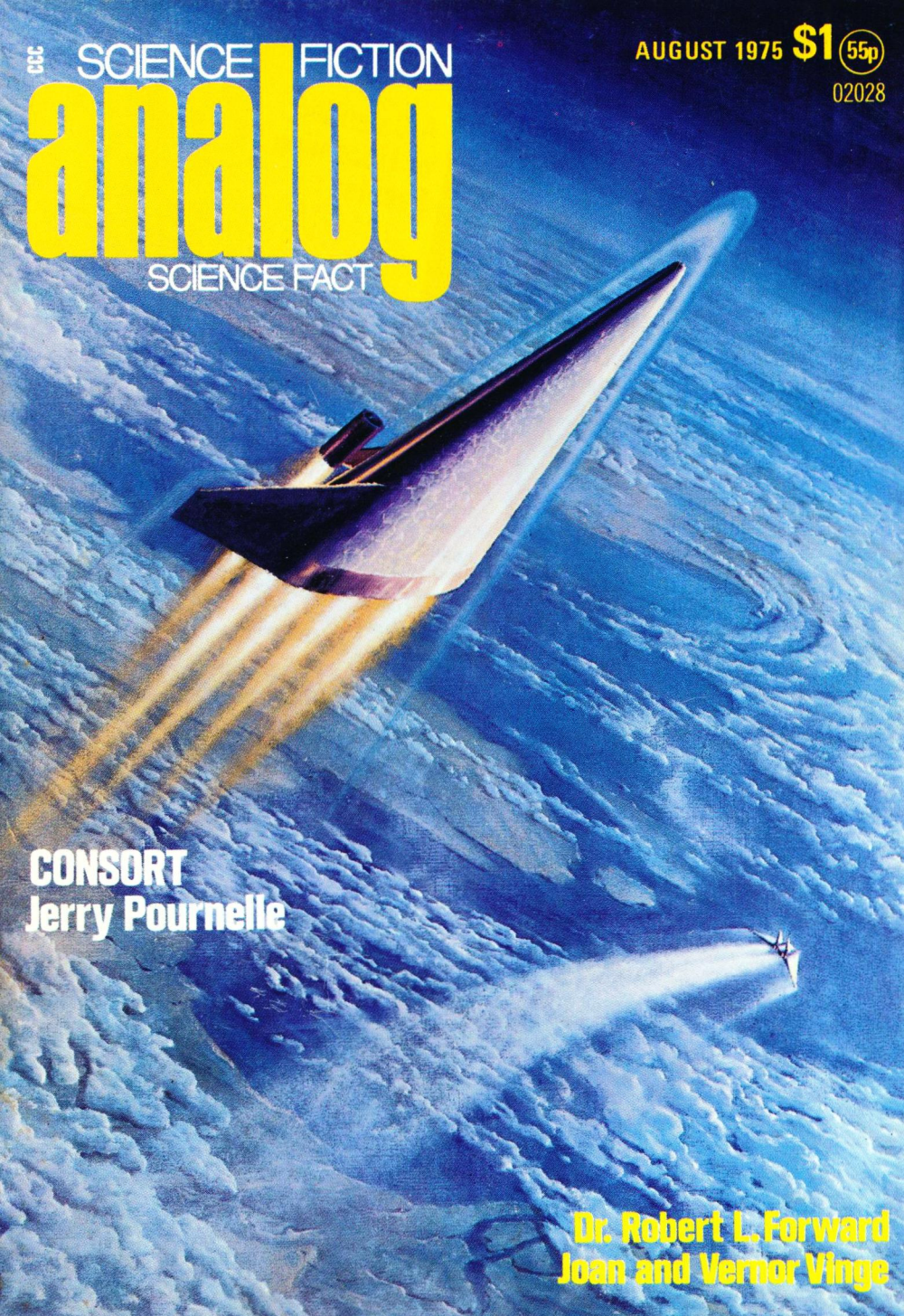

SCIENCE FICTION
analog
SCIENCE FACT
AUGUST 1975 $1 55p
02028
CONSORT
Jerry Pournelle
Dr. Robert L. Forward
Joan and Vernor Vinge

analog

A Calendar of Upcoming Events

August 1-August 3, 1975:
FAN FAIR III at the King Edward Sheraton, Toronto, Ontario. Guest of Honor—Lester del Rey; Fan Guest of Honor—Cy Chauvin. Registration: $10 attending; $2 non-attending. Info: Box 7230, Station A, Toronto, Ontario M5W 1X8, Canada.

August 17-August 20, 1975:
Meeting of the American Astronomical Society at San Diego, Calif. Info: L.W. Frederick, Leander-McCormick Observatory, Box 3818, University Station, Charlottesville, Virginia 22903.

August 28-September 1, 1975:
NORTH AMERICAN SCIENCE FICTION CONVENTION (NASFiC) at the Los Angeles Marriott, Los Angeles, California. Guest of Honor—Harlan Ellison; Fan Guest of Honor—Richard Eney. Registration: $7 during the summer, $10 afterwards. Info: 734 South Ardmore Avenue, Los Angeles, California 90005.

August 29-August 31, 1975:
FloridaCon. Info: Meade Frierson, 3705 Woodvale Road, Birmingham, Alabama 35223. (No other information available at press time.)

October 31, 1975:
Deadline for entries in the Second Annual New England Science Fiction Association SF Story Contest. Open to New England residents and NESFA members. Info: Box g, MIT Branch PO, Cambridge, Massachusetts 02139.

ANTHONY R. LEWIS

LIVE IN THE WORLD OF TOMORROW...TODAY!

(And our FREE CATALOG is packed with exciting and unusual values in hobby, electronic and science items—plus 4500 finds for fun, study or profit . . . for every member of the family.)

A BETTER LIFE STARTS HERE

SUPER 6" SPACE CONQUEROR

Superb Astronomical Reflector—Up to 576X. Capable of revealing faint stars of nearly 13th magnitude, split double stars separated by less than 1 sec. of arc. Features 48" F.L. aluminized & overcoated 6" f/8 ground and polished parabolic mirror (Pyrex®) accurate to ¼ wave, 6X achromatic finder scope, 3 eyepieces—wide field 48X Kellner, ¼" 192X Ramsden, & a Barlow to double & triple power—rack & pinion focusing mount. 47¼" aluminum tube. Electric clock drive w/manual slow-motion control. Setting circles. Heavy-duty equatorial mount. Pedestal base. Compares to $350–$400 models.

No. 85,086 (Shp. Wt. 68 lbs.).....$285.00 F.O.B. 6" WITHOUT CLOCK DRIVE...No.85,187A...$249.50 FOB

4¼" REFLECTOR (45X to 135X)

No.85,105A.....$149.50 FOB

4¼" WITH CLOCK DRIVE...No.85,107A.....$189.50 FOB

3" REFLECTOR (30X to 90X)...No.85,240A.....$ 49.95 Ppd.

KNOW YOUR ALPHA FROM THETA!

For greater relaxation, concentration, listen to your Alpha-Theta brainwaves. Ultra-sensitive electrode headband slips on/off in seconds-eliminates need for messy creams, etc. Atch'd to amplifier, filters brainwaves, signals beep for ea. Alpha or Theta wave passed. Monitoring button simulates Alpha sound; audio & visual (L.E.D.) feedback. Reliable, easy-to-use unit—comparable to costlier models. Completely safe. Comprehensive instruction booklet.

No. 1635A (8x3x4"; 24 oz.)....$134.50 Ppd.
No. 71,809A Low cost "starter" $55.00 Ppd.

THE FINAL OPTICAL ILLUSION!

Now you see it, but you don't. Put a coin, ring, rock, any small thing inside the unit—it seems to be resting on the mirrored top. Look at it, smell it, shine a light on it, even photograph it AND it's really there. Try to **touch** it, you'll get only thin air! You & everyone else will be astounded by this Parabolic Display Unit (it's science and art) that produces an amazing optical effect. Scientists call it a 3 dimensional real image. Very exciting!

No. 72,074A (w/4" dia. displ. stand).....$42.00 Ppd.

HI-VOLTAGE VAN DE GRAAFF GENERATOR

Electrostatic low-amp type. 200,000 volt potential, yet completely safe. Demonstrates lightning, St. Elmo's fire, repulsion of charges, electrostatic dust collection, many other electrical wonders. Meter, 110V, 60-cycle, AC. Humidity range, 0-90%. Current, 1.5 to 2.5 microamps. Aluminum base, frame and charge collector. Unbreakable plastic. Insulating column. Ht. 17" dia. 6¾". Full instructions.

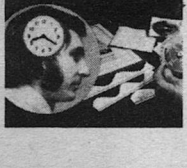
Stock No. 70,264A.....$72.00 Ppd.

TOTAL KIRLIAN PHOTOGRAPHY SET

Explore "aura" photography w/superb new **self-contained** Kirlian Electrophotography Research Unit. Terrific value—introduced at $99.95 ($140 in Sept.)! Has everything but vinyl photo changing bag. Ideal for color or b&w 35mm, sheet or Polaroid film for photos up to 5x7" **all without camera or lens.** Variable voltage 12v to 32kv. Ultimate safety design—fully encased in plastic; patented electronics. Instrs.

No. 72,104A (3x5⅞x7¾").....$99.95 Ppd.
No. 42,240A (CHANGING BAG)..$6.50 Ppd.

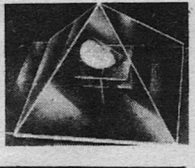
A 1-YR. BIO-RHYTHM ANALYSIS!



Know for the next **12 mos.** when to expect days of great energy & exactly when your physical & creative talents surface to do your best for happiness, success. Foresee your off days to avoid poss. errors or accidents! Personalized Bio-rhythm Chart-Report (by computer) gives you an accurate preview of your physical, emotional & intellectual high & low periods with variations, corresponding to your inner life. Send name, add., birth date (day, mo., yr).

Stock No. 19,200A.....$15.95 Ppd.

MYSTERY OF ENERGY AND AGING



Science fact or farce? Can our Great Pyramid unlock the mysteries of energy & aging—show that the ancient Egyptians contradicted nature? Did someone really get 85 shaves from a blade kept in a pyramid? Test claims like meat not rotting, things not rusting! Users of exact scale models of Cheop's pyramid oriented to true North claim all sorts of strange phenomena based on resonating energy. Ours is already assembled, ¼" see-thru acrylic, 6x9¼x9¼".

Stock No. 71,817A.....$20.00 Ppd.

MAIL COUPON FOR GIANT FREE CATALOG!

180 PAGES • MORE THAN 4500 UNUSUAL BARGAINS

Completely new Catalog. Packed with huge selection of telescopes, microscopes, binoculars, magnifiers, prisms, photo components, ecology and Unique Lighting items, parts, kits, accessories — many hard-to-get surplus bargains. 100's of charts, illustrations. For hobbyists, experimenters, schools, industry.

EDMUND SCIENTIFIC CO.
300 Edscorp Building, Barrington, N. J. 08007

Please rush Free Giant Catalog "A"

Name_____

Address_____

City_____ State_____ Zip_____

COMPLETE AND MAIL WITH CHECK, M.O. OR CHARGE NO.

EDMUND SCIENTIFIC COMPANY
300 Edscorp Building, Barrington, N.J. 08007

How Many	Stock No.	Description	Price Each	Total

☐ SEND FREE 180 PAGE CATALOG "A". Add Handling Chg.: $1.00, Orders Under $5.00, 50c, Orders Over $5.00

☐ Charge my BankAmericard * I enclose ☐ check ☐ money order for TOTAL $

☐ Charge my Master Charge * My Card No. Is

Interbank No.

Signature_____

Card Expiration Date_____ NAME_____

30-DAY MONEY-BACK GUARANTEE. You must be satisfied or return any purchase in 30 days for full refund.

*$15.00 minimum

ADDRESS_____

CITY_____ STATE_____ ZIP_____

BEN BOVA
Editor

DIANA KING
Associate Editor

HERBERT S. STOLTZ
Art Director

EDWARD MC GLYNN
Advertising Sales Manager

GERALDINE IHRISKEY
Advertising Production Manager

analog SCIENCE FICTION SCIENCE FACT

Next Issue on Sale August 5, 1975
$9.00 per year in the U.S.A.
$1.00 per copy

Cover by Andrei Sokolov

Vol. XCV, No. 8 / AUGUST 1975

SHORT STORIES

NOVELETTE

SERIAL

SPECIAL FEATURES

SCIENCE FACT

READER'S DEPARTMENTS

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

Subscriptions: Analog Science Fiction/Science Fact, Box 5205, Boulder Colorado 80302

KELVIN THROOP STRIKES BACK

As faithful readers of Analog know, Kelvin Throop was first heard from in a communication sent to us by R. A. J. Phillips, and published in our July 1964 issue. At that time, Throop was an official in the snow-bound bureaucracy of the Canadian Department of Northern Affairs. One day he answered all the mail in his IN basket as honestly as an innocent child would—an innocent child who had suffered through years of frustration from dealing with malicious and pernicious idiots in government, industry, and private life.

