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SCIENCE FACT

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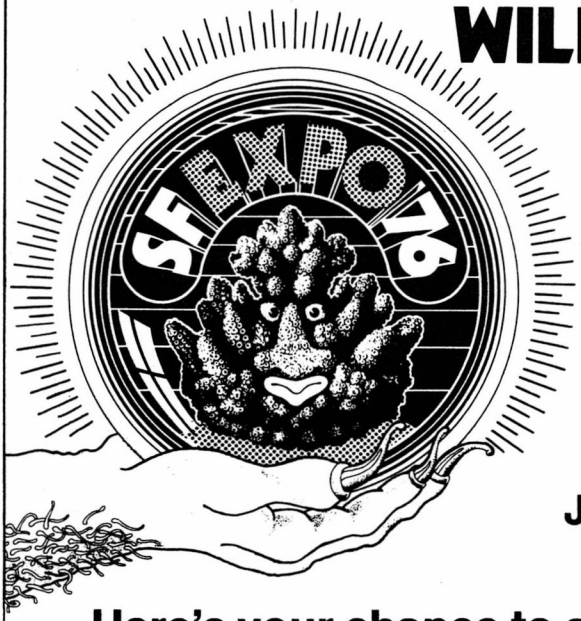
A THRUST OF GREATNESS
Stanley Schmidt

Christopher Anvil

UPDATE ON THE DEAN DRIVE
G. Harry Stine



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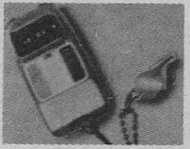

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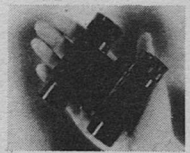

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EDITORIAL

crucial experiment II

In 1620, the year the Pilgrims landed in Plymouth, Francis Bacon published *De Nuovum Organum,* in which he outlined the fundamental principles of the scientific method of thinking.

At the hub of the scientific method is experimentation. While "natural philosophers" of earlier ages were satisfied to theorize endlessly about nature, the new breed of scientific thinkers performed experiments. Galileo, for example, performed the classic experiment of dropping two balls of different weights (probably *not* from Pisa's Leaning Tower!), and demonstrated that they both fell to earth in the same time. Since Aristotle's time, philosophers had argued the point back and forth. A few seconds' worth of experiment ended some fifteen hundred years of talk.

Astrology has been the subject of talk for even longer, but precious little experimentation has been done to prove or disprove astrologer's claims of being able to predict human affairs.

Of course, there are those who want to believe in astrology (or anything else) so badly that they are willing to loudly proclaim astrology's success in predicting everything from Presidential assassinations to the height of next season's hemlines. But astrological forecasts are usually so broadly written that anything from an earthquake to a winning lottery ticket can be claimed as a valid "prediction."

Yet there are some careful, critical thinkers who see real predictive power in astrology. Astronomers have noted correlations between the positions of the planets—particularly Jupiter—and the number of sunspots on the Sun. NASA engineers found that these correlations were as useful as any other method for predicting episodes of high solar flare activity, which cause dangerous radiation conditions in cislunar space.

Almost fifteen years ago, Joseph Goodavage produced a series of Astrometeorological weather predictions, based on astrological techniques. Published in Analog under the title "Crucial Experiment" (be-

ginning in the October 1962 issue), Goodavage's long-range weather predictions were considerably better than the US Weather Bureau's—and about as good as those in the old Farmer's Almanac.

Still, the broad claims for astrology as a method of foretelling human behavior remain unproven. What's a skeptical person of scientific inclinations to do? Goodavage has come up with a suggestion: another Crucial Experiment.

In Goodavage's own words:

"Subject: Time Twins—people with identical horoscopes who should, if astrology holds water, lead similar lives and have similar personalities, likes and dislikes, character, et cetera, allowing minor variations for genetic differences, naturally.

"Some seventeen years ago I became fascinated by the weird behavior of (natural) twins and wondered whether their same dressing, acting, and looking alike and doing the same things at the same times—even undergoing operations of a similar nature, et cetera—was just a morbid compulsion to blend their identities or one of Nature's impulses to restore preparturition conditions in the womb. So I spent years collecting published stories on twins.

"Then, when I got into astrology more or less seriously—and I could hang out my shingle and play God like most of the others who practice professionally—I got this idea of doing astrology a favor . . . by finding people with identical horoscopes, comparing the patterns of their lives and from these, determining whether PERSONAL astrology held as much good data as astrometeorology.

"Howsomever, it's a long, discouraging and often boring enterprise. To say nothing of lack of financial help. I shouldered the whole thing myself, spending years fruitlessly scanning the birth room records of New York hospitals, mailing out thousands of questionnaires to the last-known addresses of those parents who'd given birth to children within three minutes of each other in the same hospital (later the entire same city). In return, over a period of years (during which most of my data came from published news stories and magazine articles about Time Twin oddities and coincidences, which I still have), I would receive perhaps one reply out of 90 to 110 mailed questionnaires. Not once did that "one" match another—it came in *solo!*

"So for a while, I tried advertising in various newspapers around the country and spent a small fortune. It was a hundred times worse than getting started as a writer. After a few years of this, the results were worse than the hospital protocol searches.

"In 1960, the whole astrological world was agog over an upcoming "stellium" in Aquarius at the time of a total solar eclipse. Every conceivable prediction was being made (and a lot of them naturally *had* to come true). The one thing that struck me was their eager anticipation of some "Messianic type" child which would be born during such an astrologically auspicious setup. All five inner planets

This is a scientific research survey.

Because of the similarity (or parallelism) observed in the lives of children born during the period of February 2nd to February 6th, 1962, we are attempting to discover whether this similarity is pure coincidence or more common than believed.

In order to match the medical history of your child born during the above mentioned period to that of other children who were born at the same time, your help is requested. The more we know about your child the better we will be able to compare his (or her) history with that of his (or her) "time-twin."

The information will remain strictly confidential. Please fill out and post the enclosed questionnaire to Analog Time-Twin Study, 350 Madison Ave., N.Y.C., N.Y. 10017.

Name of child ..... (First) (Middle) (Last)

Address .....

Father's name ..... Date of birth .....

Mother's maiden name ..... Date of birth .....

Present age of child ..... Height ..... Weight .....

Average family income at birth of child .....

Color of hair ..... Color of eyes .....

Color of skin ..... Religion .....

Marks, scars, birthmarks, etc. ..... Location .....

Major illnesses .....

Dates these illnesses occurred .....

Length of illnesses .....

Any chronic illnesses .....

Operations? (please list) .....

Dates operations performed .....

Personal injuries? (please describe) .....

Date and treatment of injury .....

Does child wear glasses? .....When prescribed? .....

Scholastic achievements (grades) .....

Preference of academic subjects ..... Math. Science Hist. Eng.

Child's main interests .....

Likes and dislikes (general) .....

Hobbies, games, sports .....

Goals, ambitions, vocational interests .....

.....

First names and birthdates of brothers: .....

.....

First names and birthdates of sisters: .....

.....

Child's travel (dates and please indicate whether with or without parents)

.....

.....

Number of father's brothers and sisters .....

Number of mother's brothers and sisters .....

Occupation of father .....

Occupation of mother .....

Any twins in family? (give birthdate, year and hour, if known) .....

.....

Is child athletic? ..... In what ways? .....

Plays musical instrument(s)? ..... Name .....

Special accomplishments, or anything you would like to add .....

.....

Date ..... Signed .....

Mail to: Analog Time-Twin Study, 350 Madison Ave., New York City, N.Y. 10017.

"aligned" (within 16° of celestial longitude, actually) in Aquarius, with the Sun-Moon total eclipse also in Aquarius on February 4-5, 1962.

"So I've been concentrating solely on this group of children ever since. I issued a 'call for data' in one of my books, and made the stupid error of allowing a young, enthusiastic lady from Kansas City to handle all the mailing, collate all the questionnaires, and so on. We had quite a bundle of material and I was just about ready to publish when she got a divorce, moved and left no forwarding address.

"So I started all over again. I need all the data I can get. I've stretched my request for data from February 2 to 6, 1962, so as to net as many of the 'fall-outs' as possible . . ."

Among Analog's readers, there should be a statistically-significant number of families who gave birth to children during Goodavage's "crucial" period of February 2 through 6, 1962. Hence the questionnaire included in this Editorial. Whether you believe astrology is valid or vapid, an honest response to this questionnaire can help to supply the data necessary to make this crucial experiment work. Analog will, of course, publish the results as quickly as possible.

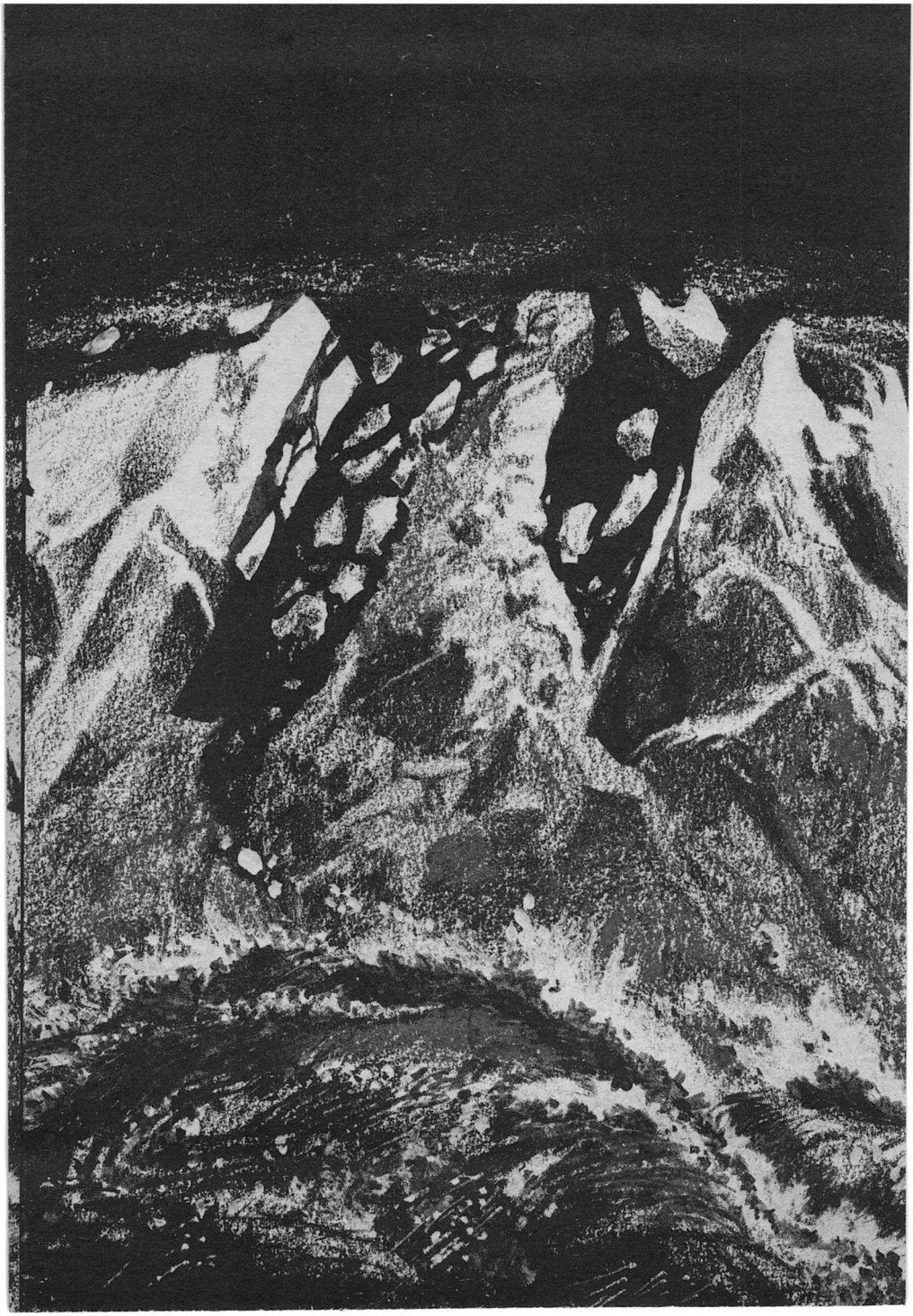
Our plan is to have Goodavage analyze the responses to the questionnaire, to see if there *are* significant similarities in the lives of these Time Twins. Isaac Asimov—no great admirer of astrology or other nonscientific modes of thought—will act as a friendly consultant, devil's advocate, and general *nudge*. He will see the data and offer his own opinions about the analysis and conclusions to be drawn.

So . . . if your family includes someone who was born between February 2 and 6, 1962, please get together with that person and try to fill out the questionnaire as honestly and completely as you can. If you know of a family that has a potential Time Twin in it, try to get them to fill out the questionnaire. Then send it in to Analog Time Twin Study, 350 Madison Avenue, New York 10017.

To quote Goodavage again:

"The astronomer . . . Bart J. Bok . . . and the editor of *The Humanist,* which published the attack on astrology signed by 186 scientists, are keenly interested in the outcome of my research. What I'd like to ascertain before publishing the results of the questionnaires . . . is the kind of objections I'm bound to get from the die-hards on either side who just AIN'T gonna buy the evidence no matter WHAT it proves! But I think the first *real* data, the first hard scientific evidence ever put together about astrology ought to justify a few of us spending a couple of hours together."

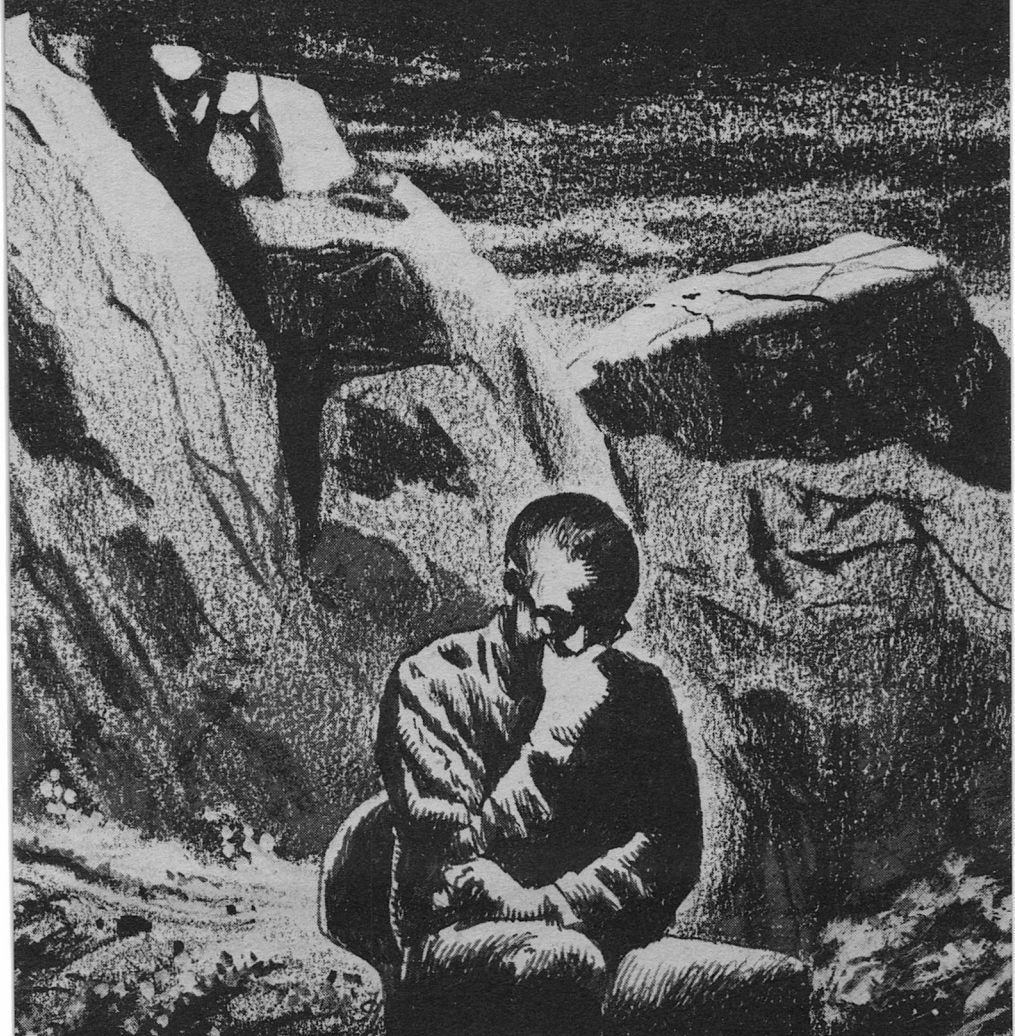
The "few of us" includes you, the readers of Analog. Here's your chance to participate in a Crucial Experiment about the validity of astrology. Maybe those "couple of hours" can end several millennia of argument. THE EDITOR



a THRUST of greatness

All human institutions are essentially conservative.
When faced with an emergency they move slowly—if at all.

STANLEY SCHMIDT



The world was coming apart at the seams.

That was where it was worst. Tremors were felt all over the Earth, beginning in the south and sweeping north in a globe-girdling wave. Mostly, the ground shuddered a little, quivered, settled, and that was all. But along the Ring of Fire which encircled the Pacific, they were more than tremors. Up the coast of the Americas on one side and Australia and Asia on the other, the plates grated against each other and those who lived along the edges felt the friction. In mere moments, whole villages slid off high perches in the Andes. Great cities like Santiago and Auckland, Lima and Tokyo, San Francisco and even Anchorage fell in one brief convulsion into fields of rubble interspersed with survivors sturdier or luckier than their neighbors. Homeless, frantic survivors roamed the ruins, calling out after missing loved ones—plaintive cries in Spanish and English under morning skies, in Japanese and a multitude of island dialects in the dark of night. Here and there a new volcano coughed tentatively, but there were few of those, and none in major population centers.

But there was a more insidious threat that did not end with the quakes and was not limited to the Ring. Everywhere the ground was tilting—so slightly as to be imperceptible to the eye or inner ear, but enough for air and water to begin flowing south. Unexpected currents caught primitive dugouts and majestic thousand-foot liners unawares and swept them off course to the south, some beyond hope of retrieval. And for those on land, they threatened flooding which nothing could stop.

Meanwhile the breezes rose somewhere in the north and blew south, smashing established weather patterns to start new ones such as no meteorologist had seen. Gradually, relentlessly, the currents of water and air swept southward, even as a spreading gray cloud forced its way northward against them.

And that was just the beginning.

After he committed the world to the end of all it had ever known, Henry Clark had little time to reflect on what he had done before he had to begin facing its consequences. Already, here in this room, he had felt the first tremors that marked the launching. He had told the first fellow members of his species what he had done, and he had finally learned why the Kyyra had offered what they had offered.

Now he stood alone, both drained and relieved, at the window of the office where all that had happened. Beldan, the Kyyra "ambassador," and Jonel and Sandy Turabian had gone out silently, leaving Clark to wonder what was in their minds. Joe Sanchez, strapped in his chair, remained like a silent specter. Clark knew what was in *his* mind, but

tried not to think about it. He had trusted and respected his former-counselor-turned-conspirator, once, but that was in the past. It must not be allowed to intrude on the present.

For several minutes Clark stood staring out the window at the expanses of concrete and swamp and seashore that were Kennedy Spaceport. He wasn't really looking at anything. The familiar Florida landscape, not quite focused, was merely a backdrop against which to project his thoughts and let them smooth themselves out. He had to be careful not to let the images of what was going on around the world intrude. It was too easy to become emotional about them.

And there was too much to do to allow himself to become emotional.

Presently he felt composed enough to begin turning his mind toward concrete actions. Then he turned briskly to leave this room for his own apartment.

The first two things, he thought as he meditatively chewed a solitary lunch of beef stew, were obvious. A serious talk with Beldan, to pin down the specifics. And then another—rather more intimidating—with Franz Gerber, to see that the required actions were taken.

He did not have to wait long for either. The knock on his door came only halfway through the stew. In a way he was grateful for the interruption. He had been half-watching the noon news on television, turned on low. He felt a moral obligation to do so—but the unprecedented listing of earthquakes and destruction and human suffering gnawed at his already sore conscience, keeping the tormenting images bright and vivid.

So it was with a certain relief that he got up and walked slowly to open the door. He had to look up to see the waiting faces—the frame was filled and more by the majestic seven-foot forms of Beldan and another of his kind. Clark didn't know the other, and to human eyes there wasn't much to distinguish them. Both had oval, hairless heads with faces strikingly humanoid despite the big, round, red eyes and the pointed ears and the lack of an external nose where a man would have had one. And both were almost completely wrapped in flowing robes of dazzling metallic iridescence and swirling colors, with two slender, two-thumbed hands emerging at angles that required two elbows per arm. Beldan's face had a slightly different color cast and a slightly rougher complexion that made him look older—and from what Clark knew or suspected of his background, that was probably the case.

That was all there was to distinguish them—except for the difference in facial expressions. Beldan's seemed to register a peculiar blend of concern and urgency and guilt. The other's was completely alien and utterly unreadable. It reminded

Clark of the one time—just this morning, he reminded himself, struggling to keep his time sense anchored—when he had seen Beldan so unnerved that he forgot to maintain human facial expressions.

"We must talk," Beldan said simply, in his soft, rather high voice. "May we come in?" His English pronunciation was impeccable, except for the oddly singsong intonation that carried over from the absolutely tonal Kyyra language.

With some trepidation, overridden by a firm sense of self-discipline, Clark nodded. "Certainly. Do you mind if I finish eating?"

"Not at all," said Beldan as he and the other followed Clark back into the single big room. "You will need your strength." Clark turned off the television and returned to the table in the dining nook. He scooped up another bite of stew, using his left hand since his right shoulder was still bandaged and somewhat painful. The two aliens, products of a planet that had started out somewhere near the burning galactic core, occupied the couch.

"This is Zhalãũ," Beldan told Clark, with a slight gesture at his companion. "She is Direct Coordinator of the engineer fleet. She will be in charge—if that is the word—of arranging technical procedures for the entire trip. And coordinating them with your people's efforts."

Clark, chewing slowly, nodded slightly toward Zhalãũ. "I'm pleased to meet you," he said formally, wondering privately what word would suit him better than "pleased." He would never have guessed that she was female. He mused idly on how the Kyyra distinguished—but he didn't waste much thought on it. "So you lit the match, huh?"

Zhalãũ, her face still inscrutable, said stiffly, "Pleased. Yes, my fleet did that, if I understand rightly your idiom. Forgive my English, Mr. Clark. It needs practice."

"It's fine," Clark assured her. "Shall we get to the point?"

"Surely." Beldan took out his music-pipe and began to play softly, improvising a quietly spine-tingling melody. But he was obviously still listening attentively as Zhalãũ began, "Now that we are underway, preparations are urgently necessary to insure the survival of as many of the Earth's inhabitants as possible. Some, of course, we Kyyra engineers must do. To do them right, we need to know everything about the planet we are moving. The things you call geology, meteorology, oceanography . . . we have had little time to study these things for ourselves. We will need access to all the information about them your scientists have been able to accumulate. A good selection of books and articles would be helpful initially. A group of experts in these fields, contin-

ually available for consultation, will probably prove even more so. Certainly they will be essential."

"I'll see what I can do," said Clark.

"Essential," Zhalãũ repeated. "I cannot overemphasize that. Essential that we have them; essential that we have them *now*. Already there has been destruction and loss of life in some parts of your planet in excess of anything we intended or anticipated. Beldan is deeply troubled. The Coordinator is deeply troubled. We are all deeply troubled. If we have misjudged some property of your planet, we need to correct the error in time to prevent future mishaps."

"Don't you think I know that?" Clark snapped. "Don't you think I'm troubled too? You don't understand what I'm up against." *They don't, either,* he reflected. *Literally. If what Sandy says she learned about their Coordinator is right, they could never understand what it's like to have all our information scattered around in books and individual minds, and every mind wanting to go its own way on the basis of its own little smattering of data.* The thought overwhelmed him. An hour ago he had felt relieved that a decision had finally been made, despite the albatross he must wear to the end of his days for having made it himself. Briefly, then, he had felt that he had done his part and the rest was up to others. Now he began to see faintly how much more he would have to do even before the others began to do their part.

That would take discipline. With deliberate effort, he forced calmness back into his voice. "I appreciate the problem," he said. "As soon as I know precisely what has to be done, I'll make every effort I can. You need information and local experts. We can start with that committee the UN saddled me with. What else?"

"The rest is what your people must do for themselves. The seismic problems you already know about; we're keeping them as small as we can. Do what you can for them. But even more urgent are the field distortion effects we have touched on briefly. Those will require prompt, massive, coordinated action on a global scale. The first thing that must be done—"

The phone interrupted harshly. Very briefly, Clark considered ignoring it. But Zhalãũ broke off, Beldan quit piping, and Clark left a barely perceptible break before he finished Zhalãũ's sentence: "—is to answer the phone." He walked over, picked it up, and sat down on the bed. "Hello!"

"Henry Clark," a familiarly stentorian voice spat into his ear. "Gerber here. What's going on?" Clark noticed at once that there was something new in the UN head's voice. He was still projecting the stern authority figure—but he was a badly shaken stern authority figure.

"Be specific," Clark suggested.

"The news," Gerber grated impatiently. "I assume you've heard some news today. Disasters all over the world. Earthquakes, mostly. I don't know how many major cities in shambles; hundreds of smaller ones likewise. I was already swamped with requests for relief before I came into my office this morning, and they keep pouring in. I'm numb; haven't had a moment's peace all day. There's nothing I can do for most of them; too many. I'm doing all I can to muster up aid from outfits like the Red Cross, but they're up to their ears, too. I've never seen anything like it."

"I doubt that any of us have, Franz."

"I could only take so much of this," Gerber said tightly, "before I started putting two and two together. All those things don't happen at once for no reason. They all have something to do with the aliens, *nicht wahr?*"

"Yes." Clark didn't even hesitate before answering, as he would have back when this all began, back in October. Those three months had wrought profound changes in him—mostly in the last few days. "Yes, Franz," he said, to leave no possible doubt, "we're on our way."

"What?" The phone was silent for a long time. Then Gerber forced out through obviously clenched teeth, "What did you just say, Clark?"

"You heard me. I hope it didn't really take you this long to figure it out. I mean, if you looked at what cities were involved, and at what times—it's pretty obvious, isn't it?"

Another lengthy silence. Without the picture switched on, Clark could see Gerber boiling only in his imagination. But that was vivid enough. Finally Gerber said, "I find it hard to believe even you'd do this. You say they've started moving the Earth. On whose authority?"

"Mine," said Clark.

"You had none!" the phone snarled. "Not to do that. Well, you'll pay for it, Clark. As for the aliens . . . well, they'll just have to stop, that's—"

"They can't stop," Clark interrupted, losing patience. Gerber was wasting time. "We can talk about it later. We're going to have to talk about it, and soon. But there's no point in it until I've finished talking to Zhalãũ."

"Who's Zha . . . who's that? And what do you mean, can't stop?"

"Kyyra engineer," Clark answered curtly. "And I mean we can't stop. I've got to find out exactly what we have to do."

"*You* have to come to New York. Right now!"

"Right after I finish with Zhalãũ," Clark corrected. "If you want to talk sooner, you can come here. But if you do, be sure you get a message to me first. The world can't afford for us to waste

time passing each other halfway. See you, Franz." He hung up without waiting for a reply and turned back to Zhalãũ. "You were saying?"

Zhalãũ had taken out a music-pipe like Beldan's and played a couple of short phrases to calm herself before answering. Then she said, "I was starting to explain the field distortion effects. The acceleration of the Earth along its axis feels like an added gravitational field, with the effect that the ground everywhere will seem to tilt toward the south. The acceleration is so low, so far, that you can't actually feel it. But it's not too low to make things happen. For instance there might be . . ."

She proceeded to tell Clark what must be done. It took two hours, and he felt pale through and through when it was over.

But he had listened carefully and taken good notes. For the Kyyra, with their long experience in planet-moving, were mankind's only hope of getting safely to M31, the spiral galaxy in Andromeda.

By 2:20 in the afternoon, Clark was striding briskly onto the spaceport's auxiliary airfield. Tony, his uniformed chauffeur, had his plane ready, checked out, and waiting—a compact lemon-yellow jet with twin engines tucked neatly under back-swept wings. As he hurried out to the ramp, attaché case in his good hand, Clark automatically sized up the weather. He hadn't done any of his own flying lately, but he still had his license and the habits he'd acquired with it. A fairly stiff breeze blew straight out of the north, just as he'd expect from Zhalãũ's briefing.

(Although, he realized suddenly, neither of them seemed to have taken Coriolis force into full account. It would be more complicated than he'd thought . . .)

There was still some clear sky to the north, stuck in among big gray and white cottony clouds. To the south the clouds had all coalesced into a formless gray mass that filled a third of the sky and gave a vague impression of pushing northward. It had no well-defined northern edge, and Clark realized that it was growing—as more and more water molecules diffused into the air—rather than moving north as a unit. Only to be expected, with the biggest reaction "engine" in human history roaring away at the South Pole.

Resigned to the fact that it wasn't going to be an especially pleasant ride, he climbed into the back seat. Tony, glancing dutifully back to make sure his seat belt was fastened, asked, "All set, sir?" caught Clark's nod, and turned to the controls to get things going.

The takeoff was bumpy and so was everything else. They climbed to a normal cruising altitude—Clark kept glancing over Tony's shoulder at the instruments, and especially

the altimeter—but the turbulence seemed to be everywhere, and so, increasingly, were the clouds. After they had leveled off, Clark said conversationally, "Tony, what were the weather reports like?"

"IFR all the way, sir," said Tony, without looking back. He was concentrating unusually hard on his flying. "Patterns look a little odd. A lot of SIGMET's and such out, but nothing we can't get through. Winds are against us, but I'll do the best I can."

"That's all I can ask," said Clark. He hesitated pensively for a few seconds, then added, "Wouldn't hurt to check the reports a little more often than usual—and the altimeter, too. Especially the altimeter."

He almost wished he hadn't said that, but Tony gave neither reply nor comment. Clark wondered how much Tony suspected about the weather patterns that he called "a little odd." Did he suspect a connection between those and the "acts of God" that the papers and casts had been full of all day? Clark surmised that he must, even if it hadn't yet reached the conscious level. *He* certainly wasn't going to ask—much less tell the young pilot how much more he knew about how all this fit together.

There was little to see outside, now, but there was plenty to think about. Clark lowered his seat back a notch and settled back against it, eyes closed and hands resting on the attaché case on his lap. He was used to the constant bounces and bumps from his own more active flying days, so they didn't interfere with his using the trip to turn the whole situation over and over in his mind. What had led up to this . . . what he would do when he was in New York and face to face with Franz Gerber . . .

Why (a piece of his mind wondered abruptly) was he going to New York at all? Why hadn't he insisted that Gerber come down to Florida instead, to save time?

Because (another piece of his mind answered) this way would save time in the long run. Because Gerber and those who worked with him were very, very human, and under the best of conditions Clark faced an uphill battle to make them see what they had to do and get them doing it in time to help. The fact that he had already forced everybody's hand was not going to make it easy. For him (whose official title was still nothing more than Lieutenant Commissioner of Grants of the World Science Foundation) to compound the offense by telling the head of the UN that he must come to see Clark rather than expecting Clark to come to him—

It would be too much. Far better to do it this way—to appear cooperative now so the UN people wouldn't waste still more valuable time trying to make him change his mind.

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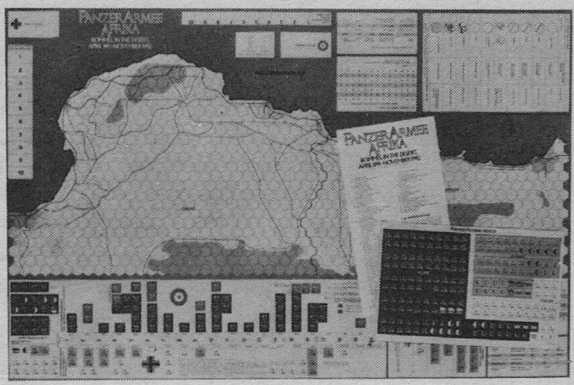

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the big reason of improving mankind's chances, and for the very personal one of getting this whole enormous burden out of Clark's hands and into the ones where it belonged. How he looked forward to that!

Only–

Only it wouldn't be like that, he realized with shocking abruptness, and his throat went suddenly dry. For an instant he caught a clear glimpse of this whole situation as it must look to Gerber, and the glimpse blossomed into a terrifying picture of what was *really* going to happen. He felt his pulse quicken as he examined that future and gradually realized what he would have to do.

He didn't like it, and he was painfully aware that he couldn't see enough moves ahead. But what he had just envisioned seemed *so* likely that he had no choice but to cover it as well as he could.

Grimly, he squeezed the qualms out of his mind, reshaped them into resolution to do what he must, and squeezed that back in. That felt better . . .

He looked at his watch. Still a bit more than an hour to New York. He allowed himself one more minute to ponder wording, then opened his attaché case, took out paper, and started writing. Oddly, his hand didn't shake, even with the soreness still in his shoulder. If anything, it seemed to have acquired a kind of firmness that it had never had before. There was shakiness in the writing, but only what came from the turbulence in the air.

He wrote–sometimes hurriedly, sometimes crossing out and pondering, then rushing on to make up lost time–all the way to New York. He took a short time out as the plane fought its way down a very bumpy final, bounced hard with one wing dipped, and roared down the runway, braking hard. By then Clark was writing again; his signature gained an added flourish from Tony's necessarily sharp turn onto the taxiway. As they taxied to the terminal, Clark sealed what he had written into an envelope, snapped the attaché case shut, and addressed the envelope:

JONEL AND SANDY
TURABIAN
PERSONAL AND
CONFIDENTIAL

As he climbed out into the bitter cold of an overcast intersection of January and New York, wishing he'd brought a heavier coat than he had, he handed the envelope to Tony. "I don't know how long I'll be," he told the pilot, "but guard this with your life. If I'm not back and you haven't heard from me by quarter of seven, you hightail it back to Kennedy Spaceport and deliver this to the Turabians, personally and immediately, regardless of the hour, and make sure they read it right away. Got that?"

Tony's puzzled frown was thinly

veiled, but he asked no questions. "Yes, sir."

Business was pretty much as usual in New York, with the possible exception of the weather. Clark took a cab—an undoubted extravagance, these days, but still worthwhile in cases of real hurry. It gave him little chance to see conditions in Manhattan, since they used the Queens Midtown Tunnel and surfaced almost at the doorstep of his destination. But they were above ground, careening through the streets of residential and shopping neighborhoods, for a goodly distance before entering the tunnel, and nothing looked terribly unusual. Traffic was normal; pedestrians went about their business in quite ordinary ways. The dirty remains of last week's snow lay on the ground and fluffy new flakes swirled aimlessly but rather violently in the air. The winds whipping tree skeletons and pedestrians' hats about weren't really spectacular, but they boded far more than routine annoyance.

The taxi entered the frantic dreamworld of the tunnel and Clark stared blankly as the neatly tiled walls whizzed hypnotically past. Then up again into the steel and concrete and glass canyons of Manhattan, with the bustling and honking of early rush-hour traffic on the sidewalks and streets. Quieter and less crowded now than in his boyhood, Clark reflected, since even more of it was underground now than it had been then, and engines had become quieter and cleaner. But still crowded and noisy, by any standards.

For half a minute, after he paid his fare and got out, he was right in it, fighting the wind from the curb to the door. For that time he merged into the human stream, heard them talking, watched them pass the headlines on the ubiquitous newsfax dispensers—and saw no evidence that any of them cared.

But he cared. And he had reached his destination.

He stepped through the door into the warm lobby, but he felt no warmth.

Franz Gerber's office occupied a corner of the twenty-sixth floor, with huge plate-glass windows, beginning less than a foot above the blue plush carpet, commanding a splendid view of the East River and lower Manhattan. But Gerber was by no means preoccupied with the view. Hardly a second passed after Clark rang his doorbell before the door flew open and the boyish-faced UN chief glared out at him, his dusky-blonde hair thrown carelessly back and his smooth round cheeks flaming even redder than usual. Boyish, perhaps, in ways, but his eyes were hard and fiery and his lips drawn sternly tight across his white teeth. "About time," his voice crackled. "Get in here, Clark. Have a seat."

He pivoted sharply, strode back to his big molded desk and sat down. He pressed a button, presumably to alert the front-office receptionist not to let anybody else in, and waited impatiently while Clark took his coat off and hung it on a hook beside the door. Gerber, ever impeccably dressed and usually impeccably groomed because he set great stock in such things, kept a half-length mirror on the inside of the door, and Clark couldn't help noticing himself in it before he turned away. His clothes wrinkled, his face more lined and his black hair and mustache more streaked with gray than they had been three months earlier—he looked harried. He looked like a man who had managed to get gracefully past his first sixty years, aging less than others—and then, abruptly, under the press of events, began to catch up to them.

But there was something else there, too—something he hadn't quite decided how to evaluate yet. Almost as if, shortly after this aging spurt began, it had taken another sharp turn, off in some other direction. To . . . where?

He thrust the silly thoughts impatiently from his mind and sat down in a leather-covered armchair facing Gerber. Gerber was leaning slightly forward, staring impatiently at Clark. The desk top between them, usually an extension of its owner's meticulous concern for appearances, was strewn with telegrams and memos and sheets of newsfax, all about the earthquakes and calls for help and sincerest regrets that no help was available. Gerber waved a despairing hand over them. "The fruits of your arrogance," he hissed. There were bags beginning to form under his eyes. "OK—you got us into this. Now get us out. After that we'll worry about what to do with you."

"I'm sorry," Clark said softly. "But that's impossible."

Gerber's eyes narrowed. "What, precisely, do you mean . . . impossible?"

"We can't stop the Earth. It's on its way; it's using reactions that the Kyyra know how to control and we don't. But it's using the Earth's substance for fuel, and it's using it on a large scale. Did you ever try to stop a forest fire instantly because somebody said you must? You can't do it. You can control it, on a large scale. But once it's going, you can't just casually stop it or ask it to bypass your favorite flower. This is something like that."

"You're lying!" Gerber snapped. But his eyes had a haunted look of terrible uncertainty.

"Besides," Clark went on, "even if they could stop it, there'd be nothing to gain by it. Absolutely nothing."

"*Nothing?*" Gerber echoed incredulously. "We could pick up the pieces of all this and get back to a normal life—"

"For seventeen years," Clark

broke in. "That's all. And even that wouldn't be normal. You'd spend a lot of it picking up those pieces. And toward the end of it even normal shortsighted human beings would begin to realize what was going to happen to them, and they'd shatter into hysteria. By then it would be too late to do anything else. That's why I told the Kyyra to go ahead."

"*What's* why? Make sense, Clark!"

"You, for instance. You still haven't really grasped what's happening, have you? I'll say it very slowly, though you've heard it all for three months. The core of our galaxy has exploded, Franz. Radiation from it has sterilized planets all over the galaxy, and we'd get ours in seventeen years. Not a thing we could do about it, on our own. But the Kyyra have already been through it. They're fleeing to the nearest homelike galaxy, using their planets as ships, and they've offered to help us do the same. But they can't wait those seventeen years for our answer. They had to know now."

"But who gave *you* the right to decide? Since when can you play God with the whole human—"

"I finally realized," Clark lashed back, "that I was doing that either way. You politicos have had this thing long enough, and you haven't done a thing with it. It's become quite obvious that you never will, and the Kyyra were about to leave. So what would have happened if I hadn't gone ahead and made a deal with them? We'd have lost that chance. What choices would we have then? Sit here and talk and finally panic and die. Or we could burrow underground and sit here like rats in a hole—we and all our descendants for the next million years. Only we wouldn't have even done that. Seventeen years sounds too far off to get excited about, even if the problem'll take that long to solve. I finally realized that the only way to make people worry about a big, long-range, far-off danger is to convert it to a big, immediate, very personal one. So I did." He sat very straight and gazed defiantly into Gerber's eyes. "And no, Franz, I don't regret it. I'm sorry people are dying, but if I hadn't done it, everybody would. This is better."

Gerber was silent for a long time, staring, wheels turning behind his eyes. He hadn't seen much of Clark these last few months, since he'd been tied up with this affair at the spaceport. But he knew that before that Clark could never have done anything like this, or even talked this way to Gerber. Yet circumstances change men . . .

"You've gone mad," Gerber announced finally. "Completely out of your skull. I can't understand why *they* would try to make a deal with *you*. Surely they know—"

"They know I'm the only person in a position of any authority who even seemed to take them seri-

ously. And they really wanted us to go–"

Gerber's eyebrows shot up. "You finally found out about that?" he demanded. The aliens' motives, which they had studiously avoided discussing, had been a very hot question up through yesterday.

"Yes," said Clark. "Just this morning. Beldan took a liking to Sandy Turabian–the girl who married Jonel after they followed him back here–and took her to visit their ship." *No need to go into all* that *story,* he thought privately. "She figured it out, and Beldan verified it. They–" He started to tell the first part of their reason, but caught himself and decided that was best kept under his hat. He skipped to the other part. "They're going to need help resettling when we all get to M31. They think we can give it."

"Over my dead body!" Gerber snarled.

"Very probably," said Clark.

Gerber's face went white. He fumed silently for a while. Finally he said ominously, "That's not funny, Clark. Does that damned space creature have a phone where he's staying?"

"He does," said Clark. "It takes a clearance to call it, but you can do it. I suggest you address him a little more respectfully than that. And think of him that way, too."

Gerber gave no answer except an indignant snort. At his touch on a button, a picture-phone screen popped up out of the desk top, facing him. He put a call through to Florida, taking more time and pushing more buttons than were usually necessary. Finally he leaned back, looking hard at the screen. Clark couldn't see the screen, but he heard Beldan's mellow voice from the speaker.

"Yes? What is it?"

"I'm Franz Gerber," Gerber said distastefully. "Secretary General of the United Nations of Earth. You probably don't remember me, but–"

"I remember you."

"Then maybe you can explain what's going on here. We're scrambled. Mr. Clark tells me he's made an agreement with you and you've started the Earth on that intergalactic trip."

"That is correct."

"Mr. Clark had no authority to make that agreement."

Silence for a few seconds. "I'm sorry."

"*I*–on behalf of the UN–have that authority. So . . ." Gerber hesitated, as if what he had to say next tasted bad. "So would you please stop the reaction? Right now. Then the proper authorities can consider this thing, and maybe we'll do it and maybe we won't. But for now, the deal's off. Do you understand me?"

"I understand you." Pause. "But I'm afraid you don't understand the situation. The deal may be off, in your view, but the reaction is on. It

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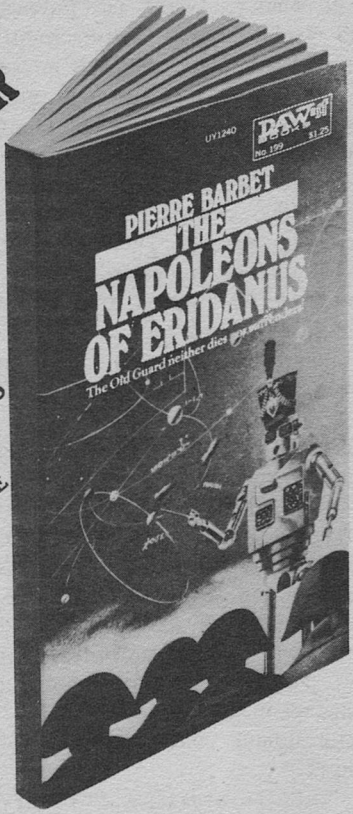

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can't be stopped—not soon enough to do what you want. The physical and technological requirements leave no alternative which is in any way preferable to continuing what has been begun. Hasn't Mr. Clark explained this to you?"

Gerber didn't answer. He glowered at the screen for a long time, breathing heavily. Then he said, "We'll discuss this later." He disconnected. The screen disappeared back into the desk top.

Gerber looked at Clark and forced a thin, sardonic smile. "So," he said, "we seem to be at an impasse. So what now? This morning you said we'd have to talk."

