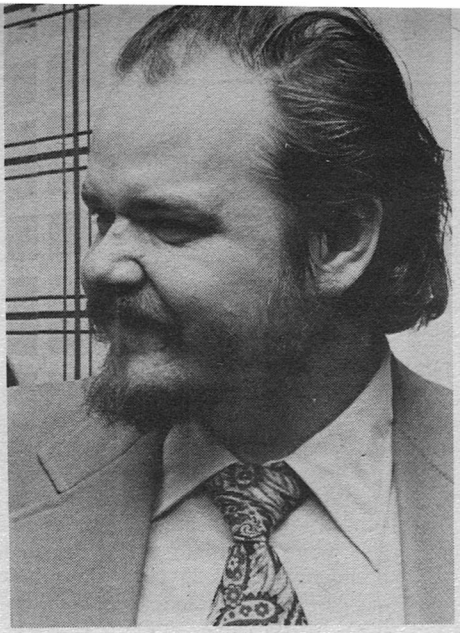
Theodore Sturgeon isn't doing nearly as much writing currently as I might like, but he's still very much with us, and his works are still in demand. Alfred Bester was always a slow writer, with a limited production; but a recent novel did well, and I understand he's well along with another now. And, of course, at the very end of this period, Ray Bradbury appeared and got his work read where no science fiction had dared go before. He does little science fiction now, simply because he's far too busy with other writing. But he certainly seemed alive and as much interested in the field as ever when he was awarded the Grand Master designation at last year's World Fantasy Convention.

There are a lot of others from those Golden Years. Hal Clement has just done a sequel to his **Needle,** and most of his novels have recently been reissued. Fritz Leiber is still producing and is winning prizes as usual. **Conjure Wife** has been reissued in a very handsome edition by Ace Books (251 pp., $1.95). The idea that *all* women are witches produced one of the best suspense fantasies of all time. A marvelous novel. Leigh Brackett is continuing the adventures of Eric John Stark, while her Hollywood activities are being devoted to working on the script for the second *Star Wars* movie.

Seemingly, most of the leading writers in the field appear in clusters, with lean years between. Arthur C. Clarke is an exception. His first story appeared in an American magazine in 1946, just before the next wave of writers came along. Or maybe he represents a whole cluster by himself. Certainly almost everything of his is still in print and will remain so, since his works continue to sell. One of my favorites (which isn't often mentioned, but which has gone through at least eighteen printings!) is **Earthlight** (Del Rey Books, 155 pp., $1.75) which is a straight adventure story of the poor, beleaguered men on the Moon when a brief attempt at interplanetary war flares up. The ending is a little less straight. And why that hasn't been made into a movie is some-

BIOLOG

by Jay Kay Klein



Jack L. Chalker

One of the newest of Analog's writers, Jack Lawrence Chalker saw his first story in print just two years ago. He started writing as an antidote to a depressing point in life—and has sold everything written since then. His recent Midnight at the Well of Souls *reached 100,000 copies in ninety days.*

Jack worked his way through college doing every type of odd job, including historical research and ghost writing—topping this not unfamiliar pathway toward authorship with a Hemingway-esque stint as a Special Forces Air Commando. After securing a B.S. at Towson State College in Baltimore, Jack's lifelong hometown, he became a high school teacher in the same city. His dual majors were English and history.

He was a science fiction fan since 13, working on the committees of five world conventions, where he estimates he auctioned off over one and a half million dollars of science fiction art. In 1961 Jack started a specialty publishing house, Mirage Press, with a home-based duplicating machine. While staying a one-man operation, the company now publishes hardcover and paperback books on science fiction and fantasy.

It's writing, though, that occupies Jack most fully, bringing in more income than teaching and publishing combined. Being an author has become, according to Jack, a habit and a compulsion. Recently released books include The Web of the Chosen, Dancers in the Afternoon, The Identity Matrix, *and the* Wars of the Well.

thing I'll never understand!

The period from 1947 to 1953 brought a larger influx of new writers than ever before. Many of them fell by the way, as the big boom of the early fifties collapsed, and while the paperback SF field was still in its infancy. But there are still a lot of top-flight writers who began back then, twenty-five to thirty years ago, and who are still working busily in the field.

There are too many to list in detail. Gordon R. Dickson, Frederik Pohl (under his own name, though he began writing fiction under assorted pseudonyms back in 1941, the previous period); Algis Budrys, whose writing is better than ever; Frank Herbert, whose *Children of Dune* became a national best-seller; Jack Vance, Robert Sheckley, who is still writing, though less than he should; Harry Harrison, Philip K. Dick, Mack Reynolds; and at the very end of the period, Marion Zimmer Bradley, whose *Darkover* books have a deserved fandom all their own, and whose early *Darkover* novels have just been reissued by Ace Books.