Throop answered his mail with candor, vigor, and a large helping of caustic prose. Then he disappeared. Apparently he jumped out a window and dashed off into the wilderness.

He surfaced again, briefly, and his antics were reported by E. Silverman in the January 1966 Analog. Apparently Throop was at that time an executive in a small engineering firm that did some Defense work in the US. Again, his patience reached the boiling point, he answered his incoming mail as clearly and incisively as he could—and vanished once more.

He has returned.

At least, he apparently sneaked into the Condé Nast Building and found the Analog office, in the dark of one late January night. The ever-alert building security forces must have frightened him away, because the next morning, some of the incoming mail left overnight had been answered, but none of the letters had been posted.

In the interests of coaxing him into the light of day, if not the limelight of deserved fame, we are publishing his hastily-penned replies to the Editor's incoming mail. The world needs more people like Kelvin Throop, who is not afraid to call a spade a spade (or even a

goddamned shovel). Herewith, his answers to a typical day's incoming mail, as he found it in the Analog office.

Dear Coward:

Since you didn't have the guts to sign your obscene letter or give a return address, I am sending this response to the Postal Service's dead letter office. Knowing the way the PO works, they'll probably get this to you overnight.

Although it was difficult to make sense out of your misspelled, four-letter prose, it seems that you don't like blacks, women, Jews, Mexican-Americans, or anyone else who can't goose-step in time to your primeval paranoia. No wonder you read science fiction: you certainly don't belong on *this* planet!

Cordially,
K. Throop

Dear Ms. Radlib:

I just don't see how we can use a female as the leading character in *every* story. True, every hero has had a mother, but many heroes accomplish their lofty feats in spite of, rather than because of, the women in their lives. And while I suppose it's possible to say "humankind" instead of "mankind," I do think it's just a bit clumsy to use terms such as "hero-person," "scientist-person," and "villain-person." Also, Mars and Venus are their *names,* lady! If you want that changed, take it up with the astronomy-persons. Finally, your suggested new pronoun that combines "she," "he," and "it," into one short word is inadvertently funny, scatological, and would give our readers the wrong impression.

Love and kisses,
Kelvin Throop

Dear High-Shooter:

Your letter was sent to this office for response by the president of the corporation, to whom you addressed your complaint.

I'm deeply sorry that you are upset by mentions of sex in some of the stories. This frequently happens to readers who have not gotten past their infantile neuroses, and it must be very painful and confusing for you.

You are certainly entitled to your opinions, but you should address your letters to the man you're angry with. The corporation's president doesn't really believe that the entire publishing industry will collapse if you drop your subscription. And going over the Editor's head merely delays response to your letter.

By the way, I'm sending copies of this letter to the president of your corporation, your pastor, and your nearest psychiatrist.

Merrily,
Kelvin Throop

Dear Theologian:

I seriously doubt, as Einstein did, that God is perverse. You may be-

lieve that He's got nothing better to do than strew this planet with fossils that were all created in 4004 BC, just to mislead paleontologists, but my own belief is that the evidence for human evolution is on very firm ground. The fact that evolution is "still called a theory," as you so quaintly put it, does not mean that scientists regard it as an unproven hypothesis.

Considering some of the human beings on this planet, I don't at all mind being related to apes.

Thoughtfully,
K. Throop

Dear Mr. Brilliant:

Your invention sounds marvelous. Not only will it solve the energy crisis, but it will apparently create more energy than it consumes.

I'm not surprised that the Energy Agency, the Patent Office, NASA, and the Department of Defense have all turned down your overtures. Obviously they're jealous. Send your proposal to the Saudi Arabian embassy in Washington, so that the Arabs can see that their days of high-living are doomed.

I doubt that the Editor will want to publish an article about your invention. He always checks with Professor Maxwell and his equations before buying a science article, and your invention will conflict with the Laws of Thermodynamics. He's short-sighted that way, just as all the rest of them are.

Back to the drawing board!

Regretfully,
Kelvin Throop

Memo to (indecipherable):

I'm sorry, but the office staff here at Analog is just too small to take on an additional person, even though your nephew is a great "sci-fi" fan and never misses a rerun of Star Trek. As you yourself pointed out, a business office is no place to teach a college undergraduate how to spell.

K.T.

Dear Mr. Faithful:

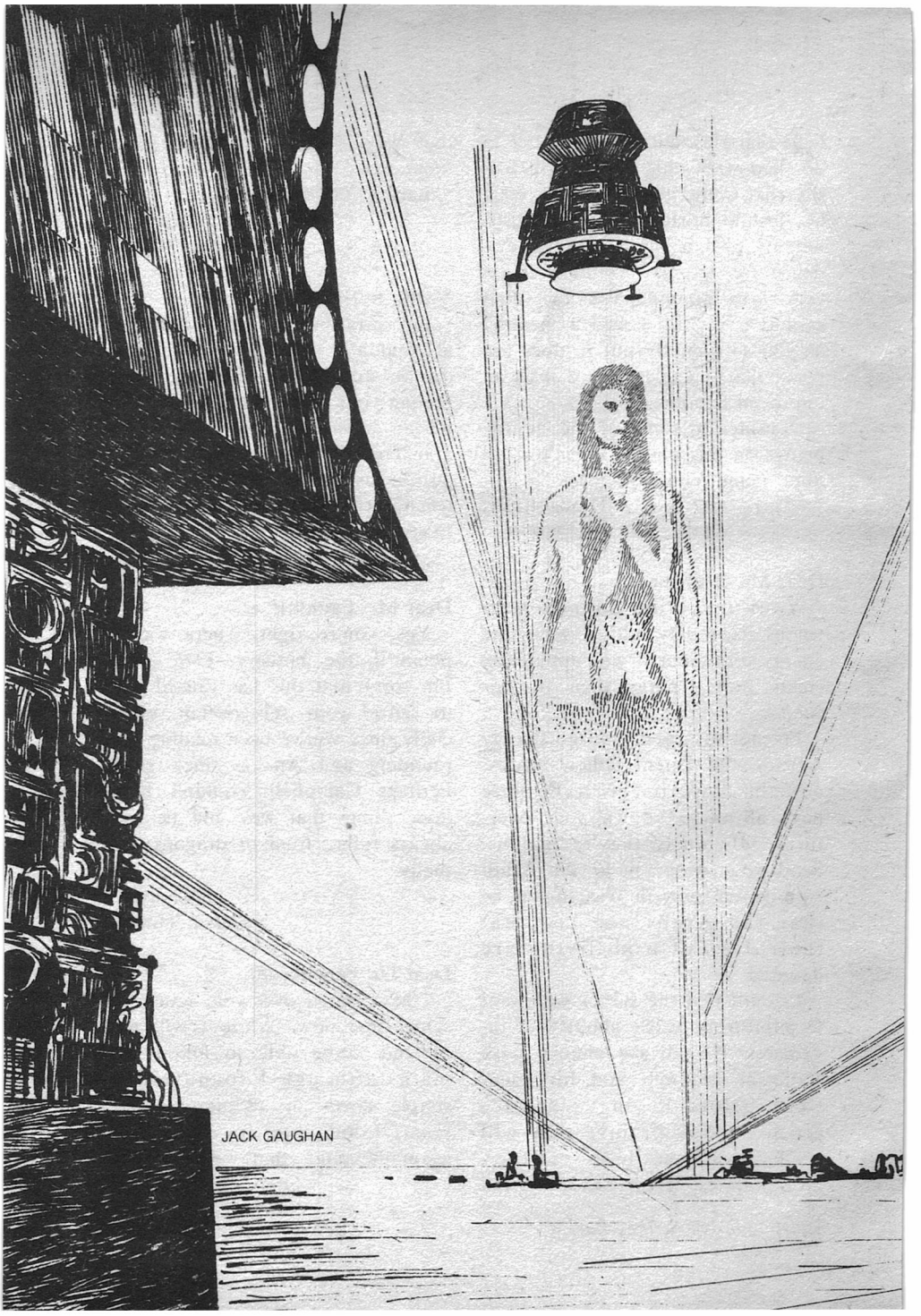
Yes, you're right. There was a poem in the January, 1975 issue. I'm sorry that this has caused you to cancel your subscription, especially since you've been reading Astounding and Analog since 1934. Perhaps Campbell wouldn't have done things that way, but he was always rather fond of dragons, actually.

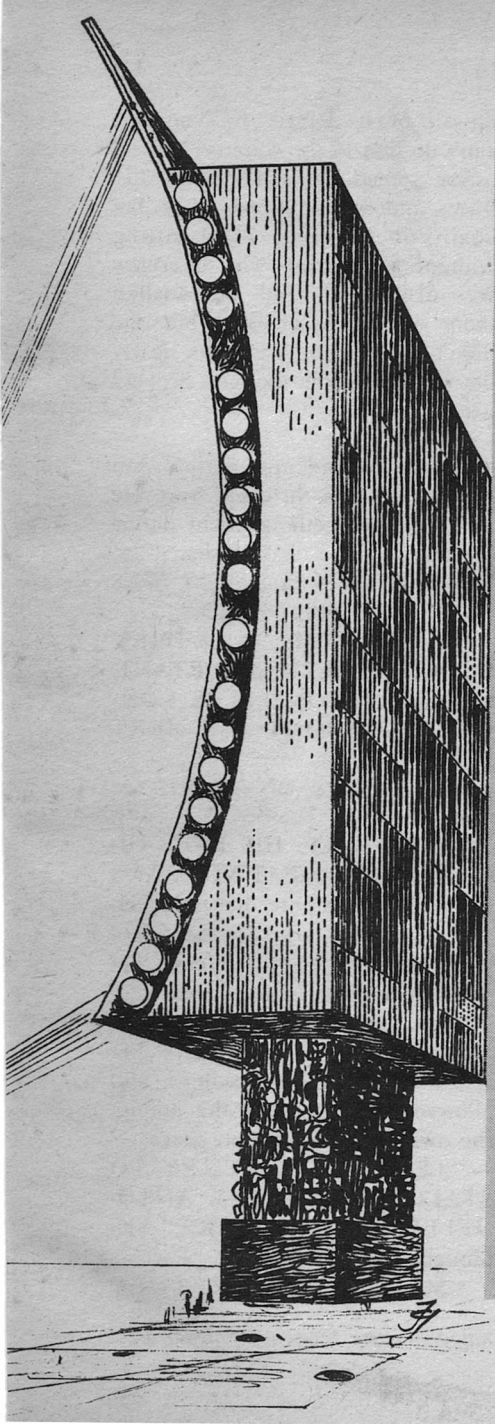
Breathlessly,
Kelvin Throop

Dear Dr. Pencilbeam:

I have pored over your letter for some time now. While I will not pretend to be able to follow the math (although I found a few simple errors in addition at one point), I don't think it's details such as mathematics that will make or

continued on page 177


JACK GAUGHAN



consort

JERRY POURNELLE

The first people to live *permanently* off-Earth will be exiles—just as the Pilgrims were.

The Senator looked from the bureau with its chipped paint and cracked mirror to the expensive woman seated on the sagging bed. My God, he thought. What if one of my constituents could see me now? Or the press people got wind of this?

He opened the leather attaché case and turned knobs on the console inside. Green lights winked reassuringly. He took a deep breath and turned to the girl.

"Laurie Jo, would it surprise you to know I don't give a damn whether the President is a crook or not?" the Senator asked.

"Then why are you here?" Her voice was soft, with a note of confidence; almost triumphant.

Senator Hayden shook his head. This is a hell of a thing. The Senate Majority Leader meets with the

richest woman in the whole goddam world, and the only way we can trust each other is to come to a place like this. She picks the highway and I pick the motel. Both of us have scramblers going, and we're still not sure nobody's making a tape. Hell of a thing.

"Because you might be able to *prove* President Tolland's a crook. Maybe make a lot of people believe it," Hayden said.

"I can."

"Yeah." She sounds so damned confident, and if what she sent me's a good sample of what she's got, she can do it, all right. "That's what scares me, Laurie Jo. The country can't take it again."

He drew in a lungful of air. It smelled faintly of gin. Hayden exhaled heavily and sank into the room's only chair. One of the springs was loose, and it jabbed him. "Christ Almighty!" he exploded.

"First Watergate. No sooner'n we get over that, and we're in a depression. Inflation. Oil crisis. The Equity Trust business. One damn thing after another. And when the Party gets together a real reform wing and wins the election, Tolland's own Solicitor General finds the Equity people right next to the President!

"So half the White House staff goes, and we get past that somehow and people still got something to believe in, and you're tellin' me you can prove the President was in on all of it. Laurie Jo, you just can't do that to the country!"

She spread her skirts across her knees and wished she'd taken the chair. She'd never liked sitting without a backrest. The interview was distasteful, and she wished there were another way, but she didn't know one. We're so nearly out of all this, she thought. So very near.

"DING."