"Yes." Clark jumped eagerly at the possibility of finally getting to the meat of the matter. "Things must be done so people can survive. Time is of the essence, and I'm talking about minutes, not days. The UN will have to direct things for maximum speed."

"I'll humor you. What kind of things?"

"They're starting out very gently—"

"Gently? You call the worst rash of earthquakes in history gentle?"

"Relatively," Clark nodded. "It could have been much worse. They made the initial shock as light as they could, to minimize damage. It's been worse than they expected, but there was no way to avoid it altogether. But they do want to minimize it. That's why one of the first things we have to do is give Zhalãũ all the information we can about the Earth, and a panel of experts to help them interpret it. Right away."

Gerber frowned. "Sounds dangerous. Maybe suicidal. How gullible do they think we are?" Pause. "What else?"

"They're building the thrust up to something like a thousandth of a G. That'll take a few days; I don't have all the numerical details. They'll hold it there to give us time to prepare for the next phase, then run it up higher. That'll be a big job, but we'll have to put everything into it and get it done fast. It's hard and inefficient for them to keep the acceleration too low—and we'll hit some time limitations of our own from things like food reserves. Agriculture as we know it is finished. But that's not what matters now. Our immediate problem is just to get through the initial phase with enough people still alive to do what comes later. The earthquakes last night and this morning are part of it, but a small part. The main thing's going to be the flooding."

"Flooding?"

"We're accelerating, and acceleration feels like gravity. It means the ground everywhere on Earth is effectively tilting downward toward the South Pole."

"This room isn't tilting."

"Yes, it is. You just can't see it because the tilt isn't very much—yet. Everything outside's tilting too.

That means the oceans are going to flow south. They'll flood land temporarily on the way, and they'll flood it permanently when the water piles up in southern latitudes. It'll be deep down there and gone up here. So the first thing we have to do is hold all the water we can in the north, and evacuate the areas that are going to be flooded. That's going to include a lot of the Southern Hemisphere. Whole cities, even whole countries, in some places up to thousands of feet above present sea level—"

"Hold it!" Gerber broke in. "Hold it. Evacuation of areas like that. Do you have any idea what you're asking? Do you know what it would *cost*?"

"Meaningless question. The economy is dead, Franz, all over the world. The sooner you realize that, the better off we'll all be. Money doesn't mean a thing anymore—but there are billions of lives at stake. I don't think you understand yet that we're in a situation where survival is the only problem we have time for."

Gerber leaned back and stared narrowly at him. "No, I don't," he said quietly. His manner had changed, as if he had finally made a decision that had eluded him for too long. "You admitted yourself that the earthquakes have stopped."

"Most of them," Clark nodded, frowning. "But the floods—"

"You're bluffing," Gerber said flatly.

Clark was stunned in spite of himself. "What?"

"You're bluffing," Gerber repeated, standing up and beginning to pace in an arc on the far side of the desk, looking down at Clark. "Beldan is bluffing. I don't entirely understand why, yet, but it's the only way I can make sense of it. You've developed delusions of grandeur and you've somehow got the aliens to put on a show for you, to make it look like there's a situation so desperate that we have to hand you virtually unlimited power. I still don't see what's in it for them . . . I'll have to talk to Beldan about it."

"There isn't time for that," Clark protested. "The evacuation must begin now."

"I can't start anything that big until I'm absolutely sure it's necessary. Meanwhile . . . the earthquakes have stopped. Your show is over."

"The floods," Clark croaked. "Check ocean currents, if you don't believe me—"

"No time. That's a big job, and the chances of its being necessary look too slim. Meanwhile, I have real problems that need a lot of attention. All those earthquake victims. And you." He frowned, pressing his lips together, and added, "And those aliens. What *is* their angle in all this? It's obviously an act of aggression on their part—"

"Words," said Clark. "So what if it is? What kind of retaliatory ac-

tion can you take against beings who mine stars and move planets?"

"None," Gerber admitted bitterly. "So we'll concentrate on you." He stopped pacing and riveted accusing eyes on Clark. "Insubordination at best—flagrant commission of acts for which you were in no way authorized. Mass murder and high treason at worst. You're a dangerous man, Clark. Too dangerous to risk letting you do any more."

Clark faced him with surprising calm. "What are you getting at?"

"Punishment can wait," said Gerber unhurriedly. "There's plenty of time to see what an international court can do with you. But it's immediately important to see that you don't get into any more trouble." He touched a button on his desk and smiled blandly. "Please remain seated, Mr. Clark. You're not going anywhere. I thought over our conversation this morning while I was waiting for you, and took the liberty of having a couple of security troops wait outside when you arrived. Just in case."

Clark heard the door open behind him. He turned sharply to see the two men in green and gold uniforms, armed and ready. Then he turned slowly back to see Gerber, forcing his body to relax and his face to appear calm. He drew some slight satisfaction from Gerber's visible disappointment that he did not seem very surprised.

But, of course, he wasn't.

Gerber wasn't as stupid as Clark seemed to believe. Sure, *if* it was true that the launching was real and irreversible and nothing could be done about it, he'd want to do everything in his power to prevent damage to life and property. Even something as mind-bogglingly expensive and formidably difficult as the evacuation program Clark was screaming for.

If.

But if it *wasn't* true . . . how could he possibly be expected to commit the kind of money and matériel and men and women Clark was talking about, and risk finding out when it was over that it was all a waste? It would be cataclysmic. The cost to the world, by any measure, would be shattering, particularly coming right on the heels of those earthquakes. The loss of confidence in the UN would destroy all the great forward strides that the world community had made in the last quarter century. He, Gerber, would be a global laughingstock, but it was far more than his own face and political skin he was concerned about. It was the welfare of all the people of the world.

He would have to find out, of course, and soon. If all Clark claimed *was* true, prompt action would be needed. But Gerber had no intention of plunging headlong into it until he was sure. A big

crisis didn't warrant losing one's head—rather, it made it all the more necessary to keep it.

The possibility that Clark—and Beldan—were telling the truth haunted him long after the troops escorted Clark out. But still it seemed remote and therefore less urgent than the attempts to get aid to the earthquake victims. The launching irreversible? That above all Gerber found hard to swallow. The aliens manipulated stars and planets as men manipulated generators and automobiles. It seemed inconceivable that they could do all that and not even be able to shut off what they had started.

But . . . *Let me be right about that,* he found himself praying with unaccustomed fervor as he dialed a call to yet another relief organization. *Please let me be right.*

Actually, he wasn't even entirely convinced the launch was real. He still didn't see why the Kyyra should want to go to all that trouble for a strange and backward race. But he did know that Clark had been developing megalomaniacal tendencies out of this thing. Joe Sanchez had alerted him to that, before his involvement in that conspiracy. *(Too bad about that,* Gerber thought. *Sanchez' heart still seems in the right place. Pity he let bad judgment get him mixed up in a thing like that.)* That being true, and Clark being in closer contact than anyone else with the aliens, who knew what crazy deals he might have made with them? Gerber should have watched him more closely, he realized now. But it was too late to worry about that.

He concentrated hard on his relief efforts for forty-five minutes after they took Clark away. Telegrams, calls to agencies who might be able to help, calls to friends all over the world who might be able to pull strings at agencies who might be able to help, people who might take some of the load off his shoulders . . .

It left him drained. The day had been too much, without a moment's relief since the first phone calls ripped him from sleep in the wee hours of the morning. The last hour had been frantic. It was dinner time. He needed food, but was afraid to take time out for it. He needed a drink even more, and was even more afraid to take that. There was so much still to be done . . .

All he allowed himself was two minutes leaning back with his eyes closed, running through a relaxation exercise with such grim determination that it defeated the purpose. Then he dialed another call.

The face that formed on the screen was one that he had never been able to consider calmly. Before it he felt somehow intimidated—and there wasn't a man or woman on Earth who could intimidate Franz Gerber.

"Mr. Gerber," said Beldan, neutrally. "I hadn't expected to hear

from you again so soon."

"You should have," Gerber said tightly. "I said I'd get back to you. We have a lot to talk about." He waited, but Beldan made no reply. He simply stared back, his limpid red eyes projecting an aura of stoical patience such as might grow out of a long and trying life. Finally, annoyed, Gerber broke the silence. "I didn't want to continue the discussion we started in front of Mr. Clark. But I have to pursue it with you."

"Where *is* Mr. Clark?" Beldan asked.

"Never mind that. Let's talk about stopping this thing you've started."

Impatience rippled faintly across Beldan's calm, then passed. "We told you that's impossible."

"I know. I don't believe you."

Beldan shrugged, but his face betrayed nothing. "I'm sorry. But that doesn't alter the fact."

"You actually expect me to believe you can start a thing like this and yet you can't stop it?"

"Not the way you want. As for believing it, do you have any alternative? I hope you will not waste so much time deluding yourself that irreparable damage is done."

"Irreparable damage has already been done," Gerber shot back. "But not by me. By you. Do you people have no consciences?" *That looks chillingly believable,* he thought. But he said aloud, "I can't believe you have so little that you'd go ahead and let the things Clark described happen."

"You refer to the flooding, I suppose?" Beldan looked deeply troubled. "Certainly we would not willfully cause such harm to your people. The possibility that you would act as you are doing—that *you* would allow them to suffer when you should be acting to prevent it—was inconceivable to us. I find your actions quite incomprehensible. But I am powerless. It's in your hands now."

Frustration pounded harder and harder at the inside of Gerber's head. "I still can't believe that," he muttered. He leaned forward, affecting confidentiality. "Look, Beldan, maybe we can make a deal. Obviously you hoped to get something out of all this. What?"

"Surely Mr. Clark has told you our reason." There was something odd in his expression then, Gerber thought. But he couldn't figure out what.

"He told me what you claimed was a reason," Gerber said. "What's the *real* reason?"

Beldan looked utterly perplexed. "I don't understand you at all."

Gerber felt more and more exasperated. "What do you want from us? Admit it—you made some kind of a secret deal with Clark, didn't you? Well, he had no power to make a deal. You won't get whatever it was." He realized even as he said all this that it seemed absurdly futile in the face of events.

But he knew nothing else to try . . . "But if you deal with me, maybe you can. We'll see."

Beldan stared out of the phone screen at him, silent, seemingly uncomprehending. At length he said uncertainly, "I don't know what deal you think you're talking about, Mr. Gerber. I'm sorry you don't consider Mr. Clark an appropriate individual for us to have made arrangements with. That was my mistake, I suppose. We have never really understood your power structure. We have nothing like it ourselves, you know." He paused, then suddenly looked out at Gerber with the uncertainty gone. His voice remained placid, yet there was a strong note of urgency in it as he said, "But you really should listen to Mr. Clark. He knows more about this situation than anyone else."

Gerber made one last desperate try to find a point of contact with the alien. "Why can't you just start dealing with us instead? With me and the others here at the UN? *We* are the duly constituted authorities on Earth."

"But Clark," said Beldan, "is the one who knows what's happening. We won't waste time trying to teach you."

"Why?"

"Because it would be futile. If we waste that time, very simply, none of you will survive. Neither your race nor ours will gain anything."

And with those words, without waiting for a reply, *he* broke the connection.

For a moment Gerber fumed at the alien's audacity. Staring at the blank screen, he almost called back, then decided he would not give Beldan that satisfaction. Instead, he leaned back, exhausted, exasperated, hopelessly frustrated. He was still hungry and thirsty and—he finally admitted—scared. He badly needed sleep, but hated to take time for it.

However, he conceded, it had reached the point of necessity. Therefore, he would do it, for just a short while. There was just one more call he would make first.

After supper that evening, Jonel and Sandy Turabian sat on their couch continuing the day's long process of sorting out their thoughts and feelings. They talked little, for what they both needed would come more from within than without. Still, Sandy, leaning on Jonel's shoulder, drew great comfort from his nearness. But it was by no means a thing of passive dependence—she knew very well that Jonel was leaning on her quite as much as she on him.

But she felt sure that in some respects his adjustment was farther along than hers. That was his way. If a thing needed doing and there was no longer any chance of changing it, he could quite calmly thrust all regrets about might-have-

beens behind him and concentrate his whole being on doing what he must. To some extent, so could she, but she was more sensitive to some things and sometimes that got in the way.

And she had been much closer to Beldan.

Her gaze fixed on the wall, her mind relived for the hundredth time the dizzying events of the last two days. The entertainment console provided a background of Vaughan Williams' *Sinfonia Antarctica,* not too loud—a thing she had chosen more to match her mood than for any literal appropriateness its title might have coincidentally had. Ozymandias the Mutt lay curled between her feet and Jonel's, unusually quiet, occasionally gazing up at him or her with big brown eyes full of worry about whatever was worrying them.

Twenty-four hours ago she had been aboard the Kyyra starship in orbit around Earth, a lone guest among Beldan's kind. In the few intervening hours had come the stunning series of revelations. She had been less a guest and more a hostage than she could ever have dreamed; Beldan had made his first known attempt at deception. She had confronted his dying "God" face to face—or mind to mind—and had learned of his ancestors' guilt in connection with the core explosion. And Henry Clark had played along with his amateurish deceit to the extent of committing the Earth single-handedly to the odyssey on which people had utterly failed to agree for three months.

And now there was no turning back.

That was what took the most getting used to. All this time, ever since the Kyyra had followed Jonel home from space, she had been in the very forefront of trying to learn what made them tick and whether men would do well to accept their offer. But, she had realized with stark clarity this morning, she had remained so objective through it all that she had never decided whether she personally favored going. Which would be better for two people in their prime: to live normal, vigorous lives into their forties and then die, or to trade all semblance of normality for more time and a chance for the grandchildren they might someday have?

She still wasn't sure. She had long since disposed intellectually of any outrage she had felt toward either Beldan or Henry. Both had had understandable reasons, probably even good reasons, for what they did. Shock had passed quickly; emotional turmoil was fading gradually. But she had not yet fully accepted the trip as something that had begun and would continue for the rest of her life, rather than something to be debated for decision at some vague time in the future. She had not fully realized that the cost would

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be so great—not even the first time she had sat in on one of the deliberations and become afraid as she had never been afraid before.

She had run through it all once more and was stuck on that again when the doorbell rang. The narrator on the record had just read the last superscription, the one that begins, "I do not regret this journey . . .". Sandy remained on the sofa, consciously hoping that wouldn't become too prophetic, while Jonel went to answer the door.

She frowned, perplexed, when she recognized Tony, who usually flew Henry's official plane. She couldn't hear all he said; he was speaking too quietly. But she heard, "He didn't come back . . . No, I don't know what happened . . . He said to be sure you both read it right away."

"Will do," said Jonel. He took an envelope from Tony and tore it open with his thumb. "Thanks, Tony."

The door closed and Tony was gone. Jonel sat back down next to Sandy and took a single sheet of paper out of the envelope. It was covered with Henry's handwriting, marred by an occasional crossed-out phrase or a place where something seemed to have bumped his hand. Jonel held it where Sandy could see it and they both read silently.

Dear Jonel and Sandy,

I hope you've managed to forgive me enough by now to read this and do what I ask. I'm writing this on the plane en route to New York. When we took off, I was looking forward to getting out of the driver's seat, but I've had enough time to think it over to decide I'm not going to get off that easy. What I'm afraid of is this: Gerber's going to be so teed off about my taking things into my own hands that he'll go overboard coming down on me for that instead of doing what needs doing. I had a long talk with Zhalãũ (ask Beldan to introduce you) and I know there's not time for that. I know what needs to be done, and I'm going to try to do it through channels. (I'm not sure I'd bother if I could see a workable alternative.) But Gerber's likely to try to block me—I wouldn't be terribly surprised if he locked me up and put a muzzle on me.

That's why I'm writing this. If that happens, a lot of people are going to die unnecessarily in the Southern Hemisphere. I don't think you and I can prevent that, but if it happens, maybe we can use the shock of it to prevent too much more of it. I'm asking Tony to bring you this if I don't come back; if he does, it means I'm out of commission for some reason like that and it's up to you.

What I'm asking you to do is this: go to the media. Jonel, at least, should have no trouble getting air time or newsfax coverage. Use it, tonight. Give them at least some of the information I wanted to. Zhalãũ

can give you a list of the places that'll be flooded, and when, and where people can go to be safe. Some of the flooding will start within a day, so we've already lost the chance for an organized evacuation of the first victims, but maybe some of them can still get out on their own. What's even more important is that you make it very clear to everybody that these things are going to happen and we knew it. Make sure they know we can get through it if and only if southerners get out of low places and northerners start saving all the water they can. Above all make sure they know I told the World Government and the World Government didn't do anything. It won't save those people in the south but if they die and the survivors know somebody knew how to prevent it—maybe it will create some pressure to listen in the future. Pressure like that can cause explosions, but it can also be channeled to get things done. I don't see any other way . . .

I don't know what you should say about my role in this. Probably the less said the better. I find it hard to think about that . . .

No time anyway. We're landing now.

Please hurry,
Henry

Sandy read it twice and then stared at it for a long time with growing dismay. She could see something of the same in Jonel's face. Mobs could be vicious and terrifying; neither she nor Jonel felt comfortable dealing with people in large masses. "Poor Henry," she whispered. "But . . . why us?"

It was almost purely a rhetorical question, but Jonel answered it. "All kinds of reasons. As he says, I can get the exposure. Like it or not, anybody who brought the *Archaeopteryx* home with the news of the core explosion and the Kyyra not far behind is going to remain grist for the newsmen's mills. Especially when he wants to talk about what Henry wants us to talk about." He took another long look at the letter and remarked, "Henry's changed. Can you imagine him doing anything like this before the Kyyra came? Or even before he was shot giving that speech?"

"We've all changed," said Sandy. "And we'll keep on changing. Anybody would, under that kind of pressure. And Henry's been under the most of all."

"True. And you've been in closest contact with the Kyyra. If anybody on Earth knows what makes them tick, you do."

"That's a frightening thought, when I think how bewildered Beldan still makes me feel sometimes. Well, what are we going to do, Jonel?"

"Two choices, as I see it. We do what Henry asks, or we don't. Do we agree with him?"

Sandy chewed thoughtfully on her lower lip. "I . . . I'm not sure what I think. Again. I hate being

that way. I'm not used to it. I hate the thought of doing what he wants and taking what the public and the UN are going to give us for our trouble. But I'm also afraid of what will happen to everybody if we don't."

"I think," Jonel mused, "Henry is in the same position, only more so. He's resigned himself to doing what he thinks he must, knowing full well it may mean he'll never have any personal peace again." He looked at Sandy and added softly, "And I think we're literally the only other people he even hopes support him now."

Sandy finished thinking it out. "I don't see that we have any choice," she said, and with that all hesitation was banished from her mind. She began planning moves, thinking out loud. "We can get in touch with a few people to announce that we have an announcement. Then while we're waiting we'll get the details from Zhalãũ. I know her already, Jonel—I met her on the ship. And . . ." she frowned ". . . we're going to have to do some hard thinking about that last question Henry raised."

Jonel nodded, but he was already at the phone. "We should be able to make some eleven o'clock news," he said, pushing buttons. Then, to the phone, "Hello, this is Jonel Turabian. Yes, *that* Jonel Turabian . . ."

Cecil Gordon sat on the hilltop overlooking the bay at dawn, leaning against a gumbo limbo tree and trying dazedly to comprehend what had been happening to him. He had first become aware of it in the middle of the night, when shouts and excited jabber in the old patois had yanked him from a sound sleep in his shack on the edge of Port Maria. The road and its margins swarmed with villagers, brandishing flaming torches and electric flashlights as they milled about, seemingly streaming toward the steep hill on the landward side of the road. Yapping dogs and bleating goats mingled with cries of children and shouts of adults trying to keep their own together. A lot of them were saying something about water, and Cecil was conscious of a steady undertone of rushing, lapping, wet sounds. He paid them no great heed at first. It had been a stormy night when he went to bed, with winds howling and shaking the coconut trees and plantain and banana plants this way and that, and waves battering the shore, sending towers of foam and spray crashing skyward when they hit the retaining wall. But there was nothing in that that should hold terror for any but a small child. So his first reaction when he got up was annoyance.

That changed to something much more, with literally chilling suddenness, when he stepped out of his front door to see what was happening. Still fumbling to get a torch lit, he didn't see the rushing water before his bare foot landed in it. He

drew it back with a startled oath, frantically finished lighting the torch, and looked down incredulously at his brown feet. The water was lapping at his very doorstep, and there was never *water on this side of the road—not since the hurricane that had struck the coast when Cecil was just a little boy begging rides in the fishermen's boats.*

He held up the torch to look at the road. It wouldn't reach that far, but there was enough moonlight and flashes from his neighbors' lanterns to see that the road was covered and the Caribbean had spilled over it. Many of his neighbors were up to their knees in churning froth.

That realization sent Cecil's eyes frantically to the side of his house, where he kept the cotton-tree boat on which his living depended. It was gone. As well as he could by the blotchy mixture of moonlight and torchlight, he looked wildly around for it. He found no trace—unless it was one of those dark shapes bobbing on the water, too far out to go and investigate. He thought of the time and work he would have to put into making a new one if he didn't find it, and felt sick.

But he had little time for that now. He felt the water around his feet again, and he had been standing up out of it. It was rising. How high it would go, he had no idea; it shouldn't have even been this high. The only sensible course was to head for high ground.

The hill started up right behind his house, and so did he, without delay. He didn't bother trying to take the torch. It would be a nuisance, and he knew the hillside well enough to pick his way up it by moonlight, even allowing for its steepness and thick vegetation. But he did take his machete. It was one of the few times he was glad he lived alone now, with no family to keep track of and watch out for. Occasionally he saw other people, their dark faces and arms barely visible among the shadows, but he made no attempt to join forces with them. He could move faster alone.

He was tired, from climbing too far too fast with a body too little rested, when he collapsed against the gumbo limbo tree. He sat there the rest of the night, trying to sleep but with little success. He did a lot of looking at the sky and water, and at some point it dawned on him that there was something wrong with the Moon. Like any good fisherman who sometimes went out before dawn, he knew the sky well, and so he knew the Moon was not where it belonged. It wasn't far off—not even enough that most people would notice. But for Cecil it was unmistakable and very, very disturbing. What did it have to do with the water in the streets below? He wished he could hear a newscast from Kingston or Mobay. But he didn't own a radio, and he doubted that any of his neighbors who did had had the foresight to bring it with them.

So all he could do was wait. Now,

as somber-tinted sunrise colors squeezed through cracks in gray clouds and ricocheted off the water—in the right place, thank God—Cecil still strove to put it all together. He could go back down now, he realized. He could see that the water had already receded and left the town behind. But he wasn't even sure that was an unmixed blessing—for it had receded too far. Looking out around Cabarita Island and along the arc off to its left, he saw the jagged top of the reef sticking out—more of it than he had ever seen exposed before.

Gerber woke at five a.m., wrenched out of a nightmare-laden sleep by the insistent buzzing of the telephone. He reached out for it groggily, struggling to clear his mind, first enough to distinguish the telephone from the alarm clock, then enough to distinguish bad dreams from reality. It wasn't easy. When he had the instrument in the general vicinity of his face, he muttered irritably, "What do you want at this hour? I've—"

"I'm sorry, Mr. Gerber," interrupted a female voice which might have been pleasant had its owner's nerves been less obviously frayed. "I don't like it either. This is Ms. Oliveira, the night operator at the office. You have an awful backlog of calls here that I thought I'd better let you know about."

"Calls, in the middle of the night? Can't they wait?"

"This is the UN, Mr. Gerber," Oliveira reminded him, with a plainly audible effort to avoid sarcasm. "It isn't the middle of the night everywhere. Some of these sound pretty urgent. I thought you might want to get an early start. You're going to have a busy day."

He winced and thought, but didn't utter, a particularly expressive oath in his native German. "Don't I know it," he muttered. "Well, give me a hint. What's urgent enough to call me now?"

"You haven't been listening to any news in the last few hours? Well, I guess the most urgent one is Melbourne."

"Melbourne?"

"Australia."

Gerber's spine began to tingle. He rolled closer to the phone stand. "Well, get on with it. What about Melbourne?"

"It's underwater." Her voice was suddenly shaky and her words spilled out in an uncontrolled torrent. "It's a drowned city, Mr. Gerber. A few people got out in airplanes, and some managed to drive to the highlands in spite of the traffic jams. Luckily there were highlands to drive to. But they had only a couple of hours' warning. Their mayor would very much like to know, and I quote, 'why the hell they didn't have a lot more.' "

By then Gerber was sitting up, wide-eyed, on the edge of the bed. He groped for words, but the operator found them first. "Frankly, sir,

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so would I. And there are a lot of people in Sydney and Buenos Aires and Cape Town and forty other places who want to know what you're going to do when the water gets to them. Which won't be long."

Gerber's throat was painfully dry and he felt his heart hammering in it. So he had misjudged—Clark and Beldan had actually made good on their threats. Now he would have to try to make up for lost time—and he was agonizingly aware that far too much had already been lost.

There was something else in Ms. Oliveira's words that brought him even more immediate chagrin. But he wasn't sure how to ask about it. "But I don't understand," he tried lamely. "Why do they assume we could have given them more warning?"

The scathing, incredulous contempt in her voice made him glad he was neither receiving nor transmitting a picture. "Come on, Mr. Gerber. Everybody heard the news last night. Didn't you?"

"What news?" he asked warily, afraid to admit he'd slept through it.

"Jonel Turabian was on. Claimed Commissioner Clark had all the information and wanted to broadcast it earlier, but you tied his hands—or worse. What do you have to say to that, Mr. Gerber?"

Gerber wanted to scream.

Clark's place of captivity was a spacious, comfortable, tastefully furnished apartment with only one overwhelming shortcoming: it was utterly isolated from the outside world. There was no telephone, no newsfax, no radio or television. He'd thought it had those things, at first, but they turned out to be dummies. The entertainment console did have tapes and a working player, but those were at best static relics of an age that had died this morning—and Clark was in no humor to be entertained. There weren't even windows—only big holograms, neatly framed and draperied, which at first glance appeared to look out on the city and the world. But a closer look revealed that nothing ever happened in their world. Again, static reminders of the past.

Meanwhile, things were happening out there—tremendous things that urgently needed his attention and help. Frustration churned in his mind all evening and night. His guards brought him a good meal shortly after they deposited him here—a better meal than he could have dialed from the dispenser. He needed it and he ate it, but he was a long way from enjoying or appreciating it. He was too painfully aware of all that was going on out there, out of his grasp.

But he resigned himself to learning no more until Gerber chose to visit him, and he made a valiant effort to sleep. Without outside references, he lost his feel for time.

But breakfast and an antique mahogany clock told him a night and half a morning had passed when Gerber finally appeared.

The doorbell rang and Clark walked with deliberate slowness to answer it. He wasn't surprised that it was Gerber. The UN chief looked as if he had slept as poorly as Clark; the bags under his eyes were worse. He stepped in with a slight nod and no words. He seemed to be trying simultaneously to give Clark an infinitely dirty look and to avoid meeting his eyes directly.

Only when he had closed the door behind him did he speak. "You weren't bluffing," he said in a dead voice. He sat down in an armchair and leaned his head back and closed his eyes. "Melbourne's drowned. The water's piling up farther and farther north, just as you said it would. OK, Clark, so you were telling the truth about that much. I blew it; I didn't believe you and didn't give them even what little warning I could have."

Clark sat down on the couch, shaking his head numbly. He had fully expected this, which dulled the shock a little—but not enough. In a sense he was still responsible, and nothing could relieve him of that knowledge.

"I didn't warn them," Gerber repeated dully, and then suddenly his eyes snapped open and flashed at Clark. "But Jonel and Sandy Turabian did," he said accusingly. "Made you look more blameless then you are, I'd say. But how did they know? About you being here, I mean."

"I suppose they could have figured it out," Clark said matter-of-factly. "But they didn't have to. I told them."

"You told them," Gerber echoed numbly. "I kept telling myself you must have. But . . . *how*? There's no way out of this room. There's simply no way."

"I'm not as naive as you think I am, Franz. Not any more. When I was flying up here I figured out that I was probably walking into a trap. So I wrote them a letter just in case. I still figured I should try to do it your way first, but I didn't expect it to work." He changed the subject. "Did they get their word out in time to help anybody in Melbourne?"

Gerber nodded. "Some. Not enough. But you undermined world confidence in the UN tremendously. Why did you do it, Henry?"

"To save lives," said Clark. "And," he added savagely, "to undermine confidence in the UN as thoroughly as you deserved. If you hadn't, it never would have happened. If you hadn't wasted time stalling and holding me incommunicado, my message would never have been delivered and you could have issued the warnings and made the arrangements yourself. As you said, you blew it. If you can't

be trusted, people need to be shown that in time to quit relying on you. You've proved my point, Franz. Resoundingly."

"So you've set us up as the goat—and yourself as the could-have-been hero."

"Did I?" *Sandy and Jonel must have helped,* Clark thought approvingly. *I don't know what they said, but if they just came out and said I OK'd it, I wouldn't have a chance. They must have made Beldan look the villain—or at least made the whole thing look like a misunderstanding all around.*

"You know very well you did," said Gerber. "With all the repercussions that can have. It still looks suspiciously like a power play, you know. You make a deal with the aliens to create a situation where the world thinks it has to do what you say, instantly. Then when they've knuckled under and given you absolute power, *then* you discover something you overlooked. You can stop the world after all, and keep it here at home. But by then it's too late, and you and the aliens live it up milking the world you took over for its last seventeen years. You probably can't expect much more than seventeen yourself, and you know it."

Clark shook his head, amazed, pitying, appalled. "Do I really seem that infantile, Franz? Think about it. What kind of a man would it take to think that way? No kind that I can respect, much less be. All I want is a future for man. *My* last years could have been vastly more comfortable if I hadn't bothered." He paused. "You've seen what's happened in the last thirty hours. Are you *still* going to persist in wasting time with absurd accusations when you should be doing things? Have you no conscience?" (*Not quite fair,* he admitted to himself. *I know he does, despite all his failings. But a misguided conscience is more dangerous than none at all.*)

"I'm doing things," Gerber said tightly, obviously pained, and pointedly ignoring the reference to absurd accusations. "I have some water-holding and evacuation efforts underway. Too little, too late, but we're trying. Cape Town has Table Mountain right behind it, and Sydney has some high country not too far away. Not high enough for a permanent refuge, if your predictions hold up, but we can supervise getting people there with their own resources. Buenos Aires is in the worst position and has the most people, so we're putting our most direct efforts into that."

"Have you talked to Zhalãũ?"

"I talked to Beldan." Gerber started to say something else, then snapped his mouth shut abruptly as if to bite it off.

"And?"

"I have the evaluation committee at Kennedy checking on your claim that they can't stop—and I know where I'd put *my* money." He stood up. "Meanwhile, you stay

right where you are. I still don't trust you—and if you thought this little maneuver was going to get you right where you wanted to be, you're dead wrong." He started for the door.

"Franz," Clark said softly just before he got there.

Gerber, his hand on the knob, turned and glowered at him. "What is it?"

"Yesterday you told me, 'You got us into this, now get us out.' I'm willing. Not the way you want, because that's still impossible. But I can spell out a coordinated plan for maximum survival whenever you want. For everybody's sake, I hope that's soon."

Gerber turned and left without comment.

Sydney.

Cape Town.

Buenos Aires . . .

Carlos Esquivel brought the huge liner out under the clouds an uncomfortably short distance above the ground. He noted with relief that the microwave altimeter was still giving a believable reading, though the pressure-operated backup unit had strayed again. Smaller planes that depended entirely on that kind would be in a bad way by now, and getting worse.

The air was rough near the ground. Esquivel brought his ship in fast, to improve controllability, but he still had his hands full. Weather was especially bad this far south, this close to the violence being done to the atmosphere by the "rocket" at the South Pole. Esquivel was not at all sure he agreed with the sudden decision that had led to that state of affairs, but that was not his concern. The rocket reaction was running, whether it should be or not, and his job was just to get his plane in, load it up with as many refugees as he could, and get them back out to a safer place. Because of them, the turbulence near the runway was even worse than "natural" causes could explain. In their haste to get as many people out as possible, the controllers were hustling planes in and out in such close succession that there was even less time than usual for the wake turbulence from one to subside before the next roared into it. That's going to get them in trouble one of these times, *Esquivel thought grimly.*

He looked down at the seething sea of people crowding against the barricades and realized abruptly that the tower had not yet given him clearance to land. Hastily, he requested one; the tower shot it back testily.

The landing was rough despite his best efforts, braking was poor on the sheet of water that already covered the runway, and the air was full of swirling spray kicked up by earlier planes. Pretty soon, *he thought as the reverse-thrusting jets screamed their loudest,* they're going to have to shut the whole thing down until it gets deep enough to land on

pontoons. Meanwhile they'll have to mount an awful lot of pontoons and find pilots who can handle them.

As he turned onto a taxiway and headed in for the terminal, he saw the hordes of hopeful passengers, now much closer. A drop in the bucket, *he thought with a sudden sense of futility.* Even packing them in like sardines and moving as fast as we can, how much of a dent can we make in the millions who live here?

He tried not to think about it.

On the ground, Rubén Marquina pressed forward among the sardines, tightly clutching the hands of Gabriela and little Javier to keep them together. Another plane was coming in now, a big one. Perhaps this one would have room. Surely the chances were better than two hours ago. Already they had quit trying to restrict passengers to seats with belts; they were letting some sit in the aisles now. And his little family had made progress toward the gate, though they were forever having to fight back those who would shove them aside.

The plane, awkward on the ground and bleak under the drizzly sky, rolled into its berth and stopped. Gangways lowered themselves with a soft whirring of machinery. Nobody got off; nobody was coming to Buenos Aires today.

The crowd surged forward. Somewhere up there, where Rubén couldn't quite see, that petite, clarion-voiced stewardess had opened the gate and people were streaming through it and up into the big silver cylinder that meant escape. Rubén and Gabriela and Javier almost made it . . .

And then the stewardess drew the chain back across the gate and tried to fasten it. "I'm sorry," she called out. "That's all this one will hold. The rest of you will have to wait a little longer."

"Not me!" a big man not far in front of Rubén yelled. "It'll take me!" There was a scuffle and a shriek; Rubén couldn't quite see what happened. He saw two male attendants in uniforms trying to hold the man back, and then the man breaking free and running out to the plane. Nobody ran after him, but the last gangway was already retracting, and nobody paid any attention to his coarse demands that it be put back down.

Craning his neck, Rubén saw the stewardess lying on the ground where the big man had knocked her down. She was struggling to get up, her clothes soaked and dirty and her expression hurt almost beyond endurance. Rubén looked away, embarrassed.

The plane was gone and he didn't know when the next would come to this gate. "Maybe we'd be better off at the harbor," he muttered.

A mild-faced stranger with horn-rimmed glasses overheard and shook his head. "No use, friend. I've called there. The docks are flooding.

They're still putting people on ships, somehow, but there's no guarantee they'll go anywhere. They have to be fast enough to buck the current and prudent enough not to get too far from land or they'll just be swept south. And they're as crowded as this."

Rubén said nothing, but he had never felt such frustration. He didn't understand what was going on. There was something about moving the Earth, for some reason he still didn't follow, and some yanqui *named Clark who had something to do with all this and yet knew how to make it easier. Maybe he'd even caused it; some said so. But if he knew how to rescue people better than this, why wouldn't the authorities listen to him?*

None of it made any sense to Rubén. All he knew was the personal threat. ¡Madre de Dios! *he thought.* ¿Qué pasa? ¿Qué pasará?

New York . . .

Jez Johnson detested violence; she always had. But she believed in Causes worth fighting for, and this was surely one. She had not instigated the demonstration; rather, at first, she had been swept up in it and then along with it. By now enough adrenaline had been pumped through her system to make her feel a fierce pride in being part of the parade that had crowded all vehicular traffic off First Avenue. She pranced along proudly, tall body erect, flame-colored hair streaming behind her in the strong north wind as a beacon for all behind her. Once in a while a timid something in the back of her mind expressed a fear that she would get into trouble . . .

But every time she squelched that unceremoniously. This was important, and it was now or never. A placard waving near her expressed her feelings perfectly: LIVES NOW, RETRIBUTIONS LATER. What was Henry Clark's role in all this? Jez didn't know, but that could wait. What she did know was that she had seen Jonel Turabian on that talk show, and he had made it quite clear that Clark could have been saving those lives being lost down south. First Australia, now South America and South Africa . . . The floods were happening, no matter whose fault they were. Turabian had told how Clark had known about them yesterday morning and hadn't been allowed to tell. He was up there, in one of the buildings Jez and the rest were marching on, with who knew what happening to him. If he knew what was happening and how to save people, why wouldn't they listen to him? Turabian had explained how those hours could have saved lives—a surprising number of lives—had they been used instead of squandered. But that took coordination. Sure, the UN bigwigs were making some motions now that would save a handful of people—now, when it was too late to do more than that. Apparently they hoped to soothe the public conscience, to appease the masses. But

people like Jez Johnson would not be appeased by such empty gestures.

She could see the door up ahead now—the new, ornate, multicolored glass entrance chamber to the Hall of Councils. The mob surged forward; Jez' heart shifted up a gear or two. She held her placard high, bracing it with an effort against the chilling wind: CLARK KNOWS—LET HIM ACT. Another nearby differed in only one small detail: CLARK KNOWS—MAKE HIM ACT. Others all around carried aspects of the general drift: THROW GERBER OUT! GERBER DOESN'T WANT TO GET INVOLVED! LISTEN TO CLARK! MERCY FOR THE SOUTH! CLARK HAS A PLAN—WHAT DOES GERBER HAVE?

Jez thought she could feel her heart crescendo as the glass antechamber grew closer, but she couldn't even imagine she heard it. The shrill and hoarse yells of the crowd were already much too loud, and growing fast. The quiet part of her that worried looked around and managed to wonder for five seconds. How many of these people understood why they were here? For Jez, this was something she believed in; for Drew Cabat, over there, it was so obviously a game that his attitude infuriated her. How could he joke about cities and countries being drowned?

Drew was not a very responsible person even away from a mob. How many Drews were here today?

The front of the crowd had arrived; the others pressed in around the entrance. The people in front began to chant: "No more Gerber! We want Clark!" The chant took form, spread, swelled. Jez was dimly surprised to notice that she had joined in, screaming at the top of her lungs. Just as dimly and gradually, she became aware of sirens approaching from both up and down the avenue.

But she didn't think about them. Shouting rhythmically while that small part of her mind watched from the sidelines, she watched Drew Cabat's arm swing in a long, leisurely arc. Something dark and shiny sailed away from it; then there was a shattering of glass and everything inside the antechamber was flame, shooting out through the broken parts and making the rest glow and flicker even in daylight. Inside, new sirens wailed and heavy iron grilles clanked into place.

That snapped something in Jez. Suddenly the ardent demonstrator was hollow, cowering huddled in a corner of her head while the part that had been on the sidelines stepped forward and said calmly, "We've got to get out of here. Fast." And then she was trying to run, but all she could do was flail helplessly against packed, shoving bodies.

From somewhere—some inconspicuous door off to the side—men were streaming out, wearing the green and gold uniforms of UN security troops and waving long objects omi-

nously at the crowd. Those are real guns, *Jez thought. Beginning to panic, she turned away, dropped her sign, and tried again to run. This time she made a little headway—possibly because others had also opted for retreat—but to no avail. Other uniforms, blue ones of city police, were closing in from all other sides.*

The Security Council met in a relatively new chamber on the fifth floor. In keeping with the recent popularity of windows, real or ersatz, it had a big one running the length of the outside wall. It was fairly soundproof, and at the moment it was covered with opaque, deep blue drapes. But it was a window rather than a wall, and some of the sirens and shouts and scuffles found their way in, distant and muted, but undeniable. Gerber sat behind the lectern, shuffling through his scanty notes, cringing with every sound from outside and earnestly wishing he were far, far away.

He stalled as long as he could. Finally the hushed whispers and fidgetings and clearings of throats became too pointed to delay any longer, and he looked miserably up into the seventeen hostile faces that surrounded him on the two-tiered semicircular dais.

Surrounded, he thought wryly. *Are they really as hostile as I think they are? Or have they reached the same conclusion I have? No matter—even if they have, they'll blame me. They'll need a scapegoat.* He rustled his papers slightly and the seventeen grew silent and somber. They waited. When Gerber spoke, his voice cracked—something it had never done before in all his years of politics and public speaking.

"Never before," he began, "have I addressed this assemblage with such cause for regret." *And that,* he thought emphatically, *is the understatement of my career.* "What I have to say this afternoon will be extraordinarily difficult, for me to say and quite possibly for you to accept." He paused, sipped water, resumed. "You are all aware of the unprecedented wave of 'natural' disasters the world has experienced in the last two days. Due to my written briefing before this meeting, if to nothing else, you are equally aware of the unnatural cause of those disasters."

"And the purpose of this meeting," said a smooth, Bantu-accented voice from the left end of the second tier, "is to take suitable action against Commissioner Henry Clark?"

Gerber reluctantly ignored the fact that the representative from Tanzania had not formally sought recognition before speaking. "Not exactly," he said, and the words were bitter in his mouth. "I will come to the purpose soon enough. You are also aware, I think, of what has happened to several southern cities today"—(*For which I myself must bear blame*)—"and of

what is now happening in the streets outside this building." Several council members glowered. Gerber concentrated doggedly on his notes to avoid looking at the faces. "I am informed that similar rioting is going on in cities all over the world. We are going to have to take immediate and drastic action."

"Yes," said a voice from the front. "Rioters must be treated firmly—"

This time Gerber did not ignore it. "The representative from Indonesia is out of order," he interrupted sharply. "Do not speak without recognition." He shifted his tone back to his main point. "Punishing rioters is not the solution—though it may be necessary—because that is not the problem. Not the real problem.

"Let me summarize briefly what the real problem is. Item: Henry Clark, the Kyyra ambassador Beldan, and the Kyyra engineer Zhalāū"—he fumbled with the alien names—"unanimously claim that the reaction with which they are dislodging the Earth from its orbit and incidentally causing the earthquakes and floods cannot be stopped. Naturally, I have been suspicious of this claim from the start, but I have been unable to sway any of them from it. If it is a conspiracy, it is well rehearsed."

He drew a deep breath. "Item: While Henry Clark has been following the discussions of the aliens' proposal more closely than any other human individual, he has not been alone. Almost since the beginning, last October, I have seen to it that a hand-picked committee of experts has been following the talks at Kennedy Spaceport, scrutinizing the technical details of the Kyyra proposals. I have been in consultation with them—and had their findings cross-checked by independent specialists—during the last day." He paused, sighed again, waited and finished. "They were not very helpful. Each of them has looked closely at some specific area. None of them claim to have the comprehensive overview that Clark does. And none of them have been able to absorb enough of Kyyra science to evaluate all of the details. They cannot confirm the claim of Beldan and Clark—but neither can they prove it false."

He looked down hard at his paper, then forced himself to look up and out at them. "Item!" he snapped, talking louder and faster. "The flooding Clark predicted has begun, catching us unprepared, and all indications are that it will become worse before it becomes better.

"Item: Clark claims to have a relief plan—and Beldan refuses to spend time explaining it to anyone else. So . . ." Gerber looked back down at his notes. His voice drooped with his head. "They have us over a barrel. A nasty, nasty barrel, but I see no way to escape it. Yes, the aliens and Clark con-

spired to start this thing without this organization's approval and consent. Yes, they *should* be stopped and they *should* be punished to the fullest extent possible. But I see no way. Stop the Kyyra? With what, gentlemen? Their capabilities are so depressingly far beyond our own that I see no conceivable leverage we can use against them—now or ever. Punish Clark? A consummation devoutly to be wished—but at this moment millions of people are dying or being driven from their homes, and Clark seems to be in the sole position to get any significant number of them through it alive."

"So," said a voice with a touch of French accent and more than a touch of suspicion, "exactly what are you proposing?"

Gerber shut his eyes. He didn't need his notes for this and he didn't want to look at them. "I see no choice," he said quietly but firmly. "I'm asking you to authorize Henry Clark to do what he's offered to do."

He heard pandemonium. Snapping his eyes open, he pounded hard and yelled louder than they for order. A semblance of it came, but most of the men and women in the two raised semicircles looked ready to pounce on him and claw his eyes out. "If you have discussion," he said peremptorily, "you will request proper recognition."