Ace has also been reissuing the novels of H. Beam Piper, who tragically committed suicide at the very peak of his powers as a writer. His **Lord Kalvan of Otherwhen** (249 pp., $1.50) is the last of his Paratime stories. (And when, oh when will Ace—which owns the rights—issue a glorious collection of the rest of them?) It's a marvelously romantic, swashbuckling adventure of a modern man carried to a period when gunpowder had just been discovered—and it's sounder in its "history" and military developments than any other such book I know. Glad to see it again.

Ace Books has also finally completed reissuing all of Philip José Farmer's "World of Tiers" novels, and has issued the long-awaited **The Lavelite World.** I loved the series, particularly **The Maker of Universes** and **A Private Cosmos.** The cockeyed universe and the rogue-hero Kickaha were delightful inventions. Unfortunately, this latest novel, about a world where nothing at all is stable, seems to lack any enthusiasm. It reads as if the writer had grown weary of it all, and was typing words to fill a contract, no more. Everything is there—characters and events—but nothing seems to matter. I had trouble finishing it. That's a pity, because there was a freshness and enthusiasm about the earlier books that made them unique. And there is still a lot about Kickaha that we don't know, and want to discover. Ah well, maybe someday Farmer will recapture his enthusiasm and give us another book to equal those early ones. I sincerely hope so.

And there's Poul Anderson, whose books started all this, and whose thirty years of writing science fiction have yielded a high consistency of craftsmanship and readability (and some delightful surprises, as when knights of old conquer the universe) that entitle him to top place in any list of writers.

The six Ace Books reissues are a handsome set, with covers by Michael Whelan, one of the best new artists to enter the field. All have brief introductions by Anderson, in which he indicates that some previous editorial tampering has been removed for these editions, restoring them to the form he wanted. (For that consideration, I bow

deeply to Ace.) Five of the titles have been changed from previous paperback appearances, using titles of Anderson's choice.

Four of these previously appeared in Astounding/Analog, and these now are under the original magazine titles. In case this confuses book buyers, the previous book titles can be found at the bottom of the covers near the spine. Look hard and you'll see! All have a uniform price of $1.50 per volume.

They are all interesting books in differing ways. But there are three that are among my favorite Anderson novels, and which I think should be part of any sizable SF library.

The Man Who Counts (previously *War of the Wing Men*) is the first novel about Nicholas van Rijn— and I think it's still the best, since he's very much the center of everything here. Shipwrecked on a hostile planet, left with minimum supplies, and unable to eat any native foodstuffs, van Rijn must somehow get back halfway around the world to his station. To do so, he needs the help of a race alien in psychology and physiology. And that race is embroiled in a hopeless war. He has to save them first, settle all their problems, and then somehow get them to do what seems impossible. And, of course, he goes at it in a way only Nicholas van Rijn would try.

World Without Stars. This is the novel that introduced the song of Mary O'Meara to SF fandom—Mary who awaits across all the countless light-years between Earth and a world beyond the galaxy. Science fiction space adventure—but not typical.

The Long Way Home. The star rovers returned to Earth after testing the first ship with instantaneous drive—to find that it was instantaneous to them, but still obeyed relativity. And 5000 years have passed, leaving them aliens. But they're treated kindly—until they find they are helpless objects to be used (and seized) in a power struggle between worlds, directed by a mechanical mind no man can understand. I'm delighted to get this to fill a hole in my Anderson collection.

Once upon a time, everyone—including most of the writers—knew that science fiction was an ephemeral thing. A story appeared in a magazine and then passed and was forgotten, except in the hands of collectors, who must watch their beloved collection slowly go the way of all short-lived pulp paper. Even minor mysteries and westerns might be preserved in hardbound books. But science fiction could never last. And only fools would choose to write such stuff and try to eke a meager living from it.

Well, the westerns and mysteries are mostly forgotten. But those old science fiction stories and writers are still with us, still faithful to their old readers and the countless new ones. ". . . A joy forever, it will endure . . ."

Today, there's a new and very promising bunch of writers appearing on the scene. Tanith Lee, C. J. Cherryh, Jack Chalker, James P. Hogan, and who knows how many more. I can only hope that they and their works will have the same endurance as those from half to a quarter of a century ago.

I rather think that at least some of them will. ■

BrassTacks

Dear Ben,

Doubtless many sharp-eyed readers have noted the discrepancy in the February, 1978, issue between the "Biolog" reported date of Jack Williamson's first story to appear in Analog (1931) and that given in the editorial preface to Jack's speech (1933). I think you'll find that he had three stories appearing in 1931. The first was "The Meteor Girl" in the March issue.