It was a sound in her mind, but not one the Senator could hear. He was saying something about public confidence. She half listened to him, while she thought, "I WAS NOT TO BE DISTURBED."

"MISTER MC CARTNEY SAYS IT IS VERY IMPORTANT. SIGNOR ANTONELLI IS CONCERNED ABOUT HIS NEXT SHIPMENT."

"WILL IT BE ON TIME?" she thought.

"ONLY HALF. HIS BIOLOGICALS WILL BE TWO DAYS LATE," the computer link told her. The system was a luxury she sometimes regretted: not the cost, because a million dollars was very little to her; but although the implanted transceiver link gave her access to all of her holdings, and allowed her to control the empire she owned, it gave her no peace.

"TELL MC CARTNEY TO STALL. I WILL CALL ANTONELLI IN TWO HOURS," she thought.

"MISTER MC CARTNEY

SAYS ANTONELLI WILL NOT WAIT."

"TELL MC CARTNEY TO DORK HIMSELF."

"ACKNOWLEDGED."

"AND LEAVE ME ALONE."

"OUT."

And that takes care of that, she thought. The computer was programmed to take her insulting commands and translate them into something more polite; it wouldn't do to annoy one of her most important executives. If he needed to be disciplined, she'd do it face to face.

The Senator had stopped talking and was looking at her. "I can prove it, Barry," she said. "All of it. But I don't want to."

Senator Hayden felt very old. "We're almost out of the slump," he said. He wasn't speaking directly to Laurie Jo any longer, and he didn't look at her. "Got the biggest R&D budget in twenty years. Unemployment's down a point. People are beginning to have some confidence again." There was peeling wallpaper in one corner of the room. Senator Hayden balled his hands into fists and the nails dug into his palms.

When he had control of himself he met her eyes and was startled again at how blue they were. Dark red hair, oval face, blue eyes, expensive clothes; she's damn near every man's dream of a woman, and she's got me. I never made a dishonest deal in my life, but God help me, she's got me.

I have to deal, but—"Has MacKenzie seen your stuff? Does he know?"

Laurie Jo nodded. "Aeneas didn't want to believe it. Your media friends aren't the only ones who want to think Greg Tolland's an honest man. But he's got no choice now. He has to believe it."

"Then we can't deal," Hayden said. "What the hell are you wasting my time for? MacKenzie won't deal. He'll kamikaze." And do I admire him or hate him for that? There's something inhuman about a man who thinks he's justice personified. The last guy who got tagged as "The Incorruptible" was that Robespierre character, and his own cronies cut his head off when they couldn't take him any longer.

"I'll take care of Aeneas," Laurie Jo said.

"How?"

"You'll have to trust me."

"I've already trusted you. I'm here, aren't I?" But he shook his head sadly. "Maybe I know more'n you think. I know MacKenzie connected up with you after he left the White House. God knows you're enough woman to turn any man around, but you don't know him, Laurie Jo, you don't know him at all if you think—"

"I have known Aeneas MacKenzie for almost twenty years," she said. "And I've been in love with him since the first day I met him.

The two years we lived together were the happiest either of us ever had."

"Sure," Barry Hayden said. "Sure. You knew him back in the old days before Greg Tolland was anything much. So did I. I told you, maybe I know more'n you think. But goddam it, you didn't see him for ten, twelve years—"

"Sixteen years," she said. "And we had only a few weeks after that." Glorious weeks, but Greg Tolland couldn't leave us alone. He had to spoil even that. Damn him! I have more than one reason to hate Greg Tolland—"Why don't you listen instead of talking all the time? I can handle Aeneas. You want political peace and quiet for a few years, and I can give them to you."

I don't listen because I'm afraid of what I'll hear, the Senator thought. Because I never wanted this day to come, and I knew it would when I went into politics, but I managed for this long, and it got to lookin' like it never would come and now I'm in a cheap motel room about to be told the price of whatever honor I've got left.

God help us, she's got all the cards. If anybody can shut MacKenzie up—

The room still smelled of cheap gin, and the Senator tasted bile at the back of his throat. "OK, Laurie Jo, what do I have to do?"

Aeneas MacKenzie switched off the newscast and stared vacantly at the blank screen. There had been nothing about President Greg Tolland, and it disturbed him.

His office was a small cubicle off the main corridor. It was large enough for a desk as well as the viewscreen and console that not only gave him instant access to every file and data bank on *Heimdall* station, but also a link with the master Hansen data banks on Earth below. He disliked microfilm and readout screens and would greatly have preferred to work with printed reports and documents, but that wasn't possible. Every kilogram of mass was important when it had to go into orbit.

There was never enough mass at *Heimdall.* Energy was no problem; through the viewport he could see solar cells plastered over every surface, and farther away was the power station, a large mirror reflecting onto a boiler and turbine. Everything could be recycled except reaction mass: but whenever the scooters went out to collect supply pods boosted up from Earth, that mass was lost forever. The recent survey team sent to the Moon had cost hideously, leaving the station short of fuel for its own operations.

He worked steadily on the production schedules, balancing the station's inadequate manpower reserves to fill the most critical orders without taking anyone off the *Valkyrie* project. It was an impossible

task, and he felt a sense of pride in his partial success. It was a strange job for the former Solicitor General of the United States, but he believed his legal training helped; and he was able to get the crew to work harder than they had thought they could.

Get *Valkyrie* finished, Laurie Jo had said. It must be done as quickly as possible, no matter what it does to the production schedules. She'd said that, but she couldn't have meant it; Aeneas knew what would happen if *Heimdall* didn't continue sending down space-manufactured products. *Heimdall* was a valuable installation, now that there were no risks left in building it, and Laurie Jo's partners were ruthless; if she defaulted on deliveries, they'd take it away from her.

Eventually the assignments were done. By taking a construction shift himself (he estimated his value as 65 percent as productive as a trained rigger, double what it had been when he first tried the work) he could put another man on completing the new biological production compartment. The schedule would work, but there was no slack in it.

When he was done he left the small compartment and strode through the corridor outside. He was careful to close and dog the airtight entryway into his office, as he was careful about everything he did. As he walked, his eyes automatically scanned the shining metallic cloth of *Heimdall*'s inner walls, but he was no more aware of that than he was of the low spin gravity and Coriolis effect.

The corridor curved upward in front and behind him. When he reached the doorway to the Chief Engineer's office, it stood open in defiance of regulations. Aeneas nodded wryly and ignored it. Kittridge Penrose made the regulations in the first place, and Aeneas only enforced them. Presumably Penrose knew what he was doing. If he doesn't, Aeneas thought, we're all in trouble.

Penrose was in the office, as Aeneas knew he would be; one of his prerogatives was to know where everyone was. The engineer was at his desk. A complex diagram filled the screen to his left, and Penrose was carefully drawing lines with a light pen. He looked up as Aeneas came into the office. "What's up, boss?"

"I don't know." Aeneas peered at the screen. Penrose noticed the puzzled look and touched buttons on the console below the picture. The diagram changed, not blinking out to be replaced, but rearranging itself until it showed an isometric view which Aeneas recognized instantly.

"Right on schedule," Penrose said. "Just playing about with some possible improvements. There she is, *Valkyrie*, all ready to go."

"Except for the engines."

Penrose shrugged. "You can't

have everything. Nothing new from Miss Hansen about getting that little item taken care of?"

"Not yet."

"Heh. She'll manage it." Penrose went back to his game with the light pen. "I used to think my part of this was the real work," the engineer said. He sketched in another line. "But it isn't. I just design the stuff. It's you people who get it built."

"Thanks." And it was true enough: Laurie Jo had put together the syndicate to finance the whole station.

"Sure. Meant that, you know," Penrose said. "You've done about as well as Captain Shorey. Didn't think you'd be much as commander here, but I was wrong.'

Now that, Aeneas thought, is high praise indeed. And I suppose it's even true. I do fill a needed function here. Something I didn't do when I was down there with Laurie Jo. Down there I was a Prince Consort, and nothing else.

True enough I came here because I was the only one she could trust to take control; but I've been more than just her agent.

"Sit down, boss," Penrose said. "Have a drink. You look like you're in need of one."

"Thanks, I'll pass the drink." He took the other chair and watched as Penrose worked. I could never do that, he thought; but there aren't a lot of jobs up here that I can't do now . . .

The newscast haunted him. Laurie Jo had the whole story, all the evidence needed to bring Greg Tolland down. We can prove the President of the United States is a criminal. Why hasn't she done it? Why?

I don't even dare call and ask her. We can't know someone isn't listening in. We can't trust codes, we can't even trust our own computer banks, and how have things come to this for the United States?

"Got a couple of new reports from the Lunatics," Penrose said. "Had a chance to go over them?"

"No. That's what I came to talk to you about." The console would have given him instant communications with Penrose or anyone else aboard *Heimdall,* but Aeneas always preferred to go to his people rather than speak to them as an impersonal voice.

"Pretty good strike," Penrose said. "Another deposit of hydrides, and quite a lot of mica. No question about it, we've got everything we need."

Aeneas nodded. It was curious: hydrogen is by orders of magnitude the most common element in the universe, but it had been hard to find on the Moon. There were oxides, and given the plentiful energy available in space that meant plenty of oxygen to breathe; but hydrogen was rare.

Now the Lunar Survey Team sent up from *Heimdall* had found hydrogen locked into various min-

erals. It was available, and the colony was possible—if they could get there. The survey team's fuel requirements had eaten up a lot of the mass boosted up to *Heimdall*, and without more efficient Earth orbit to Lunar orbit transport it would take a long time to make a colony self-sustaining.

"We've either got to bring the survey party home or send another supply capsule," Penrose was saying. "Which is it?"

"Like to hold off that decision as long as we can." And please don't ask why. I don't know why. Just that Laurie Jo says do it this way.

Penrose frowned. "If you'll authorize some monkey motion, we can do the preliminaries for going either way. That'll hold off the decision another couple of weeks. No more than that, though."

"All right. Do it that way."

"What's eating you, Aeneas?"

"Nothing. I've been up here too long."

"Sure." Kit Penrose didn't say that he'd been aboard *Heimdall* nearly two years longer than MacKenzie's 18 months, but he didn't have to.

Of course, Penrose thought, I've had my girl here with me; and MacKenzie's seen his precisely twice since he's been here, a couple of weekends and back she went to look after the money. Wonder what it's like to sleep with the big boss? What a silly thing to wonder about.

The diagram faded and another view came on the screen. "There she is," Penrose said. "Lovely, isn't she?"

Valkyrie may have been lovely to an engineer, but she was hardly a work of art. There was no symmetry to the ship. Since she would never land, she had neither top nor bottom, only fore and aft. "All we need is the NERVA, and we're all set," Penrose said. "No reason why the whole Moon colony staff can't go out a week after we have the engines."

"Yes."

"Christ, how can you be so cold about it? Moon base. Plenty of mass. Metals to work with. Who knows, maybe even radioactives. We can cut loose from those bastards down there!" He waved at the viewport where Earth filled the sky before the station slowly turned again to show the sequined black velvet of space. "And we've very nearly done it."

"Very nearly." But we haven't done it, and I don't see how we can.

"What we need are those military aerospace-planes," Penrose said. His voice became more serious. "I expect they'll be coming around for visits whether we invite them or not, you know."

"Yes. Well, we got on with their chaps all right—"

"Sure," Penrose said. "Sure. Visiting astronauts and all that lot. Proud to show them around. Even so, I can't say I'm happy they can

get up here whenever they feel like it . . ."

"Nor I." Aeneas opened a hinged panel beside the desk and took out a coffee cup. He filled it from a spigot near Penrose's hand. "Cannonshot," he said.

"I beg your pardon?"

"In the old days, national law reached out to sea as far as cannonballs could be fired from shore. Three miles, more or less. It became the legal boundary of a nation's sovereignty. There used to be a lot of talk about international law in space, and the rest of it, but it will probably be settled by something like cannon-shot again. When the national governments can get up here easily, they'll assert control."

"Like to be gone when that happens," Penrose said. "Can't say I want more regulations and red tape and committees. Had enough of that lot."

"So have we all." Aeneas drank the coffee. "So have we all."

Penrose laughed. "That's a strange thing to say, considering that you were one of the prime movers of the People's Alliance."

"Maybe I've learned something from the experience." Aeneas stared moodily into his coffee cup. I wasn't wrong, he thought. But I wasn't right either. There's got to be more than comfort and security, and we didn't think of that, because the Cause was all the adventure *we* needed.

I wonder how long it will take them to make space tame? Forms to fill out, regulations always enforced, not because of safety but because they're regulations . . .

Penrose looked at the digital readouts above his drafting console: Greenwich time, and Mountain Daylight time. "Big shipment coming up next pass over Baja. I'd best be getting ready for it."

"Yes." Aeneas listened without paying much attention as Penrose told him what the big lasers in Southern Baja would send up this time. It didn't really concern him yet, and when he needed to know more, the information would be available through his desk console.