A half-dozen buttons before him instantly glowed. He selected one at random. "The representative from Federated Panarabia."

"It seems to me," Hajji ibn Mada'ini snarled, "that the Secretary has been listening too much to the rioters in the streets. I and my constituents will not be dictated to by gangs of hoodlums."

"The fact that we do what the hoodlums demand in one instance," said Gerber, admitting privately that it sounded pretty lame, "does not mean we're letting them dictate to us. It's coincidence. They are demanding what we must do anyway, for entirely independent reasons. Although it's true that, with their numbers and the mood they're in, we could never command enough respect to govern if we ignored those reasons." He glanced down at the lighted buttons. "The representative from India!"

"But you are," said Masudan Gujarati, rising respectfully, "suggesting that we let Henry Clark dictate to us. For if I understand correctly, you are in effect asking us to grant him essentially dictatorial powers over the world community. Is that correct?" He remained standing.

"It amounts to that," Gerber admitted bluntly. "But there are situations in which such things must be done and have been done. What I'm asking, to be very explicit, is that we designate Henry Clark special administrator of emergency op-

erations, effective immediately. Until such time—if any—as we find a way to force the Kyyra to stop this, we're going to need such operations, and they're going to have to be run so efficiently that they'll have to be controlled through one man. Clark, unfortunately, is the only man who has the right background—and contacts—to do the job. I don't like it any more than you, but I see no workable alternative. So I'm asking this council to grant him emergency powers, with all the operating resources of the UN and its affiliates at his disposal."

"Including the military?"

"Including the military." Gerber realized that he was almost pleading, for something he believed in only out of desperation. "That sort of thing has been done before. Often."

"But not," said Gujarati, "on a global scale or to a man who has already betrayed the people he is supposed to protect—and is also known to have dangerously powerful outside connections."

"The Kyyra will deal with no one else," Gerber pointed out impatiently.

"Precisely. I'm sorry, Mr. Secretary, but I cannot approve such a thing lightly or hastily." Gujarati sat down.

"May I point out," Gerber said tensely, "that the decision is going to *have* to be made rather hastily? The representative from Brazil!"

"I merely wish to underline that," said João de Castilho. "I hope my colleagues from more fortunate latitudes will make some effort to realize how this situation looks, for example, to someone in Rio de Janeiro who faces the prospect of destruction in hours or days. We need action *now.*"

"Then may we vote?" suggested Gerber. "Let me emphasize once more that the emergency powers I'm requesting will be only for the duration, and Clark will still be responsible to us. When the need for him is past, he will be removed from power and will have to answer to us for what he did this week. If he fails to produce better results, he will be removed much sooner." Gerber thought sourly of what an utterly futile gesture those stipulations were, if Clark chose to treat them as such. But of course he said nothing. He seriously doubted that anybody present was actually fooled. "Are we ready to vote?"

Miraculously, they were—for what it was worth. The first vote disappointed but didn't really surprise Gerber. Straight along latitude lines, almost—severely threatened southern and extreme northern countries were for emergency powers, those in relatively well-off middle latitudes were against.

"Ten to seven," Gerber announced, trying not to let his des-

peration show. "Emergency powers are granted."

"Objection!" sang out Marcel Guyot of France. "The issue is substantive and the permanent members have not all concurred. Emergency powers are denied."

Gerber sighed. He hadn't really expected to get away with it. "My mistake," he said. "May I remind the Council that no issue is automatically substantive or procedural? You could vote to classify this as procedural."

Guyot flashed an oily smile. "Such a ploy will only waste time. Such a vote is doomed to fail because it still needs the concurrence of the permanent members and you will not have that of France. Surely I don't need to remind the Council that the question of whether a question is procedural or substantive is substantive."

Wearily, simultaneously thinking of all the parliamentary tricks he might try and wondering how many people had died during Guyot's last sentence, Gerber said grimly, "Well, gentlemen, then I must ask you to reconsider. May I point out that the very difficulty we are having is a good illustration of why we shall *have* to go to one-man decision-making . . ."

They came around, of course. There was really nothing else for them to do, and eventually even they realized that. But it took hours, and during those hours Clark was still a captive and people were still losing homes and lives with only the most makeshift efforts at rescue or aid. There was a bitter aftertaste in Gerber's mind when it was all over—and in that of all the other council members as they filed out (though by no means all for the same reasons).

Clark, too, felt bitterness when they came to tell him—and deep, haunting sorrow that it had taken even this long. Gerber had relented to the point of giving him newsfax, and he felt things he had never felt before as he read them.

But he was beyond letting them cripple his thinking. He had resigned himself to finishing what he had started two nights ago. This evening, waiting for Gerber to finish his announcement and introduction, he fiddled absently with the two index cards that held his opening notes, while his mind roamed soberly over what had happened to him in the last three months. *Well, Joe,* he thought as he remembered two incidents out of a past that included Joe Sanchez (one of them just two days ago), *it's come to this. Maybe you were right. But I was right too. It doesn't bother me the way it used to.*

Gerber, his face weary and drained of its usual color, was speaking into the other microphone, the two live cameras on him. ". . . an announcement of gravest importance to all the peoples of Earth," he was saying. "It has become clear that a global

emergency exists and must be reckoned with. Emergency situations sometimes require emergency measures which would be intolerable in normal times . . ."

Clark, preoccupied, only half listened. He remembered the last time he'd given a public speech—only days ago, incredible as that seemed. He'd already lost track of how many, though he was sure it was very few. It had been a nightmare, with a big live audience and swarms of microphones and cameras and interpreters in glass booths.

And the assassination attempts that had ended it, by two independent gunmen with ironically opposite motives. One of them was responsible for the present condition of his shoulder.

Clark would have no more of that. This room, at his firm insistence, was a very ordinary television studio, with three cameras and two mikes and a skeleton crew. The rest of the world could get what he said electronically. And what he said, this time, would be no idealistic plea for world unity. That, now, seemed far away and naive.

". . . so the Security Council has this afternoon empowered Henry Clark to administer all affairs associated with the emergency." The pain and distaste in Gerber's face were evident to Clark, but he hid them rather well from unfamiliar

eyes. "Let me emphasize that all areas of life, everywhere, are directly touched by these, so Mr. Clark's authority will be essentially absolute and general, for the duration. All facilities and instrumentalities of the United Nations are subject to his direct command—and that includes the forces which can be used to compel cooperation. Think of it, if you like, as martial law. And cooperate, for therein . . ." he seemed to choke ". . . lies our only hope of survival." Pause; then, very low, "Mr. Clark."

The little red light on the one camera already facing him, and his face on the monitor, told Clark he was on. He began immediately and directly, his voice carefully firm and calm. "Let me assure you that I hate and fear autocratic rule as much as any of you," he said, looking straight into the camera. "But a ship under battle conditions must have one commander. The job has fallen to me simply because I am more familiar with the problem than anyone else.

"Battle conditions, you may ask? Where's the enemy? The enemy is our own galaxy turned traitor, and the only strategy we have is retreat." (*The things people say in speeches!* he thought.) "We are on our way to a new galaxy which will offer sanctuary, if not to us, at least to our descendants. But the trip will be hard—harder than anything in our history. Whether we will go is no longer a question. The only question is whether we will survive. Those who fail to cooperate will not. Those who listen and cooperate . . . may.

"I am not speaking of coercion by man against man. I have the power to coerce; I will use it whenever and only when I see it as necessary. But the numbers of people in the world mean that you cannot rely on the world government or your own government to keep you alive. Ultimately, that is up to you. *You* will have to make your way to a place of safety, though we will help where we can. *You* will have to make your dwelling safe for the trip. *You* will have to collect and preserve water. *You* will have to stretch your food reserves until *you* have established new sources. We will provide guidance in how to do all these things, but it will be up to you to do them. Self-reliance and cooperation with the central authority will be the keys to survival. We will tell you what things you can do. Those who do them will have a fighting chance; those who fail to, will die. It's that simple.

"Enormous problems lie ahead. But for now we can afford to think only about those of immediate concern. If we survive those, we can tackle the next phase. The principal immediate problems are food, water, and evacuation of flood zones. Listen closely. Here are detailed instructions, prepared in cooperation with the Kyyra Earth-moving team."

Zhalãũ had given him the particulars in two hours, but he had had an extensive background to draw on. The people of the world did not. He took three hours to give them the first batch.

When the little red light and the monitor finally went out, he let himself realize that he was tired and his throat was dry and his brow was moist. But it was done; a beginning had been made. Gradually, now, the destruction might slow, and out of it some hope might begin to emerge.

Would I have done it if I'd really known what it was going to cost? he wondered. *And he answered himself: Maybe not. So maybe it's just as well I didn't.*

Well, it doesn't matter now. There's work to do.

As it turned out, it cost even more than Clark anticipated, even then. If ever he had expected the mere assurance of survival to lead to instant acceptance of his rule, he was sorely disappointed. In the early days resistance and inefficiency were rampant, both of them fed by the galloping hysteria that followed the initial shock. He himself had to gain practical experience in wielding the power that was theoretically at his disposal, and that experience was in itself a baptism of fire. He learned quickly—but external, human obstacles were huge. People in cities which had plenty of time for orderly evacuation in private cars panicked, ignored instructions designed to keep the flow smooth, and drowned in gigantic traffic jams. Work forces balked at having their services commandeered without pay, not yet realizing that money was a thing of the past. Some of them did not live to regret it. Scattered individuals everywhere simply ignored everything until it was too late.

Perhaps the saddest cases were those in backward countries where education was neglected and communications were primitive: people who simply got caught in things, not understanding what or why, not knowing what to do, and so doing nothing and being overwhelmed. Or perhaps sadder still were those scattered cases where populations suffered because their local governments, objecting in principle to accepting decrees from Clark, blocked his every effort at help that might have saved them. In a few of those cases, he finally forced himself to send in UN troops to topple the obstructive government. It served the purpose, apparently—but he was glad he didn't have to be there to watch, even though he couldn't hide his responsibility from himself. The first time it happened, he admitted to himself that he could never have done it had his sensibilities not grown protective calluses. *But,* he kept telling himself, *it's necessary . . .*

Somehow they muddled through

—some did, anyway. The early mishaps and fatal stupidities hammered home Clark's point far more effectively than any number of words: those who cooperated had a chance, those who didn't, hadn't. After watching more and more of their neighbors succumb, more and more of those who remained determined not to. Then they listened, out of desperation.

Five days out, Zhalāū's worldwrights changed the driving reaction at the Pole from the rocketlike one that they compared to a detonation cap to the far more efficient exhaustless one that only they understood. Then, with vast quantities of water no longer boiling into the atmosphere, the skies largely cleared, and by then changes were becoming large enough to be noticeable to the casual observer. Many reacted with superstitious fear, of course, but many, at least nominally enlightened, simply realized down to their bones that Clark was in no way bluffing. The Earth was *moving.* The Sun itself didn't look very different from before—to the naked and uncalibrated eye, it was neither significantly smaller nor significantly dimmer than it had ever been. But the Arctic and Antarctic circles were visibly creeping toward the equator. The oceans that had swallowed Melbourne and Sydney and Buenos Aires and Cape Town saw less and less of night. But in the north, and gradually farther and farther south, the Sun set for the last time; a cloak of final darkness spread slowly but inexorably over the Northern Hemisphere.

With all that happening, people's attention had to focus on the reality of the survival problem. Too often the response was still blind panic—but increasingly often it was constructive action. Within two weeks, things were progressing at a level of effectiveness for which Clark had wished but in the early days had not dared hope. Now, to some extent, he felt vindicated. *Sometimes,* he thought one day after reading a pile of reports that contained a small nugget of hope among all the despair, *people do better with a problem that's really too big for them than with one just the right size. Must be that the reasonable one doesn't challenge them enough to bring out even what they need . . .*

Within a month, the darkness covered most of Canada, Germany, Poland, Russia; all of Scandinavia and England. Those places had perpetual night sky, full of stars that still showed no sign of change. The Moon, after an initial effort to follow, had been left far behind. Nobody in the north saw it anymore; those in the south who still got a few hours of darkness sometimes saw it as a bright speck, almost a southern pole star, barely discernible as a half-lit disk reeling uncertainly in a violently perturbed orbit.

The howling, destroying winds and rushing water subsided. The first plateau had been reached: Zhalāū's crews had stabilized the acceleration at its low preliminary value, and the oceans and air had largely stabilized with it. It was temporary, of course—but it was a much-needed moment of respite.

It was a somewhat older and considerably wiser Clark who walked slowly out onto the airfield, savoring the ruddy sunshine and the restful, almost forgotten stillness of the air. Tony had come to meet him; his little yellow jet waited under a deep blue sky—a rather deeper blue than he'd been used to. It glistened in the light of a Sun which hung low and red in the southern sky, though it was but little after noon, and would soon set, not far west of its present position.

"Hello, sir," Tony said softly, with a note of something that was almost awe in his always polite voice. "Good to see you again. You've been busy."

"Good to see you, too," said Clark. "We've all been busy."

They talked little during the flight south. Clark used much of it to rest, stretched comfortably in the back seat, often with his eyes closed. But often they were open, too—for the face of the land had changed utterly since last he saw it.

They took off from New York—a refreshingly smooth takeoff—over an ocean that was no longer an ocean. Where once blue water had stretched sparkling off to the eastern horizon, now there was only parched mud spotted here and there with dead seaweed. And, far off to the left where he could just make it out, was the naked edge of the continental shelf, where it dropped off toward the Hatteras Abyssal Plain.

Yes, he thought, awed by the sight, *something's been happening, all right. Hopefully something with as much of beginning as of ending about it. Hopefully.*

They flew lower than they once would have, in the somewhat thinned air, and it was chilly when Clark deplaned at Kennedy Space-

port. The Sun now stayed as low here as it had in New York before, and the little heat the Kyyra let seep out to the surface from the driving reaction was distributed more uniformly than sunlight.

Jonel and Sandy were waiting for him just inside the terminal and came out to meet him with warm friendly smiles. He was surprised at how much that meant to him, and realized that he'd doubted whether he had any friends left in the world now. It was good to know he did.

"Welcome back, Henry," said Jonel, shaking his hand. "Nice work." Sandy hugged him; she'd never done that before.

"I don't know," he mused, some of the old doubt and anguish returning. "A lot of people died. A lot more will."

"But not because of you," Sandy objected. "In spite of you. More would have without you." (*Would they?* he thought. *I think so. But will I ever know? No.*) "Come on, let's go back to our place to talk."

He let them lead him back to their apartment, a pleasant little place that had taken on more of their personality since he had last seen it. Then the walls had been nearly undecorated; now they abounded in the photography and artwork that so often expressed both of the Turabians' multifaceted zest for living. Oz lay snoozing on the floor, a classic image of a dog on a hearth even in the absence of a hearth.

And there was another guest. Beldan was waiting on the couch and stood up—and up and up—when Jonel and Sandy led Clark in. "Welcome back," he said quietly. "The first phase is successfully past."

"Yes," said Clark, shaking his big hand. "I suppose you could call it successful. There are survivors, anyway." *Though how many, I'm afraid to guess.* He'd had moments during the last month when he'd wanted to lash out furiously at Beldan for not having made more explicit just how costly it all would be. But he'd put those behind him now. He still—or again—felt well-disposed toward Beldan, if Beldan could still reciprocate. There was an awkwardness there . . .

Sandy had wandered off into the kitchen. As she returned with a tray containing a bottle of rosé wine and four glasses, Clark said to her and Jonel, "I have to thank you two for doing what you did. But one thing puzzled me. How'd you keep them from lynching me?"

"We didn't entirely," Sandy chuckled, setting the tray down. "We just sort of talked around the details of how it got started. We concentrated on the clear and present danger and the fact that you could do something about it. Never mind the fact that you also started it; we evaded that." She paused and her pixyish face became momentarily solemn. "It wasn't always easy."

"But if you didn't at least encourage them to think—"

"That it was all our fault?" Beldan broke in with a surprisingly puckish grin. "They did. Not explicitly, but by omission. You're wondering if I was offended? Rather more amused, I'd say. Sandy explained it all to me—and I'd never hoped for popularity among your kind." He took out his music-pipe and doodled a little. It sounded rather more melancholy than his words. "Actually," he remarked, breaking off, "this whole business of deceit among your species fascinates me."

"Not too much, I hope," said Clark, sitting down. "It's not very admirable. But when surrounded by it, sometimes it seems necessary to practice it." *It still bothers me, though.*

"And I have a question for you," Sandy said as she handed Clark the first glass. "When you wrote that letter, were you expecting things to work out the way they did?"

Clark sipped his wine thoughtfully before answering. "To some extent," he said finally. "I'm not sure how much. When I took off for New York, all I really hoped to do was get the UN to take over. I should have known better. I should have learned by then that when you want something done, the only way to be sure is to do it yourself. Well, I've learned now. I started something when I OK'd the launch. I wrote the letter when I realized I might have to finish it." He took a longer draught and gazed at—or beyond—one of the pictures on the wall. "Once," he said slowly, "Joe Sanchez really got my goat by saying he saw me starting to think of myself as a dictator. Caesar Clark, he called me. That hurt and scared me. Another time I got his goat by saying I didn't see how we were going to get through this without one. That scared me too, and I assure you I never thought of myself in the role. But now I've come to openly admit I was right. Somebody had to do it—and it seems to be me. I still don't like it. But I don't see any other way. Do you?"

"No," Jonel said soberly. "So wear it well."

" 'Some are born great,' " Sandy quoted softly, " 'some achieve greatness, and some have greatness thrust upon them.' "

"Hm-m-m," said Clark, pondering. "Thrust, yes . . . though I doubt Shakespeare meant it quite so literally. But greatness?" That could be judged only by results, and it was much too early. It was still a long, long way to M31. The problems that lay ahead—immediately, and far into the future—were even more formidable than those now past. Not long ago, even Clark would have thought them almost certainly insuperable.

But now he wasn't so sure—because now, at least, he felt ready to tackle them. "We shall see," he said solemnly. "We shall see." ■

Detesters, Phasers and Dean Drives

This is the latest word on the controversial Dean Drive. The *last* word has yet to be written.

G. HARRY STINE

NOTE: This article is not—repeat, NOT—science fiction. The names, places, events, and inventions herein were real, and no attempt has been made to protect anyone, living or dead, from the eventual evaluation of historians. All of this really happened. This article is more than just a personal memoir to set the record straight; it is also an attempt to get things moving again . . .

In common with many other people, I once carried on a prolific correspondence with the late John W. Campbell, former Editor of Analog. We discussed lots of things, and it was stimulating because we were usually thousands of miles apart. Even today as I reread the letters, it is high intellectual adventure. If anyone thought that Campbell's Editorials were controversial, he would have considered the Campbell correspondence outrageous, because JWC often tried out Editorial ideas first in correspondence with friends and readers.

However, John's single-page letter of August 21, 1959—highly unusual because his letters normally ran to a minimum of four to five pages, sometimes more, rarely less—was to change my life and that of several other people beyond our wildest imaginings.

To quote the letter directly: "If you recall, some while back I said I believed we wouldn't use rockets to reach the planets—we'd do it otherwise . . . This week, I saw photographs of a working model of a space drive engine. It makes a


THE
SPACE-DRIVE
PROBLEM
by JOHN W. CAMPBELL, JR.
Astounding
Science
fact & fiction

monkey's uncle out of the law of conservation of momentum as we know it. The working model demonstrated the principle but was, understandably, not very successful as a flying machine. The inventor couldn't afford the auto-pilot system to stabalize (sic) it in mid-air . . . The device was powered by a standard ¼-inch electric drill . . . A non-flying model resting on a tabletop, on ball-bearing wheels giving effectively zero friction, exerted a push of some 85 pounds—also ¼-inch drill-motor powered. Set on end on a standard weighing machine, it weighed 135 pounds. With the motor activated, the weight dropped to 50 pounds.

"Engineering calculations—made by an outside firm of professional consulting engineers—show that a 3,000-pound machine could rise with an acceleration of 37 ft/sec^2—5 ft/sec^2 net over g—when driven by a 25-horsepower engine at 2,800 rpm. With a 150 hp engine at about 4,000 rpm, it would have a gross vertical acceleration of 2g, net of 1g.

"The device is purely mechanical. It depends on an elegant application of principles of centrifugal force in orbiting masses when the center of orbits is changed in a precisely phased manner. The actual result is that momentum appears at the expense of energy.

"I am getting more detailed information as rapidly as I can."

Naturally, I was excited. My return letter asked all sorts of questions. But it became a secondary thing in my life because I had just lost my pioneer model rocket company. I was starting work as an engineer at Stanley Aviation Corporation in Denver, and we had a new baby on the way. Looking back on that letter today, I realized that I had since learned that John Campbell was an excellent editor, fantastic writer, outstanding scientific dilettante, and somewhat confused physicist when it came to the Dean Drive . . . which has confused a lot of physicists.

My work at Stanley was not totally unconnected with what later happened. We were developing the crew escape capsules for the supersonic B-58 "Hustler" bomber. As the escape capsules were blasted out of the plane, they were aerodynamically stabilized by yokes with fins that snapped up. This was necessary to keep the rotation rates and accelerations within the stiff USAF criteria for human factors established by Colonel John Paul Stapp on his rocket sleds.

Well, that was the way it was supposed to work, but we couldn't keep the damned yokes from breaking off.

All calculations by the stress group proved that the cables and booms were more than strong enough to absorb the expected loads. But when they were catapulted out of the rocket sled at Hurricane Mesa, Utah, the yokes

left the capsules as the booms and cables snapped. When I ventured meekly to point out to the stress engineers that there might be some additional forces involved because of the rapidity with which the loads were applied, the reaction was, "You mean to tell us that stress isn't proportional to strain?"

I got more deeply involved when we decided to challenge the USAF human factors limits which were based on a maximum of 15 g's with a 1,500-g-per-second rate of onset. It seemed to us that ordinary athletes exceeded these limits regularly. So we put accelerometers on the shoulder pads of two burly University of Colorado football linemen and recorded what happened when they tackled each other. They performed with gusto in the CU Fieldhouse one cold February day in 1960. The data revealed that they had sustained accelerations of over 45 g's at rates of onset of 5,000 g's per second. This was written up in *Time* magazine, and we got the USAF to relax their human factors specs so that we could build a capsule that would stay together.

But before the Stanley capsule was qualified, I went to an American Rocket Society meeting in Los Angeles and met an old friend, Dr. William O. Davis, retired Colonel in the USAF, former director of the Air Force Office of Scientific Research, and mentor of Project *Farside*. He had just taken a position as Director of Research for a small, obscure company on the East Coast called Huyck Corporation. He asked me to join him in New York City as his Assistant Director of Research. I did so, moving to Connecticut and commuting to New York City for the first time in July 1960.

In the meantime, John Campbell set the SF world on its ear again—it was still recovering from Dianetics and psionics—with an Editorial in the December 1959 issue of Astounding Science Fiction, as Analog was called then. In brief, he revealed to the readers what he had told me in his August 1959 letter.

The science-fact article in the June 1960 issue was written by Campbell with photographs that he had taken. It concerned this wonderful machine which he dubbed the "Dean Drive."

The inventor of the device was Norman L. Dean, a civil service employee residing in Washington, DC. He had no formal training as an engineer or scientist; he was a typical amateur tinkerer and inventor. In common with most inventors, he didn't know that it couldn't be done, so he went ahead and tried.

Dean obtained US Patent #2,886,976 on his device, and even today it can be obtained from the US Patent Office. But it will not tell you much about how to build a Dean Drive.

Basically, the Dean Drive consisted of a pair of eccentrically-mounted, counter-rotating masses driven by an electric motor through a pair of slipper-type universal joints and a slip or sleeve joint. The rotation of these masses produced an oscillating motion commonly known as simple harmonic motion. The use of rotating masses to produce oscillatory or vibrating motion is widely-used in industrial practice and is commonly called a "Buehler Drive." However, in the Dean Drive this oscillating carriage was not permitted to oscillate freely. At one point in its cycle, the oscillating frame was hard-coupled to the main frame of the machine or to the force rod coming out of the side of the frame. During the remainder of the cycle, the mechanical oscillator was free and unclutched.

The operation of the Dean Drive is very complex and is not amenable to quick-and-dirty analysis. It is a dynamic system.

Although Campbell's article dwelt mainly on the fact that no government agency, especially NASA or DoD, had ever bothered to take a look at the Dean Drive, Campbell stated in his article: "I *think* Dean's device is a true space drive; that it does work . . . Again, I emphasize, it is not important whether Dean is right or wrong; what is important is that the (government) agencies did not find out." However, Campbell stated that he did believe that the Dean Drive was not a practical device, but a "proof of principle" machine. He also stated that he really didn't fully understand why the Dean Drive seemed to work and that he really didn't believe Dean's own mathematical analysis or operating theory. This is an important change in attitude on Campbell's part between his August 1959 letter to me and the June 1960 ASF article. Perhaps the difference can be laid to the fact that in his letter he was writing privately to a fellow space nut while his article was written for ASF readers.

Because our responsibility in Corporation Research was to investigate for Huyck Corporation any promising area of science or technology that might lead to the development of new industrial products for the company, Dr. Davis and I drove to Washington, DC from New Canaan, Connecticut on the evening of September 27, 1960. At 10:00 a.m. on the morning of September 28, 1960, we drove to Dean's apartment located on Wisconsin Avenue in the northwest area of DC.

I quote now from the laboratory notebook of Dr. William O. Davis dated September 30, 1960 and signed by me as a witness, indicating that it amounted to a joint report:

"Visited Mr. Norman Dean in Washington on September 28 at the suggestion of John Campbell to

see the Dean Drive in action. The device he showed us did not levitate, but applied a lateral force to a mass. Harry Stine accompanied me, and both of us approached this unlikely device with skepticism. The mechanism was constructed of metal and lucite in such a way that the moving parts were clearly visible. We checked for the usual gimmicks of air hoses and the like but found nothing. The model rested on the waxed floor of Dean's apartment on the eighth floor of a modern apartment house. Hidden magnets seemed unlikely and in any event could not account for the magnitude of the forces displayed, particularly since there appeared to be very little ferritic material in the device.

"The drive was arranged so as to apply its output to a push-rod which was fastened to a reaction mass (also open) which appeared to weigh approximately three times as much as the drive unit. We inspected both the drive and the reaction mass before and after the demonstration and are convinced that both were free to move on the polished surface of the floor. There was no observable tilt to the floor. Both masses rested on flange type feet and no scratches were observed on the floor when either was slid.

"When the drive was brought up to speed and the clutch mechanism activated, the drive was observed to produce a force such that the reaction mass was moved several millimeters in a gradual, steady manner while the drive unit did not move at all when observed closely with the naked eye from a distance of only a few inches.

"A second experiment was performed where the reaction mass was replaced by each of our hands in turn. When the drive operated, a definite force was felt which increased with pressure and produced motion of the hand against the pressure. With the drive turned off, this same pressure easily moved the drive unit several inches."

(Yes, the Dean Drive *did* push against my right hand as described. After all these years, I can still recall it vividly.)

"It was the conclusion of both Harry Stine and myself that we had witnessed a real anomaly and that the possibility of fraud in the demonstration was slim. When this is combined with the testimony of other competent witnesses, some of whom have witnessed the weight reduction experiment, it seems increasingly likely that Dean has produced a genuine new phenomenon. His explanation, as given in his papers on the subject, does not strike me as valid, but whether or not his theory is correct we have seen something new which I do not believe can be accounted for with classical Newtonian analyses. For this reason, I have decided to undertake a theoretical study of dynamic systems to see if a concept

J.W. Campbell

The author (left) and E.L. Victory with the rocket powered pendulum at Huyck Research Center, Milford, Connecticut on October 19, 1962. Author is pointing toward rear mass with rocket motor, strain gage thrust cell, and photo cell installed. Front mass (by Victory) has photocell installed. Light trough on floor produced light gradient sensed by photocells to determine pendulum position.

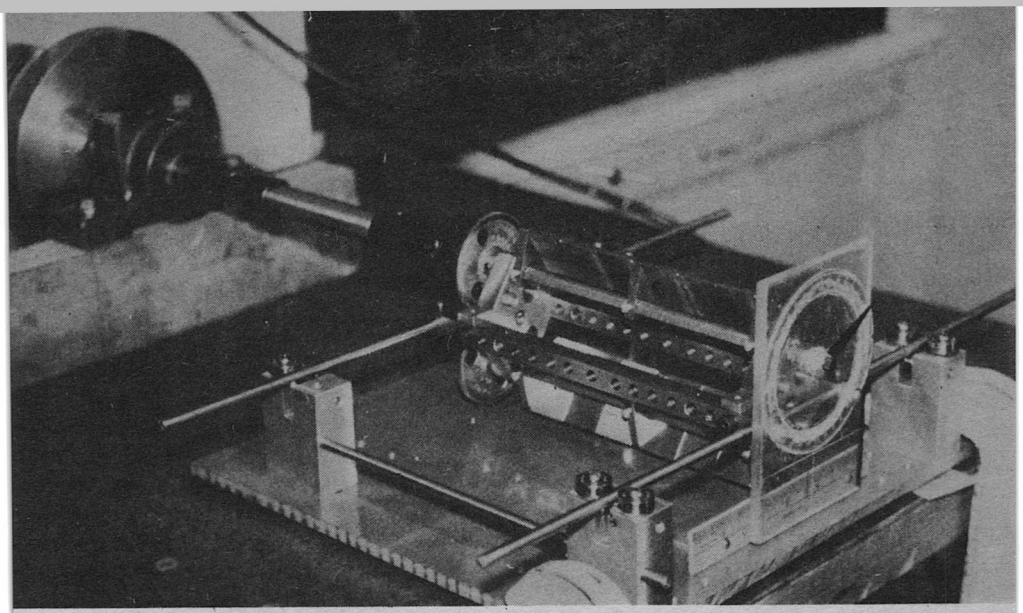
(opposite page) The Phaser Mark I, photographed in the Huyck Research Center, Factory Lane, Milford, Connecticut on May 9, 1961. This is the first Phaser that showed a phase angle of 3 degrees, but it never showed the 45 degree phase angle claimed by Norman L. Dean.

can be evolved which will describe a world in which Dean's Drive can exist and yet where other known facts are not contradicted."

I have taken the liberty of quoting extensively from written notes made within a day or so of witnessing the phenomenon of the Dean Drive in operation because they more accurately express our joint observations of the time and do not exhibit the ravages of time on the memory. They serve to key other significant memories as well.

On the way back to Connecticut that night driving up US 40 just northeast of Baltimore, I can still vividly recall Bill Davis suddenly blurting out, "I wonder if there is a force proportional to the rate of change of acceleration?"

His question led him right back to basic Newtonian mechanics



G.H. Stine

where he added a fourth term, a third derivative, to the general equation of motion. By October 14, 1960, Davis had worked out the basic mathematical equations that he later published in his May 1962 Analog article, "The Fourth Law of Motion."

His notebook entry for October 21, 1960 contains an important note:

"One point suddenly occurs to me. One consequence of the foregoing analysis, if it later proves to be correct, is that the operation of the Dean Drive does not depend upon the rotating weights, but *only on the motion of the axle,* however induced. In other words, if a simple harmonic driving force is applied to a point with suitable cyclic variation of viscous drag and other parameters, then an unbalanced force should result. Obviously, this driving force might be applied by other mechanical means, or by means of magnetic and/or electric fields. Thus it becomes possible to design an entirely new kind of inertial drive which does not incorporate the principles of Dean's machine as outlined in his patent claims!"

This was an important theoretical breakthrough because Davis had had no success at all in attempting to deal with Norman L. Dean. Most inventors want a million dollars and Dean was hardly an exception to the rule. We could not get our hands on a Dean Drive with which to experiment. Nor could we legally attempt to construct one from the patent data, John Campbell's excellent photos, and our own memories.

Although Davis had worked out a theoretical universe in which a machine like the Dean Drive would be possible, we both knew that mathematics will lead you only to the logical conclusions of your basic assumptions. The theory had to be backed up with experimental evidence, and we didn't have the Dean Drive to work with. Bill Davis and I spent months searching for an elegant experiment that would either prove or disprove Davis mechanics—Robert A. Heinlein hung that sobriquet on the work in Chapter Nine of *Podkayne of Mars,* so I guess it's official. Professor Serge Korff of the physics department of New York University, a top cosmic ray researcher, and later president of the New York Academy of Sciences and the Explorers Club, was retained as a consultant by Huyck Corporation at Bill Davis' request to "keep us honest" academically; as a top-flight physicist, Professor Korff's duty was to shoot us out of the saddle if the logic was faulty, the math bad, or the experimental program trivial. John W. Campbell was also retained as a consultant with the responsibility of assuming his classical role of a hair shirt; he kept us honest in a different way. We were soon joined by a young Iranian mathematician, E. L. Victory, a graduate of MIT who was working for Huyck at the company's paper machine drier felt plant in Renssalaer, New York. Vic had just been given the problem of analyzing why the wringer-like press section of a paper machine wouldn't squeeze water out of paper and the Huyck felts at high machine speeds. Vic had come to the tentative conclusion that the rate of onset of force between the press rolls didn't give water time to get out of the paper or the felt, creating a situation akin to the tire hydroplaning that was later described by the British.

The basis of Davis mechanics rests on the hypothesis that the energy of a system cannot be changed in zero time. In other words, there is a "critical action time" during which the system cannot behave in a Newtonian fashion and during which the system as a whole cannot accept the energy. In the case of an applied force in one dimension, Davis mechanics revises the basic Newtonian equation to the following form:

$$F = kx + V\,dx/dt + m\,d^2x/dt^2 + Dm\,d^3x/dt^3$$

This is the basic Newtonian equation of motion with the exception of the addition of the third derivative term where k = Hook's Law spring constant, V = viscous damping coefficient, m = mass, and D = the elusive critical action time.

Once a month, a meeting was held in the Huyck offices in New York City in which the theoretical and experimental programs were

reviewed. Always in attendance were Bill Davis, Vic Victory, myself, Serge Korff, and John Campbell. Because the initials of "critical action time" are CAT, we became "The Cat Pack." These were wild meetings because Davis and Victory were making real progress on the theoretical mathematical background of Davis mechanics, and the work was making logical sense. One meeting really sticks in my mind; in late 1961, I sat astounded and watched Professor Serge Korff derive Planck's Constant and the quantum condition from Newtonian mechanics using the hypothesis of Davis mechanics.

But the experimental program didn't run so well. In late 1960, I set up a small experimental area at the Huyck Equipment Company building, an old World War Two barracks located on Factory Lane in Milford, Connecticut. (Old barracks buildings are great for housing basic research programs; you can't hurt them, and their structure is infinitely adaptable.) With the help of an excellent experimental machine shop downstairs in the building and Wendell H. Stickney, Huyck Equipment's very practical, brilliant, "Down East" Yankee development engineer, I built a series of devices capable of generating simple harmonic motion. We were looking for some indication of the "critical action time," the elusive "D" in the Davis equations.

Obviously, these devices were known as D-Testers, or simply Detesters.

One by one, these experimental rigs were rejected because we could not account for all of the forces and therefore could not isolate D.

Finally, in May 1961, we decided to take a very close look at precisely the harmonic drive mechanism that was used in the Dean Drive. This is a device known as a "Buehler Drive" and it is commonly used throughout industry to generate vibration or oscillatory motion. It consists of two counter-rotating eccentric masses. I designed the device and had it built in the little machine shop. I still have the original drawings; I could build another one just like it today, and I might do it sometime. It was accurately described in a letter from E.L. Victory and me that appeared in the Brass Tacks department of the September 1963 Analog:

"Mass of the rotating weights was 1,607.3 grams, and the ratio of the mass of the weights to the mass of the carriage was 0.9333. The test device was driven by a ¼-inch electric drill motor, which was equipped with a six-inch diameter ten-pound flywheel to insure constant rate of angular rotation, thence through a universal joint, a slip joint, and another universal joint. A protractor-type dial was affixed to the front of the device with a pointer on the shaft of the upper mass to indicate angular position of

the weights. A cursor line and scale were used to determine position of the carriage in the lateral direction. Operation was observed with the aid of a General Radio 'Strobotac,' and photographs of the operating device were made. A Variac adjustable autotransformer was used to control the rotational speed of the motor."

What were we looking for? In our meeting on September 28, 1960, Norman L. Dean claimed that the classical situation of a simple harmonic motion drive was incorrect. Classically, when the masses are displaced to their maximum extent to the right, for example, the carriage will be at its maximum displacement to the left. Thus the device operates with a 180-degree phase angle between weights and carriage.

Dean claimed that the motion of the carriage led the motion of the weights by 225 degrees, creating a "phase angle" of 45 degrees.

When simple harmonic motion is considered as the driving force in Davis' mechanics, this phase angle does indeed appear . . . but not to the extent claimed by Dean.

With our oscillating device, we were looking for a phase angle. Hence, the device was called the "Phaser Mark I," with due apologies to Gene Roddenberry because we were first.

Phaser Mark I Mod O was driven with a light ¼-inch drill rod shaft, two light-duty Boston Gear universal joints which are also called "slipper joints," and a light-duty sleeve-type slip joint. I ran the device from 150 rpm to 1,500 rpm. I looked hard for a phase angle; so did Davis, Victory, Korff, and Campbell. We never saw the phase angle claimed by Dean using similar equipment. What I did succeed in doing was to tear hell out of those ¼-inch slipper joints to the point where there was at least 15-degrees of slop in them, a disparity that would have rendered any observed phase angle meaningless.

So I created Phaser Mark I Mod 1 with a beefed-up drive train using ½-inch slipper joints, half-inch drill rod shaft, and really beefy sleeve joint.

At 1,500 rpm, just at the point where the Phaser was about to tear itself to pieces and scatter parts all over the room, I saw a three-degree phase angle.

Although this wasn't the magnitude of phase angle reported by Norman Dean, it cast serious doubt on classical theory which says that there should be no phase angle whatsoever!

I saw the three-degree phase angle several times. So did Bill Davis and E.L. Victory. To eliminate any source of error, I measured the total slack in the entire drive train; it was less than a half-degree.

To prove that this phase angle, which was real, was not a consequence of the rotating masses, I

re-designed the Phaser to Mark II configuration. This used an oscillating mass, a single weight that vibrated horizontally back and forth driven by a small eccentric. The magnitude of its displacement was the same as that of the counter-rotating masses, and I maintained the same oscillatory mass and the same mass ratio as in Phaser Mark I.

With the oscillating weight of the Phaser Mark II vibrating back and forth at 1,500 cycles, the operation was a lot smoother, and I saw the good old three-degree phase angle just as before. It was highly repeatable. It was witnessed by Davis, Victory, and others.

The motion of the carriage led the driving force of the oscillating mass(es).

Looking back on this series of experiments with the Phasers, I now realize that it was probably the elegant experimental proof we were searching for. Victory's calculations said that our Phasers had a critical action time of a half millisecond. We should have built one with twice the dimensions to see if it had a CAT of a full millisecond, or at least a larger critical action time. If we had been able to predict the CAT, we would have had proof.

I believe our big problem was the fact that we had gained a large measure of respect—nay, downright fear—of the Phasers. The sight of that seven-pound Phaser shaking back and forth on a lab bench at 1,500 cycles was more than impressive. It shook the whole building when it went into resonance with the structure. And it kept trying to tear itself to pieces. I kept beefing it up. I can guarantee that when I got through with that drive train, it was strong. Although we should have taken the "American" approach of making it bigger, we abandoned the Phaser experiments. We figured that it would be easier to make measurements on a linear system instead.

So I designed a rocket-powered ballistic pendulum.

It consisted of two five-pound cylindrical masses separated by a 36-inch length of hardened ¼-inch drill rod. The device was hung as a ballistic pendulum, initially eight feet long. On the rear mass, I mounted an Estes Type B14 solid propellant rocket motor that would produce a peak thrust of nine pounds 150 milliseconds after ignition and had a duration of 300 milliseconds. The mass of the rocket propellant used was less than one percent of the total mass of the pendulum. A Dynisco bonded strain gage load cell was mounted on the rear mass to measure the instantaneous thrust of the rocket motor on the pendulum. This was read out on a high-speed Visicorder light-beam oscillograph. A light trough was placed below the pendulum with a 300-watt spot light at one end of the trough. In each

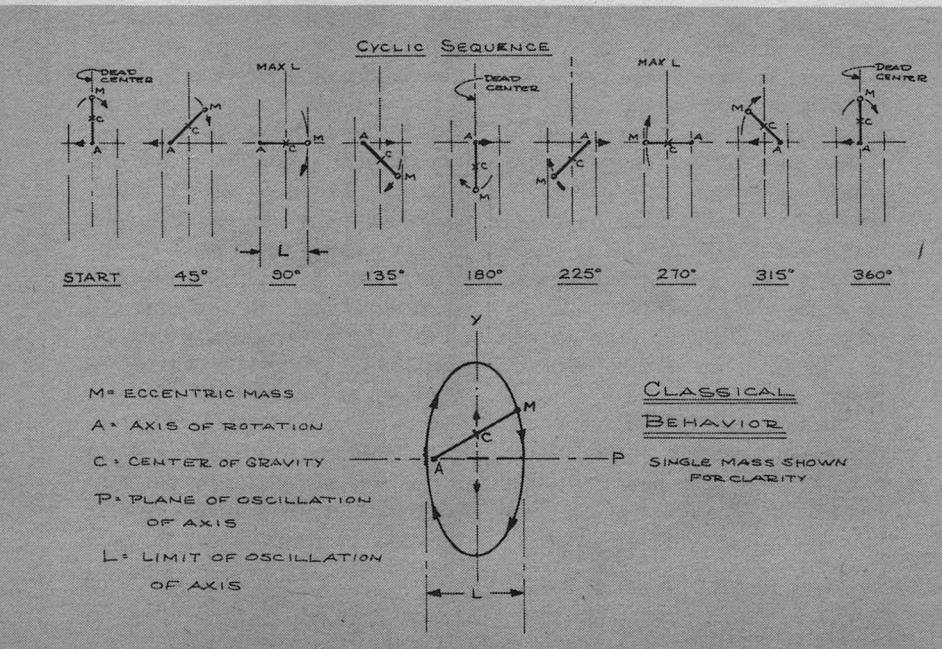
pendulum bob, a cadmium sulfide photocell looked straight down into the light trough, detecting the light gradient as the pendulum swung. The outputs of both photocells were fed into separate channels in the Visicorder. We calibrated this and discovered that it was a very sensitive pendulum position indicator.

When the rocket motor was electrically ignited, it pushed the pendulum horizontally. The thrust-time curve of the rocket motor was recorded along with the photocell output that was proportional to pendulum position.

Theoretical calculations predicted that there should be a time delay between the instant that thrust was applied to the pendulum and the instant it started to move. Davis mechanics also predicted that there would be a discrepancy between how far the pendulum swung—based on the total impulse imparted to it by the rocket motor—in reality and how far it should have swung according to classical mechanics.

We chased bugs in that rocket pendulum for over two years. First, we moved it to a new lab at 209 Greenwich Avenue in Stamford, Connecticut where it was re-hung from 16-foot lines. When we moved the lab again to 430 Fairfield Avenue in Stamford, we again re-hung it as a 16-foot ballistic pendulum and developed an even more accurate capacitance position measurement system for it.