JAY KAY KLEIN

RD 1 Box 166
Bridgeport, NY 13030
Even Homer nods . . .

Dear Mr. Bova:

In your reply to Perry Glen Moore's letter in the February 1978 issue you said that "Ender's Game" was not the last or the best work of Orson Scott Card. That you were right was proved in the pages of the same February issue by "Follower," also by Card.

Every child has to give up his purple card sometime and come to terms with the adult world. Mr. Card does not tell us who the enemy is, the outside world or ourselves. "Follower" was a very disquieting story and leaves me wanting to hear more from its author.

BRUCE ASHKENAS

2007 37th St. SE
Washington, DC 20020
More is on the way!

Dear Mr. Bova,

Congratulations on the February 1978 issue. The book reviews by Spider Robinson were excellent, I pray that there will be more of his writing in issues to come.

Overall the stories were good, but I would rate "Update: The Lord's Prayer" as excellent. It said it all.

But there was one lump of coal among the gems, your reply to Lowell G. Johnson's letter about "Star Wars." I had the feeling that you walked all around his arguments in your reply. And I think you're taking an unnecessarily harsh attitude to the film. So what if it was an enjoyable Space Opera that didn't try to say anything "socially relevant?"

Even the most rabid defenders of the faith have to let their hair down once in a while. What is more degrading to science fiction, fantasies like "Star Wars" or professionals who take science fiction too seriously?

Despite all this I remain a dedicated subscriber.

STEVE ANDERSON

115 Anthony Drive
Lakeville, MN 55044
Glad you liked Spider's book reviews and Maize's satire. As for "Star Wars," some people like comic strips. Most adults find them terribly limited. And many science fiction writers, who have labored for decades to escape the onus of Flying Saucers, Little Green Men, Bermuda Triangles, and Lost Continents of Atlantis-Mu et al, tend to cringe when the latest "sci-fi flick" convinces the gen-

eral public that SF consists of space opera—period.

Dear Mr. Bova:

Two really memorable characters in as many issues deserve a note:

Valerie Clarke in Dean Ing's "Devil You Don't Know" (January 1978). *Haviland Tuf* in "Call Him Moses" by George R. R. Martin (February).

The February issue was one of the best in some time. Can we have more of Clarke and Tuf stories, please?

CHARLES S. MACK

841 Bingham Road
Ridgewood, NJ 07450

Authors, please take note! Memorable characters make memorable stories. Science fiction may be "the literature of ideas," but characterization is vitally important to a good story.

Dear Mr. Bova,

A lot of emotional rhetoric, misinformation, and snide insinuations about nuclear power are being thrown about, and I'm getting pissed off. At the readers, at you, at everybody. Can't *someone* tell the difference between risk and danger? It's simple. Risk is your possible loss, up to the 100,000 or so people downwind of a plant. Danger is the chance of disaster, for those 100,000 people maybe one in a billion.

That cleared up, I see three basic facts to the whole matter that are important.

Fact 1: The nuclear industry is producing the most potent, deadly and long-lasting explosives/poisons known to mankind, and they don't know what to *do* with them. Storage facilities as presently designed will be a bad joke for the next 250,000 years.

Fact 2: The nuclear industry is a prime, if unexploited, terrorist target. Transport, storage, and usage (power plant, lab, university) are all guarded poorly. Despite what you told Glenn MacIntyre in the January '78 issue, the record for sabotage/vandalism is near-perfect on plants, the points of greatest danger. Eventually some terrorist group is going to decide a nuclear plant is more important than an airplane, that cutting off your power will get more attention than a five-minute news spot.

Fact 3: WE HAVE NO CHOICE. Oil is getting scarce. Barring accepting a steady diet of pollution from coal (which is why we stopped using it), there are no alternate power sources adequate to fill the place of oil to any major extent. Controlled fusion does not exist, and until it does we won't know what problems *it* has. Even after it is discovered, there will be a lead-in time of perhaps 25 years until it could be installed as a power supplier. While waiting for 2010 to roll around what do we do for light and heat?

MARK BASSETT

31 Sleepy Hollow Dr.
Danbury, CT 06810

Nuclear power is here to stay, although fission powerplants will even-

tually give way to fusion. The important thing is to design the entire fission power system to be as safe, vandal-proof, and efficient as possible. As for fission wastes, they will be boosted off this planet or converted into inert elements within the next fifty years. Until then, though, they must be handled with care.

Gentlemen:

I finally got around to reply to the Guest Editorial, "Experimentalism" in the January issue, by Richard Rosa.