As the engineer talked, Aeneas remembered what it had been like to watch the launches: the field covered with lasers, their mirrors all focusing onto the one large mirror beneath the tramway. The squat shapes of the capsules on the tramway, each waiting to be brought over the launching mirror and thrust upward by that stabbing light, looking as if they were lifted by a fantastically swift-growing tree rising out of the desert; the thrumming note of the pulsed beam singing in hot desert air.

It had been the most magnificent sight he had ever seen, and Laurie Jo had built it all. Now she was ready to move onward, but her partners were not. They were content to own *Heimdall* and sell its

products, raking in billions from the miracles that could be wrought in space.

Biologicals of every conceivable kind. Crystals of an ultimate purity grown in mass production and infected with precisely the right contaminants, all grown in mass production.

Heimdall had revolutionized more than one industry. Already there were hand calculators with thousands of words of memory space, all made from the chips grown in orbit. Deserts bloomed as the production crews sent down membranes that would pass fresh water and keep salt back; they too could be made cheaply only in zero gravity conditions.

Why take high risks on a Moon base when there was so much more potential to exploit in orbital production? The investors could prove that more money was to be made through expanding *Heimdall* than through sending *Valkyrie* exploring. They remembered that they would never have invested in space production at all if Laurie Jo hadn't bullied them into it, and that had been enough to give her some freedom of action; but they could not see profits in the Moon for many years to come.

And they're right, Aeneas thought. Laurie Jo doesn't plan for the next phase to make profits, not for a long time.

She wants the stars for herself. And what do I want? Lord God, I miss her. But I'm *needed* here. I have work to do, and I'd better get at it.

The airline reception lounge was no longer crowded. A few minutes before it had been filled with Secret Service men and Hansen Security agents. Now there was only one of each in the room with Laurie Jo. They stayed at opposite ends of the big room, and they eyed each other like hostile dogs.

"Relax, Miguel," Laurie Jo said. "Between us there are enough security people to protect an army. The President will be safe enough—"

"Si, Doña." The elderly man's eyes never left the long-haired younger man at the other end of the room. "I am willing to believe *he* is safe enough."

"For heaven's sake, I'm meeting the President of the United States!"

"Si, Doña. Don Aeneas has told me of this man who has become President here. I do not care for this."

"Jesus." The Secret Service man curled his lip in contempt. "How did you do it?" he demanded.

"How did I do what, Mr. Coleman?" she asked.

"Turn MacKenzie against the President! Fifteen years he was with the Chief. Fifteen years with the People's Alliance. Now you've got him telling tales about the Chief to your peasant friend—"

"Miguel is not a peasant."

"Ah, *Doña,* but I am. Go on, *Se-*

ñor. Tell us of this strange thing you do not understand." There was amusement in the old *vaquero*'s eyes.

"Skip it. It just doesn't make sense, that's all."

"Perhaps my *patrona* bribed *Don* Aeneas," Miguel said.

"That will do," Laurie Jo said. Miguel nodded and was silent.

"Bullshit," Coleman said. "Nobody ever got to MacKenzie. Nobody has his price. Not in money, anyway." He looked at Laurie Jo in disbelief. He didn't think her unattractive, but he couldn't believe she was enough woman to drive a man insane.

"You're rather young to know Aeneas that well," Laurie Jo said.

"I joined the People's Alliance before the campaign." There was pride in the agent's voice. "Stood guard watches over the Chief. Helped in the office. MacKenzie was with us every day. He's not hard to know, not like some party types."

"INFORMATION," Laurie Jo thought. "COLEMAN, FIRST NAME UNKNOWN, SECRET SERVICE AGENT, RECENTLY APPOINTED. SUMMARY."

"COLEMAN, THEODORE RAYMOND. AGE 25. PAID STAFF, PEOPLE'S ALLIANCE UNTIL INAUGURATION OF PRESIDENT GREGORY TOLLAND. APPOINTED TO SECRET SERVICE BY ORDERS OF PRESIDENT TO TAKE EFFECT INAUGURAL DAY. EDUCA—"

"SUFFICIENT." Laurie Jo nodded to herself. Coleman hadn't been like the career Secret Service men. There were a lot of young people like Coleman in the undercover services lately, party loyalists who had known Greg before the election.

Personally loyal bodyguards have been the mark of tyrants for three thousand years, she thought. But some of the really great leaders have had them as well. Can any President do without them? Can I?

Not here. But I won't need guards on the Moon. I won't—

"DING."

"WHAT NOW?"

"THERE IS A GENERAL STRIKE PLANNED IN BOLIVIA. TWO HANSEN AGENTS HAVE INFILTRATED THE UNION. THEY HAVE FOUND OUT THE DATE OF THE STRIKE, AND WERE DISCOVERED WHEN TRANSMITTING THEIR INFORMATION. SUPERINTENDENT HARLOW WISHES TO TAKE IMMEDIATE ACTION TO RESCUE THEM. WILL YOU APPROVE?"

"GIVE HARLOW FULL AUTHORIZATION TO TAKE WHATEVER ACTION HE THINKS REQUIRED. REPORT WHEN HIS PLANS ARE COMPLETE BUT BEFORE EXECUTION."

"ACKNOWLEDGED."

Another damned problem, she

thought. Harlow was a good man, but he thought in pretty drastic terms. What will that do to our other holdings in Bolivia? But, she thought, it will hurt my partners worse than it will hurt me. I'll have to think about this. Later, now I've got something more important.

The door opened to admit another Secret Service man. "Chief's on the way," he said.

"DO NOT CALL ME FOR ANY PURPOSE," she thought.

"ACKNOWLEDGED."

It was almost comical. The Secret Service men wouldn't leave until Miguel had gone, and Miguel wouldn't leave his *patrona* alone with the Secret Service men. Finally they all backed out together, and Laurie Jo was alone for a moment. Then President Greg Tolland came in.

He's still President, she thought. No matter that I've known him twenty years, and fought him for half that time. There's an aura that goes with the office, and Greg wears it well. "Good afternoon, Mister President."

"Senator Hayden says I should talk with you," Tolland said.

"Aren't you even going to say hello?" She thought he looked very old; yet she knew he was only a few years older than herself, one of the youngest men ever to be elected to the office.

"What should I say, Laurie Jo? That I wish you well? I do, but you wouldn't believe that. That I'd like to be friends? Would you believe me if I said that? I do wish we could be friends, but I hate everything you stand for."

"Well said, sir!" She applauded. "But there's no audience here." And you only hate that the fortune I inherited wasn't used to help your political ambitions, not that I have it. You always were more comfortable with wealthy people than Aeneas was.

He grinned wryly. It was a famous grin, and Laurie Jo could remember when Congressman Tolland had practiced it with Aeneas and herself as his only audience. It seemed so very long ago, back in the days when her life was simple and she hadn't known who her father was, or that one day she would inherit his wealth.

"Mind if I sit down?"

She shrugged. "Why ask? But please do."

He took one of the expensively covered lounge chairs and waited until she'd done the same. "I ask because this is your place."

True enough. I own the airline. But it's hardly my home and this is hardly a social visit. "Can I get you anything? Your agents have sampled everything at the bar—"

"I'll have a bourbon, then. They shouldn't have done that. Here, I'll get—"

"It's all right. I know where everything is." She poured drinks for both of them. "Your young men don't trust me. One of them even

accused me of seducing Aeneas away from you."

"Didn't you?"

She handed him the drink. "Oh good God, Greg. You don't have to be careful what you say to me. Nothing I could tape could make things worse than I can make them right now. And I give you my word, nobody's listening."

His eyes narrowed. For a moment he resembled a trapped animal.

"Believe that, Greg. There's no way out," she said. "With what I already had and what Aeneas knows—"

"I'll never know how I put up with that fanatic s.o.b. for so long."

"That's beneath you, Greg. You wouldn't be President if Aeneas hadn't helped you."

"Not true."

It is true, but why go on? And yet—"Why have you turned so hard against him? Because he wouldn't sell out and you did?"

"Maybe I had no choice, Laurie Jo. Maybe I'd got so far out on so many limbs that I couldn't retreat, and when I came crashing down the Alliance would come down with me. Maybe I thought it was better that we win however we had to than go on leading a noble lost cause. This isn't what we came here to talk about. Senator Hayden says you've got a proposition for me."

"Yes." And how Barry Hayden hates all of this. Another victim of patriotism. Another? Am I including Greg Tolland in that category? And what difference does it make? "It's simple enough, Greg. I can see that you'll be allowed to finish your term without any problems from me. Or from Aeneas. I can have the Hansen papers and network stop their campaigns against you. I won't switch to your support."

"Wouldn't want it. That would look too fishy. What's your price for all this?"

"You weren't always this direct."

"What the hell do you want, Laurie Jo? You've got the President of the United States asking your favor. You want me to crawl too?"

"No. All right, the first price is your total retirement from politics when your term is over. You don't make that promise to me. You'll give it to Barry Hayden."

"Maybe. I'll think about it. What do you want for yourself?"

"I want a big payload delivered to *Heimdall.*"

"What the hell?"

"You've got those big military aerospace planes. I want something carried to orbit."

"I'll think about it."

"You'll do it."

"I don't know." He stared into his glass. "If it means this much to you, it's important. I'd guess it's tied in with that Lunar survey party, right? Your Moon colony plans?"

She didn't answer.

"That's got to be it." He drained the cocktail and began laughing. "You can't throw me out because you'd never get anyone else to agree to this! It's pretty funny, Laurie Jo. You and Mr. Clean. You *need* me! More than just this once, too, I expect. What is it you want delivered?"

"Just a big payload."

Tolland laughed again. "I can find out, you know. I've still got a few people inside your operation."

"I suppose you do. All right, I've got a working NERVA engine for *Valkyrie*. It's too big for the laser launching system. We could send it up in pieces, but it would take a long time to get it assembled and checked out." And I don't have a long time. I'm running out of time . . .

"So you want me to hand over the Moon to a private company. That's what it amounts to, isn't it? The People's Alliance was formed to break up irresponsible power like yours, and you want me to hand you the Moon."

"That's my price, Greg. You won't like the alternative."

"Yeah. It's still pretty funny. A couple more years and you won't have a goddam monopoly on manned space stations. So you want me to help you get away."

"Something like that. We see things differently."

"You know you're doomed, don't you? Laurie Jo, it's over. You sit there in your big office and decide things for the whole world. Who asked you to? It's time the people had a say over their lives. You think I'm ambitious. Maybe. But for all of it, everything I've done has been in the right direction. At least I'm not building up a personal empire that's as anachronistic as a dinosaur!"

"Spare me the political speeches, Greg." God, he means it. Or he thinks he does. He can justify anything he does because he's the agent for the people, but what does it mean in the real world? Just how much comfort is it to know it's all for the good of the people when you're caught in the machinery? "I won't argue with you. I've got something you need, and I'm willing to sell."

"And you get the Moon as a private fief."

"If you want to think of it that way, go ahead. But if you want to be President three months from now, you'll do as I ask."

"And why should I think you'll keep your bargain?"

"When have I ever broken my promises?" Laurie Jo asked.

"Don't know. Tell you what, get MacKenzie to promise. That way I'll be sure you mean it."

"I'll do better than that. Aeneas and I are both going to the Moon. We can hardly interfere with you from there."

"You are crazy, aren't you?" Tolland's face showed wonder but not doubt. "You know you're going

to lose a lot. You can't manage your empire from the Moon."

"I know." And how long could I hold out to begin with? And for what? "Greg, you just don't understand that power's no use, money's no use, unless it's for something that counts."

"And getting to the Moon is that big." He shook his head in disbelief. "You're crazy."

"So are a lot of us, then. I've got ten volunteers for every opening. Pretty good people, too—as you should know."

"Yeah. I know." Tolland got up and wandered around the big room until he came to the bar. He filled his glass with ice cubes and water, then added a tiny splash of whisky. "You've got some of my best people away from me. You can pay them more—"

"I can, but I don't have to. You still don't understand, do you? It's not my money, and it's not my control over the Moon colony that counts. What's important is this will be one place that you don't control."

"Hah. I hadn't thought I was that unpopular with the engineers."

"I don't mean you personally," Laurie Jo said. "Your image control people have done well. But Greg, can't you understand that some of us want out of your system?"

"Aeneas too?"

"Yes." More than any of us, because he knows better than any of us what it's going to be like—

"I should have known he'd go to you after I threw him out."

"There wasn't anywhere else he could go. Mr. President, this isn't getting us anywhere. You'll never understand us, so why try? Just send up that payload and you'll be rid of us. You may even be lucky. We'll lose people in the Lunar colony. Maybe we'll all be killed."

"And you're willing to chance that—"

"I told you, you won't understand us. Don't try. Just send up my payload."

"I'll think about it," Tolland said. "But your other conditions are off. No promises. No political deals." The President stood and went to the door. He turned defiantly. "You get the Moon. That ought to be enough."

He felt dizzy and it was hard to breathe in the high gravity of Earth. When he poured a drink he almost spilled it, because he was unconsciously allowing for the displacement usual in *Heimdall*'s centrifugal gravity. Now he sat weakly in the large chair.