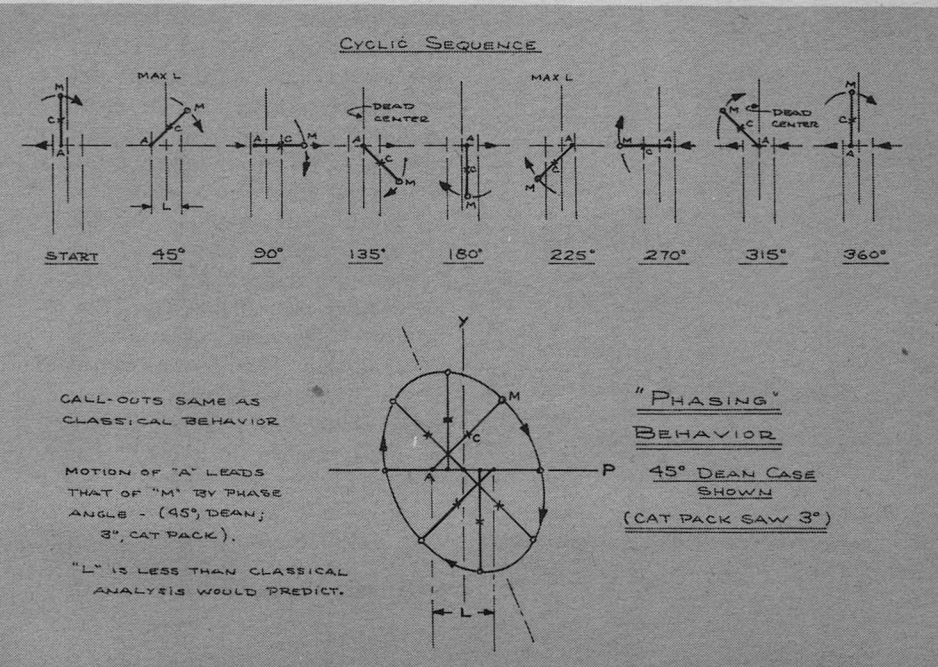
In all the hundreds of tests with the pendulum, we never detected



what we were looking for. I know now that it was because the system was too small and that the rate-of-change of force imparted by the rocket motor was too low. We should have hit it with a 16-pound sledge instead. We didn't because I hit it with a one-pound hammer once, and broke a $150 load cell. In March 1965 when we finally made highly accurate position measurements with the capacitive position system, we learned that the pendulum vibrated in four degrees of freedom when the rocket thrust hit it. We had no way of accounting for all the energy that was leaving the system by means other than linear displacement. So the experiment was abandoned.

However, the rocket pendulum did put us wise at last to the critical test for all One-Way Machines, Space Drive, Anti-Gravity Devices, and their like. When the word got out that Huyck Research Center would listen to inventors and look at their machines, the fun began. I think that I have seen every sort of shaking, spinning, whirling, vibrating, buzzing, snarling, grinding space drive that the fertile imagination of inventors can dream up. I have seen ones that would climb a slight gradient because of the stick-slip frictional phenomenon. I've seen them scoot across the floor. I have seen them do all sorts of wonderful things *except* when we put them to the critical pendulum test.

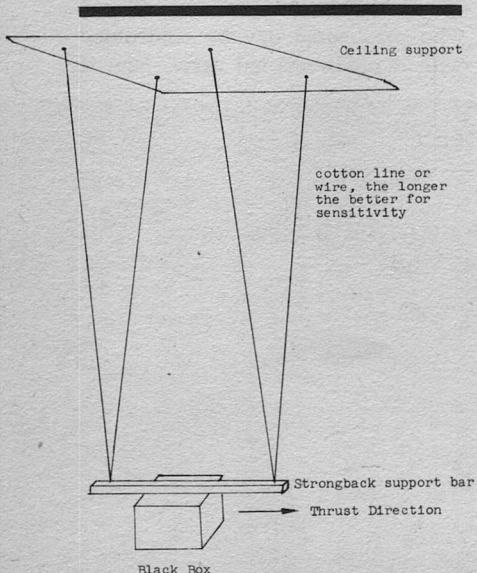
For the benefit of any of you who may some day be confronted with a unidirectional drive, here is



the Critical Pendulum Test:

Suspend the unit freely as a ballistic pendulum as shown in the drawing. The longer the pendulum, the more sensitive it will be to any unidirectional force. When the drive is turned on, it must displace itself from the vertical rest position. Furthermore, it must not vibrate back and forth about the rest position. It must displace its center of mass from the vertical and stay there as long as it is turned on.

Every space drive that we tested would not pass this test. The inventors were usually very embarrassed. "Gee, it just started to work there when it came apart. I guess we're lucky that nobody was hurt when it blew up." They all left, promising to fix the invention and return with it. Nobody ever did.



Ballistic Pendulum Rig for Testing Space Drives

There is one highly unfortunate aspect to this. Because of the total recalcitrance of Norman L. Dean, we were never able to subject the Dean Drive itself to the critical pendulum test at Huyck Research Center.

It was once claimed that the Dean Drive did pass this test. John Campbell made a comment to a letter in Brass Tacks in the November 1960 ASF as follows: "Suspended from a flexible wire, the model will push itself away from the vertical and hang at an angle." But I never saw it do that. I am very positive that Campbell never saw it, either, and that he was merely reporting what Norman Dean told him. Otherwise, Campbell would have had some very pertinent remarks during the many pendulum tests we ran not only with the rocket pendulum, but also with several One-Way Machines.

While I was involved in this frenzied, exciting, frustrating, enjoyable, disgusting, delightful, and maddening experimental program, the CAT Pack wrote a scientific paper. Entitled "Some Aspects of Certain Transient Mechanical Systems," Davis delivered it on April 23, 1962 at the Washington, DC meeting of the American Physical Society. There were no comments. Why didn't anybody hear about

this paper? Why wasn't it published? I don't know, but the APS and *Physical Review* turned it down for publication. I was given to understand that it was nearly impossible to get anything published that contradicted Einstein in the slightest degree, even in philosophical background.

Then as now, there were few avenues for published speculation in science and technology. Analog happens to be one of the few places where a person can toss a new idea to the wolves to see what happens. We knew this, so Davis wrote "The Fourth Law of Motion" that was published in the May 1962 issue of Analog. Strangely, the article didn't draw the sort of comment that we had expected; perhaps it was because it contained a couple of partial differential equations.

However, the 1962 publication efforts did finally bring us into contact with an independent investigator.

On July 1, 1963, Hermann von Schelling at the Advanced Technology Laboratories of the General Electric Company in Schenectady, New York, published a paper entitled, "Stochastic Approach to the Laws of Motion." He arrived at the same conclusions as the CAT Pack, but he did it by the statistical or stochastic method rather than by the Davis deterministic method. Von Schelling even went further to postulate a quantum of time, a time interval during which even the smallest subnuclear particle could not respond to a change in its energy. By von Schelling's method, this time quantum was calculated as 6.27×10^{-24} seconds. When calculated by Davis mechanics, the same number came out. Furthermore, this led to the conclusion that the smallest unit of length in the universe was the distance that light could travel in that smallest unit of time, and worked out to 1.88×10^{-13} centimeters.

This number agrees with the estimate made in 1955-1956 by Werner Heisenberg.

In late 1962, the CAT Pack was joined by a most formidable international scientist, Dr. Henri M. Coanda, inventor of the first jet airplane (1910) and father of the field of fluidics (the Coanda Effect). Using Davis mechanics, Coanda developed a rationale for both Reynolds Number and Mach Number.

In May 1963, Campbell published a letter from Norman Dean wherein the inventor explained in details his "phasing" hypothesis and gave implicit instructions on how to build and conduct an experiment so that his data could be confirmed by anyone who wished to try it. The Dean experimental device described in that Brass Tacks letter was identical to the Phaser Mark I. So, just to be on the safe side, I dug out the Phaser Mark I and had our two best lab technicians read Dean's letter, set

up the Phaser Mark I, and re-run the previous Phaser Tests. Both C. Philip Morse and MacLane Tilton, our chief electronic tech and chief mechanical tech respectively, conducted these tests without any supervision from Davis, Victory, or myself. I stood by in the background and just watched. Dean claimed they should see a 45-degree phase angle. They saw the three-degree phase angle that I had seen.

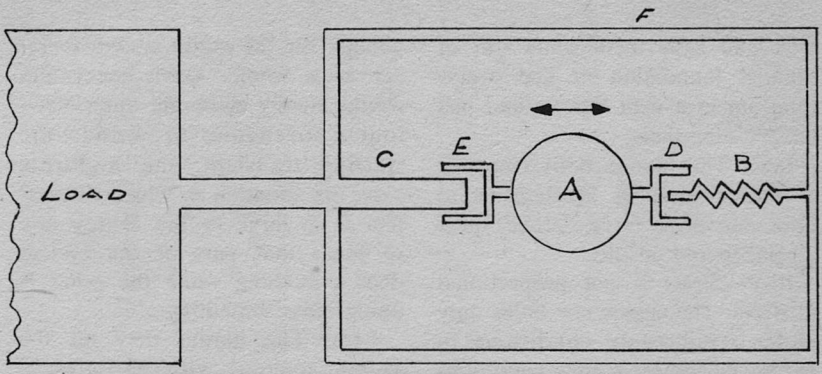
E.L. Victory and I reported this in a letter to Brass Tacks that appeared in the September 1963 issue along with a photo of our Phaser Mark I. Norman Dean must have considered this as a personal attack on him, because he fired back a vitriolic letter to Campbell that was published in the January 1964 Analog. Dean accused us of all sorts of things, including violation of his patent rights. This immediately brought in the Huyck general counsel and patent attorneys. I really wanted to go to see Dean and get it straightened out. But, acting on the advice of the Huyck attorneys, Davis instructed me not to do so.

Since that time, I have carefully studied all of the Dean materials that have been published. What did Dean do to get his claimed 45-degree phase angle, and why couldn't we get it, too? Was he using a heavy carriage with centering springs? Was his light quarter-inch drive shaft twisting? We had both used common universal joints, otherwise known as "slipper joints," that are known to possess lobes of unequal torque and rate of angular rotation when deflected; did this have a significant effect? I wanted to build Phaser Mark III with constant-torque Rezeppa Joints, the sort they use in the front-wheel drives of jeeps. Was my flywheel smoothing out something (Dean did not use a flywheel)?

We really don't know, but I strongly suspect that Dean's light-duty drive train had something to do with it.

We did a lot of theorizing about what a true space drive might be like and came to some interesting conclusions. First of all, if Davis mechanics has a shred of truth to it, the phase angle of Dean's device should have been dependent upon the rotational speed or cyclic rate. Not only should the phase angle increase with increasing cyclic rate, but the drive efficiency should increase as well. This meant that really good efficiencies could not be obtained with any device operating down in mechanical cyclic rates. It meant that a drive should be operated at megacycle or gigacycle rates.

We further came to the conclusion that the Dean Drive—or any machine capable of producing a unidirectional force under the hypothesis of Davis mechanics—would have to consist of a device that was one system during part of a cycle,



A = Oscillator. Sine-wave or saw-tooth. Wave shape may be critical.
B = Long time delay signal path.
C = Short time delay signal path.
D = Clutch
E = Clutch
F = Frame

Highly schematic diagram of unidirectional thrust device based on Davis Mechanics principles. (You couldn't build one from this diagram any more than you could build an internal combustion engine from most diagrams given in text books!)

and another system during the rest of the cycle. Or a device in which the initial system was deliberately destroyed during one part of the cycle and reassembled during the rest of the cycle.

There is only one thing that will really do this at megacycle rates and above: electromagnetic devices, gadgets based on plasmas and electromagnetic fields.

We thought about how to do this and how to build it. By April 1965, we were just about ready to start putting some experimental hardware together.

Then the nation's economy stumbled a little bit. An economy wave rolled over Huyck Corporation. And in any corporate economy drive, two things get cut back right away: advertising and research. When we came in the door of the lab on Monday, April 2, 1965, Bill Davis informed us that the research budget was no more, that the lab was closed, and that all equipment was to be disposed of at once. All of us were given severance pay, letters of commendation, and the usual regrets.

Thus ended the only serious research program that I know of that was devoted to an analysis of the Dean Drive and an attempt to construct a theoretical foundation for such devices.

And it is a totally unsatisfactory ending because nothing—*nothing*—has been resolved. The work raised all sorts of questions. It brought together a lot of hitherto inexplicable

facts and gave them some sort of rational foundation. It tied everything up in a neat bundle and just left it sitting there.

Item: The human body responds to rate-of-onset of acceleration, a third derivative force. USAF specs are still based on this.

Item: Stress is not proportional to strain. The classic law holds only under steady-state conditions in testing machines. Under conditions of high-rate loading, the stress-strain curves behave quite differently. Cables snap. Yokes break. The noses of armor-piercing shells hammer their way through armor plate while the back end of the same shells proceeds inexorably forward, not knowing that the front end is hammering away.

Item: The mundane industrial operation of squeezing water out of paper and felt is totally dependent upon the rate of onset of the force in the press roll nip; the application of the principles of Davis mechanics to paper machines permits the system to be changed so that the machine can run faster.

Item: Newton didn't have the instruments to measure high-rate phenomena. Newtonian mechanics is steady-state mechanics. Even at that, any engineer will tell you all about the Finagle Factors . . .

Item: Newtonian mechanics is true only if the energy of a system can be changed in either zero time (which is not a reasonable assumption) or in a time interval long enough for the entire system to react as a whole. Davis mechanics would merely elaborate upon Newtonian mechanics to include the starting transient, the high-rate case, the situation in which the system is so large or the energy rate so great that part of the system does something while the other is doing quite something else.

Item: The harder they hit the atomic nucleus with particles in high-energy accelerators, the greater the rate of change of energy . . . and the greater the number of wild, wonderful, and unsuspected particles that are generated. It is really difficult to account for all of these new particles . . . except in Davis mechanics where they would be viewed as a consequence of rate-of-change: the energy that the particle system cannot absorb and must then leave the system.

Item: With several very, very intelligent and respected scientists involved in the program, we never once ran up against a flaw in the logic, a trivial consequence, an irrational conclusion, or any result that did not appear to jibe with the real world.

Item: Nobody has yet designed and conducted the elegant experiment to either prove or disprove the hypotheses of Davis mechanics.

Item: Nobody has ever conducted a series of critical, objective tests on the Dean Drive. The Dean Drive has never been subjected to the pendulum test described herein

except as reported by John Campbell and never verified.

Ladies and gentlemen, there is unfinished business here that gets worse every day. Norman L. Dean passed away in the late 1960's. John W. Campbell died on July 11, 1971. Dr. Henri M. Coanda died in November 25, 1972. And Dr. William O. Davis died on May 10, 1974. Korff, Victory, and myself appear to be the only ones left who participated in this most exciting work.

I saw the Dean Drive work, and I think I know how and why it worked. I don't know if it would pass the pendulum test, but *the test must be made* before anyone has the right to sit back and be smug—on either side of the fence.

Until the basic hypotheses of Davis mechanics are either proven or disproven, the nagging specter of the space drive will haunt our scientific curiosity. Will it or won't it? Is a space drive possible or not?

If it is impossible, *what pushed against my hand*?

If it is impossible, what was the 3-degree phase angle that I saw with the Phaser Mark I and Mark II?

I am not talking about Dianetics, Psionics, or ESP. This is physics and engineering and technology. It would take so little time and so little money to find out whether we have nothing . . . or . . .

There is an unpublished series of papers written by Davis and the

rest of the CAT Pack. They hypothesize a theory of inertia and gravitation that embrace both Newton and Einstein. Based on very preliminary calculations, the theory based on Davis mechanics indicates that the speed of gravitational propagation is at least 30,000 times the speed of light.

The end of this article remains to be written.

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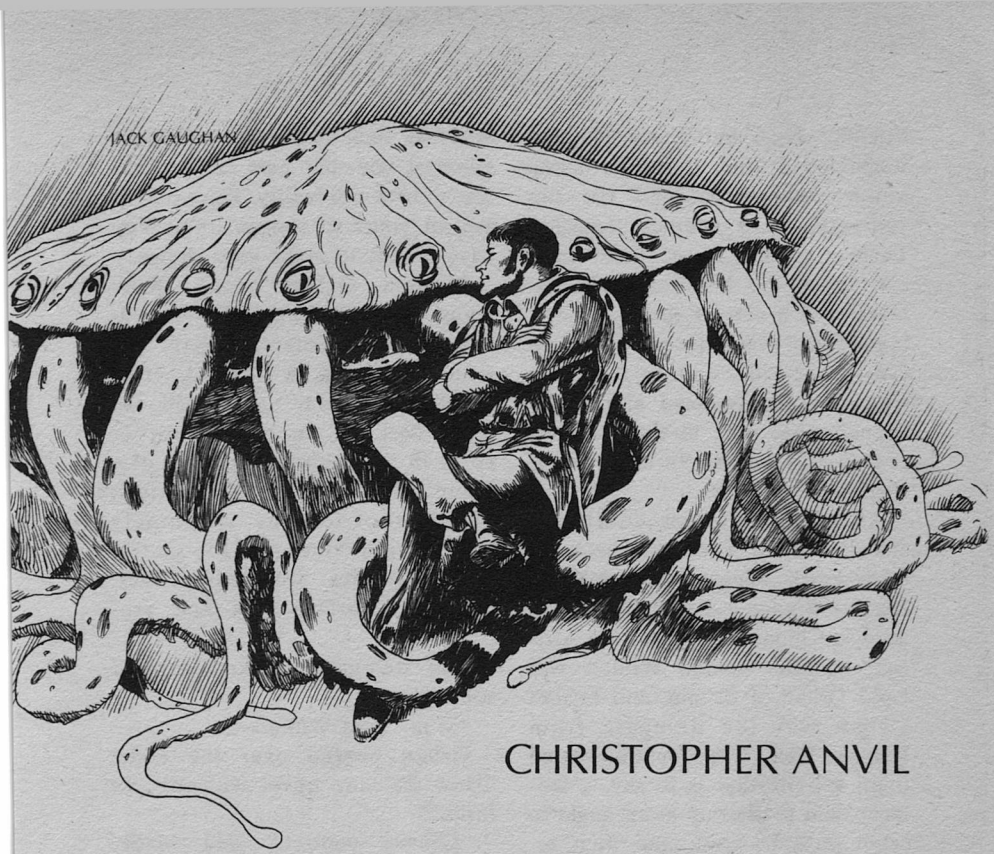


CHRISTOPHER ANVIL

BRAINS
isn't everything

Don't look a gift horse in the mouth, they say. But what about your own mouth?

After an hour inside the gigantic spaceship, Steven P. Winters, US Delegate to the Interstellar Mutual Love Conference, had a few doubts about his host.

Winters, uneasily seated on his perch, peered around the curving bulk of what had introduced itself as "Friendly Hug and Clasp Osher Diomak." As much as anything,

Friendly Hug and Clasp Diomak resembled a kind of leather flying saucer equipped around the rim with good-sized octopus tentacles. There was one large round dark eye above the base of each tentacle, with a sort of disklike membrane that evidently served as an ear to one side, and to the other side a similarly-sized slit which opened from time to time to emit reassuring words in a tone of soothing confidence.

As far as Winters could see ahead, around Diomak, there sat other Earth delegates—G. Malik of Russia; Madame Kuo from Communist China; K. Ngusi, an African delegate. Behind Winters was Lord Orban of Britain, and behind Orban was the delegate from France. Each was uneasily seated upon a limb—that is to say, a tentacle—that twisted up at an angle to serve as a backrest, and then reversed itself to pass across the delegates' shoulders and provide a friendly squeeze from time to time.

Several feet from Winters' ear, to the side of the tentacle that was serving as Winters' seat, the slit now opened up.

"Winters, my boy," said a sincere friendly voice, "what I want to bring to you and yours, I repeat, is the choice of fellowship, understanding, long life, health, vigor, vitality, plus—ah—*involvement* in the—ah—wonderful world of interstellar civilization. *Your* happiness is *my* happiness. I realize from what you say that such offers are legendary amongst you—but now, at last, the legend becomes reality. The wonders are all yours to choose from. You have merely to make your choice."

Winters, Orban, Malik, Kuo, Ngusi, and the other delegates adjourned to a "conference room" set aside for them by Diomak. This "conference room" resembled the flight deck of an aircraft carrier adrift in the Pacific on a foggy day. From the misty surface below, twenty-foot lengths of tentacle thrashed into view, and big saucer-shaped bodies, streaming water, broke the surface and then vanished again.

The delegates looked around somberly.

"M'm," said Winters.

Orban peered over the edge. "How do they travel with all *this* inside?"

"Gravity control," said Malik. "What a technology!"

The French representative sardonically eyed the tentacles erupting from the water.

Malik added dryly, "Although, technology aside, Diomak seems not completely *sincere.*"

Winters grunted his agreement.

Madame Kuo said, "But think what he offers:

"Perfect health.

"Long life.

"Great mental development.

"Universal friendliness.

"Mutual understanding.

"Great vitality . . . *And so on.*"

Malik nodded. "We can't ignore that."

"Remember," said Lord Orban, "Diomak offers us these marvels *as capsules,* to be taken once every three weeks."

"Miracle drugs," said Winters, ironically, "to end all miracle drugs.—Nevertheless, all Earth is waiting to find out what we've picked."

"And this," said Madame Kuo, "raises a curious point. Each of us may select *one* capsule. This means that China, which practically constitutes the entire human race, with only little bumps of others around the outer fringe, may select only *one* type of capsule—*for her whole people."*

Lord Orban cleared his throat.

"I should say we need a solid front against this alien and his trinkets."

Malik, eyes narrowed, said, "How will Diomak stop us from *trading* capsules?"

Winters, groping for some approach that made sense, came again to the same conclusion:

"It seems to me we've got only one choice. Whatever we do with these pills afterward, for *now* we've got to accept. So the problem is, who takes which kind of pill?"

Lord Orban shook his head. "These capsules could be disastrous."

The discussion went on, traveled in a circle, went around again, and continued until finally even the sequence of the repetitions became monotonous. Winters and Malik wanted an agreement as to who would get which capsules, so as to make trading easier. Madame Kuo became mysteriously noncommittal. Lord Orban argued for an agreement to refuse the pills entirely. K. Ngusi wanted to question Diomak further. The Japanese representative felt that there should be more time for consultation. The German delegate was impatient to do *something.*

Disgruntled and disunited, the delegates returned to talk to Diomak.

Diomak slid his tentacles around them like a friendly big brother.

"Well, Winters, my boy—did you decide?"

"I—uh—do you mind if I ask you a couple of questions, Mr. Diomak?"

"Call me Osher, Winters. *All* my friends call me Osher."

"Alright . . . do you mind if I ask you one or two questions, *Osher?"*

"Not at all, Winters. Go right ahead."

"Well—ahh—you see, there's been a certain amount of—well, mutual distrust, on Earth, and—"

Diomak put in quickly, "That's what we want to get rid of. Exactly, Winters. You are entirely right. I agree with you wholeheartedly."

Winters groped around mentally

for the thread of his thought. Before he could find it, Diomak spoke, his voice radiating good fellowship:

"So, that's taken care of, eh, Winters? Now, did you decide what you wanted?"

Winters hesitated, still couldn't remember what he had intended to say, and shrugged. "Yes, it was—"

"No, no, don't tell *me.* We will make the choices so *all* can hear. Just sit back, and we will decide, with—ah—witnesses—so everyone can trust everyone else, eh? Ha, ha.—Isn't that right?"

Winters swallowed and sat back. He now had the impression of dealing with some kind of interstellar salesman of stolen cars, with transactions in hashish and opium thrown in on the side.

"Now, dear friends," said Diomak, his multiple voice purring in many tongues, "we are all met here together in free will, no coercion or duress used to freely agree that I, Osher Diomak, will freely give to you, periodically, *and without charge,* and will *deliver* to you, also without charge, enough capsules to last two years—of whichever kind each of you publicly agrees on—one kind for the inhabitants of each political group or unit, known as 'nation' or 'country,' as follows:

"USA?" In a low voice, Diomak asked, "What will you have, Winters, my boy?"

Winters was wishing he hadn't known so many languages as to be picked for this job, or had been brought up as a trader in some tricky competitive business. As it was, he had the sensation of knowing *something* was going on—but *what?*

"Perfect health," he said.

"Excellent, excellent. *Fine.* A *wise* choice, my boy . . . Union of Soviet Socialist Republics?"

"Long life."

"Long life, eh? Excellent . . . and what does the People's Republic of China choose?"

"Great mental development."

"Good, good. Splendid choices. Next . . . Republic of France?"

The French representative stood up.

"France *refuses!*"

"What?—ah?—*Monsieur?*"

"*What* you are doing, I do not know. Until I know, I will have nothing to do with this!"

Diomak spoke earnestly, soothingly, persuasively:

"You have your people to think of. Surely, you wouldn't *deprive—*"

The French delegate turned on his heel and headed for the exit.

Lord Orban stood up. He glanced at Winters. Winters evaded his gaze. Orban leaned over.

"Would you buy bonds from Diomak?"

Winters shuddered. "At the moment, I wouldn't buy chewing gum from him!"

"If now we both walk out—"

"What would they do back home?"

Orban straightened. His voice was cold and clear.

"The United Kingdom declines every part of this proposition."

He strode toward the exit.

There was an uneasy stir in the room.

Diomak clucked regretfully.

The door banged shut behind the British and French representatives.

Winters sighed. It was an impressive exit; but when they got *home*—

Winters stayed where he was.

No one else walked out.

Diomak went down the long list of nations.

Winters braced himself to report to the President.

The President listened closely, and at the end said, "Did you find out whether these capsules *can* be traded?"

"No, sir. That was one of two questions I tried to ask. But Diomak got my mind off the subject."

"What was your other question?"

"What is *he* getting out of this?"

The President nodded.

"It all *looks* generous. But no living creature survives on generosity *alone.*"

"All that interstellar brotherhood stuff *may* be what he's after. But that isn't how he struck me."

The President picked up a closely printed sheet of paper.

"I'm told that, on analyzing this situation, the following appear to be plausible reasons for Diomak's offer:

"1. Drug entrapment—the pills are addicting.

"2. Slow poison—Diomak wants our planet.

"3. Hypnotic drugs—the pills increase suggestibility, and Diomak makes suggestions.

"4. Psychological dependency—the pills work, and we won't *want* to do without them. Then he'll name his price.

"5. Side effects—the pills' side effects will tie us in knots. Same purpose as 2.

"6. Overeffectiveness—the friendliness drug will make people easy to fool and cheat; the health drug will make people so active they can't stop to think. Same effect as 5.

"7. Fakery—the pills were camouflage. Diomak planted plague by infecting the delegates during his conference.

"8. Anaphylactic shock—the first pills will set up an allergy. Later pills will trigger a violent reaction. Same as 2.

"9. Plague inoculation—the pills contain deadly germs. This has two variants: (a) all pills are infective; (b) to make it harder to detect, only one pill out of ten thousand or so is infective."

Winters shook his head.

"Maybe I should have followed Lord Orban out the door."

"What do *you* think?"

"For whatever it's worth, I think the capsules will be useful—probably not worth what Diomak claims, but still useful. And I think he aims to make a profit some *other* way."

"You don't think he aims to finish us?"

"No, sir. I think he aims to get what *he* wants."

"And he wants?"

Winters shook his head in exasperation.

"I can't imagine what it is that he wants."

In the next few days, the pills were delivered to each nation's capital, and the US found itself with hundreds of millions of little yellow capsules, packed in six-sided drums with flat tops and bottoms. The delivery was simplicity itself. The fun started with the distribution.

One and only one capsule had to be somehow gotten to each and every individual, out of all the increasingly impatient millions of individuals. And each capsule, offering three weeks of perfect health, obviously could be robbed or stolen.

The government, at least, showed no hesitation. Paratroops controlled the roads leading to the sites where the pills were landed. Armor backed up the paratroops. Marines ringed the site itself. The Treasury Department handled the pills, roughly along the lines of gold bars. The Internal Revenue Service, supposedly best acquainted with who lived where and had how many dependents, mailed out the capsules in special containers. The containers, designed by the CIA, proved to be waterproof, shockproof, corrosion resistant, heat resistant, child-proof and almost adult-proof. Meanwhile, the Food and Drug Administration, testing random capsules, announced that they contained only a mixture of salt, starch, sugar, gelatin, and baking soda, and could not possibly cure anything—although harmless, they were a fraud.

The government, with an election coming, paid scant attention to this announcement, and kept putting capsules in the mail under the watchful eye of the postal in-

spectors, with the FBI backing *them* up.

With the capsules at last distributed, the Internal Revenue Service smilingly offered to pass out extra leftover pills to adults who could prove they had never made out an income tax. One measure of interest in the capsules was the number of people who came forth to accept this offer.

Soon, as capsules were rushed to sick relatives, word came that the hospitals were emptying.

Winters found himself reading the headline:

MEDICAL SOCIETY SUES!
ALIEN PLOT AGAINST MD'S
CLAIM PILL FRAUD!!

He skimmed the article, to find that "mental suggestion," "mass hypnosis," and "interstellar chicanery" were ruining medicine:

> "Hospital occupancy in this state is down by sixty-nine percent. This is a devastating blow to the hospital industry, and there is no end in sight."

Winters eyed a little plastic box containing a small yellow capsule that he carried around like a good luck charm. What did Diomak want in *return* for this?

The phone rang.

"Georgi Malik," said the voice on the other end. "Madame Kuo and I would like to see you."

"Fine. At my place?"

"Ah—it's such a nice day—why don't we go for a ride?"

"A taxi?"

"Why not?"

They picked the second taxi after the one Malik was agreeable to, following the one Winters wanted. Madame Kuo had expressed doubts about earlier selections.

"Possibly," said Malik, as they pulled out into traffic, "they are *all* bugged. Besides, the things are so small now—ah, well—who knows?" He studied Winters alertly. "Your health—pardon me for prying—appears good but not extraordinary."

"I haven't swallowed the thing."

"Ah."

"Are your people living longer?"

"Well—of the people given the actual capsule, there have been no deaths. Some were in severe automobile accidents, and are having a painful recovery. But they are *living.*"

Winters blinked, started to ask a question, and changed his mind. He glanced at Madame Kuo.

She smiled briefly.

"If I seem no more intellectual than before, do not be surprised. I—what is the expression?—'chickened out'."

"You didn't take it either?"

"I look at it now and then. It is an odd shade of blue." She hesitated. "One of my superiors ate his, however, and for entertainment now works out calculus problems in his head."

The taxi slowed for a light. On the sidewalk, a man in his eighties

jogged past. A man of forty or so turned handsprings. A policeman, beaming and swinging his club, strode along whistling.

Malik said, "You have heard of the upheavals in Britain and France? Diomak refuses to allow them any capsules of whatever kind."

"Yes," said Winters. "But I thought that was on account of some regulation Diomak is stuck with."

"The result is the same. Ah—did Lord Orban recover from that mob attack?"

"I've heard he's living on a small island in the Caribbean. I couldn't locate it on the map."

Madame Kuo said, "Mr. Malik and I felt we three might—ah—mutually equalize the distribution of the capsules."

Malik nodded. "One of the automobile accident victims happens to be a high official of the Party. Such is his suffering that even euthanasia has—h'm—received consideration. But it didn't work. We would like to restore him to perfect health."

Madame Kuo said, "We have a similar situation—a brilliant theoretician, made more brilliant by the capsule. He is, however, well along in years. But if he could spend his last days *in perfect health,* there is no predicting what he might accomplish."

Winters nodded. "Why not buy some capsules from a dealer? There seem to be about twenty million Americans who don't trust these pills, and millions of others who want to be sure of a second one when the first wears off. So there's a natural market for them."

Malik looked unenthusiastic. "*Those* capsules are unreliable."

"Sometimes," said Madame Kuo, "they are good. Our people here used some that were effective. Those shipped home were worthless."

Winters said hesitantly, "There is a rumor that certain capsules from – ah – other countries – have found their way here, and been totally worthless. Though they worked *there.*"

Madame Kuo looked startled. "Could it be?"

"Diomak," said Winters, "may have some way to deactivate them."

"Then," said Malik, "we will have to try bringing the patient to the medicine. Though I cannot conceive how Diomak could do such a thing."

Several weeks passed, and soon Winters had *two* little capsules he hadn't taken, then three. Most of his friends were glowing with health, but there were still a mysterious twenty million who refused to take the pills. Yet the only such people Winters knew were the President himself, the Vice-President, all the members of the cabinet, several senators, and—Winters paused. Could there be *twenty mil-*

lion distrustful people in the *government?*

As for himself, Winters had now been debriefed, interviewed, and present at so many hearings that he fell asleep still struggling with questions, and woke up giving answers.

Malik and Madame Kuo appeared to be suffering from the same difficulty.

"What," she said, "is Diomak's *motive?* What does *Diomak* receive? *Why* is he doing it? How am I to say?"

Winters said, "Do the health pills work for your people *here?*"

They both nodded. "Diomak's *motive* is the problem."

Winters nodded. "That's my problem, too."

Winters' ears hurt as vigorously healthy interviewers demanded, "*Why* is Osher Diomak doing this for us?" "Is there an interstellar civilization based on love and generosity?" "Why can't *our* government be selfless?" and "Does pure generosity rule all the *other* races in the Universe?"

As the pills accumulated, Winters hoarsely talked his way through "Face the People," and then found he was scheduled for a double-length session of "Meet the Nation."

So far, no one had shown any sign of poisoning, allergy, strange illnesses, unusual suggestibility, drug addiction, or even so much as mild stomach acidity. The only

signs even of strain appeared to be amongst doctors—who were leaving for less healthful climates—and travel agents, who were laboring overtime to accommodate the gigantic tourist trade generated by people who wanted capsules other than those their government had officially chosen.

Winters moodily added another pill to his collection, and turned as the phone rang.

There was a meeting at the White House, and Winters was wanted.

The room, as Winters went in past the guards, had that silence reached when everyone has said everything he has to say, and what

everyone has said adds up to something no one present can even so much as get in focus.

The President, at the far end of the crowded table, sat with his chair tilted back, frowning. Around the table, people slumped, leaned on their elbows, vacantly exhaled smoke, massaged their eyelids, massaged their temples, sat back staring at the ceiling, or sat chin on chest staring at the tabletop.

Winters, alarmed, pulled his chair out a little incautiously, and banged the leg of the table.

The President looked up.

"Have a seat, Winters. Maybe *you* can clear this up."

Everyone at the table glanced dully around.

Winters kept his face expressionless.

"Anything I can do, sir—"

"We have reached an impasse. Around this table sit administrators whose physicians, biochemists, intelligence experts, military men, physicists, statistical analysts, and computers have been focused on Diomak since he showed up. To make a long story short, every scrap of objective evidence suggests Diomak is being perfectly fair with us. *But there is not one of us here who doesn't think we are being manipulated.*"

Winters, under the weight of watching eyes, spoke carefully. "I think, sir, he could be a *trader.*"

"How does that fit in?"

"Then the evidence of his being fair would be consistent with the idea that he is manipulating things for his own advantage. A trader, in the right circumstances, can give everyone a good deal, including himself. It's all a question of what's scarce in one place and plentiful in another."

The President nodded.

"The trader pays a good price for an item that's cheap *there.* He brings it here, where it's expensive, and sells it cut-rate. He takes our cheap surplus item in payment, because it is worth more elsewhere."

"Yes, sir."

The President leaned forward.

"But *what* have we got to offer?"

"I've been thinking about that, sir. Obviously, this free gift is to demonstrate *his* merchandise. He must be going to offer eventually to buy something from *us.* Well—what have we *got?*"

Everyone around the table, as if by some signal, sat up, to listen alertly.

The President said, "This is where we got stuck. What could *we* offer Diomak? Consider the access to raw materials that space travel must give to Diomak's people. For manufactured goods, consider Diomak's spaceship, and the techniques *that* implies. So far as intellect is concerned, consider the ease with which he learned our languages. For good measure, do you know that those pills evidently contain tiny 'seed-organisms' that are scarcely more than molecules—

and yet, when absorbed through the walls of certain tissues, they build up structures that act almost as factories to turn out things *like* viruses, but the action of which reinforces certain bodily functions? These 'viruses' are useful. Then there is a mechanism apparently activated by limiting factors involving gravitation, inertia, and the Earth's magnetic field, and that deactivates the capsules. We still don't have *that* worked out. Now—consider a civilization that can do *that*—and then you tell me exactly what *we* can offer *them.*"

Winters nodded. "Yes, sir. But"—he glanced around at the shrewd and knowledgeable eyes focused upon him—"with apologies to present company, sir—*brains isn't everything.*"

"What do you mean?"

"It's the *scarce* item that's most highly valued. If gold lay around in chunks, but copper were scarce, which would be higher-priced? Since the human race is a—ah—a trifle short in brain power now and then, it follows that learning, degrees, and reputation for brains, get great credit. We assume that, *with enough brains,* everything *else* will follow. But suppose you have a place where brains are commonplace, and something else is in short supply? Then what?"

There was a stir in the room.

The President said, "What *could* they lack?"

Winters shook his head.

"All I can say is, it must be something we take more or less for granted, and don't appreciate the value of."

It was about two pill-deliveries later when Winters got another call:

"Diomak wants all the original delegates on board his ship. You have to be ready to go by five p.m."

This time, Diomak was not so cheerful. Some of his tentacles lay stretched out limp. Others were wrapped around his central "head." All his numerous eyes were either shut or half-shut. He had the look of an octopus on Monday, after a little overindulgence on Friday, Saturday, and Sunday.

When everyone was settled, Diomak made a visible effort to pull himself together.

"Wonderful, wonderful," he said dully. "We are all here, just like before. This time, we have a—a thrilling surprise. A wonderful—ah—heh—friend has come to make sure everything is the way it *should* be."

Winters glanced around.

Through a doorway across the room stepped an entity vaguely suggestive of a tall stork that had been dipped in India ink, dried off, and provided with a thing like an eight-sided attaché case, a pocket calculator, and a microphone.

Diomak shuddered.

"It is Gentle Corrector Vark, *Himself.*"

Winters strained to get Gentle Corrector Vark in focus. Part of the trouble was that the Gentle Corrector's knees worked in reverse, the lower leg swinging up almost at a right angle on each step. Another problem was the long black bill, which appeared slightly flexible, showed no visible lengthwise opening, but had a great number of regularly spaced perforations. It suddenly dawned on Winters that this "bill" might be some form of filter or gas mask. Winters made a mental note of the possibility, then watched Vark raise the microphone.

"AAaaahhhkk!"

A series of complex twanging noises made the air hum and vibrate.

Winters' ears hurt.

Diomak's voice trembled as he translated:

" 'I. Subject: Possible infringement of Regulation Z of the Office For Legal Regulation of the Correlation and Controls Department of the Alien Consolidation Administration.' "

Winters leaned over to Diomak's ear membrane.

"Does Gentle Corrector Vark always talk in paragraph headings?"

"Always. They all do."

"Why?"

"They rule as a legal bureaucracy, and it is they who make and interpret the law. They always talk to us in regulations, for our convenience in obeying them."

A light was slowly beginning to dawn on Winters. It was almost blotted out as, across the room, Gentle Corrector Vark spoke again:

"Ssnarrr! Eeeyee—eeeyang—"

Winters' teeth buzzed. His hair tingled at the back of his neck. His eardrums vibrated to selected tones from auto accidents, fire alarms, untuned pianos, and mosquitoes passing overhead at midnight.

Diomak's voice quavered:

"Gentle Corrector Vark states:

" 'II. Classes of Possible Corrective Action

" 'A. For Infringement

" '1. Intentional

" '2. Unintentional

" '3. Indeterminate

" 'B. For Non-Infringement

" '1. With Prejudice

" '2. Without Prejudice

" '3. Indeterminate' "

"Gllll . . . Snnarrrr!" said Gentle Corrector Vark, as the air hummed, shrieked, and twanged. "Yik—eeeeeyyokk—*vakkkkhh!*"

Diomak trembled all over.

" 'C. Applicable Corrections

" '1. Dismemberment

" '2. Acid

" '(a) Dip

" '(b) Spray

" '3. Tongs . . .' "

There was a tap at Winters' shoulder.

Lord Orban, tanned where he wasn't bandaged, growled, "Look there."

A column of more or less stork-like creatures was coming in through a rear door. Each carried a sort of large heavy bat.

Diomak was now translating the various ways in which tongs could be used for corrective purposes.

Winters leaned close to Diomak's ear membrane.

"What's this gang coming in the back door?"

The tip of Diomak's tentacle clutched Winters' ankle.

"Those are Corrective Healers!"

Winters took another look. They were adjusting their clubs as they came. Nozzles thrust out the ends of some. Steel claws slid out of others.

Diomak tremblingly started translating again:

"'. . . and all alien entities are hereby advised that constructive collusion in violation of Regulation Z requires immediate restitution of all items wrongfully appropriated, without exception.

"'B. Failure to comply with "A" above, whether voluntary, involuntary, or indeterminate, will mandate application of one or more of the following Corrective Entitlements:

"'1. Extermination

"'2. Decimation

"'3. Compulsory fratricide

"'4. Exile

"'5. Sterilization

"'6. Other

"'C. Appropriate entitlements shall be determined by the Gentle Correctorship. All decisions will be final.

"'D. Manner of–'"

Winters leaned over to Diomak's ear membrane and spoke urgently.

"What's Vark talking about now?"

"He's saying you will have to return all the pills."

"What? We've already eaten most of them."

"Those, too."

"How do we accomplish *that?*"

"It is impossible, but you must do it anyway."

"Why?"

"The Gentle Corrector has spoken."

"Oh, I see. And just what was wrong with our accepting the pills in the first place?"

"Vark hasn't yet announced that anything *was* wrong. What he would be punishing you for would be *obstructing the investigation.*"

"Because we don't cough up the pills?"

"Certainly. He has *ordered* you to do it. Not to obey is obstruction."

"Did you know this would happen?"

"I–er–there is no way to tell what they will do next. But they were extending their exploration in this direction, and I thought I should get here first."

Winters cast a glance over his shoulder at the Corrective Healers, who had split into two lines, and were marching along the walls of the room toward the front.

"Didn't you know Vark would tell us to give back the pills?"

"No."

"Why?"

"The Gentle Correctors have rules for everything, and the rules can all be interpreted in different ways. Only the Gentle Correctors can decide which way to interpret the rules."

"Well, that fits. And what's a Corrective Healer?"

"One who specializes in quick cures for mental confusion. He is a Pain Expert."

At the head of the room, the Gentle Corrector twanged and buzzed. From the side walls of the big room, the Corrective Healers closed in with tongs, claws, nozzles, and electrodes.

Winters growled, "What's this long cone-shaped thing they all wear on their heads?"

"That is their air-filter. There is little dust or smoke on their home planet, and their air passages are extremely sensitive. As there are many impurities in the air here, they are wearing filters."

Winters snarled, "Tell the other Earth delegates about the filters." A Corrective Healer was coming straight for him, bat outstretched. At this distance, Winters could hear as well as see the snappy spark jumping between the bat's electrodes.

In front of Winters, Malik leaned over to listen to Diomak—then twisted around to observe a Corrective Healer coming at him with outstretched nozzle.

Winters jerked his foot free of Diomak's clinging tentacle, and dove for the nearest set of long slender legs. As he slammed the creature to the floor, Winters got a grip on the air filter and yanked. The cone, which felt like some kind of stiff rubberized fabric, came partly loose.

There was a mind-stopping screech, a gagging, then a sneeze that seemed to jar the room. Then Winters' opponent took a swing. The bat grazed Winters, and the effect was like walking into an electric fence. Winters got a fresh grip, yanked the filter completely loose, and as the creature doubled up in a sneeze, Winters got the bat. He turned it around and tried it on the Corrective Healer, who made a noise like a piano with all the keys hit at once, took a flying jump, collapsed in a heap, then lifted up in a heavier sneeze.

Winters glanced around at his colleagues.

Lord Orban was straightening over an inert heap on the floor. Malik was bent over using the baton like a hammer. Madame Kuo was grappling with a Corrective Healer equipped with a set of steel claws. Winters politely stepped over, yanked the "Healer's" filter loose, and threw him headfirst into the wall.

At the front of the room, Gentle Corrector Vark, eyes wide, hands

spread on the bulkhead behind him, had stopped talking.

Diomak was flushing various shades of pink and blue. Winters bent close to make himself heard above the sneezes and screams.

"Vark," said Winters, "doesn't look happy."

"This is unthinkable to him! Only *Vark's* people are allowed to use force! It is their *law!*"

"And just how do they enforce that?"

"With hideous threats and tortures!"

"Why let them?"

"They use force!"

Winters frowned.

"Do they have many spaceships?"

"Hundreds."

"How many warships?"

"Almost a dozen."

"Are these to fight other spaceships, or to bombard planets, or what?"

"They have some of each—those to destroy spaceships and those to bombard planets."