We have and always have had "experimentalism" in the social sciences. All we have to do is place some concepts and phrases in proper context to show it.

Mr. Rosa defined the "scientific method" as observation, development of a theory to explain observed data, and experiments to prove or disprove the theory. Followed, in true science, by modification of the theory to explain observed data more fully.

Social science experiments begin by observing data from the society that suggests defects. Then a theory is developed which the proponents believe will correct the defects. Then a mass movement is developed (the experiment) to test the theory. If it works, the theory is adoped and becomes a permanent part of the society until a better one is developed.

This idea could be applied with equal validity to Christianity in Roman times, the union movements, the race movement, the Russian and French Revolutions or any of a thousand other movements. If you want an example of a theory that didn't work, look at Hitler.

Part of the test of a theory is hostility and open opposition. In social science, this is war, election in some cases. In science, the opposition of the "scientific establishment" serves much the same purpose.

You could easily apply the same theory to economic experimentalism as well. Right now, we are engaged in economic experiments in the cults, the communes and a dozen other would-be utopias. Already I see signs of success, in that the communes are out producing and out pricing the conventional farmer so badly he's about to go out of business—witness the farmer's strike, whining for money from the government teat to save them.

The only real difference I see between hard and social science is that the social sciences have been experimenting far, far longer than the hard sciences, utilized a far wider variety of experiments, and, above all, a social science experiment may be valid in one environment, completely invalid in another. It is this variable but still valid result that often confuses the hard-science researcher. He is, after all, accustomed to getting the same result from the same procedure everywhere. It appears to me that this is Mr. Rosa's blind spot.

EUGENE AUSTIN

P.O. Box 104

Foley, MO 63347

But the experiments that physical scientists do are carefully separated from the "real world," for several reasons. And the final test of a scientific theory is its ability to make valid predictions. Which social "experiments" have led to the formation of a theory that accurately predicts future social behavior?

analog

A Calendar of Upcoming Events

24-25 June
MIDWESTCON 29 (Midwest Relax-a-con) at Holiday Inn North, Cincinnati, OH. No regular programs but there will be hucksters, art show, films. Registration $4 payable at the convention only. Banquet $7.50. Info: Lou Tabakow, 3953 St. Johns Terrace, Cincinnati OH 45236.

1-4 July
WESTERCON 31 (Annual Western Regional SF conference) at Marriott Hotel, Los Angeles, CA. GoH—Poul Anderson; Fan GoH—Don C. Thompson; Toastmaster—Jerry Pournelle. Registration $7 before 1 June, $10 thereafter. Info: Westercon XXX1, Box 5785, Mission Hills CA 91345.

7-9 July
CONEBULUS 2 (Upstate New York area SF conference) at Syracuse Hilton, Syracuse, N.Y. GoH—Ben Bova; Fan GoH—Tony and Suford Lewis. Registration $6 before 1 June, $7.50 before 6 July, $10 at door. Art show, hucksters. Info: Carol Gobeyn, 619 Stolp Avenue, Syracuse NY 13207.

14-16 July
ARCHON II (St. Louis area regional SF conference) at Stan Musial & Biggie's Hilton Inn, St. Louis, MO. GoH—C. J. Cherryh; Fan GoH—Rusty Hevelin. Registration—$5 until 1 July, $8 thereafter. Sunday brunch $4.85 ($6.50 after 1 July). Hucksters, art show. Info: Archon II, P.O. Box 15852, Overland MO 63114.

14-16 July
EMPIRICON at Hotel Taft, New York City. GoH—Alfred Bester. Registration—$5 before 30 June, $7 at the door. Info: Susan Rothman, 35 Seacoast Terrace, Brooklyn NY 11235.

30 August-4 September 1978
IGUANACON (36th World Science Fiction Convention) at the Hyatt Regency, Phoenix, AZ. GoH—Harlan Ellison; Fan GoH—Bill Bowers; Toastmaster—F.M. Busby. Registration—supporting (Hugo voting and reports) $7, attending (all privileges) $20. The Hugo Awards and the John W. Campbell Award for Best New Writer will be presented. Selection is made by members of the convention so join and get a chance to vote. Info: Iguanacon, Box 1072, Phoenix AZ 85001.

ANTHONY R. LEWIS

READ IT SLOWLY.

You'll want to. It's that good . . . it's The Hugo Winners: 23 speculative fiction stories that have won the science fiction equivalent of the Oscar —Arthur C. Clarke's superb story, "The Star," Jack Vance's classic, "The Dragon Masters," and Poul Anderson's award-winner, "No Truce With Kings," plus 20 more.