The Atlantic Ocean lay outside his window, and he watched the moving lights of ships. The room lights came on suddenly, startling him.

"What—*Miguel!*" Laurie Jo shouted. Then she laughed foolishly. "*'Sta nada. Deseo solamente ser, por favor.*" She came into the

room as Miguel closed the door behind her. "Hello, Aeneas. I might have known. No one else could get in here without someone telling me—"

He stood with an effort. "Didn't mean to startle you." He stood uncomfortably, wishing for her, cursing himself for not telling her he was coming. But I wanted to shock you, he thought.

"You didn't, really. I think Greg has called off his dogs. I'm safe enough. But—you're not!"

"I'll take my chances."

"Why are we standing here like this?" she asked. She moved toward him. He stood rigidly for a moment, but then stepped across the tiny space that separated them, and they were together again.

For how long? he thought. How long do we have this time? But then it didn't matter any more.

"Laurie Jo—"

"Not yet." She poured coffee for both of them, and yawned. Her outstretched arms waved toward the blue waters far below their terrace. "Let's have a few minutes more."

They sat in silence. She tried to watch the Atlantic, but the silence stretched on. "All right, darling. What is it?"

"There's been nothing on the newscasts about Greg. And then I got a signal. Prepare *Valkyrie* at once. The engines will be up, intact."

"And you wondered if there was a connection?" she asked.

"I knew there was a connection." There was no emotion in his voice, and that frightened her.

"I've bought us the stars, Aeneas. The engines will go up in a week. Tested, ready for installation. And you've done the rest, you and Kit. We can go to the Moon, with all the equipment for the colony—"

"Yes. And Greg Tolland stays on."

She wanted to shout, what is that to you? But she couldn't. "It was his price. The only one he'd take."

"It's too high."

She drew the thin silk robe around herself. Despite the bright sun she felt suddenly cold. "I've already agreed. I've given Greg my word."

"But I haven't. And you didn't tell me you were doing this."

"How could I? You wouldn't have agreed!"

"Precisely—"

"I can't lie to you, Aeneas." And now what do I lose? You? Everything I've worked for? Both? "The deal hasn't been made. Greg wants your word too."

"And if I don't give it?"

"Then he won't send up the engines. You're close enough to know what happens then. I'm at the edge of losing control of *Heimdall* to my partners. This is my only chance."

But it didn't have to be, he thought. You're in trouble because you insisted on speeding up the

schedule, no matter what the cost, and it cost a lot. Technicians pulled off production work for *Valkyrie.* The Lunatic expedition. "You've put me in a hell of a fix, Laurie Jo."

"Damn you! Aeneas MacKenzie, damn you anyway!" He tried to speak, but the rush of words stopped him as she shouted in anger. "Who appointed you guardian of the people? You and your damned honor! You're ready to throw away everything, and for what? For revenge on Greg Tolland!"

"But that's not true! I don't want revenge."

"Then what do you want, Aeneas?"

"I wanted out, Laurie Jo. It was you who insisted that I direct your agents in the investigation. I was finished with all that. I was willing to leave well enough alone, until we found—" Until it was clear that Greg Tolland had known everything. Until it was clear that he wasn't an honest man betrayed, that he was corrupt to the core, and had been for years. Until I couldn't help knowing that I'd spent most of my life electing—"You intended this all along, didn't you?" His voice was gentle and very sad.

Her anger was gone. It was impossible to keep it when he failed to respond. "Yes," she said. "It was the only way."

"The only way—"

"For us." She wouldn't meet his eyes. "What was I supposed to do, Aeneas? What kind of life do we have here? It takes every minute I have to keep Hansen Enterprises. Greg Tolland has already tried to have you killed. You were safe enough in *Heimdall,* but what good was that? With you there and me here? And I couldn't keep the station if I lived there." And we've got so little time. We lost so many years, and there are so few left . . .

They were silent for a moment. Gulls cried in the wind, and overhead a jet thundered.

"And now I've done it," she said. "We can go to the Moon. I can arrange more supplies. *Valkyrie* doesn't cost so much to operate, and we'll have nearly everything we need to build the colony anyway. We can do it, Aeneas. We can found the first Lunar colony, and be free of all this."

"But only if I agree—"

"Yes."

"Laurie Jo, would you give up the Moon venture for me?"

"Don't ask me to. Would you give up your vendetta against Greg for the Moon?"

He stood and came around the table. She seemed helpless and vulnerable, and he put his hands on her shoulders. She looked up in surprise: his face was quite calm now.

"No," he said. "But I'll do as you ask. Not for the Moon, Laurie Jo. For you."

She stood and embraced him, but as they clung to each other she couldn't help thinking, Thank God, he's not incorruptible after all. He's not more than human.

She felt almost sad.

Two delta shapes, one above the other; below both was the enormous bulk of the expendable fuel tank which powered the ram-jet of the atmospheric booster. The big ships sat atop a thick solid rocket that would boost them to ram speed.

All that, Laurie Jo thought. All that, merely to get into orbit. And before the spaceplanes and shuttles, there were the disintegrating totem poles. No wonder space was an unattractive gamble until I built my lasers.

The lasers had not been a gamble for her. A great part of the investment was in the power plants, and they made huge profits. The price she paid for *Heimdall* and *Valkyrie* hadn't been in money.

There were other costs, though, she thought. Officials bribed to expedite construction permits. Endless meetings to hold together a syndicate of international bankers. Deals with people who needed their money laundered. It would have been so easy to be part of the idle rich. Instead of parties I went to meetings, and I've yet to live with a man I love except for those few weeks we had.

And now I'm almost forty years old, and I have no children. But we will have! The doctors tell me I have a few years left, and we'll make the most of them.

They were taken up the elevator into the upper ship. It was huge, a squat triangle that could carry 40,000 kilos in one payload, and do it without the 30G stresses of the laser system. They entered by the crew access door, but she could see her technicians making a final examination of the nuclear engine in the cargo compartment.

She was placed in the acceleration couch by an Air Force officer. Aeneas was across a narrow passageway, and there were no other passengers. The young AF captain had a worried frown, as if he couldn't understand why this mission had suddenly been ordered, and why two strange civilians were going with a cargo for *Heimdall.*

You wouldn't want to know, my young friend, Laurie Jo thought. You wouldn't want to know at all.

Motors whined as the big clamshell doors of the cargo compartment were closed down. The AF officer went forward into the crew compartment. Lights flashed on the instrument board mounted in the forward part of the passenger bay, but Laurie Jo didn't understand what they meant.

"DING."

"MY GOD, WHAT NOW?"

"SIGNOR ANTONELLI HAS JUST NOW HEARD THAT YOU ARE GOING UP TO *HEIM-*

DALL. HE IS DISTURBED."

I'll just bet he is, Laurie Jo thought. She glanced across the aisle at Aeneas. He was watching the display. "TELL SIGNOR ANTONELLI TO GO PLAY WITH HIMSELF."

"I HAVE NO TRANSLATION ROUTINE FOR THAT EXPRESSION."

"I DON'T WANT IT TRANSLATED. TELL HIM TO GO PLAY WITH HIMSELF."

There was a long pause. Something rumbled in the ship, then there were clanking noises as the gantries were drawn away.

"MISTER MC CARTNEY IS VERY DISTURBED ABOUT YOUR LAST MESSAGE AND ASKS THAT YOU RECONSIDER."

"TELL MC CARTNEY TO GO PLAY WITH HIMSELF TOO. CANCEL THAT. ASK MISTER MC CARTNEY TO SPEAK WITH SIGNOR ANTONELLI. I AM TAKING A VACATION. MC CARTNEY IS IN CHARGE. HE WILL HAVE TO MANAGE AS BEST HE CAN."

"ACKNOWLEDGED."

"Hear this. Liftoff in thirty seconds. Twenty-nine. Twenty-eight. Twenty-seven . . ."

The count reached zero, and there was nothing for an eternity. Then the ship lifted, pushing her into the couch. After a few moments there was nothing, another agonizing moment before the ramjets caught. Even inside the compartment they could hear the roaring thunder before that, too, began to fade. The ship lifted, leveled, and banked to go on course for the trajectory that would take it into an orbit matching *Heimdall*'s.

"GET MC CARTNEY ON THE LINE."

There was silence.

Out of range, she thought. She smiled and turned to Aeneas. "We did it," she said.

"Yes."

"You don't sound very excited."

He turned and smiled, and his hand reached out for hers, but they were too far apart. The ship angled steeply upward, and the roar of the ramjets grew louder again, then there was more weight as the rockets cut in. Seconds later the orbital vehicle separated from the carrier.

Laurie Jo looked through the thick viewport. The islands below were laid out like a map, their outlines obscured by cotton clouds far below them. The carrier ship banked off steeply and began its descent as the orbiter continued to climb.

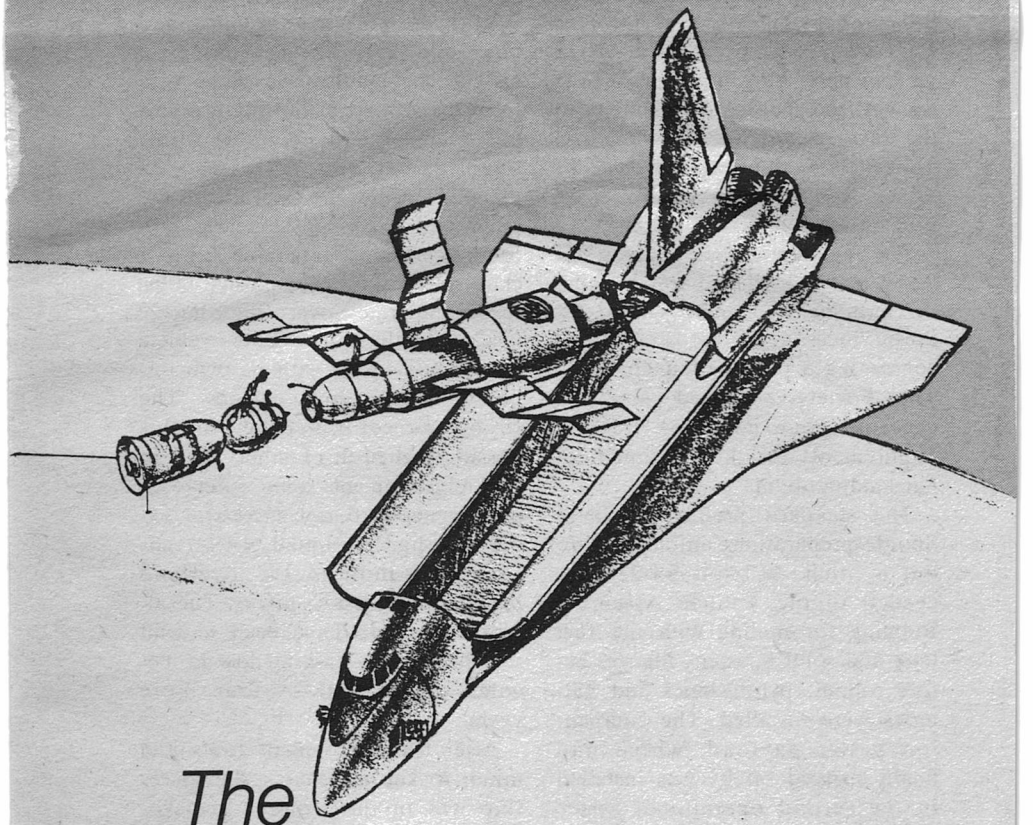
Done, she thought. But she looked again at Aeneas, and he was staring back toward the United States and the world they had left behind.

"They don't need us, Aeneas," she said carefully.

"No. They don't need me at all."

She smiled softly. "But I need you. I always will." ■

SPECIAL FEATURE



The Legacy of Apollo-Soyuz

The joint American-Russian orbital mission has been criticized as a "useless stunt." Like Apollo. Like Sputnik. Like Lindbergh, Columbus, and Marco Polo.

JAMES E. OBERG

Sixty days before blastoff, the main Salyut crew module arrived at Cape Canaveral in a Soviet AN-22 jet transport. After unloading at the runway, the spacecraft was taken to the Payload Assembly Building and placed into the payload bay of Space Shuttle number three, in preparation for mission SS-22.

The Japanese equipment was still being mated to the Spacelab pallet in Germany, and anxious trans-Atlantic messages were exchanged concerning a possible launch delay. The Soviets expressed unofficial concern about impacting tracking requirements for their planned lunar landing flight.

The standard pre-launch Space Shuttle preparations unfolded without a hitch. Mission SS-22 proceeded to the Vehicle Assembly Building for mating with the fuel tank and solid boosters. Shortly before rollout, pyrotechnics and batteries were installed. The companion pallet payload, which had finally arrived safely, was installed in the second operational Space Shuttle being prepared as mission SS-23 in an adjacent bay of the VAB.