Winters said uneasily, "How long will it take them to get a warship of either kind here?"

"They could have one here in less than a decade."

Winters blinked. *"Ten years?"*

"Yes. They are almost as fast as light, but we are far from the center."

"I see." Winters straightened. Around the room, the screams were dying down, but the sneezes continued. He said, "Are such ships hard to build?"

"Not," said Diomak, "once you have the engine designs and the proper alloys—both of which I can offer."

"How *long* do they take to build?"

"Several of your planet's years—when you have the designs."

The great light finished dawning on Winters.

"I see. And what is it *you* want from *us?*"

Diomak explained.

At the end, Winters said soberly, "We'll see. That is usually an expensive proposition."

As Winters, back on Earth, re-

ported what had happened, everyone listened intently.

The President said, "What *is* it he wants?"

"He wants us to *free his home planet.* And from what he says, and from what we wrung out of Vark and his crew, we evidently could do it."

"And in return—?"

"In return, he offers us his race's *complete technology."*

A murmur went around the table. The room filled with smiles. There were even a few administrators to be seen briskly rubbing their hands.

The President said, "So *that's* what he wants?"

"Yes, sir. A little of Vark goes a long way."

"But this still doesn't make sense! Are Vark and the rest of these overseers ahead of Diomak's people technologically?"

"Diomak said—and Vark didn't dispute it—that his race is ahead of Vark's race. Vark's race is the *governing* race—that's their specialty."

The President frowned.

"Are they more *numerous?"*

"No, sir."

"Then—why look for somebody *else* to do the job? That *is* what Diomak was doing here, wasn't it?"

"Yes, sir."

"Well—Diomak's people have the technology, they've got the numbers, and they've got the brains. What can anyone else possibly offer that they haven't got already?"

Winters shook his head moodily.

"They've apparently lost or mislaid something."

"What?"

"Well, sir, *we've* been lacking in technology, so we rate it above other things. But there's a lack that's worse yet."

The President said impatiently, "What *is* it?"

Winters shook his head.

"Winston Churchill said it, sir—but I don't remember the exact wording."

"Never mind that. Let's have it."

Winters cleared his throat, and around the crowded table they leaned forward.

Winters repeated slowly:

"Of all the virtues, the father of the others is *courage."*

The President straightened.

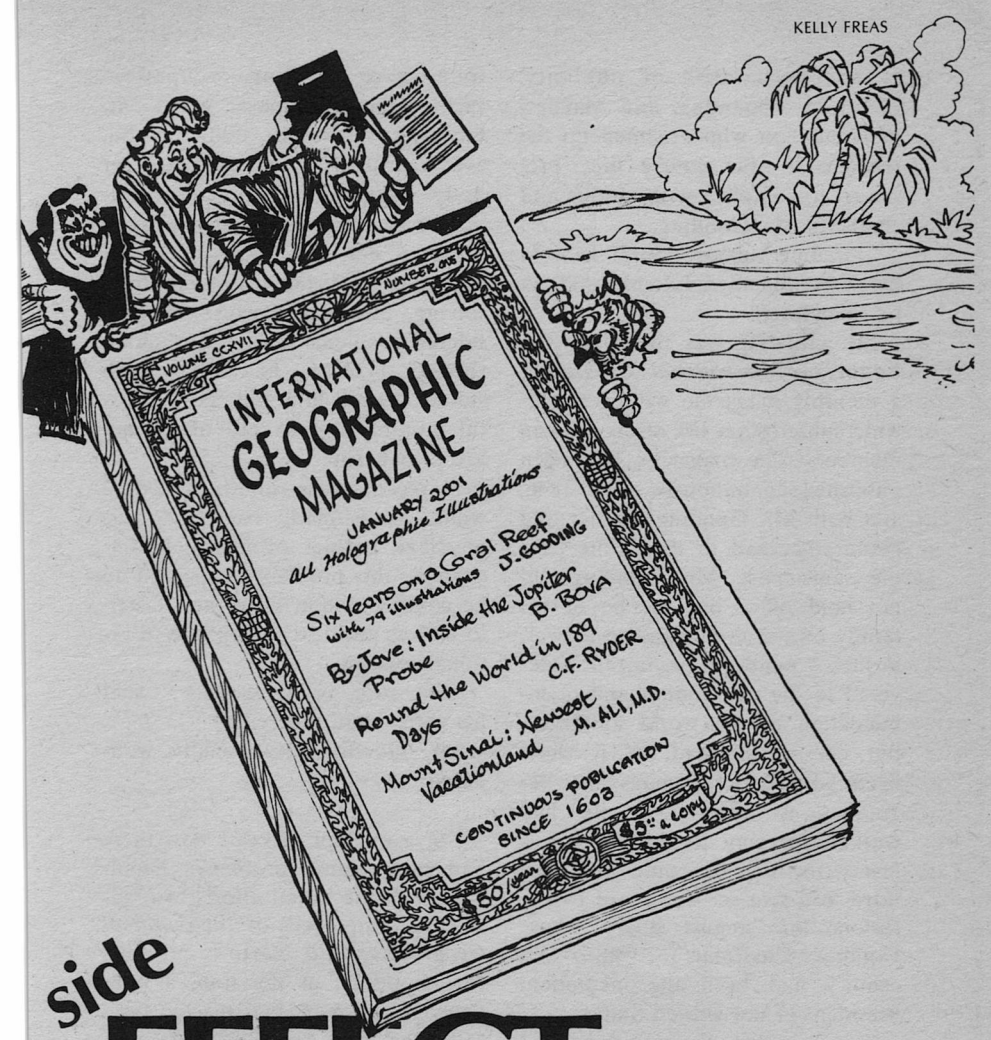
"They're *afraid?"*

Winters nodded. "And the result sure shows that brains and technology aren't a cure-all. They got stuck with Vark's kind several generations ago, and ever since they've been looking for a way to get rid of them. They've got the technology, they've got the numbers, and they've got the brains, but—"

The President smiled.

"But they aren't *belligerent* enough."

"No, sir," said Winters, suddenly smiling, himself. "But they *are* good traders. They kept hunting—till they found a place with an oversupply of exactly what they need." ■



side EFFECT

The magazine publishing business gets more complex every year!

HAYFORD PEIRCE

It was Richardson of publicity, Dalby of accounting, and Mayhew of circulation who dreamed up the scheme. In due course they presented it, complete with graphs and charts, to Mr. Gooding.

"Lifetime subscriptions?" snorted Mr. Gooding incredulously. "Don't be ridiculous."

Mr. Gooding was the Managing Editor of *International Geography*, a monthly magazine with a worldwide subscription list of six million members. The magazine had been published continuously since 1846, and both Mr. Gooding's father and grandfather had in their time held the same post. Mr. Gooding did not hold office because he or his family owned the magazine—it was, in fact, a nonprofit organization devoted to the exploration and documentation of the world at large—but because he had, as it were, been born into the magazine. Beginning as office boy, he had worked his way to the top; in a few years now he could look forward to a seat on the Board of Directors, that august Board whose Honorary Chairman for well over a century had been the incumbent President of the United States.

Simply stated, the magazine and its well-being were Mr. Gooding's lifeblood.

For most of an adult lifetime, Mr. Gooding had had to contend with vexatious problems. A man of less dedication would have thrown up his hands in dismay and turned to a more soothing occupation, such as bomb disposal work. Mr. Gooding, however, soldiered on, ever courteous, ever courtly, ever dryly waggish, ever the unpretentious New England gentleman of a vanished era, not because he reveled in the satisfaction of problem-solving, but only because he considered problems to be the random, though malign, hazards which stood between him and the successful monthly appearance of his beloved magazine.

In recent years—so Mr. Gooding would occasionally confide to his marriage partner of nearly half-a-century—the problems appeared to be coming at him faster and faster, to be less and less susceptible to rational solution.

"I'm sure you'll manage," said his wife. "Salt, please."

Mr. Gooding occasionally wondered.

For a number of years now there had been union problems, beginning with the initial efforts to organize the employees of *International Geography* into various unions. Mr. Gooding, at the time a relatively young man, had reacted typically: he had raised salaries, improved working conditions, and gone out of his way to permit the union organizers to proselytize.

The cost of the magazine had been increased.

Later there had been actual strikes, with picket lines, and

demagoguery from union leaders and members of the Board of Directors in equal amount. Mr. Gooding alone had met with the union leaders in uninterrupted bargaining sessions lasting up to fifty-six hours. The issues were resolved, but the cost of the magazine was increased.

When automation loomed, the strikes reappeared, particularly among the typesetters. As the strikes dragged on, it appeared that twenty-seven men threatened the livelihoods of five hundred men—themselves included—and the very existence of the magazine. Against the wishes of a number of the Directors, Mr. Gooding successfully proposed the publication of a subsidiary magazine, *International Handicrafts and Ceramics.* Sixteen employees automated out of jobs with *International Geography* took over the operation of the new magazine. After nineteen years it now sold 17,000 copies monthly and continued to lose a small but regular sum of money, to Mr. Gooding's total indifference. He sighed, and raised the price of *International Geography.*

In recent years a baleful Congress had raised the postal mailing rates by over 800%, a numbing blow to a magazine which was distributed exclusively by subscription. Sadly, Mr. Gooding attended to the amending of the bylaws of the Society and for the first time permitted commercial advertising to sully the previously chaste and edifying pages of his lifelong love. The size of the pages were reduced by 40% to minimize postage and the price once again increased.

Mr. Gooding took to having a second martini before lunch.

When paper costs began to spiral upwards, he felt the end was near. But Mr. Gooding had underestimated himself. In a flurry of activity, he caused the Society to become the owner of a medium-sized—no larger than Delaware—forest of Canadian timberland and of a decrepit but functional paper mill. The supply of paper was now ensured, but to nobody's surprise the price of the magazine went up.

The cost of print surged while its availability shriveled to the vanishing point. Mr. Gooding, an abstemious man by nature, found himself in the habit of drinking two, and occasionally three, glasses of brandy after his evening meal. He also found the strength to organize a computer-run consortium of the higher-quality glossies to provide a common pool of print.

But once again the price was raised.

Mr. Gooding was not allowed to rest on his laurels and devote himself to the simple but pleasurable task of merely editing his magazine. The full-throated cry of Women's Liberation was heard in the land. For Mr. Gooding it was—comparatively speaking—child's play to raise the salaries of his fe-

male employees, to hire an additional sixty women, to assign some to make-work jobs and others to *International Handicrafts and Ceramics*, to avert his eyes from unbra-ed breasts and rampant nipples. More difficult to accede to were the vociferous demands for equal pictorial space devoted to naked male savages, "full frontals" in the horrid jargon of the day, with nothing airbrushed. Mr. Gooding, tolerant to a fault to the shortcomings of his fellow man (and woman) wearily complied. But he no longer took his magazine home with him, where his grandchildren might chance upon a copy, and he subsequently learned that certain issues of *International Geography* were being bootlegged in Forty-second Street porn shops. Mr. Gooding developed an interest in the ancient French practice of the *trou normand*, which consists of smartly downing a fair-sized shot of Calvados about ten in the morning.

Nonetheless, the magazine managed to celebrate its 130th anniversary of continuous publication with only a token increase in rates.

At present the magazine's offices were being picketed by a diverse spectrum of members from the Gay Liberation Movement. Mr. Gooding's milk of human kindness had finally been quaffed to the bitter dreg; he had curtly rebuffed a spokesman for the Movement, a spokesman who had proposed a monthly series of articles on exotic and little-known homosexual communities of the world.

Mr. Gooding was morosely asking himself if he could ensure the magazine's smoother functioning by the removal of his office to the relative sanity of a padded cell, when Richardson of publicity, Dalby of accounting, and Mayhew of circulation broke in on his reflections with their proposal of lifetime subscriptions.

"It's quite out of the question," said Mr. Gooding. "Six million subscribers at $12.50 per year bring in seventy-five million in annual revenue, not to speak of advertising. Our profit—were we allowed to show a profit—of twelve million is surely more than adequate."

"Exactly!" cried Dalby of accounting. "The profits are handed over to the Foundation, which in turn uses them to finance explorations, expeditions, and projects in the commonweal. That medical group among the Eskimos, for instance, that team of doctors investigating tribal medicinal herbs at the headwaters of the Amazon. On a somewhat more grandiose scale, that reconnaissance satellite orbiting Mars. All this takes money, Mr. Gooding, far more money than is available from annual income. The Board's upcoming budget for the next fiscal year—"

"I don't give a hoot for the Board," snapped Mr. Gooding peevishly. "I am not interested in dispatching boy scouts about the

Solar System, I am concerned solely with publishing a magazine. Furthermore, I fail to see how by offering lifetime subscriptions for $150 you propose to increase our income. That is the equivalent of a mere twelve years of subscriptions. And twelve years from now, what on earth will a year's subscription cost? $25 in all likelihood."

"Ah, but you have failed to grasp the essential point," chided Mayhew of circulation. "Six million subscribers times $150 is $900,000,000, nearly a billion dollars. These are days of high interest rates, Mr. Gooding. Prime bonds may be purchased yielding over 10%. An annual income of ninety million could be procured, more than our present subscriptions yield. Actually, a judicious mixture of stocks and bonds would overcome the inflation problem. And, of course, these stocks and bonds could then be used as security for the Foundation to borrow against in time of need."

"Borrowing?" exclaimed Mr. Gooding, shaking his head in bewilderment, "what on earth would my grandfather have thought of borrowing?"

"Furthermore," said Dalby of accounting, hauling out a graph, "those subscribers most likely to purchase a lifetime subscription are naturally those with the most money, and those with the most money, I need hardly point out, are those in late middle-age. Now, these tables here"—a thick booklet—"show the actuarial calculations. . . ."

"In brief," he concluded twenty minutes later, "it is quite conclusive that the average lifetime subscription would actually run for a mere 9.72 years, the equivalent of $121.50 in yearly subscriptions."

"In that case, to ask $150 smacks of sharp practice," said Mr. Gooding firmly.

"If that troubles you," said Richardson of publicity smoothly, "we'll mount our campaign to attract an equal number of *younger* readers. That way it'll all balance out nicely." He pursed his lips. "I have a few interesting ideas—"

Mr. Gooding was a man of a gentler, perhaps outmoded, era, lost perhaps in the newer byways of publishing which were springing up about him, but not for nothing had he spent a lifetime producing and reading *International Geography.*

"Ah ha!" he cried. "I know *exactly* what you're scheming! You're thinking of drumming up publicity by handing out lifetime subscriptions to those Caucasian Russians who supposedly live to be a hundred and fifty. And those Equadorian Indians, I should imagine. Well, I absolutely forbid it; forbid it, do you hear?"

Richardson of publicity nodded, unabashed. Mr. Gooding had neglected to mention certain long-lived tribes of Afghan hillsmen. They would do equally well.

The argument continued for the rest of the week. In the end, for he *did* have a magazine to publish while the others had nothing more to do than argue, Mr. Gooding sadly and reluctantly yielded. It was the thin end of the wedge, he knew, the beginning of the end. Shortly there would be foldout centergates of bare-breasted Balinese dancing girls, and hoopla to promote contests with all-expense-paid prizes of trips to Moscow. When that time came, he told himself, he would resign his position.

He went before the Board, to explain the proposal, meticulously pointing out his personal opposition. The Board, primarily retired politicians, reigning captains of industry, and former chiefs of staff, heard only the word "billion", a word with which they were on intimate terms, and enthusiastically endorsed the project. The single quibble was raised by Joseph Cardinal Harrington, the Board's acknowledged expert on points of ethical nicety.

"By lifetime, do you mean the *subscriber's* lifetime, your *own* lifetime, the *magazine's* lifetime, or what exactly? I think this point should be clearly elucidated."

"Oh, the subscriber's lifetime, Your Eminence."

"So how do we know he won't cheat?" demanded the Attorney General. "You know, pass it along to his kids after he's dead."

There was a moment's silence, broken by the Chairman of the Board of IBM. "Easy. We require each subscriber to furnish his Social Security number. After that we tie our computer in with the ones over at the IRS. Easy."

Mr. Gooding shook his head.

Four years passed.

Richardson of publicity and Mayhew of circulation outdid themselves. Millions of lifetime subscriptions were sold, hundreds of millions of dollars piled up in the Foundation's coffers.

Explorers were sent exploring. Research ships were launched. A Jovian probe was financed. An international medical center was founded. A television series was sponsored. A round-the-world race, with mechanical engines banned, was organized, and won by a mixed team of Polynesian sailors and Kenyan game wardens, sailing and running in relays.

As an afterthought, or so it seemed to Mr. Gooding, *International Geography* continued to be published twelve times a year. And soon, he thought sadly, they'll find a way to do without that.

The news was released from the Space Foundation's medical center in the Poconos, the most staggering piece of news in the history of mankind.

It was the fruit of dangerous years of collecting unknown Amazonian herbs, difficult years of studying the metabolism of the Es-

kimo, painstaking and diligent years of correlating forty centuries of medical knowledge.

It was a simple, certain, cheap, and safe method of procuring immortality.

Mr. Gooding, who was now in his sixty-eighth year, should have been pleased by the news.

He was not. How now, lifetime subscription? he mused bitterly.

In the worldwide uproar and chaos which followed the announcement, it was another four years before his case came up for trial. He was charged with, pleaded guilty to, and was convicted of first degree homicide with respect to Richardson of publicity. Dalby of accounting, and Mayhew of circulation.

The judge pronounced sentence.

"This is a particularly heinous crime in view of the fact that you have deprived three human beings not merely of their alloted threescore years and ten, but quite literally of their immortal lifetimes." The judge frowned. "It has long been held that human life is sacred, but this is a truism which has been honored more in the breach than in the observation. Now, however, human life *is* sacred. All human life. Any human life. Even the life of the most despicable and perfidious murderer is now sacrosanct. The most horrible punishment that man can devise without profaning the sanctity of human life is now exile, exile to a penal atoll in the Marshall Islands."

Mr. Gooding swallowed. He knew what was coming.

"I sentence you," said the judge, "to a treatment of immortality, and then," he smiled slyly, "to a lifetime proscription." ■

IN TIMES TO COME

■ Best Laid Plans Department.

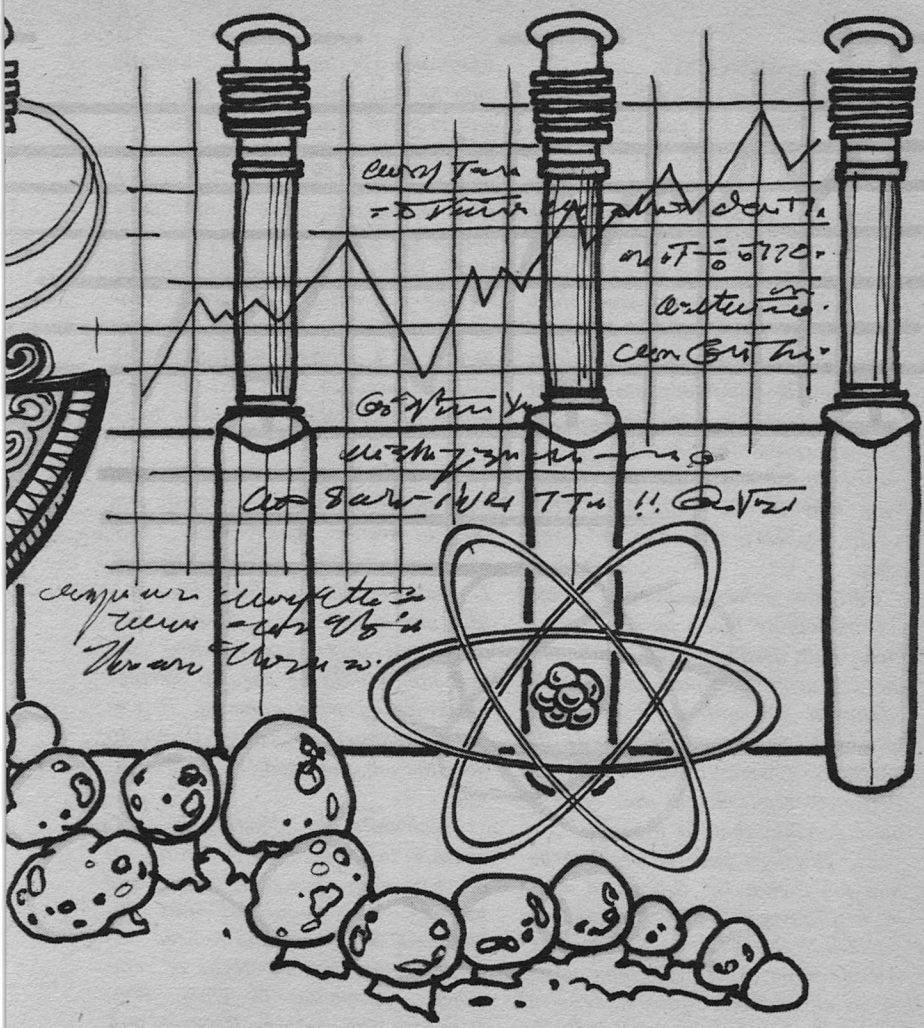
For our Bicentennial Issue we planned a little something special. A Guest Editorial by Arthur C. Clarke. A lead story by Joe Haldeman. An article on space colonization by Norman Spinrad. And a very special cover painting by Rick Sternbach, featuring one of the astronomical delights of the universe—the North America Nebula.

Rick painted a gorgeous cover for us. But it turned out that the painting looked better upside down than it did in the orientation that Rick originally painted it. Except for one minor problem. The North American Nebula—upside down—doesn't really look much like North America. Which upset the Artist, Art Director, and even the Editor. But upside down is the way the painting will be . . . because it's easier to understand, visually, what's going on *in front of* the Nebula.

Everything else in our July issue will be definitely right side up.

Part Two of Three Parts.
How do newly discovered subnuclear particles, ancient Cretan religious beliefs, and a stock swindle relate to each other?

RICHARD and NANCY CARRIGAN



Minotaur in a Mushroom MAZE

SYNOPSIS

Most scientists hadn't believed that an elementary particle with a single magnetic pole even existed until Mario Petronelli's group at Brookhaven Laboratory found some of them. Petronelli even managed to collect a few of these elusive building blocks of nature and store them in a vat of oil. Fredrick Holzman named the particles petrons *in honor of Petronelli. His flamboyant partner was proud of his namesake and of that vat containing the only known petrons in the world. He didn't know what else it was good for but it would probably win him a Nobel prize.*

But then someone dropped a concrete shielding block on the experiment and destroyed the equipment for capturing petrons. And in the confusion a small, dark man had spirited away the petron vat. If the particles generated such violence, Petronelli realized that they must be more precious than he thought.

The physicist laid the problem before his friend, Dr. Silverman, head of a quasi-governmental agency called Science Processing, Inc. Among other things, SPI had a staff of scientist-investigators. One of these, John Leigh, had left the agency to do basic physics research, but Silverman decided that he needed to recall the physicist to solve the puzzle of the theft.

Leigh was reluctant to leave his experiment. But then Silverman told him that because of the unique south-only or north-only magnetic pole of each petron their discoverer had realized that it was possible to use them to create the dreaded anti-matter bomb. The news left Leigh little choice but to try to return the petron vat to the right hands.

He was instructed to put himself on the job market. Silverman reasoned that whoever had the petrons would need a large superconducting coil to reproduce them and that they would need a technical staff to build one.

The only slim lead that appeared was at, of all places, a mushroom farm in western Pennsylvania. Leigh was attracted by the interviewer, Daydala Pandarou. She was beautiful and a very sharp physicist. The large coil they were building, she told him, would be used to sterilize mushroom-growing compost. It was offbeat enough to cause Leigh to take the job and head for Pennsylvania.

Meanwhile, in Washington, DC another investigator was setting off on his own game of hare and hounds. The Securities and Exchange Commission had noticed suspicious movement in stocks of some electric companies in Ohio, West Virginia, and western Pennsylvania. Investigation showed that the stocks, purchased by various agents, were disappearing into the hands of a Lebanese banker. While not exactly illegal, the SEC was worried about who that Lebanese was fronting for. Was it possible that the Middle

West would find its power companies in a Mafia-like hold? Nathan Hunter was a specialist in unknotting such tangled skeins so he too was dispatched to Pittsburgh to do some checking.

Hunter found the assignment timely for he had an ax of his own to grind in that area. His sister had written from West Virginia about a particularly heartless boiler room operation among her public health patients there. Someone was selling them stock in a firm called Golden Bull Mining, and she was worried. "Some of your people," her letter had said, "black people with just enough money to live out their days in peace . . . they give it all to the man on the telephone who promises them the moon."

Financial criminals were Nathan Hunter's favorite game and West Virginia was close enough to Pittsburgh to combine the two chases in one.

Meanwhile, John Leigh found himself in a trap. He discovered that he and Daydala Pandarou were both employed by financier "Bull" Tauroman who housed (or held?) his staff in a unique baronial castle on an island in the middle of the Allegheny River. There Tauroman ruled supreme over a household which also included Daydala's fey, precise cousin Alexi; a herd of prize Charolais cattle serviced by the champion bull, Pride of Knossos; and a snarling pack of vicious pit bulldogs. Leigh had experienced violence in his past adventures with SPI—had, in fact, been forced to resort to it himself. But violence was never a sport for him. He realized as he watched Tauroman calmly allow his favorite old fighter to mangle and kill a younger dog, that he was in the employ of a strange and dangerous man.

Part Two

The dinner that night was memorable. Leigh resolutely put the gory battle he had just witnessed from his mind and was surprised to find that he was able to eat a hearty meal. The pièce de résistance was the steak raised on the farm. He had never tasted Charolais beef before and was quickly convinced of its superiority. The rare beef was complemented by the delightful, nutty flavor of sautéed morel mushrooms and a simple salad. If Bull had kept him here in a rather imperious way, at least he was getting royal treatment.

Dinner ended as it would for many nights to come with liqueurs around the fire in the great Hall.

Suddenly a deep-throated bark sounded from the outside. Bull and Daydala seemed to ignore it, but it brought back to Leigh the unwanted memory of the great dogs and the heartless way in which his employer had watched them fight.

"What's the matter, Leigh? You looked a little sick there. Something wrong?"

"No," he answered and then

went on truthfully. "I guess I can't say I like the thought of those big dogs of yours wandering around loose. I'd sure hate to run into one of them by mistake."

Bull let out a shout of laughter. "You're not the only one. They scare the hell out of old Alexi here. Every time one of them barks he looks like he's going to pass out. Right, Alexi?"

The slight, dapper little man had, in fact, winced when the dog outside barked. Now he answered with as much dignity as he could muster. "I do find them rather—er—excessive, though I'm sure they are excellent watchdogs. But I agree with Dr. Leigh. I should hate to run into one by mistake."

"Especially the Old'un, eh? How'd you like him taking that young upstart Cassius, Leigh? Did you see how fast he moved?" Tauroman made a quick, twisting motion with his hands. "Like that! Right at the throat and Cassius had had it. That old fellow's never lost a fight yet. Mean as Satan. Won't take any crap from anybody. Yes," Bull nodded in a satisfied way, "that's quite a dog."

Alexi turned pale at the description of the fight. Daydala threw her employer a dark glance which Leigh couldn't fathom. Wary, it seemed, and fearless at the same time. She was obviously a lot tougher than her cousin.

Tauroman finished his drink and set the glass down.

"Well, I'll leave you and Daydala to work out your schedule for tomorrow. Alexi and I have things to attend to. I'm going to beat him again in a tower game. Do you know the game? It's from Denmark."

"No. I'm afraid not," Leigh answered.

"I guess I'll have to teach you someday. I played once with another physicist. Some guy I met on Long Island. He won, but that doesn't happen often, does it Alexi?"

Alexi smiled ruefully.

"Never when we play, Mr. Tauroman."

"It won't happen again with that other guy either, believe me," Tauroman said in a determined voice.

"Well, nice to have met you, Leigh. I'm sure you'll have lots to contribute." He turned to the small man. "Come on, Alexi."

Alexi paused to offer Leigh his hand. It seemed almost to crumble in John's grasp when he shook it.

"So nice to have you with us, Dr. Leigh. I shall be looking forward to working with you."

And he turned and glided from the room behind the massive figure of Tauroman. Daydala watched the two men go, that same inscrutable look in her eyes. Then she turned to Leigh.

"We will meet in the breakfast room at 7:30 in the morning. We're on a tight schedule and Mr. Tauro-

man is most anxious that you get oriented as quickly as possible. I shall give you a set of directions to the breakfast room. The Hall has been added to frequently over the years and it is very easy to get lost in it."

She sketched a small, but precise map on a piece of paper and then summoned the butler. "Take Dr. Leigh to his room, please, Henry.

"I shall expect you at 7:30 then," she reminded Leigh.

"Good night."

The room Henry showed him was not luxurious on the scale of the rooms downstairs, but it was far better than any hotel room he would have rented for the night. There was a desk and TV which, when he turned it on, proved to be an excellent color set. A thick carpet covered the floor and a neat tiled bath opened off of the spacious dressing room. The bed was large, firm, and comfortable, and he was well-rested and refreshed when, at 7:15, he started out to find the breakfast room.

"Left from the door, down the corridor about twelve paces to the cross-corridor. Right down three steps past the wall painting of the wild boar hunt." Leigh stopped to admire the handsome mural—a copy of an old fresco showing a beautifully striped and elongated wild boar being chased across seventeen feet of stylized meadow by three ferocious but ribboned dogs. "Take the right turn down six more steps through the enclosed cloister. The breakfast room is at the end of the cloister."

He found that the breakfast room formed one side of an enclosed courtyard. The view out of the French doors was bleak now in the grip of winter, but planters and carefully laid out flowerbeds promised beautiful possibilities for the summer.

The breakfast room itself was in marked contrast with the rest of the Hall. It was a bright, modern room containing a number of small, round, white pedestal tables for two with matching, molded fiberglass chairs. Where the walls in the parts of the Hall he had already seen were hung with heavy oil paintings or cases of Minoan artifacts, here they glowed with the brightest examples of minimal and op art. A gleaming chrome slab sculpture sporting a single strip of green greeted him at the doorway. A different hand had obviously been at work here than elsewhere in the building.

Though he was a few minutes early, Daydala was already there eating Sugar Pops from a handcrafted stoneware bowl and reading the *New York Times.* She looked up as Leigh entered.

"Ah! John. You found us."

"Your directions were very good. I must say that this room is a surprise after the rest of the ca . . . Hall," he said, looking at the sharp, undulating lines of a Bridget Riley

painting hung on the wall.

"Mr. Tauroman has a stepdaughter who studied ceramics in Finland," Daydala explained. "She is quite an artist of the *avant-garde* persuasion. I believe this room is her handiwork. A bit cold for my tastes, but then in some ways a nice change and very efficient for breakfast.

"If you will give Eileen your order . . ."

A maid had appeared from somewhere with a tray loaded with hot coffee and a selection of fruits. Leigh took some of the coffee and half of a grapefruit, and ordered bacon, eggs, and rolls. Then he turned to Daydala again.

"I'm glad you gave me the map. I'd never have found my way here without it."

Daydala smiled. "Wait until you have to find your way around the mine. That really is a labyrinth. There's a model of it in the main entry hall of the mine so you can see what I mean later. And underground it's quite easy to get turned around. I'll stay fairly close today as a guide. There are also good, well-lit maps in the mushroom workings and the lab area. But that old section across the river . . ." She nodded in the direction of an old, boarded-up, horizontal shaft just visible through a window on the river side of the room, ". . . you can wander around in there for days if you take the wrong turn because there are no lights, no phones, and no electricity. Best stay out of that area. It's closed off anyway to prevent accidents. I suspect if our work on the compost sterilizer is successful, however, Mr. Tauroman will be opening more and more of it."

"Speaking of Tauroman, I don't see him," Leigh said. "Doesn't he breakfast here?"

"Very rarely. He's usually up early going over yesterday's stock market reports. He has quite a considerable financial empire to oversee. The morels are something of a sideline with him."

"He seems to have several sidelines—the mushrooms, the Charolais, and the dogs," Leigh remarked.

"Those dogs," Daydala shuddered. "They're . . . they're barbaric."

"Barbaric. Just the word I've been hunting for since I saw them," Leigh agreed.

At this point the maid appeared with Leigh's breakfast and more coffee for Daydala, then left discreetly. Their agreement about the dogs seemed to bind the two of them together. She offered him a section of the *Times* and they finished their meal in companionable silence. Soon, however, Leigh noticed Daydala glancing at him with a look of tightly-controlled impatience so he took one last, fond gulp of the excellent coffee and said, "OK, I'm finished. Shall we go?"

Several tiny Toyota coupés stood parked in the courtyard outside. Daydala opened the French doors and headed for one of these. "Mr. Tauroman," she explained, "keeps these little cars on the estate for our convenience. Usually they start." She said something very unladylike in French to the balky engine and as if it spoke that language instead of Japanese, it caught. "The keys are always left in the ignition since no one could get them off the island anyway." The car shuddered and coughed as if it was going to die again, but she gave the accelerator a firm kick, and some more French, put it in gear and set off down the road that circled the castle and brought them once more to the elevator where Dr. Alexi had met Leigh the night before.

In the clear, cold morning light Leigh paused to get oriented. The elevator building was downstream of the castle about in the middle of the island's length. This end of the island sloped gradually in rolling fields that were neatly divided by white stock fences. Across the river he could see the blue and white warehouses he had seen the day before and the small building he now knew was the top of the shaft of the mainland elevator. Farther upriver, not far from the boarded-up shaft opening and the old road leading to it, he noticed something he hadn't noticed before—a huge cylindrical green and white tank of the type usually used for storing liquid gas.

"Looks as if you have low-temperature work going on here," he said to Daydala, pointing at the tank.

"The mushrooms, freeze-drying you know," she answered vaguely. "And of course we do use a bit ourselves in the laboratory."

"Very interesting," Leigh thought. "It must be a bigger operation than I thought to need so much. I'll have to look into that and those power lines coming into the mine. They look big enough to handle the power for a fair-sized town. I wonder . . ."

Daydala's voice cut into his thoughts. "Come. We'll go over to the mainland so that I can show you something of the mine operation before I take you to our laboratories."

They took the elevator down to the tunnel and drove one of the little electric cars to the elevator at the other end. When they had entered the mainland elevator, Daydala pressed the second button from the top.

"I thought," she explained, "that you might want to see the mine itself. It's quite an interesting concept and you should have some idea of it before you start your work with us."

The elevator glided to a stop and they found themselves in a huge, brightly-lit room, white-tiled like the tunnel below and with more of

the carved and glazed tiles in the same motif which, Leigh found later, appeared as a waist-high line in every passage in the mine. It was attractive and vaguely classical in style.

The room was rapidly filling with cheerful, chattering girls, almost all of them dressed in slacks and warm sweaters or flannel shirts under their winter coats.

"They have to dress warmly under their company coverall," Daydala explained. "One of the reasons people started using old mines for mushroom farming was that, like caves, they have an unvarying, cool temperature. Summer or winter, rain or shine, those girls will work in a constant temperature of 56° Fahrenheit. Humidity is also easy to control and maintain.

"That gray-haired lady over there is one of the best mycologists in the country. There's not much she doesn't know about mushrooms. Her lab is on level three below us where she can simulate growing conditions of the commercial venture. Dr. Landry," she called to the lady in question, "come meet our new physicist."

"I had some of your morels last night," Leigh told her when the introductions had been performed. "I've never tasted anything so good."

"They're not really 'my morels,' but thanks anyway," Dr. Landry smiled. "The morels are as yet only a small part of the operation. Mostly we raise the common white button mushroom. Commercial growing of morels has puzzled my colleagues a long time, but I think we're on the brink of a breakthrough there. Perhaps you'll be helping us along, Dr. Leigh. I hope so. Now I must run. I'm eager to see what's been going on downstairs over the weekend.

"We're waiting for the sterile compost, Dr. Pandarou. It will be done soon, I hope," Dr. Landry shot over her shoulder as she turned on a sturdy heel and was gone.

Leigh noticed now that the girls he had seen earlier had made a trip to a locker room somewhere and had donned blue coveralls embellished with Westpenn's charging bull medallion. Each girl also wore a standard miner's lamp on her head. They were taking their places in open cars in trains pulled by heavy-duty electric cars. As their cars filled, the trains disappeared down various of the brightly-lit tunnels leading to the growing rooms. Leigh watched them go. It looked like fun, going off like that to harvest the savory crop that was ready to pick every day of the year-round springtime in the mine.

"Their main complaint is not knowing what the weather's like outside," Daydala seemed to guess at his thoughts. "That's why Mr. Tauroman has those at various places in the mine." She gestured to a color TV set showing the prize

Charolais bull, Pride of Knossos, ambling happily in his snowy pasture. Plumes of steam coming from his nostrils made him look almost mythological as his warm breath hit the cold air.

"Pride's sort of a pet of the place," Daydala continued. "His pasture's just above us and everyone can see what the weather is and what Pride's up to. It helps the claustrophobia."

"That's a good idea," Leigh remarked. "They must enjoy it most when it's 101° in the shade out there."

"We all do except for the colds. We get them because of the abrupt temperature change in very hot weather. Here's the map I was telling you about." Daydala drew him over to a glass-enclosed model. "The lights show the whereabouts of the crews. The black parts are abandoned diggings. Some have roof falls and it's hard to say just which of them is passable. One leads to the shaft in the side of the hill we saw from the Hall. They took the rock down on chutes to river barges when this was used as a limestone mine. As you can see, it would be easy to get lost."

The model showed an intricate maze of rooms, corridors, and dead ends. It was constructed as a negative. Instead of a corridor or room showing as a hole in the model, it was shown as a solid piece of plastic. It was as if a miniature mine had been filled with plastic and then all the surrounding earth washed away. Colored green lights winked on as the work crews reached the growing rooms. Other red ones showed where crews were bringing huge, carefully-planted, compost-filled trays to the place where they would spend three months in the dark of the mine. A third set of white lights showed the laboratories. Daydala pointed out the mycology lab where Dr. Landry and her staff were already at work. Across the river where a smaller mining operation had left several large rooms, the physics laboratories also glowed white.

"I guess we'll save a more complete tour for later," Daydala said, glancing at her watch. "We'd better go over to the lab and get to work ourselves."

They retraced their steps through the tunnel and into the elevator on the island. There Daydala pressed the middle button, and Leigh found himself in another white-tiled corridor. Daydala led him down this to a door marked "Linac."

He followed her inside to a long, brightly-lit room which contained a tube about twenty feet long and six inches in diameter. Other tubes, which led off to large electrical boxes, joined the main tube every few feet. To a layman, a linac looks incredibly complicated—something out of a science fiction movie, perhaps. But to Leigh's experienced eye, this one appeared as

a three MeV, or almost garden-variety, machine.

"Here's our first sterilization machine," Daydala explained. "We bought it secondhand from a small university that suffered a budget cut. We're testing on that pile of compost down there. The magnet at that end smears the beam out so we can work on a larger bulk.

"There's Alexi. We'll see how it's working today."

She walked over to where her cousin stood gazing at the linac. Leigh thought he looked as if he wanted to give the machine a good kick. He was dressed in a neat white lab coat, something Leigh hadn't seen in an American lab for a long time.

"Good morning, Alexi. How does it march today?" she asked him.

Alexi nodded primly to Leigh and turned a dismal face to his cousin.

"There is no beam. It marches not at all. There seems to be some breakdown in one of the cavities."

"Can you tell which one?"

"I think around the fourth one."

Daydala went over to the complicated control board and began to flick the switches on the Tektronix scope. She paused for a moment then tried several other knobs.

"It looks as if the load terminator has gone bad on number four. Look down along that cavity line."

Alexi glided over to a linac and began to fiddle with the machine. Daydala's imperious voice cut like a knife. "No, no, Alexi. Not that one. I said number four."

A few more fumbles and Alexi got it right. In several minutes Daydala had the current up in the linac and everything functioning properly.

"Now," she said harshly to her cousin, "I hope that you can get those sterilization runs done today. Dr. Landry's been after me for days to get some test compost for her morels. Keep me informed of your progress and move it along. We've no time to waste.

"Come along, Leigh. We've work to do."

Leigh hid a slight smile under his beard as he muttered inaudibly, "Yes, boss."

"So much," he thought to himself, "for demure North African women with veils and downcast eyes. She's about as demure as a field officer at Parris Island." He trotted obediently behind her to her office, a large neat room in which the main piece of furniture was an outsized, sturdy desk presently covered with rolls and stacks of engineering drawings. As they entered, she deftly turned several of these face down and then motioned Leigh to a chair by the desk.

"Now then, while Mr. Tauroman's private investigators check your background for us, you can be working on some components. Here are the drawings."

As she started to unroll a sheaf of drawings for Leigh, Daydala was interrupted by a slight, dark man not unlike Alexi in appearance. He asked if he could speak with her about an urgent matter.

"If you will excuse us, Dr. Leigh. Just wait over there," she motioned him to the far side of the room.

Leigh tried as surreptitiously as possible to get a look at the plans which the engineer unrolled. He could see that there was a drawing of a large, spherical tank circled by a set of small magnetic coils. Several rather strange penetrations projected out of the tank at odd angles. He could make out no more from where he stood.

Daydala and the other Moroccan spoke rapidly in low tones. Worse, they were speaking French in a heavy North African accent. At best Leigh's French was shaky. With the accent overlaid on it, they could have been speaking in code. He caught some reference to silver fabrication and the need to get the tank shell smooth. The rest was beyond him.

Finally the tone of their conversation suggested that Daydala and Yusuf (for so she called him) had reached agreement and with the suggestion of a bow in Daydala's direction and a curt nod at Leigh, the man left.

"A skillful engineer, Yusuf," explained Daydala. "He's designing some tanks for the new sterilizer."

"With silver walls and magnetic coils?" thought Leigh. "That'll be some sterilizer."

"Now," she continued, "let's get you to work."

She picked up the drawings again and unrolled them on her desk.

"Here are the plans for the choke for the new accelerator we're building."

The plans showed a very long coil of wire called a solenoid. A glance at the scale designation told Leigh that when built it would be about the length of the linac in the other room. The entire coil was encased in a vacuum can that was actually a cryostat, a device for keeping an object at temperatures near absolute zero.

"So some of that gas from the tank I saw will go into this superconducting gadget?" he asked.

"That's right. It will save some power," Daydala answered quickly. "Now, an important feature of this coil, uh, choke is field uniformity. A normal solenoid is, of course, pretty good that way, but we have to know every possible source of slight fluctuations in the field of this one as it is of a special design."

She went over to the blackboard on her office wall and began to expand the solenoid field equations. After a while she had covered the board and caught Leigh's attention completely. There was no time to solve the mystery of the superconducting solenoid if he was to

keep up with Daydala's rapid calculations. Besides, it was interesting. They had lunch sent in and by afternoon had evolved a plan for attacking the problem. Finally Daydala said, "You see that at this point the equations can't be solved directly. We'll need time on the computer Tauroman rents downtown. Here's the manual. Study it and think about coding our little problem for their system. Come with me and I'll show you your office."

She led the way down another tile-lined corridor to where a workman was already painting the name, John Leigh, under that of Alexi Pandarou on the ground glass of the office door.

"Damn!" thought Leigh. "Cousin Alexi . . . co-worker? Keeper? Or just plain nuisance? Damned if I know which."

Excusing herself graciously to the sign painter, Daydala took Leigh into the large, blank-walled office and pointed to a huge desk with a comfortable chrome and leather chair.

"Here's your desk. I'll leave you to your work now. We shall meet again at dinner. It is served at 7:30 sharp and Mr. Tauroman always eats promptly. 'Til later, then," and she was gone.

Leigh sat down at the desk and unrolled the plans.

So! A choke was it? With a superaccurate field uniformity. A choke? Or could it be perhaps the long magnetic field that Silverman had mentioned in connection with the petrons. "All you'd need," he'd said, "would be a long magnetic solenoid to accelerate the petrons." Was this choke really a petron accelerator? Could be. But it would only be useful if Daydala and Tauroman already had the missing petrons. That, it seemed, was the problem—to find that stolen vat. And if he found it, what could he do with it, trapped as he was as a "guest" of Tauroman on the island? He was scowling unhappily at the plans when Alexi minced in and sat down at his own desk.