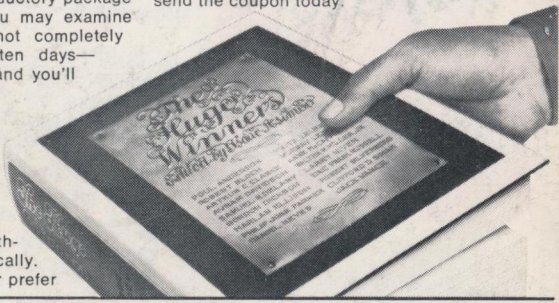
This fabulous 864-page anthology of speculative fiction sells for $15.45 in the original publisher's edition. It's yours, if you wish, as one of 4 books for just 10¢ (plus shipping and handling) when you join The Science Fiction Book Club.

Here's how the Club works:

When your application for membership is accepted, you'll receive your introductory package of four books for just 10¢. You may examine them in your home, and if not completely satisfied, return them within ten days—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. If you want both Selections, you need do nothing; they'll be shipped automatically. If you don't want a Selection, or 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 try to allow you at least ten 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 remain a member as long as you wish. At least one of the two Selections each month is only $1.98 plus shipping and handling. Other extra-value selections are slightly higher but always much less than Publishers' Editions. Send no money. But do send the coupon today.



ANY 4 SCIENCE FICTION BEST SELLERS FOR JUST 10¢ with membership

8532. **The Hugo Winners, Vol. I & II.** Giant 2-in-1 volume of 23 award-winning stories, 1955 to 1970. Asimov introduces each. Pub. ed. $15.45

6221. **The Foundation Trilogy.** By Isaac Asimov. The ends of the galaxy revert to barbarism. An SF classic. Comb. ed. $19.85

0372. **Splinter of the Mind's Eye.** By Alan Dean Foster. The further adventures of Luke Skywalker and Princess Leia Organa. Pub. ed. $7.95

7849. **Close Encounters of the Third Kind.** By Steven Spielberg. Novelization of the hit motion picture about Earth's first contact with an alien race. Pub. ed. $7.95

0141. **Time Storm.** By Gordon R. Dickson. A major novel by one of SF's best writers. Gripping adventure and fascinating ideas set in a vast scope of time and space. Pub. ed. $10.00

0380. **Up The Walls of the World.** By James Tiptree, Jr. Aliens from Tyree try to escape destruction by transferring their minds into beings on another planet—Earth. Pub. ed. $8.95

6320. **A World Out Of Time.** By Larry Niven. A black hole in space sends Jerome Corbell 3 million years into Earth's future where the ultimate battle of the sexes is raging. By co-author of **The Mote in God's Eye.** Pub. ed. $7.95

7625. **The 1977 Annual World's Best SF.** Donald A. Wollheim, ed. The best SF published during 1976 by Asimov, Knight, Varley and others. Includes Tiptree's **Houston, Houston, Do You Read?** Special ed.

0158. **The Faded Sun: Kesrith.** By C.J. Cherryh. The planet Kesrith is ceded to the human forces as part of a peace treaty, but the inhabitants aren't told. Special ed.

7518. **The Starchild Trilogy.** By Frederik Pohl and Jack Williamson. Conceived as a trilogy and together here for the first time are 3 classic tales, **The Reefs of Space, Starchild** and **Rogue Star.** Special ed.

4440. **Stellar Science Fiction Stories #4.** Judy-Lynn del Rey, ed. Six original stories about alien races, Galactic Empires and fabulous inventions by SF authors Stephen R. Donaldson, Alan Dean Foster and others. **Explicit scenes and language may be offensive to some.** Special ed.

4465. **Three Hainish Novels.** By Ursula K. Le Guin. One of SF's major talents explores the isolation of humans in alien worlds in **Rocannon's World, Planet of Exile** and **City of Illusions.** Comb. ed. $23.85

The Science Fiction Book Club offers its own complete hardbound editions sometimes altered in size to fit special presses and save members even more. Members accepted in U.S.A. and Canada only. Canadian members will be serviced from Toronto. Offer slightly different in Canada.

Science Fiction Book Club
Dept. SR023, Garden City, N.Y. 11530

I have read your ad. Please accept me as a member in the Science Fiction Book Club.

Send me, as a beginning, the 4 books whose numbers I have indicated below, and bill me just 10¢ (plus shipping and handling). I agree to take 4 additional books during the coming year and may resign anytime thereafter. SFC books are selections for mature readers.

Mr.
Mrs.
Miss _____

Please print

Address _____ Apt. ____

City _____ State _____ Zip ____

Order not valid without signature.
If under 18, parent must sign.

45-S131