Launch day arrived for the first mission. The three American crewmen and the four Russian passengers entered the spaceship on the pad. Flight commander Dick Truly was on his sixth spaceflight, his second with Russians along. The two groups exchanged pleasantries in Russian and English before strapping themselves in for takeoff.

With its three main engines and two solid fuel boosters firing in unison, the giant space plane rose from the flames. Following a nominal launch sequence, the solids burned out and fell away as planned, while the fuel from the main tank took SS-22 nearly into orbit. The tank separated with a clang and a thud of explosive bolts, to disintegrate over the Pacific Ocean, while the Orbiter vehicle pushed into orbit with its own onboard maneuvering engines. The retrograde orbit needed for this mission had been obtained through the relaxation of some safety requirements, but past successful experience had prompted NASA officials to authorize the overland launch on these two flights. The alternative would have been to wait for the West Coast facility to become operational in four more years.

After twelve hours of trims and minor rocket maneuvers, the spaceship was in the required sun-synchronous orbit several hundred miles above the Earth. The cosmonauts transferred into the Salyut for the final pre-separation checkout.

The four Russians strapped themselves in at the Salyut control station, and Space Shuttle flight engineer Carl Konkel fired the charges which cut the connections between the two vehicles. The grappler arm slowly swung the payload free. When it was sufficiently

clear, Salyut test commander Yuri Romanenko opened the craft's solar panels and radio antennas. They were now ready for independent flight, and the American spaceship returned to Earth a few hours later.

Six days later mission SS-23 was launched, after Romanenko had reported that the Salyut equipment had been completely checked out. Mission commander Bruce McCandless completed the rendezvous with the Salyut and prepared to disgorge his vehicle's special cargo. The grappler arm swung the twenty-ton package out into space, where Colonel Romanenko lined up his own vehicle for a manual docking. The modules linked together, and two spacesuited cosmonauts completed a permanent welding job on the attachment interface. The spacecraft was ready.

Through an inflated fabric transfer tunnel, the Space Shuttle and the Salyut prepared to exchange crews. The four cosmonauts who had checked out the Salyut would now turn it over to the actual mission crewmen who had ridden up in the Space Shuttle.

Congratulations and best wishes were exchanged among the American Shuttle crew, the Soviet Salyut test crew, and the four men who were about to undertake the most difficult manned space voyage ever attempted.

Spacemen Vladimir Dzhanibekov, Maarten Houtman, Akinori Nakamura, and Franklin Musgrave were to spend 365 days in orbit. They would test the regenerative life-support systems that would enable men to reach Mars and beyond.

Their year-long international flight had been prepared by scientists and engineers all over the world. It would have been science fiction a decade before. Now it was just the inevitable legacy of Apollo-Soyuz.

In 1975, an American Apollo and Soviet Soyuz had linked up in orbit. Cosmonauts and astronauts had shaken hands in space. Although important engineering and scientific research was carried out on ASTP (the Apollo-Soyuz Test Project), the primary impact on the world was political and psychological. Cooperation was possible in space.

The immediate consequence of the joint ASTP flight was the opening of possibilities for new cooperative unmanned space missions. Even before the launching of the five spacemen, follow-on efforts were initiated. Late in 1975 an American instrument package spent three weeks in space on board a Soviet "Kosmos" biosatellite, the first time that Soviet and American scientists had exchanged hardware on a single mission. More advanced biosatellites were launched in the following years, and by 1978 American instruments had "hitchhiked" to the Moon aboard a robot

"Luna" orbiter. In that same year a small Soviet satellite was launched into an equatorial orbit from the Italian San Marco platform off the coast of Africa.

Cooperation opened the route to the planets as well, although the Soviets had some difficult habitual barriers of their own to overcome. Following the successful Soviet Venus orbiter in 1975 and the American Mars landing in 1976, both countries began to discuss future research goals. It was hard for the Soviets to break with tradition and actually announce their future plans, but it slowly happened. The first really combined planetary exploration began in 1978 with the launchings of a pair of Venus probes by both countries.

Also in 1978, the International Deep Space Network was inaugurated with the reception at Goldstone of signals from the first Soviet Jupiter probe. NASA needed the use of similar Soviet tracking antennas in the Crimea to replace the 210-foot Spanish facility. Tied in to Goldstone and the Australian receivers, Soviet deep space probes could increase their data rate by an order of magnitude. Cooperation in space began to pay off.

One of the main advantages of the Apollo-Soyuz docking was its spectacular symbolism, emphasized and accentuated by the fact that it was a manned space mission. Planners in both countries sought a feasible follow-on manned project which would continue to attract the surprisingly large worldwide public enthusiasm for the joint mission and other efforts like it.

A backup Apollo spacecraft and Saturn booster were available to NASA, and suggestions were discussed for an American visit to a planned six-man Soviet Salyut complex scheduled for space assembly in 1977. However promising these plans appeared, the Americans were compelled to back out for budgetary reasons.

Since the Soviets were also anxious to maintain this forward momentum which had been started with ASTP, they proposed an interim program for the five years before the US Space Shuttle became operational. US astronauts were invited to fly aboard Soviet Soyuz spacecraft in a special test program to try out new spacesuits and space rescue techniques.

A Russian cosmonaut and an American astronaut rode a Soyuz ship into orbit late in 1977 on the first shot of a three-flight "Intersoyuz" program. Both men wore American-built spacesuits of a radical new design. During their four days in orbit, spacemen Valery Bykovsky and Ronald Evans performed an extensive series of EVA experiments, including the first open-space untethered tests of the Astronaut Maneuvering Unit (AMU) first tried out inside the Skylab. The landing in Kazakhstan

was normal in every respect.

The second jointly-manned flight the following spring called for a visit to the derelict Skylab space station, which had decayed in its orbit low enough for Soviet rockets to reach it. The Soyuz docking gear had to be replaced with equipment cannibalized from a surplus Apollo command module so that the Soviet ship could make a linkup with the Skylab's Multiple Docking Adaptor. Lieutenant Colonel Vladimir Dzhanibekov and Lieutenant Colonel Jack Lousma crossed into the space station and managed to activate the life-support systems with residual consumables left in the tanks. This allowed the two pilots to work in shirt sleeves during their three-day visit, during which they tested various pieces of scientific equipment and made test observations of the Earth and the sun. They retrieved a special "time capsule" package of specimens designed to show the effects of long-term space exposure on various materials. During the last two days of the flight, after they had separated from Skylab, the men performed several EVAs to test the inflating and deorbiting procedures for a revolutionary new "space bailout" system.

This space bailout system was a new project initiated by the United States but shared with the Soviet Union. Once operational, the system would allow stranded spacemen of either country to leave their crippled spaceships and return to Earth unaided. Compact kits to be included on all future manned spacecraft would deploy into one-man heat shields. A small solid-fuel retrorocket could knock the space-suited man out of orbit. Once through the flames of re-entry, the pilot would freefall until he deployed his individual parachute and recovery beacon.

This system worked well in theory, in ground tests, and on the space tests during the second joint Soyuz flight. Now it was time to try it for real. On the last planned Intersoyuz flight in 1979, Soviet cosmonaut General Aleksey Leonov commanded the ship while Ameri-

can astronaut Lieutenant Colonel Robert Overmyer prepared to play human meteor. The whole world watched in tense expectation, as the greatest space drama since Neil Armstrong's Moon step a decade before began to unfold.

The launching from Baikonur cosmodrome was routine, and the first day in orbit was spent checking out the bailout kit. Thirty-three hours after blastoff, astronaut Overmyer was descending by parachute through a Texas sky while recovery forces tuned in to his radio beacon. His purely ballistic uncontrolled reentry brought him down sixty miles from his planned landing point, and the world held its breath until he was picked up. Cosmonaut Leonov urged on the rescuers from orbit, and he expressed his ultimate relief with a string of mixed Russian and English curses.

The following day Leonov conducted a surprise experiment of his own. After placing the Soyuz on autopilot, he donned the alternate bailout kit in the spaceship and cast himself off. His unexpected landing in the Ukraine turned out to be an authentic case of a real space emergency pickup, and he was severely reprimanded for taking the unnecessary risk. Leonov, who had been a champion parachutist and parachute instructor, confessed that he would never have forgiven himself if he had passed up this chance for the highest jump ever made.

The maturation of the new approach to joint space planning occurred during the Mars-9 and Mars-10 missions in 1977-1978, when the Soviets announced the flight schedules and experiments in advance of the actual launchings. A Soviet-American planning board was set up in Moscow, where they drew heavily upon US Viking experience to put together the optimum science program for the three planned orbiter-lander probes. When the third shot failed to reach orbit, Moscow discovered that nobody held it against them, despite the twenty years of official Soviet gloating over American space failures (which were always prominently reported in the world press, even when American successes were ignored). The remaining two missions did much to fill in the gaps left by the Viking experiments, and a permanent cooperative Mars exploration directorate was established.

This joint effort led directly to the planning for the 1981 Mars sample-return mission, in which pairs of Soviet and American vehicles would be launched independently. The unmanned Soviet spacecraft would land on Mars and deploy a "Marsokhod" robot car similar to those landed in 1978. Soil samples would be collected and loaded into a small rocket stage for launch into orbit around Mars, just as Soviet robots had been returning soil samples

from the Moon since 1970.

Once in orbit, the soil canister would be chased down by an American orbiter spacecraft, which would automatically dock with the Soviet satellite and transfer the soil samples by remote control from Earth. Blasting out of orbit, the American vehicle would begin a ten-month return voyage to Earth. It would eventually parachute back to waiting scientists in the USSR's Kazakhstan recovery zone.

Space cooperation would pay off again. A mission too complex and too expensive for either country was made possible by both countries. ASTP had shown American and Soviet space engineers how to work together, and the lesson was not forgotten or wasted.

By the late 1970s, Soviet and American space specialists were well on their way toward construction of their nations' next generation of manned spacecraft. The American "Space Shuttle" and the European "Spacelab" would carry payloads and scientist crews into orbit for research expeditions into the nature of space, of the Earth, of the sun, and of the universe.

The Soviets had a broader array of space vehicles under development. Their "Proton" and "Kosmograd" (or "G-class") boosters continued to make expendable flights into orbit. They had launched their 24-man Kosmograd space station in 1979, an impressive space outpost which was the size of Skylab but weighed half again as much. The two-man Soyuz manned spacecraft had become obsolete in all but its lunar versions, when a reusable twelve-man space ferry (launched on an expendable Proton booster) became operational in 1980.

Soviet and American space officials realized that the vehicles being developed in both countries could be complementary to each other if managed and coordinated carefully. To cooperate in such mission planning, permanent liaison offices were established at Houston and in Moscow, with branch offices in Washington and in Zvyozdniy ("Star Town," the home of the Soviet cosmonaut detachment). Both sides brought valuable and different approaches to the same problems: the Soviets adopted the American-designed weightless toilet, while the Americans began to use the USSR's water recycling equipment. Cooperation paid off.

Space pilot training also improved. All new spacemen of both nations (and later, from Europe and Japan) were required to learn and use a special two-hundred-word Russo-English space vocabulary in the event of an emergency space rescue situation. Voice transmission frequencies were standardized, and a worldwide alert system for emergency communications and landings was set up. Soviet cosmo-

nauts trained for Extravehicular Activity in the Huntsville underwater facilities, and also trained for jungle landings at the US Air Force survival school in Panama. American students were regular visitors at Soviet arctic survival schools. Cooperation paid off economically and psychologically.

With the first Kosmograd and Space Shuttle missions carried out by 1980, NASA and the USSR Academy of Sciences realized that both countries had left gaps in their manned spaceflight capabilities. The large permanent Soviet space station was a valuable platform for space research, but it was also expensive and inflexible when new equipment was needed for special time-critical experiments. The first vehicle had been orbited in 1979, and a second was not planned for another three years. Heavy equipment was sent into space on strictly scheduled unmanned Proton launches every four months.

At the same time, US officials realized that their total dependence on the Space Shuttle meant that no manned flight could be longer than the 30-day mission duration of the reusable space plane's orbiter section. This would eventually be overcome with the development of the "free-flying Spacelab" module which would be ready for testing in a few years. Meanwhile, all US manned flights were restricted to a maximum of thirty days.

These restrictions were overcome in a makeshift fashion by new cooperative exchange programs. Soviet scientists flew on a Space Shuttle mission early in 1980, and two American scientist-astronauts spent three months in the Kosmograd station later that year. Space cooperation paid off.

It paid off again the following year when NASA's Space Shuttle mission 12 carried a Soviet Salyut module into orbit in response to the supernova in Auriga. The vehicle had been outfitted in two weeks and launched with a three-man crew on an extended monitoring mission. An American astronomer, Robert Parker, was included at the last minute in the crew. The flight was put together quicker than the Soviets could have done, and stayed in space longer than the Americans were capable of.

With the exciting results from Viking-2 in 1976 and Mars-9 in 1978, world scientists began to press for a manned expedition to Mars as soon as possible. The 1981 cooperative unmanned sample return mission was seen as only an intermediate step in a program of exploration which would see men on Mars by the late 1980s.