"You look, John, (I may call you John, mayn't I, since we will be office mates. I do so hate this business of last names only that physicists use all the time.) You look," he repeated, "as if you had a problem."

Leigh looked up at the sound of the irritatingly precise voice.

"Yes," he answered. "Several."

One of them, of course, was Alexi.

Leigh struggled through the solenoid field equations from Garrett's article for the sixth time. His last attempt had turned up a bug in his coding which, he supposed, was at least progress, because by now he knew every step by heart, probably including the wrong ones. The trouble was that the formulas still didn't converge fast enough. As a result he was chewing up computer time as if it were free. Worse yet,

when the field lines got near the conductors, everything went haywire. He scratched his short, black beard and frowned in contemplation. "Maybe it's my approximation formulas for these elliptic integrals," he mused.

He picked up the computer output and was just going to check to see if he was correct when he had that undefinable feeling that someone was looking over his shoulder. He looked up to see who it was. Cousin Alexi again!

He knew that's who it would be. It seemed that Cousin Alexi was always looking over his shoulder. For days Daydala or Alexi Pandarou had been his constant companions while he worked the bugs out of the field-uniformity program and the bungles out of Alexi's running of the linac.

He had gotten occasional glimpses of Yusuf, the engineer, coming out of Daydala's office with his ever present drawings under his arm, and he had met some of the technicians, but he was quite cut off in his "operating room" as he had dubbed the empty white brightness of his office. Nightly he had dinner at the Hall and fell asleep to the deep-throated barking of the guard dogs.

But Leigh was growing more and more restless at his inability to put the whole picture together. The labs and mine seemed busy, but not frantically so. The pace was that of a well-run business. It seemed that often when he needed Daydala, her office was empty, but physicists are notorious for never being in their offices. Maybe the damn thing was just a choke after all. Maybe all they planned to reproduce with it were morel mushrooms. Why had he given up a perfectly good experiment in Illinois to go all the way to Pittsburgh to follow a lady whose eyes didn't quite match? Hell!

He gave up trying to concentrate on the formulas and turned crossly to where Alexi was hovering. "Did you want me for something?" he asked shortly.

Alexi looked hurt at Leigh's tone of voice. "Only to see if I could interest you in a tour of the mine. You have been working so hard on the program and I thought perhaps you would like to take a break. I've a moment, myself, and would be delighted to act as your guide."

Leigh shrugged. Spending another afternoon with Alexi held all of the excitement of watching the three-toed sloth at the zoo take a nap but, he reasoned, the way Alexi stuck he'd never get rid of the man anyway. Alexi always seemed to "have a moment."

"OK," he answered, trying to sound pleasant. "I'd like to see the mine. Just let me leave these papers on Daydala's desk."

And so they toured. Alexi managed to make the trip through what was really a unique and imaginative business about as exciting as a

tour through a third-rate beer factory. He laboriously dragged Leigh through every stage of mushroom farming from the assembling and curing of the compost to the harvesting and packing of the succulent white buttons which made the operation so successful financially.

When they stopped at the mine manager's office, he told them that they could see the picking crews at work on level three and so it was there that Leigh found himself two interminable hours later still being lulled by Alexi's nonstop monotone.

This working part of the mine was less elegant than the more public parts of the operation. The corridors were tiled only to waist level, the white tiling topped with the familiar strip of carved and colored tiles. The rocky ceiling here was exposed. An occasional damp spot gave the air a cavelike smell in spite of the ventilators. The lighting was bright and glaring, consisting as it did of only the plainest of fixtures and electric cables hung from iron hooks embedded in the rock above their heads.

They were heading toward the growing room where they had been told the picking was being done when the businesslike thump of Dr. Landry's sturdy heels echoed down the corridors. The husky voice of the mycologist startled Leigh out of the crushing drowsiness Alexi's droning had induced.

"Ah, Pandarou!" Her voice boomed against the tile and rock walls. "They told me you'd probably be down here. I want to talk to you about that last batch of compost you cooked for the morels."

Alexi winced visibly as she bore down on him. "But Dr. Leigh and I were just returning to our laboratory."

"That's all right, Alexi. I can find my way back. You go ahead," Leigh assured him.

"But . . ."

"Come along then, Pandarou. Mr. Tauroman's eager to get this moving. If you'll excuse us then, Leigh?"

"Sure. Go ahead."

They turned back the way Dr. Landry had come, Alexi trotting behind her like an unwilling poodle. Leigh remembered then that the mycology lab was down that corridor. He also remembered something even more important. The map had shown that large areas of level three were abandoned. "Dangerous. Mustn't enter," Daydala and Alexi repeatedly told him. Too repeatedly, he had decided. Those abandoned rooms needed looking into. He'd have done it sooner if he hadn't been watched like a hawk. But now here he was. And alone. He flashed a look of gratitude after Dr. Landry's retreating back and ducked down another corridor where, far at the end, he had seen a large timber

door plastered over with signs.

AREA CLOSED!

DANGEROUS ROCK FALL

KEEP OUT!

The signs on the door were clear enough. It was the other less obvious signs that interested Leigh more. Both the Pandarous had insisted that there was no electricity into the closed areas of the mine, yet the heavy, insulated cable which looped its way along all the other corridors of level three continued through the heavy timber jamb of the marked door. The tile floor too continued under the door, and long heavy scratches indicated the passage of heavy equipment through the opening. That door held the most promise of anything his sharp eyes had observed since he had entered the mine.

He leaned a shoulder against the heavy beams and pushed. Nothing gave. Then he reached up and grasped the cross timber of the door and pulled. It nearly knocked him flat as it swung towards him on noiseless hinges. Quickly he slipped inside and was immediately enveloped in gloom as the door swung closed again.

He paused to let his eyes adjust and then he realized that he was not in the complete darkness he should have experienced in the depths of an unlit mine. From what must be a cross-gallery in front of him came a slight glow from the right and, he now heard, the hum of machinery at work as well as the murmur of voices. He took out a pencil flash he always carried with the pens in his shirt pocket and, shielding it in his hand, played it along the wall.

The meager light revealed the rough stone walls and the ever present row of decorative tiles at waist height. But that single line of tiles appeared to be the only attempt at finishing the corridor other than the scarred tiling of the floor. The light barely reached the ceiling, but he thought he could see in the gloom the thick electric cable looped from its iron hooks. He followed the cable and found that it turned right at the cross-gallery and, predictably, towards the light. Closer and closer came the heavy hum of motors. Such a familiar sound. What was it?

Leigh made his way carefully along the corridor to the cross-gallery and followed the twisting course of the cable to the light. It seemed to come from just around the next turning. He came to the corner and carefully looked around it. His gray eyes widened in surprise.

A short way down the corridor was a full-scale cryogenic testing laboratory and it was as busy as an ant's nest. There were large tanks of liquid gas stored against the walls, pipes running all over the place, technicians scurrying around, and over all, the hum. He knew it

now. It was the subdued sound of a smoothly-running vacuum system at work. Leigh pulled his head back and thought. He had seen the engineer, Yusuf, in there, though it was hard to tell for sure since all five of the men looked much alike. But there was no doubt as to who the woman was. So that was where Daydala spent all her time. He heard her familiar voice now and it was coming down the corridor. He shrank into the dark to listen. She was talking to Yusuf.

". . . think this man Leigh will be a big help as soon as Tauroman's detectives clear him. But remember, he's Bull's man, not one of us, so act accordingly. It marches well, however. You've done a fine job, Yusuf. Keep it up. The prophecy will be fulfilled at last, you will see. Well, I must be going. Poor Alexi's getting a bit tired of his watchdog role around Leigh, so I try to take over now and then."

She spoke a few words of farewell during which Leigh scurried as noiselessly as possible back the way he had come. Suddenly he froze in his tracks as all the lights in the corridors came on. He could hear Daydala's voice coming nearer, firm and distinct, as she gave Yusuf a few last instructions. He looked for a place to hide. There was none. He ran. It was easy now, with the light on, to follow the cable. The voice was coming nearer. Suddenly another welcome sound echoed down the hall. *"Mlle. Pandarou. Un moment, s'il vous plaît."*

Leigh didn't wait to see what his savior wanted of Daydala. He sprinted to the timber door, pushed it open, and was out into the clean, tiled corridor of the mushroom mine. Ahead, an empty electric-car train was headed for wherever empty trains went. Leigh hailed the driver and climbed aboard the car right behind him.

"Mind if I hitch a ride?" he asked in a friendly but slightly commanding voice. "I'm going your way, I think."

"It's OK with me if you don't mind riding in the freight elevator," the driver answered with a shrug.

Leigh made it back to his desk before either of the Pandarous appeared. He sat down and scratched his beard reflectively. It was time to piece it all together. Daydala's "choke" plus all that cryogenic equipment could equal a pretty damned efficient petron accelerator. It was all pretty far along too . . . except what was all that stuff about a prophecy? He'd heard her talk about it before, but . . .

The buzzing of the intercom on his desk roused him from his thoughts. It was Daydala's voice, very much the boss lady, requesting his presence in her office. Regretfully he put the problem aside and went in to see her.

She was all business as usual.

"Dr. Leigh. Tauroman tells me your computer charges have been

very great. Is there perhaps some problem?"

"Well, I've been having trouble with convergence. Somehow the approximation formulas don't seem to obey Gauss' law. I left the papers on your desk earlier for you to look at."

Daydala picked up the sheet of equations he pointed out to her and scanned rapidly through the figures. In a moment she was writing out a second set. Once again Leigh marveled at the theoretical power this woman brought to bear on a problem.

"Here it is," she said after some minutes, pointing to a spot on the paper in front of her. "You see, if you retain a third order term here there won't be a problem. You ought to be able to triple the mesh size now."

Leigh's answer was cut off by the buzzing of the sleek Princess phone on Daydala's desk. She picked it up and answered softly, "Yes?" There was a pause as she listened and then she replied, "I'll be up directly."

She gathered up the papers and handed them to Leigh.

"You understand the problem well enough to proceed, then? I have been called to a conference, but I shall get back to you as soon as possible."

Leigh nodded and Daydala moved briskly out of the office and was gone. Leigh's gray eyes were speculative as he watched her go, then he gave a shrug and returned to his own office to struggle with the convergence once more.

Tauroman's office was on the main floor of the Hall. It was luxurious in the same, overpowering way that its owner was. Dark Persian carpets on the floor, massive carved oak furniture, draperies of a thick cut velvet, and dark-toned family portraits made the opulence seem stifling. The only bright note was a cheeful fire hissing and popping in the grate beneath the ornate oak mantel.

Daydala entered a bit diffidently and was greeted with a growl.

"Sit down."

Her eyebrows raised momentarily and then she did as she was told, demurely, hands folded in her lap, eyes downcast.

"How's it going?" Tauroman asked.

She gave her employer a brief and accurate rundown of her work.

"So it looks as if it'll work out as we'd planned. Good! I hope this other problem can be solved as well."

"Have we another problem?" Daydala asked.

"We do. A problem named Nathan Hunter. He's some hotshot investigator from the SEC. Seems to be on the trail of Golden Bull Mining."

Daydala let out a murmur of surprise.

"You know that's where all the

capital for our little scheme comes from. If Hunter closes down sales on Golden Bull, you're in trouble. You'd better work fast before the ax falls, if it does, and do your damndest with that cousin of yours in Casablanca to keep it from falling at all. Warn him that utmost discretion is called for. The Government can't get into that numbered account in Beirut but they can be a damned nuisance and they can raise hell with me if they connect the whole scheme together. It's up to you to see that Hunter's trail goes cold in Casablanca."

Daydala nodded. "I'll get the message to them at once."

"Good. See that they understand."

Bull rose from his desk and Daydala thought that perhaps the conference was over. Instead of dismissing her however, Tauroman started to pace the floor, his hands shoved deeply into the pockets of his elegant cashmere slacks. He looked more bull-like than ever as he lowered his head further into that great, thick neck.

"Damn it, Daydala," he said in a low, angry voice. "All these nit-picking, hairsplitting, half-ass rules make me sick. If some old miner wants to buy a pie in the sky, why not let him? It makes him feel like a big shot for once in his dull little ineffectual life. These people don't know what to do with money except put it away for a bigger TV set. But us . . . look what you and I can do for them with that money." He gestured toward the mainland mine just visible from the window. "What you're cooking up over there will change their whole lives. Then along comes this namby-pamby, do-good investigator with all his protecting-the-small-investor crap.

"Without men like me there wouldn't be any small investor. Why? Because there wouldn't be anything to invest in. Hell, he ought to give me a medal for what I'm doing for his blessed 'small investor'."

Bull's fair complexion had become flushed with rage and his voice was rising to a bellow. Daydala rose and came to him, slipping her arms around his waist.

"Of course he should," she murmured consolingly. "But he (Hunter, did you say his name was?) can't do you any harm. Our Casablanca people have the accounts where no one can get at them. Cousin Ibrahim is a skilled banker. Why did you think he suggested that you handle that money through a numbered account—no tax records and no subpoena powers. You're safe from that Hunter person. Relax."

Her soft hands stroked his neck gently as her voice soothed his mind. "I'll warn him as you suggest, but Ibrahim needs no advice on how to run his business. He will handle it well."

Bull's big, square hand absent-

mindedly returned Daydala's caress.

"You're a smart woman, Daydala . . . smart enough to know you need the Tauroman money to succeed. See to it that the hand that feeds you doesn't get bitten."

"Of course not," she said softly, laying her head against his neck and nuzzling his ear affectionately. "I'm the only one who gets to bite."

They had drifted slowly over to the low couch beside the window.

Dusk fell.

At the other end of the island Leigh wondered idly what conference could take so long and then, deciding correctly that Daydala would not be returning, put away the papers he'd been working on and walked up the hill to dress for dinner. The stroll gave him time to think about how he would find a way to get a better look at that hidden lab, and how to get a report to Silverman.

During dinner that night, Tauroman and Daydala seemed strangely at ease with each other. Leigh looked at them sharply and wondered exactly how many reasons there were for Bull Tauroman's nickname.

Alexi, on the other hand, nodded wisely to himself. He knew many things about Bull Tauroman and his personal proclivities—perhaps even more than his cousin did and certainly more than Leigh could even guess.

Leigh's computer program had developed a bug. He knew it was there, causing calculations to hang up each time he typed the program into the remote console unit at Westpenn Foods. It was the kind of a bug which could benefit from his taking a trip into the main computer center and consulting with their software specialist. Ordinarily Leigh would have fixed a problem like this even if it meant no sleep for a week, but this one came at a most opportune moment. He had to get away from Westpenn and the ever present company of the cousins Pandarou. So it was a satisfying kind of a bug for Leigh and actually he was quite proud of it because he had written it into the program himself.

He showed the bug to Daydala. She seemed busier than usual and did not have the time to correct it. Cousin Alexi was firmly in the clutches of Dr. Landry these days and in any case the program was way over his head. So it was Leigh who was reluctantly chosen to make the trip into Pittsburgh, program in hand, to be told in subtle terms by the comp center that he was an ass for not recognizing the trouble by himself.

It was good to be in the Triumph again. He drove happily, scanning the highway for what he needed. Ahead he saw it on a rise in a welter of stoplights—a huge shopping center with a branch of Joseph Horne and a maze of

smaller shops. He whipped the red car to the left on an amber light, glanced in his rearview mirror and smiled. The red light had left stranded that inconspicuous green Chevy which had been tailing him since he'd left Westpenn Foods. There were two levels of parking. He took the ramp to the upper one and followed it around to the rear of the center. As he'd hoped, there was another ramp to the lower level where he found a parking place in a darkened corner. He locked the car and walked quickly to the entry.

The shopping mall was jammed with shoppers taking advantage of George Washington's Birthday Sale Days. Again he felt lucky. The more the merrier for his purpose. Tailing him in a crowd like this would be next to impossible. He picked his way around strollers, fat ladies with their hair in curlers, trim, expensive-looking suburbanites, and an occasional harassed man. Finally he stopped at an office supply shop where a girl of about twenty was arranging an artful design of notepaper and Easter cards in the window. He went into the shop and flashed his most winning smile.

"Hello. I've got a problem and I wonder if you could help me. I'm supposed to report in to my office at ten and every phone in the place has a line of ladies three-deep waiting to use it. Could I make a call from your phone if I reverse the charges? The boss said no later than ten or he'd have my hide."

The girl looked at the boyish, open face and hesitated. Mr. Sachs would probably chew her out. Should she? He was glancing nervously at his watch. "Nice," she thought, "but right now he looks kind of browbeaten." She heard him mutter, "God! It's two minutes to . . ." and saw him run a hand through his dark, unruly hair.

"Well," she said hesitantly, "I guess it's OK. But leave me your business card in case there's any flap from my boss. The phone's in the back."

"Thanks. You're a doll. I'll buy you a box of candy if the boss OK's this sale."

He walked quickly to the back office and picked up the phone, propping it against his shoulder as he placed the call. From his pocket, meanwhile, he drew an ordinary-looking cigarette case and pressed a latch hidden in the design on its side. Two small wafers attached to the ends of three-foot sections of wire fell from the concealed compartment in the bottom of the case. He secured one wafer to the mouthpiece and the second to the earpiece of the telephone so that all was in place when Emily Parkway's crisp voice accepted the charges in New York.

"Good morning, John. May I help you?"

"Hi, Emily. I've got a message for the boss. Is he in?"

"Just a moment. I'll connect you."

In her office in the rambling old South Shore mansion that served as SPI's Long Island headquarters, Emily engaged the tape machine which would record the message that John would send from his miniature cigarette-case tape recorder. Sent at ten times the frequency and one/tenth the volume of normal conversation, to an unwanted listener the message would sound like a bothersome, but not impossible background noise. Played at the right frequency and speed to Silverman, it would give John Leigh's report safely and secretly to his boss.

"Go ahead, John," Emily spoke. "Dr. Silverman's on the line now."

Leigh flipped the switch to "play" on the recorder and launched into a detailed explanation of why he needed a price reduction to make the sale of a small computer to a food company in New Kensington. Silverman answered with appropriate "Uh-hum's" and "Sure's" and "Of course's" as he listened to the properly-played report about the secret cryogenics lab coming in on an earphone from the decoder.

Finally he said, "Yes. I think I understand your problem now," and Leigh knew the tape had spun to an end. He flicked the switch to record Silverman's answer.

Aloud Silverman said, "It seems to me that the company looks like a good potential customer. I'd keep trying to make the sale with them. As for the price cut you want, go ahead and handle things as you think best. Watch your step, however. Who knows what kind of competition we're up against. I've got a feeling they're after the same thing we are. It's a question of who gets there first. And we've got to be first if we're to stay in business. Anything else?"

"No, sir," Leigh said.

"Then I'll send you back to Emily to set up your itinerary for the rest of the month."

Leigh and Emily held a long and meaningless conversation about sales meetings, mutual friends, and nonexistent customers while Silverman continued speaking rapidly into the scrambler in his office. Finally when the red light on her desk flashed the news that Leigh's instructions were safely transmitted to him, she said, "Then you have everything you need. That's all for now. Good-bye," and hung up.

Quickly repacking the cigarette case, Leigh also hung up and came out of the office smiling. "It looks as if you get the candy," he smiled at the girl. "I'll be right back."

And true to his word, he went two doors down to a candy shop and came back with two pounds of their fanciest chocolates which he handed to his benefactress, blew her a kiss in his best traveling-salesman manner, said, "Thanks again," and was gone. The girl, de-

lighted with her gift, had, of course, forgotten to ask for his card. She worried about it afterwards when she thought about it, but decided to say nothing to Mr. Sachs and hope everything would come out all right. Why rock the boat?

At Horne's, meanwhile, Leigh stopped and purchased a box of the most expensive imported lime soap and a new bathrobe. He wanted an excuse for his stop and the man in the green Chevy waiting a few spaces down from his parking place growled in disgust when he saw the familiar Horne's bag and box under his quarry's arm.

Once again in the Triumph, Leigh took out the cigarette case, removed the tiny tape cassette and dropped it into the hi-fi tape player attached to the dashboard. He pressed the button and soon Silverman's broad Boston accent filled the little car.

"All that you describe is very interesting but scarcely illegal. If these people have a new industrial process it is not surprising that they work on it secretly. The only thing which can bring them to the attention of SPI is if they have in their possession that vat of stolen petrons. That is what you have to find. Otherwise they're as legitimate as General Motors. The Minoan angle is mildly interesting although if you recall, the medallion we found was of modern origin. There's an old friend of mine from the University who works at Carnegie Institute in the Antiquities Department. His name is Randall Durrell. He may be able to give you some line on this man Tauroman. I'll see if I can set up an appointment for you this afternoon if he's not off digging somewhere. That's all from here. Good-bye."

"So much for bravos from the boss," thought Leigh. "It always comes back to those damn petrons. Even if everything else fits, I still have to find them. Eyes that don't quite match and secret labs just aren't enough."

The computer people were condescending as he knew they would be. A slightly stale vending-machine sandwich and a cup of instant coffee had done little to improve his day. Leigh was glad to leave the comp center at two o'clock. As he pushed open the heavy glass doors, the wind snatched hungrily at the inch-thick pad of Z-fold computer paper. Visions of it streaming down Forbes Avenue like a roll of toilet paper at a football game caused him to jam it more securely under his arm and sprint for the Triumph. The paper, magnetic tape, and box of punched cards safely stowed, he relocked the car and strode briskly to the great, sprawling mass of the Carnegie Institute. He passed by a Henry Moore bronze and into the building through a pair of massive doors where he was confronted with what seemed acres of marble and ter-

razzo. He stood at the foot of the broad staircase, puzzled.

The Carnegie, "Pittsburgh's Attic," contains something to delight and whet the curiosity of almost everyone. Many of the finest dinosaur skeletons in the country are there as well as contemporary natural history displays. A sixty-foot high Hall of Architecture contains such a hodgepodge as the facade (actual size) of St. Giles cathedral mixed with a Pisano pulpit and copies of classical structures. The museum owns exquisite collections of decorative pieces—French and English eighteenth-century furniture and the most elegant of Meissen animal figures bequeathed to them by Pittsburgh heiress Alisa Mellon Bruce. In a turning of a corridor is Andrew Carnegie's dream, an extensive public library, and to one side, an ornate concert hall. To the newcomer, Carnegie Institute is a baffling, fascinating rabbit's warren of culture.

After wandering for some time through halls of paintings and rooms of stuffed birds and prehistoric fossils, Leigh finally gave up and asked a guard for the directions to Dr. Durrell's office in the antiquities department. The guard gave him precise and lengthy instructions. It seemed to Leigh that his life in Pittsburgh had been one long series of such directions after another. But, carefully followed, these did indeed lead him to the sedate paneled office of R. W. Durrell.

Durrell proved to be an archetypal Yankee—Vermont accent when he spoke, which was as little as possible; tall and spare with a shock of silver-gray hair and blue eyes; a long, thin face lined in a healthy way with sea squint and smile wrinkles. He was dressed in the style of a conservative banker of the Fifties and Leigh bet himself that some Durrell brother was home in Brattleboro, or Montpelier, or West Rutland running the family bank.

After the conventions of introduction and welcome were disposed of, Durrell looked intently at his guest and said, "Silverman said to give you a hand. Didn't say exactly how I can help, though. Guess he thought you'd explain."

Durrell sat back and waited.

Leigh wasn't sure himself what he wanted of this man or even where to begin. "I guess," he said somewhat vaguely, "he thought you could give me some background on a man called Clinton Tauroman. He lives on an island up in the Allegheny. Silverman felt you might know him because he has a rather good collection of Minoan artifacts."

"Good's an understatement. Bull Tauroman's got one of the best collections of Minoan gold, eggshell pottery, and terra-cotta figures anywhere in the world. Any museum would want those pieces but having

them so close and just out of reach is enough to drive a curator crazy. He did let us have a part of the collection for an exhibit three or four years ago, but we don't know what his final disposition of it will be.

"The gold's worth a fortune. Not surprised the Government's interested in how he got so much, and got it into the country. All of us in the business have wondered that—not that we haven't suspected plenty."

Leigh, for some reason remembering the pit bulls, decided to satisfy his own curiosity. "The gold's interesting, of course. But what do you know about Tauroman himself . . . as a man, I mean. Did you have many dealings with him when the collection was here on loan?"

"Even before that," Durrell answered. "Know him through my wife. She and Tauroman's late wife went to school together. Both of the girls came from old Pittsburgh families. So does Tauroman, in fact."

"Oh?" Leigh encouraged him to continue.

"Well, his grandfather, Gerhard, came to Pittsburgh around 1840 or so. It was old Gerhard who started the family's interest in archaeology. He was a childhood friend of Schliemann's before they both left Germany to see the world."

Leigh looked puzzled. "I'm afraid I'm not up on archaeologists. Who's Schliemann?"

"The man who excavated Troy. Don't know if you'd call him an archaeologist. He wasn't quite as scientific as we'd have wished—destroyed all kinds of valuable data, digging through layers of stuff like he did. But he was determined and a great lover of antiquity. Spent huge amounts of his own money to prove Troy wasn't a fable. The field owes him . . . well . . . a huge debt."

"And Tauroman knew him?"

Durrell nodded. "There's evidence that he even visited Gerhard here in Pittsburgh in the Sixties. Got him all fired up about Troy, but Gerhard didn't have the money Schliemann had—just a job in a glassworks. Hadn't, in fact, even married the boss's daughter yet. It was Gerhard's son, Gottlieb, who made the fortune. Patented a machine to make good, cheap glass bottles. Revolutionized the industry, in fact. Gottlieb married late, like his dad, but he also married well. His wife, Colletta, was a distant cousin of my wife's." The archaeologist smiled ruefully. "From the wealthy branch of the family."

"So Tauroman's always had money then."

"Not what he considered money. His mother was a little . . . ah . . . eccentric. Nutty about animals, but didn't like her son much. Gave him about half-a-million when he was twenty-one and told him to get out. When she died, the rest of the fortune went to Clint's two sisters and

to her foundation for homeless cats. In fact, she made the Hall into an animal shelter after she booted Clint out.

"Tauroman went out West then with his money and a little more his grandfather'd left him from the glassworks. Guess it was oil that made Clint his own fortune. Anyway, when he found out about his mother's will, he left for Europe and came back with that fortune in Cretan art."

"But how come he's living at the Hall? I thought you said it was an animal shelter."

"It was, but it was terribly expensive for the foundation to maintain, and when some epidemic killed all the cats, they built a more modern facility up in Butler. Clint took it over after both his sisters were killed when the three of them had a boating accident on the river. One of those barbarous dogs of his was with them, got upset by some powerboat, and capsized 'em. The Tauroman sisters, both of 'em real old maids, were too ladylike to ever have learned to swim, and he couldn't save either one.

"He was their only heir . . ."

"I see. And the wife? You mentioned she was a friend of yours."

Durrell's face saddened. "Yes. Her name was Evangeline. She and my wife, Anne, were like sisters, neither of them having sisters of their own. Anne's never gotten over Ev dying like that."

"Like what? Was she ill?"

"No. Last we saw her she was fine. She was found one morning in one of the garages at the Hall with the doors closed and the motor of her car running."

A knot of suspicion had hardened in Leigh's mind. "And she was wealthy too, I suppose."

"Very. Old steel money from her father and a railroad fortune from her first husband, Andy Boulton. Nice guy. Old Philadelphian. Got killed in World War II when his submarine was hit out in the Pacific somewhere. Never saw their daughter. Ev had to raise her alone. Maybe that's partly why she married Clint—give the girl a father and all that."

"So when Mrs. Tauroman died, Bull Tauroman inherited another fortune."

"Only part of one," Durrell corrected. "All of the Boulton money was in trust for the girl, Ariadne."

"Ariadne?"

"Her mother was a classics buff too. Something she and Clint had in common. Usually the girl's called Abbie because of her initials. (A. B., you know.) Abbie was away in Finland when her mother died. Took it very badly. She and my wife are very close . . . think a lot alike. In fact, they even have this crazy idea that . . ." The sentence skidded to a halt. "That is to say, Clinton Tauroman isn't exactly one of their favorite people." He suddenly seemed ready to end the interview.

"I'm afraid I've been too personal, but you said you wanted to know what Bull was like. I don't know if what I've told you will help."

"I don't know either," Leigh said truthfully. "But he's such a complex guy, anything's bound to be of some use." He rose from his chair. "I sure appreciate you taking the time to fill me in."

"Don't mention it. Tell that elusive boss of yours that next time he's in town, Anne and I will be expecting him for dinner."

"I will," Leigh promised.

"Say, before you go you should take in the contemporary sculpture show over in the art galleries. The local Sculptors' Society got together with the Museum of Art this year and put together a really comprehensive show. I think you'd find it especially interesting, if you have time."

Leigh looked at his watch. "Well, I don't think I'll have too much of a chance to get any real work done before dinner by the time I get back. That might be a good idea. How do I get back to the Museum of Art?"

Durrell gave him another set of instructions and aimed him in the right direction. He acknowledged Leigh's thanks with a pleasant, "Not at all. Nice to have met you. Be sure to get a good look at that sculpture show. It will be well worth your while."

With a genial wave of farewell, the men separated—Durrell disappearing into his office and Leigh retracing his steps to the art galleries.

The Museum of Art is a lively force in the Pittsburgh art scene. It sponsors the Triennial International, a prestigious showing of contemporary thinking in the visual arts, and lends, when possible, support to local artists. The sculpture show was an example of local contributions being intermixed with artists of wide national and international reputation. The first room was devoted to transparent Plexiglas works, the second to fascinating intricate constructions of neon that looked as if the artists had received their training at a good electrical engineering college. A shaggy young man was tinkering with the circuitry on one of these as Leigh entered and the physicist found himself unable to resist a look at the workings of the piece and the temptation to become embroiled in a long technical discussion with its creator. The galleries were quiet and peaceful. The restless classes of school children on field trips had already left for the day. A pair of well-dressed matrons passed him, each trying to sound more knowledgeable than the other about the artists whose work they were seeing. Three blue-jeaned art students slouched by and Leigh felt certain that if he just had the time, he would be able to tell if they were boys or girls. He was thor-

oughly enjoying the people, the transparent sculptures, the chrome, the neon lights, the bright color. It was happy, sensual stuff but, he felt, essentially forgettable. He didn't really have that urge to take any of it home to live with until he reached one of the last rooms. The sculpture was not large—no more than a few feet high. It showed a very abstracted terra-cotta figure of a bull struggling to free himself from an intricate network of welded bronze rods. From some angles, the bull took on an almost human shape, but the maze held his tortured body fast.

Leigh paused and slowly walked around it. A chattering gaggle of children in tow of their culture-bent mothers rattled by but still his attention was held by the struggling shape in its shining trap.

"I wonder what it's called," he finally asked himself and started to search through the catalog for the number displayed on the base of the piece.

Before he could find it, a woman's voice at his shoulder said, "It's called 'Crete Revisited' and it's done by the best damn welder in western Pennsylvania. Like it?"

Startled, Leigh turned to observe his informant. "Very much," he answered.

She was tall and big-boned and wore a two-hundred-dollar pantsuit as if it were a pair of jeans. Her dark auburn hair was not so much dressed as brought under dubious

control. Her face was open and friendly. For some reason she reminded Leigh of Silverman's prize Airedale, Brown Betty.

"Do you know the artist?" he asked.

"Not as well as I'd like to, but better than most. Why?"

"It's just that this piece is so interesting. All the other work seems cold and mechanical. This one almost doesn't fit with all the neon and chrome and plastic. It's sort of . . . of . . . I guess baroque."

"Bless you, my child," the girl replied surprisingly. "I just knew I should come down here today. You've made my afternoon."

She chuckled at Leigh's surprised expression.

"What with my work getting tucked away back here and all the prizes going to the electrical engineers and their light shows up front, I'd decided that art appreciation in America was dead."

"Your work?" asked Leigh. "So you're the artist then?"

"Sure am. Just got back from a crummy interview in New York this morning. Decided I'd stop here to see how things were going before I went home and here's a knight in shining armor standing looking at my sculpture and telling me he likes it. Bless you again.

"Say! Why don't you buy it? I forget what the price is but it's not high. I'm as yet undiscovered you see. What they call a 'minor' artist, damn it. You can find out the price at the desk. I've got to run now. Don't want to get tangled up in rush hour. Thanks again. Bye now."

Her heels made a pleasant click as Leigh stared after her open-mouthed. He suddenly realized that he'd let her get away without even asking her name. "Idiot! You're slipping. The most interesting thing you've seen in Pittsburgh and you just let her walk off."

He slapped the catalog against his open palm in disgust.

"Wait a minute," he remembered. "She'll be listed in here . . . number 350 . . ." He leafed through the pages to the entries for the United States.

"Boulton, Ariadne. Born Pittsburgh, Pennsylvania, 1945. Studied painting and sculpture, Carnegie-Mellon University and privately with David Smith. Trained also in Finland, 1964-65. Works primarily in ceramics and welded metals," the catalog read.

"Boulton! Ariadne! That's Tauroman's daughter. So that's what Durrell meant when he said the show would be interesting." Leigh's face broke into a grin. "She hasn't gotten away after all. In fact by rights she's really part of my job. Now that's what I call a fringe benefit."

He gave "Crete Revisited" a mock salute and turned briskly to go back to the Hall and, he hoped, to see again the "best damn welder in western Pennsylvania."

There was no sign of Ariadne Boulton, however, when Leigh joined Daydala, Bull, and Alexi at the Hall for dinner that night. Daydala quizzed him closely about the program and his success in finding the bug. The talk was strictly "shop" as usual. Leigh suddenly realized how bored he was with his role as guest-vassal of the Tauroman estate. Now if that big, beautiful welder were around . . .

She appeared as they gathered around the fire for liqueurs. Still dressed in tight pants, this time of heather-colored wool, she filled out an Irish fisherman's sweater the way no Irish fisherman ever had. Leigh took a good look and decided he liked her way best.

When she caught sight of him, Ariadne pointed her finger in mock accusation. "You! Well I'll be damned," she exclaimed. "My knight in shining armor. What the hell are you doing here.?"

Daydala's eyes widened in surprise. Alexi frowned in prissy disapproval. Bull came forward and took Ariadne's arm. "Now Ariadne, that's hardly a proper way to greet a guest." He turned to Leigh. "I take it that you two have met somewhere."

Leigh answered. "Not exactly met. I ran into Miss Boulton at the Carnegie this afternoon."

"Ha!" Ariadne interjected. "So you looked up my name. Did you buy it like I told you to?"

"Not yet."

"Perhaps one of you would be so good as to explain," Alexi put in. "I'm afraid that I find this conversation most puzzling."

Ariadne promptly launched into an account of their meeting at the art museum and ended with the statement, ". . . so he could look up my name in the catalog, but I still don't know his. That's not fair."

Alexi, proper as always, came forward. "Then may I present our new colleague, Dr. John Leigh. Dr. Leigh is a physicist. Miss Boulton is the daughter of the house, John."

"Stepdaughter," Ariadne corrected. "Say, sorry I missed dinner. Ran into some old friends after I left the knight here. Hadn't seen them since I left for New York so I got hung up. Stopped at a McDonald's on the way out."

Leigh smiled to himself. Filet mignon waiting on fine china at home and she stops at a hamburger stand for supper. He watched in amusement the varied expressions of disdain this announcement brought to the faces of the little group of sybarites. Ariadne seemed to notice nothing.

"A physicist, eh? Interesting. I thought you looked somehow scholarly. Course I knew you must be bright. After all, you recognized the superior quality of my sculpture, bless your heart. Say, do you know anybody at Niels Bohr Institute? I used to drink beer with some postdocs there when I was visiting friends in Copenhagen."

Leigh and Ariadne played "Do-you-know-what's-his-name?" until Tauroman broke in. "You say you met at the sculpture show. I didn't know you were interested in art, Leigh."

"I like it," John replied, "but I'm hardly an artist or a collector. Certainly not on the scale of the present company. I used to draw pretty good P-38's on my homework papers in eighth grade though."

Ariadne smiled at him.

"Actually I was at the Carnegie looking up an acquaintance, Dr. Durrell. I mentioned I worked for you and he said he knew you," Leigh continued. "He thinks quite

highly of your collection, by the way."

Bull chuckled in a self-satisfied way as he poured himself another hearty shot of Jack Daniels. "You're damned right he does. In fact he'd like to get his hands on it. If he weren't so stuffy proper he'd be happy to push me off a bridge to get it."

"Uncle Randy?" said Ariadne, shocked. "Why you know he'd never do a thing like that."

"Of course not," replied her stepfather in a smooth voice. "That's why he'll never get the collection and that's why I have it." Tauroman drank some of the whiskey.

Leigh watched the two. Tauroman's voice had sounded affectionate, but Leigh realized that there was no love in the cold, calculating look the financier gave his stepdaughter.

"You mean because Uncle Randy wouldn't push someone off a bridge you won't leave the collection to the Carnegie?"

"No, I mean because I'm not going to let anyone push me off a bridge—ever. And because I didn't sit on my ass in a plushy office waiting for someone to die, all this"—he waved his hand possessively at the treasure-filled cases—"is here in my house instead of Durrell's museum."

"But Uncle Randy's been on lots of digs," Ariadne objected. "He's worked terribly hard to add to the collection at the museum."

Tauroman finished his drink and went to the table to pour himself another. "Digs!" he said disdainfully. "A bunch of namby-pamby fruitcakes sitting around with their grants and all the comforts of home. Fussing around with this agency and that official, sifting sand and rocks like a bunch of kids at the beach. Shit! That's no way to get a treasure like this."

The man took a key out of his pocket and unlocked one of the cases. "Just come over here and look at this."

He removed a golden ax head from the case and handed it to Leigh. John, unprepared for its weight, almost dropped it.

"Heavy, isn't it? That's called a *labrys*. It's solid gold. So's this." He took a golden pendent from its display case of black velvet. "Look at the way those bees twine around that honeycomb in the center. Have you ever seen gold craftsmanship like that?

"And you, Ariadne. Look at the stirrup vase. See the way that octopus fits around the form. Those Finnish potter friends of yours couldn't produce anything better and that piece is 3,500 years old. Do you think things like this fall into the laps of museum curators in paneled offices? Like hell they do." For emphasis he finished off the last of the whiskey and poured more. Leigh had never seen him drink so heavily. He wondered if Ariadne's return had something to

do with it. The girl spoke to her stepfather again.

"Then how did you get it?" his stepdaughter asked. "I've never known."

Bull chuckled again. John was beginning to wonder if he was drunk, but the hand that poured the Jack Daniels was rock steady. If Tauroman was drunk, John decided he was the most competent drunk he'd ever seen.

"No one knows, except me of course. Old Durrell'd have a stroke if he did. That's why I've never told him. I've got too much to think about without him on my back."

"But why should he bother you about it after all these years," Ariadne persisted.

"I just told you—no guts. He thinks you've got to 'go through channels.' Not if you want something you don't. If I'd gone through channels this gold would still be buried in the cave where I found it or stuck off in a museum in Crete somewhere. Channels get you nowhere except into dead ends."

"Where you found it? Then you dug up this treasure yourself?" Leigh asked.

"Let's say I got hold of it, with the help of one of Daydala's uncles. She was just a baby then. Her uncle knew Crete and wanted some adventure. I'd just read about Sir Arthur Evans and David Hogarth's discoveries in the Grotto of Zéus at Psychro on Crete. I suspected there were other caves like Psychro just ripe for the picking.

"Besides Evans and Hogarth, a Cretan scholar named Hazzidakis had found thousands of double axes and weapons at a cave called Arkalochori near the town of Lyktos in the center of the island. But Plato, Daydala's uncle, said once that the place was a honeycomb of caves and he'd heard that children knew of entrances archaeologists never saw. All he needed was money to finance a search and I had money. You could make it and keep it in those days."

Bull's eyes half-closed in reminiscence. In a gentler man the last statement would have sounded almost wistful.

"No, I didn't sit in a paneled office to get this."

"But what did you do?" Ariadne asked doggedly. "How did the gold get here to the Hall?"

Daydala, who had been sitting motionlessly listening with complete attention to the story, finally broke her silence.

"No one has ever been told exactly what happened. Your stepfather has a strict rule about that."

Bull nodded his assent to that, and then a half-smile that was not at all humorous crossed his face. "I'll tell you this much. The Cretans around Lyktos claim they heard a dynamite blast one night. It seems someone had opened a chamber of Arkalochori closed thousands of years before by an

earthquake. When authorities arrived they found very little of value in the cave. Hazzidakis searched the neighborhood with a police escort. He found a few things some shepherds had run off with, but no really fine stuff. He was mad as hell. Those damned archaeologists always worry about this 'common man' garbage. 'Get artifacts into museums. Save their heritage for the people.' Crap!

"Do you know what his precious 'common people' did with their cultural heritage? In 1912 Hazzidakis was offered bronze daggers by some peasants who told him that they'd already taken a hundred pounds of such bronze artifacts to a scrap merchant. That's what your 'common people' made of their cultural heritage—scrap. And they called me a barbarian when they found this treasure had been removed from Crete."

He withdrew a silver goblet decorated with delicately-worked figures of a prince and his guard around it. "Does this look like scrap to you? Does it?" he repeated himself in a voice now tense with anger.

"What happened to Daydala's uncle?" asked Ariadne, more to calm her stepfather than because she really cared.

Again Daydala interposed. "He was killed. Crete, as you know, has had much political unrest. Some hill bandits assassinated him."

"Yes," Bull explained, "I was in the village seeing to some business details. Some peasants who knew we were associated with each other brought me the news of Plato's death. He hadn't a chance, I guess."

"You said this archaeologist Hazzidakis had a police guard. Did the Government have an interest in the treasure then? Were there laws controlling it?" Leigh knew his question was blunt, but he was too interested in Tauroman's revelations to care. He wanted to find out as much as possible while Bull was in his whiskey-mellowed mood.

Tauroman threw back his head and laughed a bellowing laugh.

"Laws?" he asked. "When it comes to a treasure like this one there's only one law that counts—that's the law of possession. I've heard 'em say it's nine-tenths of the law. With treasure like this, it's one hundred percent of the law. Possession, Leigh, possession. Governments can holler 'til they turn blue about art leaving their shores, but it's plain, cold possession that counts."

Leigh hefted the heavy, solid gold *labrys*. "Thirty-five hundred years old. Fantastic."

Bull took the ax head from him and held it up to the light.

"Fantastic. Beautiful. Priceless," he spoke softly. Gently he placed the object back into the black velvet nest inside the case, closed and locked the door. "And mine," he added decisively.

"Now," he went on. "I have work to do and I know Ariadne does too. Daydala, let's go over those progress report figures."

Daydala followed Bull out the door to his study. Everyone had ignored Alexi completely through the narration of the story of the treasure. He rose from his chair, cleared his throat and tried to look important. "If you will be so kind as to excuse me, I also must go over some work Dr. Landry has entrusted to my care. Good evening, John, Ariadne." And he bustled off. John watched him go thinking as he did so that if Alexi wasn't such a pompous ass he'd feel a little sorry for him.

He turned to Ariadne and grinned.

"Alone at last. Do you really have to work or can art wait while we have another drink?"

"What do you mean, another drink? This is tomato juice, not a Bloody Mary. I'm welding tonight and when I weld, booze is out, especially when I'm working with that damned silver."

"Silver? That'll make a pretty expensive sculpture, won't it? Do you work in silver often?"

"Me? You've got to be jesting, my friend. We undiscovered artists can't afford silver. Oh, no. This job's a deal of my stepfather's and his sexy Moroccan genius in there." She nodded her head in the direction Daydala and Bull had gone. "What they need a silver kettle for is beyond me, but he's probably cooking up something shady. What do you think of a guy like that? He'd swipe the gold in Fort Knox except the US Treasury isn't a bunch of 'namby-pamby scholars' like Uncle Randy."

"Uncle Randy? You mean Durrell? I didn't know you were related."