Simultaneously, two startling facts were noticed by space planners looking at the problems of manned flight to Mars. Even the best Soviet atmosphere, water, and food regenerative systems—chem-

ical, mechanical, or biological—could not be made light enough and compact enough for the best American boosters to launch toward Mars. Better systems and better boosters were needed.

Meanwhile, one of the world's leading industrial and technological nations, whose population had always been fascinated with space exploration, had been left out of the US-Soviet-European space combine. Suddenly, the unique skills of Japan were crucial to success in the next step in man's conquest of space.

The resulting Ussuriysk conference in 1979 saw a formal invitation extended to Tokyo to design the regenerative life-support systems for a two-year manned expedition to Mars. The Japanese reacted enthusiastically. As the excitement engulfed the nation, thousands of private citizens began experimenting with "organic space gardens" to grow "Mars food." It was from the garden of postal inspector Shinobu Tsukahara that the now-famous "Japple" fruit was developed, to feed men on Mars as well as starving multitudes in Bangladesh, Brazil, and Ethiopia.

Japan had always been a resource-limited nation, where efficient recycling of all by-products was an absolute necessity. In the late 1970s, the Japanese had finally overcome their suffocating industrial pollution to develop a resource-regeneration industry which became a model for the rest of the world. Now traditional virtues were combined with futuristic visions, and the result in national pride and ingenuity was astounding to foreigners and Japanese alike.

Preliminary systems were ready for space testing within eighteen months, but space planners were

THE ANALYTICAL LABORATORY

May 1975

Place	Title	Author	Points
1	.....The Storms of Windhaven	*Lisa Tuttle* and *George R.R. Martin*.....	1.734
2	.....Nascent.....	*Michael Sutch*	2.553
3	.....Two Heads Are Better Than One	*Spider Robinson*	3.013
4	.....Country of the Mind	*W. Macfarlane*.....	3.717
5	.....A Scraping at the Bones	*Algis Budrys*.....	3.813

dismayed to find out that there were no appropriate vehicles to test them with. The Kosmograd was too inflexible, the Space Shuttle was too brief, and the ferry vehicles were too small.

So a new space mission was born from the unique and complementary capabilities of the four main space powers. A Soviet Salyut laboratory would be modified to carry control and communications gear and living quarters for the men. The Europeans modified a "Spacelab" pallet to support the Japanese space garden. The two separate payloads would be launched by American Space Shuttles into "sun-synchronous" retrograde orbits where they would experience continuous sunlight for the duration of the mission.

Four spacemen would represent the world on this test of new engineering skills needed to fly to Mars, and of man's ability to withstand the long periods of weightlessness on the way. The mission commander would be a Russian, since the main spacecraft was Soviet. The mission engineer would be a European, since they had designed the supporting equipment for the experiments. The mission scientist would be Japanese, since they had designed the botanical systems. The mission flight surgeon would be American, since they had the most experience in space medicine. The common language would be English. By late 1981, the four men were picked, trained, and ready.

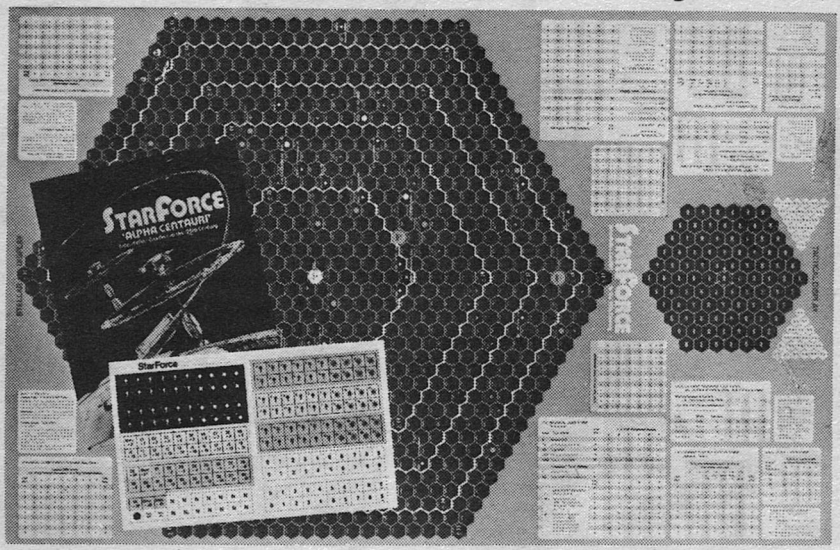
The success of this bold mission, and the success of the joint Soviet-American automatic Mars sample return effort under way at the same time, would be critical for the planning for a manned flight to Mars. If all went well, the pieces would fall into place within five years. It would not cost anywhere near the horrible fifty-billion-dollar figure quoted by opponents a decade before; the total US expenditure would be closer to ten billion dollars in 1975 prices.

The Americans, meanwhile, pushed on with plans for the development of a nuclear rocket stage for use in space. It would reopen the road to the Moon and make flight to Mars possible. The effort had temporarily been stalled when the designed vehicle appeared to be far too large and heavy for the limited payload bay of the Space Shuttle. This restriction was overcome when the Soviets volunteered (on an exchange reimbursable basis) the use of their large Kosmograd booster which had three times the lifting power of the Space Shuttle. Space cooperation paid off again, and men all over the world turned their eyes on Mars.

When the first man stepped out onto the surface of Mars several years later, the whole Earth watched. The whole Earth had sent him. It was the legacy of Apollo-Soyuz. ■

STARFORCE

Interstellar Conflict in the 25th Century



A Future-History Space War Simulation

StarForce is serious science-fiction in game form. You command the space fleets of the Human, L'Chal-Dah, Rame and Xenophobe races as they fight for control of the 74 star-systems depicted on the forty light-year "Stellar Display". The future becomes history in fourteen scenarios simulating wars taking place from 2405 to 2785 A.D. StarForce fleets, StarGates, interstellar flight, tactical space maneuvering, empires and revolutions, induced novas, a written future history, a rescue mission - **StarForce** has all this and more! A big 22"x34" game map, 200 playing pieces, and a 24-page, illustrated rules booklet packaged in a beautiful, compartmented plastic box...all for only $8 direct from Simulations Publications, Inc., publishers of Strategy & Tactics Magazine.

Send check or money order to:
Simulations Publications, Inc., Dept. 568
44 East 23rd Street, New York, N.Y. 10010

Please send me the following simulation games:

- ☐ **STARFORCE,** Interstellar Conflict in the 25th Century. **$8**
- ☐ **World War III,** Global Warfare in the '70's. **$8**
- ☐ **The East Is Red,** The Sino-Soviet Conflict. **$8**
- ☐ **Seelowe,** The German Invasion of Britain. **$8**

Enter my subscription to **Strategy & Tactics,** the military history magazine with a simulation game in it!

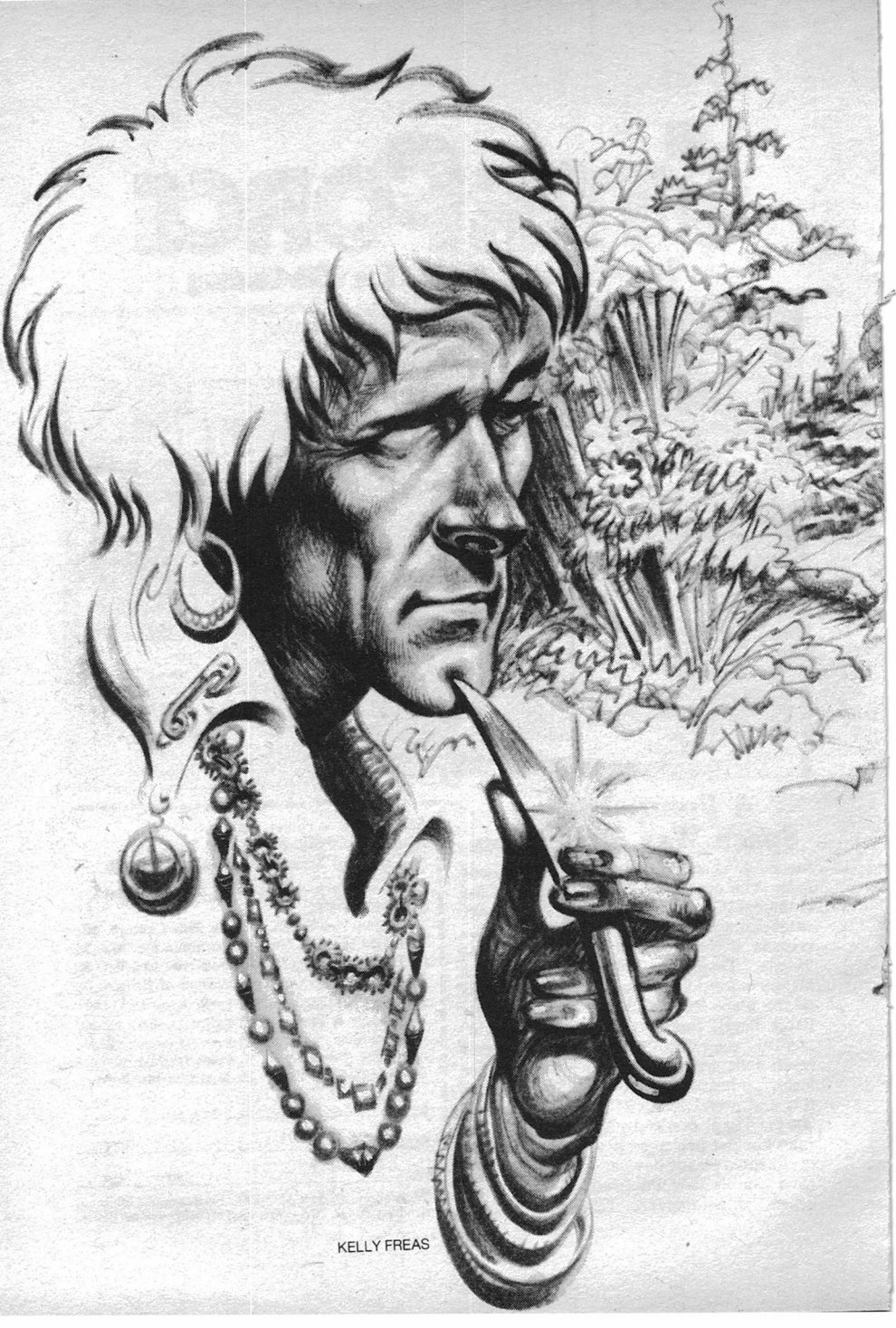
- ☐ **1 year** (6 issues): $14.00
- ☐ **2 yrs.** (12 issues): $26.00
- ☐ **3 yrs.** (18 issues): $36.00
- ☐ **6 mos.** (3 issues): $9.00
- ☐ send free brochure

name _____

street _____ apt# _____

city _____ state _____ zip _____

Prices apply to U.S. & APO/FPO. Foreign orders subject to handling charge. Prices are subject to change without notice.



KELLY FREAS

JOAN and VERNOR VINGE

Any man can learn to be a magician if he's wise enough to follow the right teacher.

the peddler's apprentice

Lord Buckry I of Fyffe lounged on his throne, watching his two youngest sons engaged in mock battle in the empty Audience Hall. The daggers were wooden but the rivalry was real, and the smaller boy was at a disadvantage. Lord Buckry tugged on a heavy gold earring; thin, brown-haired Hanaban was his private favorite, the boy took after his father both in appearance and turn of mind.

The lord of the Flatlands was a tall man, his own unkempt brown hair graying now at the temples. The blue eyes in his lean, foxlike face still perceived with disconcerting sharpness, though years of experience kept his own thoughts hidden. More than twenty years had passed since he had won control of his lands; he had not kept his precarious place as lord so long without good reason.

Now his eyes flashed rare approval as Hanaban cried, "Trace, look there!" and, as his brother turned, distracted, whacked him soundly on the chest.

"Gotcha!" Hanaban shrieked delightedly. Trace grimaced with disgust.

Their father chuckled, but his face changed suddenly as the sound of a commotion outside the chamber reached him. The heavy, windowed doors at the far end of the room burst open; the Flatlander courier shook off guards, crossed the high-ceilinged, echoing chamber and flung himself into a bow, his rifle clattering on the floor. "Your Lordship!"

Lord Buckry snapped his fingers; his gaping children silently fled the room. "Get up," he said impatiently. "What in tarnation is this?"

"Your Lordship." The courier raised a dusty face, wincing mentally at his lord's Highland drawl. "There's word the sea kingdoms have raised another army. They're crossing the coast mountains, and—"

"That ain't possible. We cleaned them out not half a year since."

"They've a lot of folk along the coast, Your Lordship." The horseman stood apologetically. "And Jayley Sharkstooth's made a pact this time with the Southlands."

Lord Buckry stiffened. "They've been at each other's throats long as I can remember." He frowned, pulling at his earring. "Only thing they've got in common is—me. Damn!"