"The title's honorary. Anne, his wife, was Mom's best friend. But she's not exactly Bull's biggest fan. Can't stand the sight of him, in fact. She really hit the ceiling when I accepted his offer of studio space here in the Hall. Says she's afraid for me. She claims Mom's death wasn't right. Death never is though, is it?" The girl's face took on a lost look of pain momentarily. Leigh, remembering his own father's death, so similar to that of Ariadne's mother, brushed a sympathetic hand over her shoulder.

"No it isn't. Especially when it's someone close to you."

"Anyway," Ariadne shook off the mood, "I've got my reasons for being here and I've promised to finish that kettle before I can cut out for good. It's a real chore, too. They're so damned particular about its being just right—smooth and all that.

"Which means I've got to get off my bottom and get to work. It's been pleasant talking to you. You're a nice change from Bull and his mistress and Adorable Alexi. God! What a crew! See you

around, Knight-in-Shining-Armor. 'Bye."

She rose, gave a wave of her hand and was gone, leaving Leigh to his thoughts and her lingering perfume of woodsy freshness.

His first impulse was to chuckle. "Adorable Alexi . . ," a perfect description. A hamburger instead of filet mignon. That white sweater. Finally Silverman had done him a favor.

Silverman!

That damnably calm voice with the flat Bostonian accent drifted back to him over the crackling of the wood burning on the grate.

". . . that vat of stolen petrons. That's what you have to find. Otherwise they're as legitimate as General Motors."

So Ariadne Boulton was welding a big tank which might be just the right thing to hold millions of the damn things if Daydala and Bull knew how to reproduce petrons. But without that original vat, the silver kettle and his mysterious "choke" were as legitimate . . .

Hell!

Reluctantly Leigh left the warmth of the fire to dress for yet another of his futile, furtive, and probably dangerous searches of the laboratories while outside the guard dogs flung their deep-throated warnings into the night.

Daydala Pandarou's room at the Hall was an odd mixture of elements much like the woman herself with her strange, unmatching eyes. In one corner of the apartment was a broad, low bed laid over with a huge woven shawl delicately embroidered with an arabesque pattern. The floor was covered with a finely-detailed carpet from Isfahan. An exquisite tray of beaten brass filled with fresh dates shared a low, carved wooden table with a coffee service of antique Chinese porcelain.

But on a corner of the Persian carpet sat the most common of steel office desks, the edges of which were piled with books. Shelves lining the walls behind the desk were loaded with volumes bound in dull green, their gold-printed titles encompassing the world of modern physics. Stacks of journals lay in corners, their garish green and orange covers contrasting with the subtle colors of the rug. From the top of an antique umbrella stand of pierced and engraved brass protruded neat rolls of engineering drawings. Yet the walls glowed with the golden lights of Islamic miniatures beautifully framed.

Daydala herself stood in front of a low divan before a small fireplace, a demitasse of thick, hot coffee in her hand.

"He still thinks that we do not know what happened to our uncle," she spoke almost to herself. "He should know that there is little honor among those who kill for pay. What would he say, do you

think, if I had said to him tonight as he told his stepdaughter those lies, 'We know, Tauroman. We have always known how you paid those bandits on Crete to kill our uncle so that the whole of the Minoan treasure could be yours. We know because our family went to Crete to avenge his death and our victims told us the truth as they begged for mercy.' What would he say, do you think?"

Alexi, reclining on the divan behind her, answered.

"I think perhaps he might fear you, my cousin, even more than he does already."

"Tauroman is afraid of me?"

"A little. I see it in his eyes when he talks of you to me when we are alone in our intimate moments together. I think, like me, he can never be quite at ease with a woman, certainly not with you."

"And yet with all he has on his conscience he has asked me for more help." She sounded both puzzled and satisfied. "In doing so he has put in my hands the instrument of his own destruction just at the time I needed it."

Alexi stirred on the couch. His face became alert and excited. "The prophecy?" he asked. "Then you have succeeded?"

"Not yet. But it is only a matter of days until we have the means to return the great god Zeus and his protectress, the Earth Mother to their rightful place as the rulers of mankind."

"That quickly, do you think? Will the bombs have their effect that quickly?"

"We will have the knowledge by then. Do you doubt that once the knowledge foretold us in the prophecy is ours that the rest will not follow? The mighty Zeus proclaimed it to our King Minos in the very cave which that infidel Tauroman desecrated with his greed."

"Of course. Of course," Alexi agreed hastily. "The prophecy will be fulfilled. Man will return to the Earth Mother and her son Zeus. I only wondered how quickly we as her disciples could complete the cycle."

"As soon as the bombs are ready," his cousin answered, "we will mail them to fictitious addresses in all the major cities of the world. No one will be spared—Communist, Capitalist, Socialist, Royalist. All must return to the true faith.

"When sufficient time has elapsed for the devices to find their way to dead letter offices around the world, we shall proclaim the Earth's return to the Earth Mother and her son. Those who hesitate will have the blood of a great city on their hands, for one by one, we shall explode the bombs."

"And the prophecy will be fulfilled, for they will not hesitate more than once," Alexi murmured.

"And the prophecy will be fulfilled," Daydala repeated. She

raised one hand over her head and spoke a phrase which Alexi answered, raising one of his arms, palm outward, to his forehead as if to shield himself from a strong light.

Silence fell on the room. Then Alexi spoke again.

"What remains to be done before the bombs can be made ready?"

"The silver kettle must be completed. Is it not fitting that the mother of our unwitting accomplice, the lady welder, should have given her daughter the name of the daughter of our god—King Minos? As soon as this latter-day Ariadne finishes her work, we shall be able to produce the particles and use them to make bombs no bigger than this cup. A fitting sacrifice to the goddess in an age of technology. Gifts of oil and gold may have been sufficient for our ancestors. Today one of the greatest engineering feats of humanity is the only fit sacrifice to Her glory."

"But the man, Tauroman. What about him? You said that the time for his destruction had come."

"Yes. He has used us long enough. First the weakness and greed of our uncle. Now the two of us as tools in a plan he thinks is his. The chosen of the Earth Mother will not be so used forever." A hint of mania crept into her voice as she spoke.

"Is one of the bombs planned for him, then?"

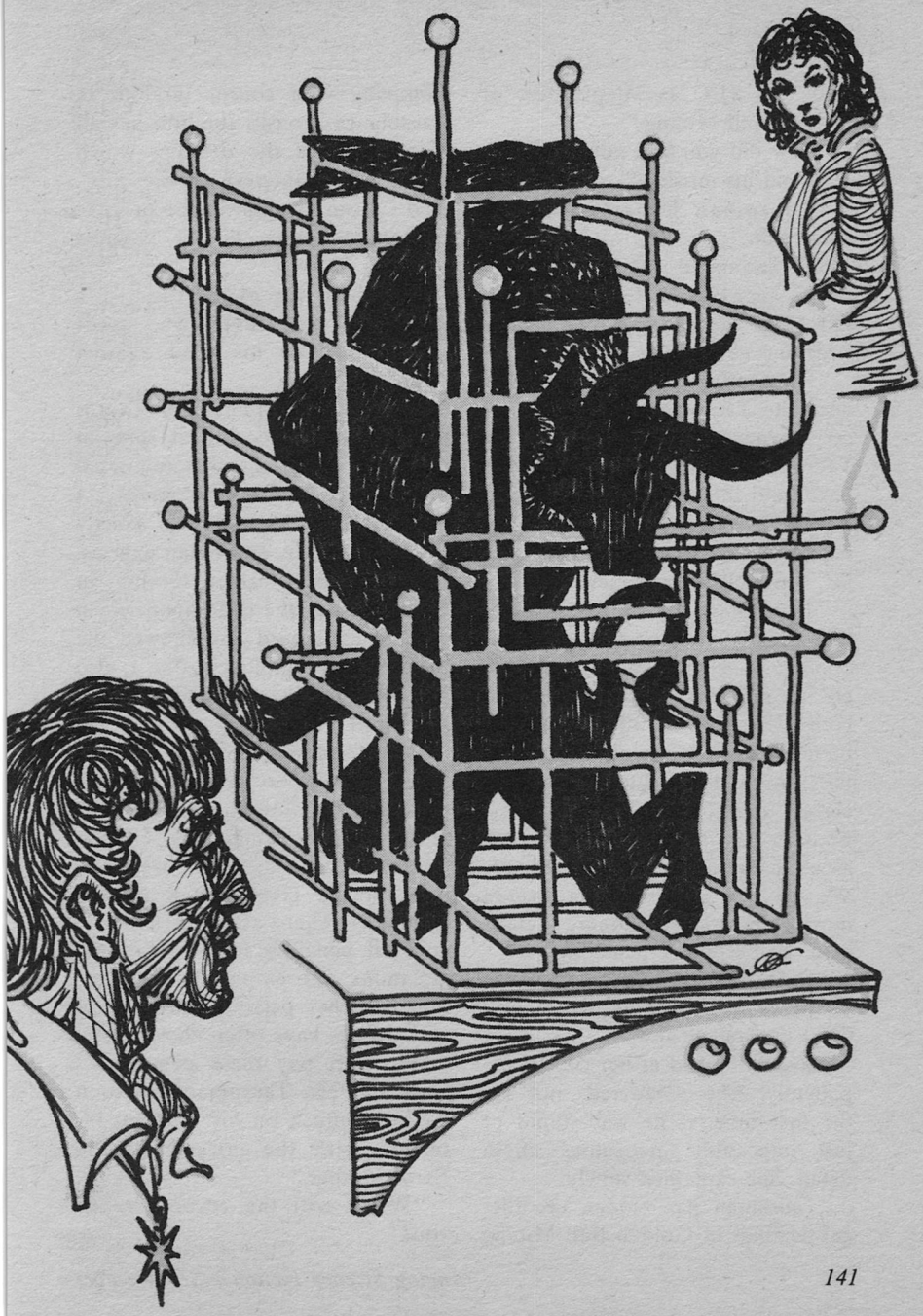
"No, no. That would give us away too soon. No, Alexi, the instrument of which I spoke is an official of his own Government—a man named Nathan Hunter." Her voice was cold and reasonable again.

"Why should a Government agent wish to destroy Tauroman? Is he one of us?"

"Of course he is not one of us," Daydala answered shortly. "You would know him if he were. Nathan Hunter will destroy Tauroman simply because it is his job to do so.

"Surely you must recognize by now a basic fact of Tauroman's way of life. If laws are passed which get in the way of his getting what he wants, then those laws, in his eyes, are made to be broken. The United States has passed laws to protect American investors from manipulation and dishonesty in the securities market.

"These laws were inconvenient for Tauroman in his plans to use the Golden Bull Mining Company to raise money for our researches. So of course, he broke those laws. Oh, he was apparently very clever. He hid most of his illegal dealings with Cousin Ibrahim in Casablanca. But still, he broke the law. Now responsibility for seeing that laws governing the sale of securities are followed rests in an agency of the US Government called the Securities and Exchange Commission. Mr. Hunter is an agent of this SEC



and the SEC is suspicious of Golden Bull Mining."

"How did you find out about this man and his mission?"

"Tauroman himself told me about him."

She recounted the meeting between herself and Tauroman during which she had received her instructions concerning Hunter.

"'Remember,' he told me, 'you need the Tauroman money to succeed.' And so we did. Without the Tauroman money we could never have built the expensive equipment we needed to reproduce the particles you and Yusuf liberated from Dr. Petronelli's experiment.

"Tauroman, of course, thinks that he is financing the development of a new, cheap source of electric power which will make him rich. He has no idea that his money was only an instrument of the sons and daughters of Minos, chosen of the Earth Mother. Yes, I needed the Tauroman money to succeed. But now success is ours. We do not need the Tauroman money any longer. Clinton Tauroman has become expendable."

Alexi's face remained impassive. "And so he must go. But I still don't understand how? . . ."

Daydala looked at her cousin impatiently. She wondered, not for the first time, if he was stupid or just impossibly meticulous about detail. She explained slowly.

"Tauroman has hidden the illegal dealings of Golden Bull Mining Company with cousin Ibrahim in Casablanca. Cousin Ibrahim has all the records of the dealings which could be of interest to the SEC. And Cousin Ibrahim is one of us."

Comprehension finally dawned on Alexi's face.

"And so we give Ibrahim's records to Mr. Hunter who needs them to make his case against Tauroman."

"Exactly. You remember Tauroman asked me to contact Ibrahim to see to it that he was reminded of his duty of banker's secrecy. I have done so, but not with exactly the message Mr. Tauroman expects. Oh, of course I cabled Ibrahim in Casablanca in the code upon which we had all agreed and showed the copy to our employer. But I also sent our cousin a second message via Yusuf's niece who works in the embassy in Washington. In it I asked Ibrahim to produce for me records and information in his possession which would link Clinton Tauroman with the dubious operations of the Golden Bull Mining Company. There are both financial and jail penalties for some of the violations our employer has committed. Other persons convicted of such crimes have often chosen exile rather than pay these penalties. I think our Mr. Tauroman will soon have too much on his mind to interfere with the miracle of the Earth Mother."

"When will the records reach you?"

"Tomorrow. Yusuf heard from his niece today that they have arrived in her hands. She has arranged to use a few days of her annual leave to visit her uncle in Pittsburgh. She will arrive early tomorrow morning. There will be a party in town given by her uncle in her honor. She will deliver the papers then.

"I have discovered where this Nathan Hunter resides while he is in Pittsburgh by the simple process of calling hotels until I found the one where he was registered. Soon he will be in possession of a copy of the records which will make his case against Clinton Tauroman complete."

"Am I to have a part in this plan?" Alexi asked hopefully.

"Yes. You will keep a second set of the records in case something should happen to mine. If I cannot for some reason deliver the papers, you must get your copy to Mr. Hunter."

Alexi looked very earnest and important. The passive role suited him quite well, the way being third-string back on his school soccer team had satisfied him. At least he was on the team and he just might even be called upon to save the day.

"And so the great Bull is to be led to slaughter."

"Precisely. In days that defiler of the sacred places of our lord Minos will be ruined. His fate is, as it always has been, in the hands of the followers of the Earth Mother. He is finished."

Alexi looked into the beautiful face of his cousin and wondered again at the fanaticism and power he saw there. Inwardly they made him cringe and he murmured a prayer to the Goddess that they never be directed against him as they were against the man whose protection he had enjoyed up to now. Yet Daydala fascinated him, as a stalking tigress is fascinating as she plays out her drama of life and death.

"My dear cousin," he said, "may I salute your genius. The Goddess will surely reward your faithful service with riches and honor."

Then the small man rose gracefully from the low divan and made a small bow. "But now you must excuse me. It is very late and Dr. Landry has quite exhausted me today. The woman is a veritable fiend for work."

"Of course. I too must become a veritable fiend for work. Miss Boulton is as quick as she is skillful and the welding on the tank will be complete in a matter of two or three days. Our plan must be carried out before that time. Good night."

"Good night."

He left the woman seated on the divan, the firelight flickering and dancing in her excited eyes.

Nathan Hunter was also up late that night. He sat at a small, ordi-

nary hotel room writing desk which was completely covered with stacks of files, papers, and scratch pads filled with figures. His massive body was clothed only in a brightly-colored dashiki his wife and daughters had given him for Christmas because they thought it made him look like an African prince. The scholarly frown behind the horn-rimmed reading glasses and the complicated calculations on the scratch pads, however, revealed the head for figures which topped the athlete's body. Nathan Hunter on the trail was no less formidable a figure than was Daydala Pandarou.

For Nathan Hunter, too, was a fanatic.

While most of his friends dreamed of becoming another Hank Aaron or Muhammad Ali, Nathan Hunter dreamed of catching crooks—not burglars or murderers—but financial crooks like the smooth talkers who had conned his father out of the meager savings he had managed to put away. Sure, he had enjoyed football. It gave him a chance to go to one of the best universities in the country. But he saved his real zeal for his life's work—the apprehending of the bloodless but deadly swindler, killer of dreams.

So now his dark eyes narrowed in anger as he read the answers to the questionnaires he had sent to his sister Addie's patients. They had been only too glad to answer the simple, multiple-choice questions. They liked and admired Addie. If she said the questionnaires were OK, they were OK. A picture of high-pressure selling emerged; of facts which would warn off sophisticated buyers neatly concealed in high-flown language that these simple people just had not understood; of puff and promise; of something for "almost" nothing; of plain gullibility. Hunter shook his head sadly and turned to the Golden Bull files.

There was no doubt that Golden Bull was a good cover for manipulation. The company had mined profitable amounts of copper in the Lake Superior region and had been intelligently, if conservatively, managed. The change seemed to have taken place a few years before. Some shadowy presence had intruded itself into the facts and figures spread before him on the cramped hotel desk.

The company was absorbing small, less-well-managed firms, using their marginally profitable leases as a basis for puffed-up claims of great things to come. It was, as his sister had said, vaguely reminiscent of the Tellier case, except that the brains of this operation were so nebulous. The proceeds from the sales of the diluted stocks were diverted and finally hidden in dummy holding companies.

Hunter tried to understand the transactions by following the life

history of a single share of Golden Bull, but that too proved frustrating. Somehow the money was leaking out of the country, and through such tortuous channels it was almost impossible for even a man of his skill to trace it.

Hunter looked at his watch. One in the morning. And tomorrow it was back to trying to find out who was behind that steady drain of utilities stocks. He felt very close to a solution there but he'd need all of his wits to clarify in his report the complicated process by which those stocks were ending up in Lebanon. Hell! Was everyone in the world crooked? Were there unmentionable things crawling under every rock? After the years he'd spent in his business he'd begun to think so.

Glancing ruefully around at the paper-strewn room, he sighed and began to gather up his folders of reports and organize them in his bulging briefcase.

"Man, I sure could use a fumble by the other side," he thought. "But somebody on that team's a real pro." He wearily flung his multicolored robe over the foot of the bed and dragged back the covers. He was just turning out the light when the phone rang.

The voice that answered his puzzled "Hello?" was a woman's, sensuous and carrying the faintest possible tinge of the too-correctness that suggested its speaker was an adult newcomer to the English language. She identified neither herself nor him.

"Good morning. I have some interesting data you will, I think, be impressed by. The hour is terribly late and I'm sure we are both weary. If you will remain by that telephone I shall reach you later today. I know you too have worked hard along the lines I have explored and I shall find it a privilege to aid you in your research. Until later then, good-bye."

There was a click on the other end of the line.

Hunter replaced the phone on the cradle and lay back in bed. The faint light from the street revealed the broad grin on his dark face. Could it be that someone on the other team was about to hand him the ball on a silver platter? It wouldn't be the first time a tip had broken a case wide open. Interesting voice. Wonder what Lucille would say if she knew her husband was getting phone calls from sexy women at one a.m.

The grin broadened. He wondered if he'd be able to get to sleep. But long training had perfected his ability to turn off his racing mind. In five minutes his breathing took on the regular rhythm of the sound sleeper.

Hunter woke the next morning with the same sense of excitement and impending accomplishment he used to feel on the day of an important football game. He swung

himself out of bed and reached for the telephone.

"Room Service? This is room 1217. I'd like breakfast sent up. Tomato juice, coffee, two eggs over and ham. Oh, and a hard roll if you've got it. Also the *Wall Street Journal.* Thanks."

He hung up thinking of how this extravagance would wreck the careful budgeting of his *per diem* but he dared not leave his room. "Stay by the phone," she'd said, and that's where he intended to stay.

He did a few quick knee bends and flattened himself on the rug for his daily push-ups. Those completed, he showered and was just running the water for shaving when there was a knock on the door.

The room service waiter was young and impressed by Hunter's fame on the football field. He pushed in the rolling cart with the reverence of an acolyte. "Morning, Mr. Hunter. What did you think of them NBA play-offs last night? Cool, huh? That Kareem Abdul-Jabbar—Wow! I don't care what he calls himself so long as he plays ball like that. Hey, what do you think the Steelers'll do next fall? My old lady, she really blows her cool football season. Claims Dad'n me, we just turn into TV zombies."

Hunter finally got the steady stream of sports news turned off and steered the eager youngster out the door with a good tip. He smiled tolerantly at the closed door and turned his attention to the steaming food on the tray.

Journal scanned and breakfast finished, Hunter got down to the business of the day. The background material on the movement of the electrical utilities stocks was in order now. He knew how many shares had been offered in the last six months, how many bought, and at what prices. He'd talked to officials of some of the companies in question and tried to understand the financial position of the firms involved. No one seemed to have any idea why the movement in their stock was taking place. Their annual reports and company records did not seem to indicate much except that they were conservative and a little out-of-date, perhaps due to expansion because of rapid growth in their areas. The action was subtle, certainly not a flashy power play, and perhaps not even something that would come under the aegis of the SEC.

Hunter sighed. It wasn't much but it was enough to write Washington a report on, if only to show them he was earning his keep. He got out his small portable and started to compose the report. Typing lists of facts was dull work, but Hunter didn't like to waste time. Though his mind wandered constantly to the obstinately silent phone, he continued to tap away on his faithful Olympia.

"So I know," he concluded, "how much, how many, and from whom, but still not why or for

whom. Whoever is behind this has plenty of capital and that capital's coming from the Middle East. That much we know.

"But our man (or men) is well-advised or damn clever. He may, however, have made an enemy."

The phone rang.

"Room 1217," Hunter answered.

"Mr. Hunter. I have spoken with you earlier this morning concerning our mutual research."

"I remember. Are you able to speak freely now?"

"Yes. I am at a public telephone where I am quite safe. You are, I am informed, currently investigating the financial dealing of a company called Golden Bull Mining."

"That's right."

"Under the impression that the dealings of this firm are not completely in accord with the rules of the Securities and Exchange Commission for whom you work?"

"Perhaps."

"I think that papers in my possession would convince you that your suspicions regarding Golden Bull are extremely well-founded and that the management of the firm has fallen into the hands of a financial scoundrel."

Hunter smiled at the rather old-fashioned word. Any issue of the *Wall Street Journal* carried news of chicanery in high places—cabinet officers perjuring themselves, judges accused of manipulating racetrack stock, public officials keeping illicit earnings in shoe boxes. He had begun to wonder if anyone thought in terms of scoundrels anymore.

"Just what is the nature of these papers?"

"They are copies of financial records of dealings of a Pittsburgh financier with a businessman in Casablanca. This businessman has deposited large sums of money for the financier in a numbered account in Beirut, Lebanon where the businessman has family connections. The records are complete and show how high-pressure selling activities for Golden Bull have been financed and how money from Golden Bull has been used to stage raids on other companies to build a large financial pyramid. I do not know if you or the tax collectors of your country will be most interested in my information. I shall leave that in your hands as I am untrained in your laws and the intricacies of your investigative agencies."

Hunter hunched over the phone, his face gleaming with excitement.

"How can I get these papers?" he asked. "Can I meet you somewhere? I'd like to see them as soon as possible."

"I need not tell you that I wish to dispose of them myself as quickly as I am able to do so. It would be most unpleasant for me if the gentleman in question were to find them in my possession."

"What did you have in mind, then?" Hunter's mind clicked over the possibilities. Were the papers

for sale? Was it a grudge that motivated the woman? Could he swing the cash to buy if money was her motive?

The precise voice continued. "The gentleman who sent me the papers from Morocco has made two copies of them. I have one. Alexi Pandarou of this city has the other. I plan to give you mine. Dr. Pandarou will keep the other in case I should for some reason be unable to make the delivery. Incidentally, the papers are a gift from my family to you. We are not paid informers."

Hunter cleared his throat. He was not sure exactly how to respond to such a pronouncement. "I'm sure your information will be a great help to us," he finally decided was best. "But how do you plan to get it to me? Are you in danger?"

"No." (He thought he noted a trace of hesitation in her answer.) "It is only difficult for me to get away. I am attending a party in town tonight, however. I shall slip away from the affair and meet you at an establishment on Mount Washington called The Tin Angel. Are you familiar with this bistro?"

"Yes. What time will you be there? And how will I know you?"

"Reserve a table for two for 10:15 p.m. I shall arrive at 10:30. I am fairly small by American standards and have dark hair. I shall be wearing a dress of purple and black and a purple cape. You must arrive first and wait. I will say that I am with Mr. Hunter. I do not wish to be conspicuous, you understand."

"Of course. I'll be there."

"Very well. Until this evening then."

The phone clicked into silence. Hunter sat hunched on the edge of the bed and stared at the wallpaper mural across the room. It was a lush Mediterranean scene in green and blue and to him it suddenly seemed peopled with djellaba-clad figures. Absent-mindedly he ran a large hand over his black, wiry hair.

"Well, I'll be damned!

"Is there a connection?

"I sure never thought I'd find them both tangled up together but the name's the same. I wonder how many Pandarous there are in Casablanca."

He picked up the letter he'd just written and reread a part of it.

"A name that keeps coming into the picture in connection with purchase of these utility stocks is that of a Moroccan businessman named Ibrahim Pandarou. Though the stocks seem to pass through his hands, he is not the man we're after but probably an instrument of the real backer of the scheme (if it is a scheme.) I'd sure like to get hold of this man's private papers," he had written. "They'd probably tell us a lot."

He rolled the report back into his typewriter. "And now," he said

to himself, "the name comes up again only this time in connection with the Golden Bull Mining Company. I guess this report isn't finished yet," and he began to tap out the story of his phone call from his mysterious lady.

Daydala meanwhile entered a dentist's office not far from Westpenn Foods.

"Please forgive my lateness," she said demurely. "I had some most important business to attend to." The dentist, completely enamored of his exotic patient, would have forgiven her a great deal more than five minutes' tardiness. He brushed aside her apologies and guided her to his chair.

For Hunter the rest of the day dragged like lead. His curiosity over the connection between Pandarou, Golden Bull, and the utilities stock pricked and teased him like an unfulfilled appetite. He finally gave up working and went to the zoo where the animals were delighted to see this rare winter visitor. He had a leisurely dinner and tried to work up an interest in the current copy of *Fortune* until it was time to go. Finally by 9:30 he could stand it no longer so he went downstairs to get his rented car from the hotel garage and kill a few minutes chatting with the attendants there.

Hunter took the bridge across the Monongahela River, turned northwest onto Carson Street and parked in a small lot at the base of Mount Washington. This bluff rises steeply along the southern bank of the Monongahela and directly overlooks Pittsburgh's famous Golden Triangle where the Monongahela and the Allegheny Rivers meet to form the Ohio. Over two hundred years ago, the French builders of Fort Duquesne worried that the bluff would endanger their outpost at the confluence of the rivers, so commanding a view it had of the triangle. In later years early Pittsburghers mined coal from the hillside, sending it down the side of what was then called "Coal Hill" on primitive coal hoists. Finally the heights were recognized as possible homesites and these same coal hoists served as the locations for inclined railways for hauling people and supplies up the steep slopes. Only two of these inclines are left now and it was at the lower station of one of these that Nathan Hunter parked his car.

The Duquesne Incline was always his second stop (after the zoo) when he had any free time in Pittsburgh. He loved the little wooden cars with their hand-carved cherry panels and trim of oak and bird's-eye maple. It was pleasant to stand at the end of the car as it moved slowly up the hill, passing its twin on its own way down. From the window he would watch the rivers drop away, the neat beauty of Point State Park and the glistening elegance of the buildings of Gateway Center proudly pro-

claiming the triumph of civic pride over dust and soot.

Once, late at night, the engineer, pleased by his interest, had taken Hunter under the station to show him the giant, wooden-toothed drive gear, a piece of the original equipment still functioning faithfully after almost a hundred years of service. Hunter never missed an opportunity to ride the incline and tonight he could mix business with pleasure for The Tin Angel was only a few steps away from the station above. Early settlers may have found coal and homesites on the heights of Mount Washington. The latest ones had found the most spectacular view in the city around which to build restaurants. The Tin Angel was one of these.

He knew that he was early but there were a lot worse places to kill time than the quiet dimness of The Tin Angel. He entered the bar and claimed the table he had reserved by the window.

"There will be a lady along soon. Short with dark hair, purple and black dress and purple cape," he told the maître d'. "Please send her to my table when she arrives."

A comfortably large bill changed hands.

"Yes, sir, Mr. Hunter. As soon as she comes."

Hunter sat down, ordered a whiskey sour, and leaned back to enjoy the scenery. The river traffic was absent as the ice-choked waterways waited the coming of spring, but the panorama of the city was still interesting. The top of the Gulf Building was glowing red again. The color had something to do with the weather, he'd heard, but he never could remember the code. Lights coming on or going off gave the scene an air of constant movement as if he were watching a living organism. He frowned in thought.

"She's down there somewhere walking around with what may be the answer to at least a thirty-five-million-dollar puzzle. I sure hope she's safe."

He looked at his watch again.

Only five minutes had passed.

He tried to get interested in the secret unfoldings of the city lives laid out below him.

Three more minutes.

A new thought occurred to him. What if the whole thing was some sort of an elaborate hoax and she never came. Well, she'd given him a clue or two perhaps and it had only cost him a room-service bill and a tip so far. It wouldn't be the first time he'd been made to look foolish by some malicious practical joker. "She'll come," he reassured himself but he couldn't help another look at his watch.

"I believe it is exactly 10:30," a now-familiar, precise voice spoke in his ear. He looked up with a start and then rose quickly to his feet.

"Hello," he said. "Yes, it is exactly 10:30. You certainly are prompt." He seated the lady at the

table and then sat again himself. "What may I order for you?"

"Bitter Lemon, please."

Hunter signaled the waiter, ordered, then leaned forward intently. "May I ask your name or do you wish to remain anonymous?"

"It would be best if you did not know to whom you are speaking. I am not a part of the manipulations you seek to halt."

"Is there anything you would like to tell me, however . . . any background material you can give me on our man . . . anything which would help to explain the information the papers contain?"

"I can tell you that I know that the man ordered a murder a number of years ago of which he was never accused. I can tell you that this man has inherited three legacies due to the untimely deaths of women with whom he was connected. The papers tell you that he has used the money to acquire Golden Bull Mining and that he has used the company to build an empire. They also tell you that proceeds from Golden Bull leave the country to avoid, among other things, both investigators like you and your tax laws. And that they return to buy up electric utility stock—great masses of stock, because, you see, this man knows a secret."

"And what is that?"

"That I have developed a new, cheap, pollution-free source of electrical power. His stock is worth millions now, but when this secret becomes general knowledge, Clinton Tauroman will see his dream come true. He will be one of the richest men in the world."

Hunter sat back and thought about what he had just heard. It either made sense and he was on to something that would shake the utilities market to the bone or this mysterious, beautiful lady was as crazy as a bedbug. Tauroman was known on the Street of course. He was a sharp, ruthless man, but Hunter had no idea that he was playing for stakes as high as this or with cards (if, of course, the lady was telling the truth) as good.

"This discovery. You say that you made it. Are you a scientist then?"

"Other than what I have already told you, I shall say no more about my work. I have come to deliver the papers. Do you wish to see them?"

"Of course. Sure. Of course," Hunter stammered, "only . . ."

The woman drew a brown manila envelope from a small, slim attaché case she had carried under her cloak and laid it on the table.

"Here they are. I'm sure you will find them interesting. My knowledge of finance is too limited to understand them or be of any more help in interpreting them. You will find their author, Mr. Ibrahim Pandarou of Casablanca, most willing to aid you, however. You need only ask him when the time comes.

"And now," she said, gathering up purse, case, and purple cape, "I shall return to my party. I wish you *bon chance.* It is now up to you. I shall not contact you again."

Hunter scrambled to his feet and tried to stop her or at least thank her for her help, but she moved swiftly to the door and was gone. He seated himself again and picked up the brown envelope she had just left.

"For Mr. Nathan Hunter. Room 1217. Official Business. To be opened only by the designee."

"Well," he said to himself, "it's either a bunch of old newspapers or a break." He felt a childish urge to cross his fingers for luck.

Hunter untied the figure eight string-closing and reached inside. There was a thick wad of paper. He pulled it out and looked closely. Pages and pages were covered with close, fine type, notations made in a spidery, unfamiliar script in English, French and Arabic, photostats and xerox copies of bank statements and other business documents. It would take days and a good translator to get through it all. Besides he could hardly read it here. Lighting at The Tin Angel was dim even by barroom standards so as not to detract from the view outside the glass walls facing the river. Frowning, Hunter held the first few pages up to the ineffectual light of a red-glass candle lamp and reached into his coat pocket for his reading glasses. His hand felt instead a large business envelope. His letter to Washington. He'd forgotten to mail it. He pulled it out. The flap wasn't even

THE ANALYTICAL LABORATORY/March 1976

The AnLab is your chance to tell us which stories you like best, and thereby reward your favorite authors with solid cash. It works this way: send us a card or letter with a list of the stories in each month's issue, ranked in the order in which you preferred them. We average the votes and publish the results here. The story that comes closest to having an average of 1.00 (which would mean it received a first-place vote from everyone voting) earns its author an extra one cent a word: $100, in the case of a 10,000-word novelette. The story in second place receives a half-cent extra per word.

Place	Title	Author	Points
1	Children of Dune (Pt. 3)	Frank Herbert	1.694
2	A Penny's Worth	Stephen Robinett	2.205
3	Field Test	Keith Laumer	2.410
4	Blessing in Disguise	Herbie Brennan	3.513

sealed and then he remembered he'd thought of adding a quick note on the meeting before he sent it off. There was space on the last page and he got out a small ballpoint pen and started to write.

"I've met the lady and received the papers. It's a hefty packet and will take some looking into. I'll have reported by phone by the time you get this, but I want to get it down while it's fresh.

"The lady was full of surprises. Besides these papers, she gave me the news that there is a direct connection between Golden Bull Mining and my prime job here—the electric utility stock accumulation. According to my lady who, by the way, insisted on anonymity, Clinton Tauroman is the man behind both schemes."

In short, concise sentences Hunter sketched out the details of what he had just heard and of the woman who had just spoken with him. He closed with . . .

"There can't be many visitors (She kept saying 'your country,' not 'our country.') who fit her description. And if she's good enough to do what she says she's done, *someone* must know her."

"May be back in DC before this reaches you. That's it for now. N. H."

Hunter sealed the envelope and signaled the waiter for his bill. Outside he saw a mailbox on the corner. He strode over, dropped the letter in the box and then retraced his steps to the incline station.

"You're just in time," the stationmaster told him. "Car's just about to leave."

"Thanks. Good night."

"Good night."

He was alone in the car and took his favorite seat at the far end. Then he tried to relax by watching the river come closer and closer but it had been an exciting day and was going to be an even more exciting night. He planned to spend a good share of it with the reading his anonymous lady had brought him. He rested his hand more firmly on the slim leather case into which he had slipped the manila folder. What a break!

The old hand-rolled glass near his head shattered suddenly into a spiderwebbed pattern as the bullet pierced it. Nathan Hunter was dead even before the quaint little car bumped to a stop at the bottom of the incline.

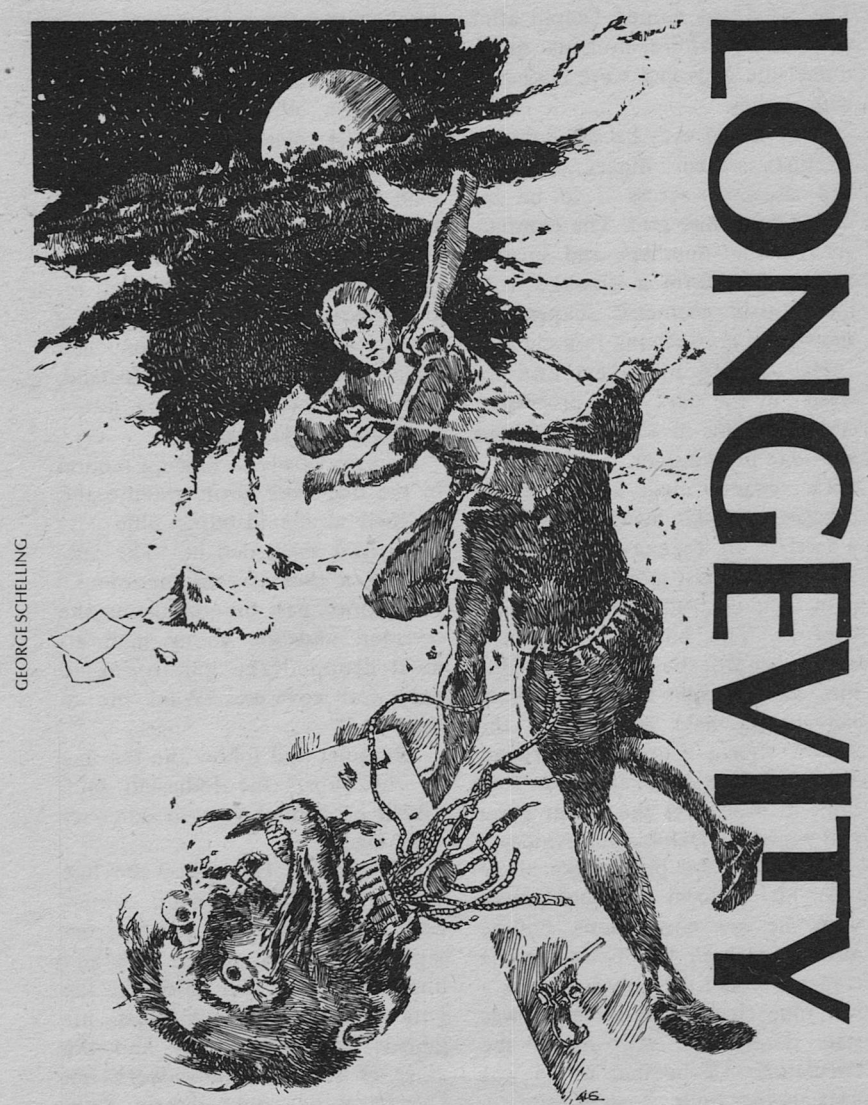
Across the street, Hole Jones slipped the high-powered rifle into its worn leather case. It had been an easy shot for a West Virginia mountain man.

"Hell," thought Jones. "That was easier'n picking off a gopher. It was worth tailing that black son-of-a-bitch all week to get a shot like that."

Hole gave his rifle a satisfied pat and then started his car.

"Well, he won't bother the boss no more."

TO BE CONCLUDED



LONGEVITY

GEORGE SCHELLING

When we make radio contact from intelligent extraterrestrials, chances are they'll be *very* much like us.

SCOTT W. SCHUMACK

The place was named Delphi after the oracle where mortals questioned the gods and were answered with riddles.

With closed eyes he still saw the terminal screen. Binary numbers had streamed across it to be replaced by a fine grid. The computers read the numbers, and squares darkened to form a message from the stars in geometric shapes like snowflakes crystallizing in a cloud.

He opened his eyes, and he wasn't in the dark data processing center; he was in a dark storeroom with one locked door.

Lieutenant Calvin Sanger lay in a corner with his head pillowed on a carton of freeze-dried apple slices, conscious more of physical pain than the agony of defeat and capture. The back of his head ached where the guard had hit him, and his right hand stung from the surgery he'd had aboard the Allied Space Command cruiser *Powers* before he'd dropped from orbit to dash over the Lunar plain and penetrate Delphi Observatory.

His watch had been taken along with his uniform and equipment while he was unconscious, but he guessed an hour had passed in the coolness where the only light was a soft blue chemglo and the air was stale despite the whirring of the circulators. All he had to do was wait another hour.

The door slid open with a hiss and yellow light poured over crates, tanks, and Calvin Sanger. Cal blinked and saw a young man in a Delphi jumpsuit holding a recoilless rocket gun as if it was a rattlesnake. "Dr. Wilkinson will see you now." The voice almost cracked.

Past him Cal could see another man who might have been his twin despite the darker complexion. They both looked nervous and impressionable; just the sort of recruits Wilkinson had been picking for his staff. Cal decided one had been sent to hold the other's hand, like schoolchildren carrying a notice between classrooms.

He rose slowly, a flowing motion in the one-sixth Earth gravity, and brushed at the ill-fitting blue coveralls he'd awakened in. "The doctor has a crummy waiting room." He stepped past the guard into the corridor, and the young man almost dropped the gun trying to keep Cal covered. "Want me to take that?"

"Be quiet and follow the red line on the floor," the Indiasian said, "We'll be behind you, so don't try anything."

Cal nodded. He trailed the line he knew led to the main conference room down the narrow passage carved from native rock and lined with pipes and wires like the guts of a mechanical beast, his guards following. They had the grace of skilled Moonwalkers, but Cal knew he could disarm them easily. However, he was more interested in patience than heroics, and far more interested in the chro-

nometer they passed at an intersection. It was 10:00, and he had slightly less than an hour to go.

A ramp took them to the brighter, wider, plastic-paneled halls of the laboratory levels, but they met no one; the largest observatory in the Solar System seemed deserted. Once Cal heard a door slide shut behind them, and he guessed the staff was huddled together, waiting for their leader to solve everything, and daring only glimpses of their enemy.

He'd sighed with relief when they left the maintenance and storage levels, hoping his guards wouldn't hear. The underground passages reminded him too much of the tunnels under the old gas works, particularly the one he'd walked with his sister's body bloody and crushed in his arms.

The guideline led through a transparent tubeway joining their dome to the one where Wilkinson waited, and Cal stopped, his guards shuffling their feet beside him, to let the view smother memories that still stirred.

They were on the edge of the observatory complex, and Radio Crater lay on the close horizon, a glittering jewel box creation. Cal remembered circling it in a rocket jeep five years ago; he had felt like a fly passing a dew-shining web with the focal assembly a fat, long-legged spider in the center. Sixteen-thousand square kilometers of aluminized plastic sheets covered the crater floor to make the largest radio telescope in history. Lesser telescopes and antennas girdled the crater like gems strung on an invisible necklace, thinning gradually into the mushroom patch of living domes and laboratories.

A few hours ago he'd come over the pale gray rock and crumbly brown soil in long, low leaps, his air recycler gurgling gently and his pressure skin tight over his body, to break into an emergency air lock and rifle Delphi for secrets it shouldn't have.

His eyes rose to Farside's night sky. Earth had never shone on that ebony sheet with its scattered icy stars, but three hundred light-years in the general direction of Ursa Major a planet quite like Earth orbited a reddish G8 star. Voices echoed over the parsecs on the twenty - one - centimeter wavelength of hydrogen, and here, shielded from the electronic noise of Earth by the Moon's mass, Radio Crater had listened in the vacuum clarity and proved humanity wasn't alone in the Universe.

"You made the greatest discovery in history," Cal said. "What are you hiding? I saw a handful of numbers. What are they that you should break the law and risk the Directorate's wrath?"

The dark guard ignored him, but the other pursed thin lips and said, "I don't know."

Cal shrugged and led them into the other dome. What bothered

him was that he believed what he had heard.

The door closed on the guards and Cal walked into the conference room to the sound of shouts and stamping feet and the scent of lilacs. Andrew Wilkinson stood beyond the long table watching a large telescreen. His narrow back was to Cal, who waited silently for the next move.

The screen held newscast film of the latest food riot in the Northwestern Metroplex. Bluish coma gas rolled over the twisted faces and writhing bodies packed into the narrow streets, and the shouts became screams and died. Wilkinson fingered the control box to change the image to live coverage of the debate at the World Council Center. The trade minister of the Southern Federation was threatening new taxes on South-based Northern industry, and the Northern Alliance was threatening military retaliation. Wilkinson shifted the screen to a limited animation Ursan landscape.

His voice was firm and sharp; his English accent had died long ago. "If I could amputate human passion I'd do it in a second."

Frail and slender in dark tunic and hose, he turned to Cal. In the wrinkled, expressionless mask of his face only his darting black eyes were as much alive as his voice. "Sit down, Calvin."

Cal took a seat at the table as Wilkinson walked to the bar against the wall and took a squeeze bulb of water. His movements had the halting perfection of an ancient clock ticking away the seconds, but he wore a black market ASC rocket pistol on his belt.

He drank and put the bulb down. "Why did they send you, of all people?"

Cal turned from the hard black gaze. "I know the observatory and the Ursan code, and I know you, Dr. Wilkinson."

"When will you learn to call me Andrew? If only the war hadn't taken you away."

"Would you have made me a trained pet like everyone else here? Did you think you could populate Delphi with incompetents and yes-men so you could rule like an autocrat and not have it noticed?"

"The truth had to come out eventually, and maybe it's best that you were the one to find it." He looked to the picture window framed with purple and white flowers where Farside lay cold and desolate. "I suppose they're waiting for you."

"If I don't meet our hopper in three hours this place will be swarming with marines. I doubt if your children can hold off an attack."

"You'll make your rendezvous." He sat down across from Cal. "How much do you know, or what do you think you know?"

Cal was a short, stocky man, but he was a head taller than Wilkin-

son and had twice his mass. A touch of radiation sickness in the Second Space War had thinned his fair hair and made him look more than his twenty-seven years, a tendency countered by his bright blue eyes. There was no mistaking Wilkinson's age; his hair was gray-shot and his pale skin worn and spotted.

"I was in your data center for hours before your sentry caught me. I know you haven't had contact with Ursus in four years—that's what made us suspicious. The counterfeit messages you were releasing to Earth were good but we could still tell they were fakes. The papers your people have been publishing have been too obviously rehashes of old material."

"I feared that, but there was no other way." The wall behind Wilkinson held the emergency shelter; the bright orange border around the door framed him like a halo. "What does the Alliance Directorate think we're doing?"

Cal grimaced. "They think you're collaborating with the South on some superweapon from Ursan plans. I told the Intelligence Board how stupid that was and got them to assign me to a solo reconnaissance mission instead of raiding Delphi."

"Thank you. I know you broke the data lock on my private memory bank—you were our best computerman. How much did you understand of what you saw?"

"I know it was a physical formula of some sort. Can you answer some questions? What did the Ursans tell you that you don't want published? Why have they stopped broadcasting? You said interstellar communication was like a religion to them."

"They also worshipped other gods." He silenced Cal with a chopping gesture. "Before I answer, tell me this; do you think I could harm the human race?"

Cal stared at him, and he remembered the years he'd worked at Delphi under Wilkinson before being drafted. Wilkinson had gotten him into the Science Academy and had him assigned to the most important project at Delphi, Star Reach, the search for alien intelligence.

Wilkinson had fought to make Luna a neutral zone for scientific research. That effort had won him the last Nobel Peace Prize awarded and the directorship of Delphi. Six years before he met Cal the Federation battleship *Bolivar,* crippled in the Battle of Farside, during the First Space War, had crashed into the Lunar surface near the gravitational telescope Wilkinson had been inspecting, killing him.

He'd been revived and healed with prosthetic bones and muscles, but artificial organs hadn't changed him. He was still the man who'd searched the stars for guidance for humanity and dedicated himself to using knowledge for human good.

"No, what you're doing may be

wrong, but your motives must be good."

"Five years with the Space Command haven't changed you much. What you saw on that tape is known only to me. Everyone else alive who ever saw those formulas has had their memories of them erased. The people here know only that we must guard them with our lives."

Something had bothered Cal ever since Wilkinson had turned from the telescreen. He realized the old man was no longer struggling to put expression into his artificial face muscles or his metal braced posture as he had five years ago. Something seemed to have drained the life from him, except for his taut voice and blazing eyes. "What are those formulas?"

"They are the secret of total conversion of mass into energy. They came in the first batch of messages after the basic symbols. If you had stayed here just another month you would have been with us when we received them."

Cal felt as he had in his initiation to free-fall. He was dizzy, disoriented, and enthralled. "Is it practical? Can we use it?"

"Yes. It is a means of generating nearly unlimited power with almost no waste. Fission is a wet match compared to it, and even fusion power—if we ever learn to control it on a large scale—would be nothing in comparison. That's how the Ursans generate a strong, omnidirectional signal; total conversion powers their transmitter."

"I thought total conversion was impossible, like antigravity."

"Everything is impossible until someone does it. By studying quasars the Ursans learned that the central black holes of some galaxies can become linked to similar holes in galaxies in an antimatter universe opposite us on the time axis. Matter is exchanged, mutual annihilation occurs, and energy is released.

"The formulas tell how to generate a catalytic field that links the subatomic black holes composing matter to their equivalents in the anticosm. This can put a miniature quasar in every power plant."

Cal barely heard him. He recalled his parents' tears and his childhood hunger. His older brother had died in a raid on a Southern oil refinery, and his sister had been crushed by collapsing ruins while hunting scrap metal. He had fought to enter the Science Academy and escape the poverty that gripped most of Earth, and he had failed until Wilkinson noticed him.

Cheap, clean, limitless energy couldn't change the past, but it could keep it from happening to someone else.

"Why are you hiding this?" Cal's hands tightened into fists. "Why didn't you tell the Directorate, the World Council, or anyone?"

"At first we felt the way you do,

Calvin." With the inexorable strength of a vine growing sunward in a time-lapse film, Wilkinson's hand rose to rub the loose flesh around his eyes. His voice fell to a whisper from his electronic larynx. "We saw only the benefits of conversion power. We thought we could cleanse the air and water, mine the planets and make them paradises, build starships and learn the secrets of nature, and above all, build a decent life for everyone. Then the Ursans stopped transmitting.

"We didn't release the initial news because we hoped the Ursans would elaborate the basic formulas, tell us about generators and such, but after the messages stopped we panicked. With the new war brewing we were afraid the Directorate would close Delphi if they learned our one contact was lost, so we began faking messages. That went on a year, and then we received the last message anyone will ever hear from Ursus.

"It was sent by some last survivor who fought through a devastated world to tell the stars that his people had destroyed themselves in a nuclear war."

The wallscreen showed an Ursan landscape from the first year of messages. A jungle like a huge coral reef covered a blue plain under a pinkish sky laced with white cloud. A city like a sculptured glacier lay on the horizon, and shapes like slim, mobile tree stumps moved along the jungle's rim.

"I suppose that war was fought with conversion weapons," Cal said slowly.

"Weapons are always easier to forge than tools. The Ursans discovered conversion power a year before they began broadcasting. Even as they were shouting their glory to the heavens they were arming with conversion bombs and annihilation rays. They had great technology, but they also had separate nation-states, race hatred, and vast extremes of wealth and poverty. They were like us. Some spark ignited a holocaust that consumed everything."

Cal imagined molten continents and an atmosphere set afire, but his own memories were more real. "So you're suppressing the formulas because you're afraid we'd use them to destroy ourselves."

"I *know* we would. The last two wars did nothing but build more hatred and pour our resources into space. Earth *must* not have this knowledge. Some of my colleagues disagreed. Remember the cave-in we had in the new tunnels three years ago? I hated it, but I had to do it. Don't make me do it to you."

Cal's eyes widened. "You were the most civilized man I ever knew." He shook his head. "What do you want me to do?"

"We've built a brain manipulation lab here. Let us erase the formulas from your mind so they

couldn't be pulled out of you through deep hypnosis. Any competent physicist could reconstruct the formulas from a few symbols if he knew what he was looking for. We'll plant the idea that we were faking messages to conceal a temporary malfunction in our equipment, and that is what you'll tell the Directorate. They're devious enough to believe it." He sighed heavily. "It will be easiest if you cooperate. We'll have to overcome your Space Command conditioning."

From the corner of his eye Cal read the chronometer; there was half an hour left. "I won't cooperate." He leaned forward with his palms on the table. "Dr. Wilkinson, Earth must have that knowledge." The plastic was cool under his hands.

"Why? So we can melt our planet as the Ursans did? Believe me, conversion weapons could be built cheaply and easily by even the small nations, and with modern espionage not even the Alliance could keep the secret more than a month."

Wilkinson pulled a small control box from his breast pocket. "This button will instantly erase my private memory bank." He replaced the box and put a pale hand over his artificial heart. "If Delphi is captured I will erase the tapes and turn myself off. The knowledge will die with me—no one will probe my brain. That's how sure I am of what I say. Don't doubt me, Calvin."

"I don't, but I disagree with your reasoning. If we're ready to fight again it's because of thirst and hunger. You've let fear blind you; if conversion power is as great as you say it can build a world in which we won't have to fight."

"Let me teach you fear, though I'd prefer to call it guilt." Wilkinson pulled a terminal over and his wire-tendoned fingers tapped a staccato rhythm on the keyboard. He swung the little screen around so Cal could see. "Recognize this?" The screen read, $N = R^* f_p n_e f_l f_i f_c \cdot L$.

"It was in your lectures at the academy. It's the old equation for the number of civilizations in the galaxy capable of interstellar communication."

"Yes, where N is the number of civilizations, R^* the rate of star formation, and so on. The only factor we don't understand fully is L, the longevity of a technological civilization. We have had only two examples, the Ursans, who've destroyed themselves, and ourselves, and we could commit planetary suicide anytime. The value of L seems very low.

"There's a perversity in intelligent beings, a will to destruction. If anything the Ursans were saner than we are, and they couldn't stand total power. If we have it we'll cut our lifeline out of reality in a great flash." He cleared the terminal.

Cal shook his head. "You're wrong. We've fought to steal each other's resources, not because of some death wish. If conversion power can feed the world we won't fight anymore."

"You are a naive fool," Wilkinson said coldly. "Physical poverty is the least of the reasons men fight."

"What do you know about it? My family was one of a hundred trying to live in the hulk of the old American natural gas complex on the western plains. We scavenged metal from the ruins when we weren't digging out of the latest cave-in. The air stank and the sky was dark with old ashes. I've seen old people and children fight over rotten food. I swore I'd escape that hole even if I had to work on a scum boat sifting edible algae from that sewage pit we call an ocean.

"We murder over puddles of oil, clods of coal and uranium, and square meters of arable land, and you say conversion power would kill us! If war is inevitable who cares if we fight with fission bombs or annihilation rays? At least with conversion power we have some chance of saving ourselves."

Wilkinson's reply was soft and quiet. "You think the problems of your time are the worst of all time, but they aren't." He ignored the sound Cal made at the back of his throat. "I was frozen after death and sent to Earth for revival. I was shocked when I left the hospital and saw Earth after years on Luna. I hadn't known things had gotten so bad. The war hadn't touched Earth, it only looked as if an army had raped the planet. I wasn't ready for underground cannibalism, mass sterilization and old-age euthanasia for the poor, or the tyranny of mobs and frightened leaders.

"Then there was my son. I had tried to get him to come to Delphi, but he believed the admirals who said the war would be a chess game in space, that all we had to do was outmaneuver the Southern fleet and demand bread from their people's mouths. He was my only kin, and he was killed aboard the ship that disabled the *Bolivar.* I wondered if I shouldn't die again.

"Then I saw that life went on. People still worked, played, and complained. It is terrible, but there's nothing so horrible we can't adapt to it and survive as long as we don't destroy ourselves. We'll endure, Calvin, and that is why I must guard the conversion formulas until we have the wisdom to use them well and search the stars for a race that has withstood our troubles and can guide us."

"Will we want to survive if things get much worse?"

"We have hope, as I had hope." His eyes locked onto Cal. "You resemble my son so very much, Calvin."

Cal's eyes screwed shut. "Spare me that. I thought you helped me because of my ability, not out of

pity. If I ever had a chance to pity you it's gone. You've killed and lied, and Andrew Wilkinson would never have done that."

"Do you think I like it? It was what I had to do."

"Why? Who gave you responsibility for all mankind?"

"It was thrust upon me. If I let someone else decide, like your Directorate, I'd be guilty of mass murder for my cowardice. I never wanted power, but I must accept it."

"What if you're wrong? How many people have starved while you hid the knowledge that might have fed them?"

Wilkinson's head fell. With his eyes shut his face was a withered husk. "That thought is the worst of my punishment."

"Your punishment does nothing for the hungry. You're insane with grief over what happened to your Ursans."

"What does your sanity tell you to do?"

"Tell Earth everything." He silenced Wilkinson with a gesture before he could object. "There'd be danger, but we're in danger now. The good, sane men in the North and South will have to control the maniacs who want war."

Wilkinson's laugh was a machine gun sound. His artificial face muscles had no expression, but his voice held contempt. "Your 'good men' would be the worst of all. Suppose we build a utopia, what about the idealists who know man does not live by bread alone when they've never been without it? What about the liberators who want to free their people? What about the messiahs who want to enlighten the heathen? What about the saints who know their vision of the future is the only right one? What happens when the good, sincere men who aren't satisfied with mere physical comfort and know it's their right to make others die for *their* beliefs get the power that smashes worlds?"

"Give Earth a chance to prove you're wrong, Dr. Wilkinson. How else can you be sure?"

"The proof will be worse than the wondering." He stood. His ceramic boned hand was steady on the pistol grip. "I had hoped we could avoid raping your brain, Calvin, but it's hopeless. We're going to the psych lab."

It was 11:00.

Cal rose, breathing deeply and slowly. His right hand was a fist with his index finger extended.

The bombs he'd planted in the solar accumulator and emergency reactor went off. They heard nothing, but the lights flickered, faded, and were replaced by the dim blue shine of the chemglos. The wall screen died.

Cal knew assault craft were arching over the observatory ejecting clouds of marines with rocket packs to search for hidden weapon labs and Southern agents.

"What?" Wilkinson's cry was a shriek of tortured machinery. He stared at Cal through the gloom. Someone pounded on the door.

"I lied. I couldn't stop the raid. They sent me to pave the way. *Give up, Andrew.*"

Wilkinson's arms were blurs of motion. He slapped the radio box through his clothes to erase the tapes. He drew the gun and fired at Cal. His free hand grabbed the edge of the table. The gun spat fire and air screamed behind the solid fuel missile.

Cal had dived to the right, taking one last breath to flush out his lungs. He tensed his hand muscles and the laser implanted in his artificial finger shot a pencil of ruby light that connected him and Wilkinson, then went out. He hit the floor, mouth wide open.

He had pointed at Wilkinson's right shoulder, but the older man's motion threw his aim off, and the beam sliced through the right side of his head and seared his face away. Wilkinson spasmed. His scream reached into the supersonic. He crumpled to lay still. The gun tumbled from his hand.

The missile hit the wall behind Cal and the explosive charge erupted into a ball of flame. The thunder rolled through the small room and deafened Cal instantly. He didn't hear the clang as the vent cover slammed shut, or the metallic shout as the overhead lights were torn loose to crash onto the table, much less the hurricane roar as the air gushed through the hole that was much too large for the automatic sealers to heal. The missile had hit the outer wall, and nature abhorred the absence of vacuum.

Cal had put an arm across the back of his head to keep the flame from his hair, and his coveralls were fireproof, but the blast singed his neck, hands, and ankles. The shock wave grabbed him and threw him against the floor. It was padded but he felt a rib crack. He bounced backward and threw out his arms to grab anything in reach.

The table was welded to the floor; he gripped a leg with both hands. A storm wind was trying to pull him into vacuum. The escaping air caught every loose object and whipped it outward. Papers pelted Cal's face. A drinking bulb brushed his leg. He saw the terminal lifted and carried away. Then the wind stopped.

His arms ached unbearably. Past the pain soaking him he felt his skin tingling and the sharp cold as his body moisture was leeched into space. He released the leg and rolled over.

He blinked. His eyes stung but he saw it, the worse thing an astronaut can see. It was naked space without window, faceplate, or view screen. Pure blackness lay behind the jagged hole a meter across that had been torn in the thin wall. He could see another dome some dis-

tance away—the psych lab? Air condensed in the dome's shadow and made a wispy cloud. Sealing jelly bubbled impotently from between the plates, shredded insulation, and dead wiring.

He'd guessed right. Wilkinson had fired an explosive missile instead of a hypo or solid slug at the last minute to make sure of killing him. Only his speed and intuition had saved him.

Calmly, moving just quickly enough, he stood and walked around the table toward the emergency shelter. His lungs ached as much as the rest of him, and he felt rather than heard the pounding of his blood, but he had a good chance for life.

As a Space Command trainee Cal had spent thirty seconds in a vacuum assembling a tri-dee puzzle. He'd hated it, but he'd done it. With preparation a trained man can stay conscious almost a minute in a vacuum. Cal was trained, and he'd prepared himself as best he could. All he had to do was enter the shelter, press the switch that would flood it with oxygen-rich air, collapse and await rescue.

He was a meter from the door when something caught his left shoulder. He almost panicked and screamed into the void, but he still had many seconds left. Something must have been torn loose from the ceiling and dropped to hook him. He turned his head.

Andrew Wilkinson's corpse had reared up to grab him.

Only his will to live kept Cal from curling up like a fetus to close out the sight.

Half Wilkinson's head was gone, and his jaw dangled unhooked from his skull on one side. What was left of his face was an open wound with bubbling fluids. His left eye was dead, but the right sparkled at Cal through the airless clarity. The pale blue light silvered him.

The artificial organs would not let him die. His atomic heart pumped fluorocarbon blood that wouldn't boil into the vacuum. The batteries fed current to his wire muscles. Implanted packets spilled drugs that kept him conscious with half his brain gone. The left side of his body was dead, but he'd locked his hand to the table to keep from being pulled out of the dome and risen on his right leg to grab Cal with a metal-ceramic claw. He was dying slowly and in great pain, but all he had to do was hold on a few seconds.

Cal grabbed his little finger and tried to bend it backwards. He might have been holding wrought iron. An attempted judo break also failed; Wilkinson seemed knitted of steel.

Cal stuck his right hand under his arm and used the laser to sever Wilkinson's arm at the elbow. The grip relaxed and the lower arm fell away, and suddenly Wilkinson was

clubbing Cal's head and back with his stump.

Cal fell to his hands and knees. Black dots swam across his vision and he felt faint. He looked back and saw Wilkinson bending his right leg, the dead left leg sticking out stiff and hard. He was going to jump and kick Cal's back. He couldn't move from the table, but he didn't have to.

Cal turned, half-rose, and lasered off Wilkinson's head.

The body jerked like an engine turning over and the battered head fell away, nightmare slow in the low gravity. Fluids pulsed from the neck and wires sparked. The limbs froze.

Cal felt ready to explode. He stepped into the shelter and hit the switch. He felt the cold air blast over him but he didn't hear his hoarse wail of pain, horror, and revulsion; he imagined it. He fell backward and passed out.

When he awoke his nose was bleeding. He was slumped in the little chamber and when he moved he coughed up bloody phlegm. Fumbling at the medikit, he injected himself with anything that seemed half-appropriate. His pain eased as the drugs coursed through him. He spread cream over his singed skin and bruised shoulder. His rib hurt, but he'd lived.

He lay back, lungs still heaving, body numb and stiff, unable to hear himself breathe, but he heard his thoughts.

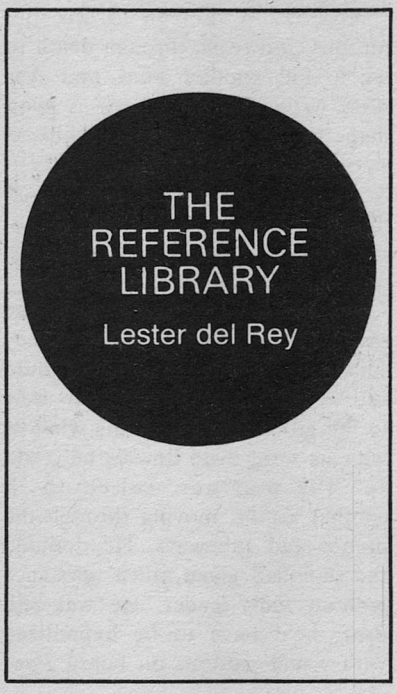
Andrew Wilkinson could lie, murder, and reach through death to try to kill another man, and Andrew Wilkinson had been a good man. Calvin Sanger could kill to save his own life, and Calvin Sanger had thought he was a good man. What about the other good men who could do horrible things for what they believed?

A few minutes later he left the shelter in the clumsy emergency suit with a coil of rope he would use to lower himself out the hole to the ground. Through the window with its torn, dead flowers he could see the marines, inhuman in combat armor, moving through the domes and tubeways. He doubted the staff had given much resistance without their leader. He was still deaf; he'd have to be hypnotized with visual patterns on board *Powers.*

Wilkinson's body stood on locked legs. His head had rolled under the table. His right forearm lay on the floor, fingers spread wide. His flesh had withered around the plastic and metal within, and he looked like a scarecrow that had been in a cyclone.

You wanted to teach me guilt, Cal thought, *and you did. Is this how it began for the Ursans?*

He walked toward the hole. The first battle of the final war was done, and he wasn't sure it was the last battle. He still thought he was right, but he was much less certain now. ■



SOMETHING OLD,
SOMETHING NEW

There seems to have been a sudden upturn in the quality of novels being published in the field. Many of the classics that have been too long out of print are being reissued; in some cases, related books are being brought together under a single cover. And the quality of the new works improved remarkably recently, if one judges by the best and forgets the rest. 1975 produced far more good books than most previous years, and 1976 already promises to bring us an even larger crop of excellent novels.

I keep track of this largely by what happens to my shelf space. One section of that is reserved for those books, both old and new, that I want to read again. That has been going through constant change. I keep having to expand it to handle new volumes, and the ancient dog-eared books that I'd lost hope of replacing are constantly being changed for new and most-welcomed reprints. As a matter of fact, I've had to buy a new wall of shelves to provide for my expanding sf library.

(To complete the quote in this month's subtitle, there is still something borrowed and a little of something blue. A lot of books are nothing but rehashes of old ideas, lacking either new material or really new treatment; probably most novels in any field represent such borrowing. And some writers still think that sex is so shocking that readers will grab up anything labeled slightly blue; but this trend in science fiction is happily on the wane, and most sex in today's novels is kept to its appropriate treatment and place.)

Unfortunately, I find myself unable to devote as much space to some of these books as I'd like, simply because I'm falling behind already in reporting on what I have read.

One auspicious sign for 1976 is the appearance of a new novel by Arthur C. Clarke, which is always major news. His previous novel won every sf prize for the year and its sale was remarkable, despite the

fact (or because of it, perhaps?) that it was a "hard science" story.

Imperial Earth (Harcourt Brace Jovanovich, $7.95, 303 pp.) is a much different book. There is still enough scientific speculation to delight those who like hard science and engineering, but the emphasis this time is on the human side of the story. Clarke has said that he considers it his best novel, and I suspect that a great many readers will agree with him.

The book takes place in 2276, during the celebration of the fifth US centennial celebration. And while it's obviously meant to take advantage of our current bicentennial, it's done so well that there's nothing opportunistic about it.

Duncan MacKenzie has grown to maturity on Titan, the largest moon of Saturn. He's sort of the grandson of the still-living man who was largely responsible for settling that most interesting world. (Sort of—because the original MacKenzie is unable to have children. Duncan is actually a clone from the clone "son" of the old man.) Now that Duncan is fully mature, it's time for him to continue the MacKenzie tradition by securing a clone offspring for himself, since this is the only way to continue the line. But cloning can only be done on Earth; returning there is both extremely expensive and very difficult; the difference in gravity between Titan and Earth will impose quite a strain on Duncan.

The problem of expense is solved by a request from Earth that Duncan shall appear there to speak during the celebration as a representative of his world. Despite the difficulties, he goes. And we get to see a fair sampling of Earth three hundred years from now. Unlike far too many writers, Clarke isn't crying gloom over the future of mankind; he recognizes the problems we face in the future, but he also sees with full clarity the opportunities. And generally the novel strikes a nice balance between the good and the evil that lie ahead of us.

There is a great deal more to the novel. It isn't a mere travelog of future Earth, though that is part of it. There's a new type of spaceship (highly original in concept) to be examined, new problems facing the people of Titan, complicated human relationships, and some rather strange developments in the personal problems of Duncan MacKenzie.

My personal reaction was that the novel is a very good one, indeed—but less satisfying than his *Rendezvous with Rama.* In this, I seem to be at variance with most others who have read the book and who nearly all agree with Clarke that it's his best novel. I think that sf readers generally will probably also consider it the finest of Clarke's work. But read it for yourself, by all means!

Donald A. Wollheim has a long record of discovering major new writing talent. Over the last quarter-century, he has published the first books of more topflight authors than any other editor in the field. (Delany and Zelazny are two examples out of dozens.) Hence, I'm always interested when I see an

unfamiliar name on one of the books he edits.

The latest example is **Gate of Ivrel**, by C. J. Cherryh (DAW Books, $1.25, 191 pp.), and it's an excellent example. Cherryh is a fine new writer of adventure science fiction, and the book deserves attention. The characters are drawn with feeling and clarity, the writing is full of color and yet clean and direct (after the brief bits of "quotations" that set the mood). And the action moves surely, without any feeling of mere action for action's sake. Above all, the world Cherryh shows us is an interesting one, with a full sense of history and some rich bits of social development.

The gate of the title is one of those "star gate" things that have recently been popping up all over the field. Why there should be so many novels based on this idea is a mystery to me. I don't think most of the writers who use it are borrowing; rather, it seems to be one of the odd ideas whose time has come, and which has suggested itself to many people. Anyhow, in the past some race—and there are dark hints of their fate here—has developed gates that permit passage instantaneously from world to world, spreading mankind (and other creatures) across the galaxy. In this case, the potential for misuse exceeds the advantages, apparently. And we have characters sent out across the worlds to close the gates.

The story is told from the view of Vanye, an outcast from his tribe or nation (nothing here is quite simple). He discovers one of the "gate closers," a fascinating woman of mystery named Morgaine; apparently she was one of a party who long ago started an ancient war that ended in a tragic disaster that is still having ugly repercussions in Vanye's time. She entraps Vanye into her service and proceeds at once to set out upon her ancient mission, now grown trebly difficult and surrounded by both wonder and danger.

The trip across the strange world is richly imagined. And the peculiar relationships between the characters are always fascinating. Not only is there Morgaine for Vanye to contend with, but he also must handle his strange brother, Erij, in one of the best love-hate family struggles I've seen for some time. The ending is first-rate, and it leaves room for more—which I hope will be forthcoming from Cherryh. This is an excellent adventure novel by a new writer with exceptional ability.

Marion Zimmer Bradley is back with another new Darkover novel, this time one that is quite different from the others. **The Shattered Chain** (DAW Books, $1.50, 287 pp.) takes place early in the history of the rediscovery of Darkover by Earth. And Bradley is looking at her world from a view quite unlike that of the other novels.

Women have been somewhat neglected in the series, apparently. They are, in one aspect, the major power behind the Darkover culture—they are the ones who control the psi-jewels. But this applies to only a few. Most women are essentially subject to the men's whims,

as hinted previously but not really developed. This novel deals with three women. One is a "typical" woman who is married to one of the Comyn, the Darkover lords. To rescue a sister and niece from captivity, she is forced to hire the help of a band of Free Amazons, the women who recognize no male domination. The niece eventually chooses to become one of the Free Amazons, and she becomes involved with one of the women from Earth—where sexual equality has long been (at least technically) accepted.

There is obviously a lot of thought behind this novel. Bradley avoids the trap of making this another sf female lib book. Her Free Amazons are not the man-hating overdeveloped females the name might suggest. Her noble lady is hardly suffering from male domination. In fact, the novel apparently is an attempt to strike a rational balance between the needs of sexual difference and the desirability of parity between the sexes. In general, I found it achieved that balance in viewpoint, with no compromises toward any simplistic view. And the events that result from the entangled lives of the three "heroines" are all interesting.

However, I missed the magic of Darkover—the use of that magic is here somewhat scanted. And while there is considerable good plotting and a fair amount of action, this is a more leisurely and thoughtful book than the other Darkover novels. In some ways, it is probably a better novel than most of the others—but the sense of wonder suffers a bit. To all Darkover fans, this is a valuable look behind the scenes; but to others, I can only recommend it as good reading without my usual raves about Bradley's works.

Alan Dean Foster's **Midworld** (Science Fiction Book Club, $1.98, 179 pp.) demonstrates a growing skill by the writer responsible for the *Star Trek Log* series of books. Obviously, his novelizations of the television scripts haven't hurt his writing. Both his realization of character and his narrative skill are at their best in this story.

It involves a world with an ecology gone wild—a world where jungles grow through level upon level from the basic soil thousands of feet into the sky, and where all life depends on the trees that rule the planet. Men landed there long before and were savagely forced to make an adaptation with the planet. They have also struck up a somewhat symbiotic relationship with native beasts called furcots. (The life relationships on the planet are incredibly complex, as the surprising and excellent end of the novel indicates.)

Then men from Earth appear on the scene. Born, the hunter who is the hero, must conduct a small group from a crashed spaceship to their base. The dangers of the journey are well-realized, and what Born finds when he reaches the Earthmen's base poses a threat of still greater magnitude to his way of life. This is an excellent adventure story with a great deal more meaning behind it. I recommend it highly.

Roger Elwood called me up to discuss Laser Books, which he edits. According to him, the later books in the series are more typical of what he wants than the first seven which I previously reviewed. He sent me four, which he felt were better than any I had seen before. On the whole, I agree. They do average better. (However, they are selected examples, and I haven't yet had time to read all the books through #18.)

Two of them are somewhat routine but acceptable adventure stories, probably entirely suitable for the readers they are supposed to reach. (All sell for 95¢ each and have 192 pages per book.)

Falling Toward Forever, by Gordon Eklund, tells of a mercenary soldier who is caught up out of a battle and thrown forward in time. There he finds a decivilized future, which he begins to take over. Then he and some others are again thrown forward into a world of supercities. And again, just as things are developing, the group is tossed forward. The ending which shows why all this has a purpose is a bit gimmicky, but the writing is good—as Eklund's writing always is. Nothing outstanding, but a book that can be read without serious objections.

Seeklight, by K. W. Jeter, sets up a much more complicated situation. It takes place on a world sinking toward ruin, apparently once settled by Earth. There are sociologist observers and robot priests. And there is a young hero who is an outcast and who must seek his rightful place and find the secret of the world. All this is very well done. But as the hero begins to find the answers, the novel becomes much too contrived and needlessly "busy." Fairly good reading, however.

Blake's Progress, by R. F. Nelson, strikes me as the only bad book of the four. It attempts to explain (apparently, since there must be some reason for the book) the wild visionary poet, William Blake, by having him able to see creatures out of time or probability. But this is a story out of control, where so much can happen that nothing really matters. And in the end, rather than making Blake seem more understandable, this makes Blake seem merely petty and silly. Forget it.

The best of the four books is **Invasion,** by Aaron Wolfe—and this is generally a very good book. It shows what can be done with a familiar idea of science fiction when a good writer takes the trouble to look at it with fresh insight. This is the old business of invaders coming from space and trying to destroy Earth—or at least a part of Earth. But the action all takes place on a small, isolated farm during winter, with a blizzard howling outside the house. It involves one human family—a man, his wife and son. It's strictly their problem, and the development from discovery to final danger is logical and convincing. The ending is a bit weaker than the rest, but I recommend the book.

There are also a couple of old books that have been out of print too long and which are high on the

recommended list. The first of these is a bit more than a reissue; actually, **The Compleat Enchanter,** by L. Sprague de Camp and Fletcher Pratt (Ballantine, $1.95, 432 pp.) includes both the previous *Incomplete Enchanter* and its sequel, *The Castle of Iron.* This brings together for the first time all the adventures of Harold Shea that appeared in *Unknown* magazine. And they are truly wonderful adventures as Shea manages to magic himself into the world of the Norse gods, the trouble at the end of the *Faerie Queen,* and the complexities of *Orlando Furioso*—with a magic based on mathematics that he only partly understands. This is a classic example of fantasy that remains as fresh and enjoyable as when it was first written.

Little Fuzzy, by H. Beam Piper (Ace, $1.25, 174 pp.), is a most welcome reissue. I recently paid $10 for a battered copy of the original paperback book, just before this came out. It was money I considered well-spent. Piper was rapidly becoming the best adventure writer in science fiction before his tragic death, and his books have been out of print much too long. This tells of what happens to a well-established colony planet when men suddenly discover that some of the native life may be intelligent. Men are not supposed to colonize worlds with indigenous intelligent races. And now what happens to their colony? (The full answer comes in a sequel which is also being issued by Ace as *Fuzzy Sapiens*—originally published as *The Other Human Race.*) This is a really delightful book. If you don't have it, get it!

A Calendar of Upcoming Events

June 4-6, 1976:
KUBLA KHWANDRY (Nashville area SF Conference) at the Music City Rodeway Inn, Nashville, Tenn. Guest of Honor: Donald A. Wollheim; Master of Ceremonies: Andrew J. Offutt. Registration: $7.50 in advance; $8.50 at the door. Info: Ken Moore, 647 Devon Drive, Nashville, Tennessee 37220.

June 7-10, 1976:
National Computer Conference (IEEE CompSoc, AFIPS) in New York, New York. Info: IEEE, 345 East 47 Street, New York, New York 10017.

June 11-14, 1976:
D-CON (Dallas area SF Conference) at the Sheraton-Dallas, Dallas, Texas. Registration: $10 attending; $3 supporting. Info: D-Con 76, 2515 Perkins Street, Fort Worth, Texas 76103.

June 25-27, 1976:
MIDWESTCON 27 (non-programmed SF Conference) the original "relax-a-con" at the Quality Inn Central Motel, Cincinnati, Ohio. Info: Lou Tabakow, 3953 St. John's Terrace, Cincinnati, Ohio 45236.

June 25-29, 1976:
SF EXPO 76 at the New York Hilton, New York, New York. Toastmaster: Issac Asimov. Registration: $18.50 in advance; $25 at the door (attending); $10 supporting. Info: Science Fiction Services, 2 Church Street, Montclair, New Jersey 07042.

June 28-July 1, 1976:
Meeting of the American Astronomical Society at Haverford, Pennsylvania. Info: H. Gurin, 211 FitzRandolph Road, Princeton, New Jersey 08540.

September 2-6, 1976:
MIDAMERICON (34th WORLD SCIENCE FICTION CONVENTION) at Hotel Muehlback, Kansas City, Missouri. Guest of Honor: Robert A. Heinlein; Fan Guest of Honor: George Barr; Toastmaster: Bob Tucker. Panels, talks, masquerade, films; presentation of the Hugos and the John W. Campbell Award for Best New Writer. Registration: $25 attending until July 31, 1976; $6 non-attending. The committee is handling all room reservations so don't write directly to the hotel. Info: Post Office Box 221, Kansas City, Missouri 64141.

—ANTHONY R. LEWIS

BRASS TACKS

Dear Mr. Bova:

I am glad to learn from Mr. LaBelle's letter to you (January issue, p. 177) that the worst of the energy crisis would be over by 1990 if we but let him and others produce hydrogen. I wonder if he would be good enough to tell us whether he has discovered a hydrogen well or, if not, from what kind of energy he proposes to produce it by 1990?

I think it is about time we look a bit at this hydrogen economy fad before it becomes a cult. To begin with, it has nothing whatsoever to do with hydrogen fusion, the until-now unsuccessful attempt to open a new source of energy through the fusion of deuterium and tritium nuclei to helium. But it proposes no more and no less than to use hydrogen instead of coal, natural gas and oil and its derivatives, such as gasoline, liquid gas and fuel oil, for heating, cooking and powering our cars. Despite my facetious question to Mr. LaBelle, there are no hydrogen wells, and if there were any, they would soon be dry. I forgot to mention that the reason for this proposal lies in the fact that hydrogen on burning does not set free any polluting substances but only steam, and the originators of the scheme have forgotten that similar results may obtain—and as we'll see soon, with far less overall pollution—by using natural gas for heating and propane-butane for cars if and when we use alternate energy sources. Well, without wells, how do we get hydrogen? By electrolysis of water. This process is about 60 percent efficient. But producing electricity is in itself a wasteful process, about 40 percent efficient, so the combined efficiency is about 25 percent. In other words, when you heat or drive with hydrogen, you—or rather your power station—use up four times more fuel than you would by using fuel directly. Pollution would be less than four times as great because it is easier to control in a big power station, but cost would increase more than fourfold: prices for fuel would go up, if past experience is any guide, and to that we should add interest for the capital outlay. So far, so bad. Worse is to come: hydrogen boils at a very low temperature, so for fueling a car we should not only have to lug about a heavy Dewar double-walled tank, but also a still heavier rare metal hydride accumulator for taking up the spillover when idling or stopping. Our car would become a nearly unbrakable juggernaut. For re-accelerating it we would need rocket assists.

Anybody still for hydrogen? It also forms very explosive mixtures with air at nearly all proportions (five to 95 percent versus five to 15

percent for methane). It easily penetrates small fissures and cracks ignored by the bigger molecules of natural or coal gas, so for home use we should dig up all our pipelines and city gas nets, carefully test and repair all couplings, tube seams, valves and welds, change or modify all our ranges, boilers and heaters, and trust in God that householders will be careful. But accidents and car smashes will happen—and hydrogen thus blast us into Kingdom Come, by the busload and by the city block.

The perpetrators of this sorry hoax should easily win three important prizes: the Stalin-Lenin prize for wasting specialized person power and resources needed on energy and defense projects; the Arafat-IRA prize for hoisting us with a petard of our own making without any risk to precious terrorist lives; and the Oily Baba-Opec prize for fourfold boosting their blackmail power.

JUAN G. LOEWENSTEIN
Buenavista, 20
Alicante, España

William J. D. Escher, who authored "The Case for the Hydrogen-Oxygen Car" in our September 1973 issue, replies . . .

Dear Mr. Loewenstein:

No, there are no hydrogen wells. Hydrogen is thus quite analogous to electricity, not natural gas or oil, so far as its sources go. Observe: though electricity's usage is ubiquitous, there are no electricity wells either. So, like electricity, in the production, delivery and end-use of hydrogen energy, one can never get back all or even most of the energy one puts into splitting the water molecule in producing hydrogen to begin with. Most studies show that this energy conversion and delivery inefficiency, which shows up as so-called waste heat, is approximately that of equivalent-technology electricity generation, transmission and distribution.

Cost-of-energy, in the end the pragmatic measure of efficiency, also appears to be competitive between these two synthetic energy forms. Of course, both are significantly more costly than "coal, natural gas, oil and its derivatives." Look at the situation in the US. Per unit of energy delivered to the consumer, electricity costs over five times natural gas. However, today there is a critical shortage of natural gas while there is little shortage of electricity. Natural gas curtailments are ramping up each year. We are, in the long run, depleting this resource. On the other hand, electricity as a "manufactured" energy form (like hydrogen is to be) can flexibly use more plentiful fuel oil, and in the longer run, coal and uranium for its generation . . .

So, with fossil fuels being a finite, nonreplenishable energy resource, we must find a substitute fuel to complement the use of electricity as we move into the future. Besides, natural hydrocarbons should be reserved for petrochemical feedstocks and other priority uses. This industrial sector will always be able and willing to outbid the energy sector.

For all of these reasons, proponents of hydrogen energy do advo-

cate: ". . . no more and no less than to use hydrogen instead of coal, natural gas and oil . . ." Other than alternative synthetic fuels which still require a source of carbon for their synthesis . . . what proposal do you offer for "heating, cooking, and powering our cars" in the Twenty-first Century?

. . . Let's go now to your hydrogen-fueled automobile. This seems to be a favorite subject for speculation even though it is generally agreed that it will be a latter-day application area for hydrogen. Let me point out that several 190-liter (50-gallon) hydrogen "Dewars" have been successfully installed in motor vehicles with hydrogen-converted engines. These containers weigh *less* with a full load of hydrogen in cryogenic liquid form, than the gasoline-plus-tank weight required for the same driving range, in one case 450 miles. And these were first-of-a-kind units; they can be made lighter and priced within reach of the car buyer given production.

The alternative of metal hydride hydrogen storage—both cryogenic and hydrides need not be used in the same vehicle as you imply, although this too has been demonstrated—is a prospect requiring considerable future development. And a number of laboratories in the United States are at work in this area under ERDA and industry sponsorship. But actually, little of this effort is being devoted to your "rare metal" types. Rather, these are hydrides based on iron, titanium, magnesium and nickel materials.

Incidentally, there is never a need to vent hydrogen to the atmosphere from a vehicle under normal circumstances. A simple, inexpensive catalytic device can convert any boil-off gas to harmless water vapor. Metal hydrides need not vent at all. Better, one would use the small amount of hydrogen otherwise lost for its energy value. Battery-charging via a small fuel cell, for instance.

But, in spite of all these prospects, if you still require "rocket assists," there is no higher specific impulse rocket fuel than hydrogen as demonstrated by Centaur and Apollo.

Yes, "accidents and car smashes" will happen—hydrogen cannot intrinsically negate human error. And hydrogen *is* a dangerous substance. Were it not, it would not be a fuel.

Hydrogen's flammability range is four to 75 percent in air (as compared to five to 15 percent, by the way). But observe that it is the *lower* limit of this range which usually gets one into trouble. Consider the mechanics of a leak occurring in a closed building where a concentration is gradually built up. Hydrogen, from this standpoint, turns out to be rather more "forgiving" than such in-use fuels as propane and gasoline; the latter has a lower limit of 1.3 percent. True, its very small molecular size vis-à-vis natural gas (mostly methane) causes it to leak through a given crack or hole in a pipe or container at a higher volumetric rate. But hydrogen has only about one-third the amount of energy per unit volume, hence the *energy* rate

of escape turns out to be roughly the same as in the case of natural gas. It is this energy which contributes the potential for damage.

And hydrogen has a much higher rate of diffusion in air than methane, and being a very light gas, rises. Local pockets of ignitable gas at ground level, where ignition sources are found, would not usually occur as it might with, say, a propane spill. On the other hand, with hydrogen it is especially important to provide "high point" venting outlets in any closed space where there is a possibility of hydrogen escaping.

In closing, I can offer no cogent comment on the hypothetical prizes which you suggest for "the perpetrators of this sorry hoax" (that is, the hydrogen energy concept). In this general direction, however, I have arranged to have forwarded to you one H_2indenburg Society button for your expressed interest in the field. The Society promotes the safe use of hydrogen as a fuel, as noted by Mr. Bova in the September 1973 issue of Analog.

You pose the question: "Anybody still for hydrogen?"

I cast one vote "for."

WILLIAM J. D. ESCHER

Dear Mr. Bova:

Mr. Sauter's solar power article in the January 1976 issue is technically very illuminating to the few hundred thousand people that appreciate Analog. Very few of us will be able to install wind generators in suburbia or urbia and it will be a long time before the power companies give up their abortive romance with nuclear power. But there is a way for most of our power to unhook from the tankers that glamorize our ports and beaches. (Aside: Where does Henry Sauter find 2¢/kwh? My kilowatt-hours are 4¢, using 1,000 kwh/month!)

Suppose all municipal sewage were primary/secondary treated, then used to cool nearby 200-500 Mwe conventional combustion steam boiler plants. Then use the warmed, nutrient-rich effluent for year-round irrigation while ash and sewage sludge provide fertilizer so that otherwise unusable land can grow fuel fiber to feed the boilers. If the municipal trash is also used as up to ten percent of the fuel, and a revitalized coke/coal industry supplied the remainder, domestic petroleum would be sufficient to heat the homes, power industry, and move the vehicles until fusion and direct solar/electric are finished and ready for our cautious utility powermasters.

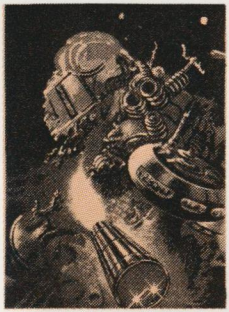
While I install my solar water heater, and look at designs for space heater collectors, I am hoping for a clever article on modifying an automotive freon compressor in a motor to turn alternators, so a low magnification collector (400 degrees) might yield 15 percent efficiency house power.

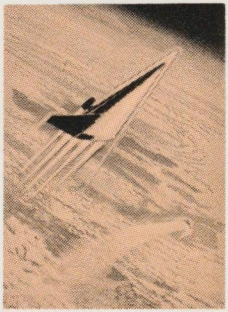
JON P. RAMER

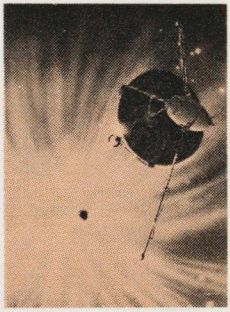
8969 Farley Street

Orlando, Florida 32811

Several communities are already turning garbage into kilowatts, and a few companies are making profits out of reclaiming metals from trash. As for the rest—any ideas, readers?







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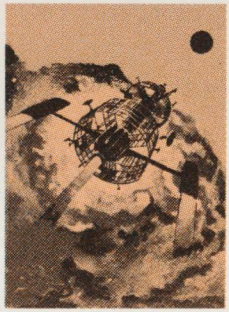

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