He listened distractedly to the rider's report, then stood abruptly, dismissing the man as an afterthought. As the heavy doors of the hall slid shut he was already striding toward the elevator, past the shaft of the ballistic vehicle exit, unused for more than thirty years. His soft-soled Highlander boots made no sound on the cold polished floor.

From the parapet of his castle he could survey a wide stretch of his domain, the rich, utterly flat farmlands of the hundred-mile-wide

valley—the lands the South and West were hungry for. The fields were dark now with turned earth, ready for the spring planting; it was no time to be calling up an army. He was sure his enemies were aware of that. The day was exceptionally clear, and at the eastern reaches of his sight he could make out the grayed purple wall of the mountains: the Highlands, that held his birthplace—and something more important to him now.

The dry wind ruffled his hair as he looked back across thirty years; his sunburned hands tightened on the seamless, ancient green-blackness of the parapet. "Damn you, Mr. Jagged," he said to the wind. "Where's your magic when I *need* it?"

The peddler came to Darkwood Corners from the east, on Wim Buckry's seventeenth birthday. It was early summer, and Wim could still see sun flashing on snow up the pine-wooded hill that towered above the Corners; the snowpack in the higher hills was melting at last, sluicing down gullies that stood dry through most of the year, changing Littlebig Creek into a cold, singing torrent tearing at the earth below the cabins on the north side of the road. Even a week ago the East Pass had lain under more than thirty feet of snow.

Something like silence came over the townspeople as they saw the peddler dragging his cart down the east road toward the Corners. His wagon was nearly ten feet tall and fifteen long, with carved, bright-painted wooden sides that bent sharply out over the wheels to meet a gabled roof. Wim gaped in wonder as he saw those wheels, spindly as willow wood yet over five feet across. Under the cart's weight they sank half a foot and more into the mud of the road, but cut through the mud without resistance, without leaving a rut.

Even so, the peddler was bent nearly double with the effort of pulling his load. The fellow was short and heavy, with skin a good deal darker than Wim had ever seen. His pointed black beard jutted at a determined angle as he staggered along the rutted track, up to his ankles in mud. Above his calves the tooled leather of his leggings gleamed black and clean. Several scrofulous dogs nosed warily around him as he plodded down the center of the road; he ignored them as he ignored the staring townsfolk.

Wim shoved his empty mug back at Ounze Rumpster, sitting nearest the tavern door. "More," he said. Ounze swore, got up from the steps, and disappeared into the tavern.

Wim's attention never left the peddler for an instant. As the dark man reached the widening in the road at the center of town, he pulled his wagon into the muddy morass where the Widow Henley's

house had stood until the Littlebig Creek dragged it to destruction. The stranger had everyone's attention now. Even the town's smith had left his fire, and stood in his doorway gazing down the street at the peddler.

The peddler turned his back on them as he kicked an arresting gear down from the rear of the painted wagon and let it settle into the mud. He returned to the front of the cart and moved a small wheel set in the wood paneling: a narrow blue pennant sprouted from the peak of the gable and fluttered briskly; crisp and metallic, a pinging melody came from the wagon. That sound emptied the tavern and brought the remainder of the Corners' population onto the street. Ounze Rumpster nearly fell down the wooden steps in his haste to see the source of the music; he sat down heavily, handing the refilled mug to Wim. Wim ignored him.

As the peddler turned back to the crowd the eerie music stopped, and the creek sounded loud in the silence. Then the little man's surprising bass voice rumbled out at them, "Jagit Katchetooriantz is my name, and fine wrought goods is my trade. Needles, adze-heads, blades–you need 'em?" He pulled a latch on the wagon's wall and a panel swung out from its side, revealing rows of shining knife-blades and needles so fine Wim could see only glitter where they caught the sunlight. "Step right on up, folks. Take a look, take a feel. Tell me what they might be worth to you." There was no need to repeat the invitation–in seconds he was surrounded. As the townspeople closed around him, he mounted a small step set in the side of the wagon, so that he could still be seen over the crowd.

Wim's boys were on their feet; but he sat motionless, his sharp face intent. "Set down," he said, just loudly enough. "Your eyes is near busting out of your heads. They'd skin us right fast if we try anything here. There's too many. Set!" He gave the nearest of them, Bathecar Henley, a sideways kick in the shin; they all sat. "Gimme that big ring of yours, Sothead."

Ounze Rumpster's younger brother glared at him, then extended his jeweled fist from a filthy woolen cuff. "How come you're so feisty of a sudden, Wim?" He dropped the ring peevishly into the other's hand. Wim turned away without comment, passing the massive chunk of gold to Bathecar's plump, fair girlfriend.

"All right, Emmy, you just take yourself over to that wagon and see about buying us some knife-blades–not too long, say about so." He stretched his fingers. "And find out how they're fastened on the rack."

"Sure, Wim." She rose from the steps and minced away across the muddy road toward the crowd at the peddler's wagon. Wim grim-

aced, reflecting that the red knit dress Bathecar had brought her was perhaps too small.

The peddler's spiel continued, all but drowning out the sound of Littlebig Creek: "Just try your blades 'gin mine, friends. Go ahead. Nary a scratch you've made on mine, see? Now how much is it worth, friends? I'll take gold, silver. Or craft items. And I need a horse—lost my own, coming down those blamed trails." He waved toward the East Pass. The townspeople were packed tightly together now as each of them tried for a chance to test the gleaming metal, and to make some bid that would catch the peddler's fancy. Emmy wriggled expertly into the mass; in seconds Wim could see her red dress right at the front of the crowd. She was happily fondling the merchandise, competing with the rest for the stranger's attention.

Hanaban Kroy shifted his bulk on the hard wooden step. "Three gold pigs says that outlander is from down west. He just come in from the east to set us all to talking. Nobody makes knives like them east of the pass."

Wim nodded slightly. "Could be." He watched the peddler and fingered the thick gold earring half-hidden in his shaggy brown hair.

Across the road, the merchant was engaged in a four-way bidding session. Many of the townsfolk wanted to trade furs, or crossbows, but Jagit Katchetooriantz wasn't interested. This narrowed his potential clientele considerably. Even as he argued avidly with those below him, his quick dark eyes flickered up and down the street, took in the gang by the tavern, impaled Wim for a long, cold instant.

The peddler lifted several blades off the rack and handed them down, apparently receiving metal in return. Emmy got at least two. Then he raised his arms for quiet. "Folks, I'm real sorry for dropping in so sudden, when you all wasn't ready for me. Let's us quit now and try again tomorrow, when you can bring what you have to trade. I might even take on some furs. And bring horses, too, if you want to. Seein' as how I'm in need of one, I'll give two, maybe three adze heads for a good horse or mule. All right?"

It wasn't. Several frustrated townsfolk tried to pry merchandise off the rack. Wim noticed that they were unsuccessful. The merchant pulled the lanyard at the front of the cart and the rack turned inward, returning carved wood paneling to the outside. As the crowd thinned, Wim saw Emmy, clutching two knives and a piece of print cloth, still talking earnestly to the peddler.

The peddler took a silvery chain from around his waist, passed it through the wheels of his cart and then around a nearby tree. Then he followed Emmy back across the road.

Ounze Rumpster snorted. "That sure is a teensy ketter. Betcha we could bust it right easy."

"Could be . . ." Wim nodded again, not listening. Anger turned his eyes to blue ice as Emmy led the peddler right to the tavern steps.

"Oh, Bathecar, just lookit the fine needles Mr. Ketchatoor sold me—"

Sothead struggled to his feet. "You stupid little—little— We told you to buy knives. Knives! And you used my ring to buy needles!" He grabbed the cloth from Emmy's hands and began ripping it up.

"Hey—!" Emmy began to pound him in useless fury, clawing after her prize. "Bathecar, make him stop!" Bathecar and Ounze pulled Sothead down, retrieved needles and cloth. Emmy pouted, "Big lout."

Wim frowned and drank, his attention fixed on the peddler. The dark man stood looking from one gang member to another, hands loosely at his sides, smiling faintly; the calm black eyes missed nothing. Eyes like that didn't belong in the face of a fat peddler. Wim shifted uncomfortably, gnawed by sudden uncertainty. He shook it off. How many chances did you get up here, to try a contest where the outcome wasn't sure— He stood and thrust out his hand. "Wim Buckry's the name, Mr. Ketchatoor. Sorry about Sothead; he's drunk all the time, 'truth."

The peddler had to reach up slightly to shake his hand. "Folks mostly call me Jagit. Pleased to meet you. Miss Emmy here tells me you and your men sometimes hire out to protect folks such as me."

Behind him, Bathecar Henley was open-mouthed. Emmy simpered; every so often, she proved that she was not as stupid as she looked. Wim nodded judiciously. "We do, and it's surely worth it to have our service. There's a sight of thieves in these hills, but most of them will back down from six good bows." He glanced at Sothead. "Five good bows."

"Well then." The pudgy little man smiled blandly, and for a moment Wim wondered how he could ever have seen anything deadly in that face. "I'd like to give you some of my business."

And so they came down out of the high hills. It was early summer, but in the Highlands more like a boisterous spring: Under the brilliant blue sky, green spread everywhere over the ground, nudging the dingy hummocks of melting snow and outcropping shelves of ancient granite. Full leaping streams sang down the alpine valleys, plunged over falls and rapids that smashed the water to white foam and spread it in glinting veils scarcely an inch deep over bedrock. The ragged peaks skirted with glacier fell further and further behind,

yet the day grew no warmer; everywhere the chill water kept the air cool.

The peddler and his six "protectors" followed a winding course through deep soughing pine forest, broken by alpine meadows where bright star-like flowers bloomed and the short hummocky grass made their ankles ache with fatigue. They passed by marshes that even in the coolness swarmed with eager mosquitoes, and Wim's high moccasins squelched on the soft dank earth.

But by late afternoon the party had reached Witch Hollow Trail, and the way grew easier for the horse pulling the merchant's wagon. Somewhere ahead of them Ounze Rumpster kept the point position; off to the side were fat Hanaban, Bathecar, and Shorty, while Sothead Rumpster, now nearly sober, brought up the rear. In the Highlands even the robbers—particularly the robbers—journeyed with caution.

For most of the day Wim traveled silently, listening to the streaming water, the wind, the twittering birds among the pines—listening for sounds of human treachery. But it seemed they were alone. He had seen one farmer about four miles outside of Darkwood Corners and since then, no one.

Yesterday the peddler had questioned him about the area, and how many folk were in the vicinity of the Corners, what they did for a living. He'd seemed disappointed when he'd heard they were mostly poor, scattered farmers and trappers, saying his goods were more the kind to interest rich city folk. Wim had promptly allowed as how he was one of the few Highlanders who had ever been down into the Great Valley, all the way to the grand city of Fyffe; and that they'd be more than glad to guide him down into the Flatlands—for a price. If a little greed would conceal their real intentions, so much the better. And the peddler's partial payment, of strange, jewel-studded silver balls, had only added to the sincerity of their interest in his future plans.

Wim glanced over at the peddler, walking beside him near the dappled cart horse. Up close, the stranger seemed even more peculiar than at a distance. His straight black hair was cut with unbelievable precision at the base of his neck; Wim wondered if he'd set a bowl on his head and cut around it. And he smelled odd; not unpleasant, but more like old pine-needles than man. The silver thread stitched into the peddler's soft leather shirt was finer than Wim had ever seen. That would be a nice shirt to have— Wim tugged absently at the loops of bead and polished metal hanging against his own worn linen shirt.

Though short and heavy, the stranger walked briskly and didn't seem to tire; in fact, became

friendlier and more talkative as the afternoon passed. But when they reached Witch Hollow he fell silent again, looking first at the unusual smoothness of the path, then up at the naked bedrock wall that jutted up at the side of the narrow trail.

They had walked for about half a mile when Wim volunteered, "This here's called Witch Hollow. There's a story, how once folk had magic to fly through the air in strange contraptions. One of them lost his magic hereabouts–up till twenty years ago, there was still a place you could see the bones, and pieces of steel, they say, all rusted up. Some say this trail through the holler ain't natural, either."

Jagit made no reply, but walked with his head down, his pointy black beard tucked into his chest. For the first time since they had begun the journey he seemed to lose interest in the scenery. At last he said, "How long you figure it's been since this flying contraption crashed here?"

Wim shrugged. "My granther heard the story from his own granther."

"Hmm. And that's all the . . . magic you've heard tell of?"

Wim decided not to tell the peddler what he knew about Fyffe. That might scare the little man into turning back, and force a premature confrontation. "Well, we have witches in these hills, like Widow Henley's cousin, but they're most of them fakes–least the ones I seen. Outside of them and the bad luck that folks claim follows sin"–a grin twitched his mouth–"well, I don't know of no magic. What was you expecting?"

Jagit shook his head. "Something more than a piddling failed witch, that's sure. The more I see of this country, the more I know it ain't the place I started out for."

They walked the next mile in silence. The trail pierced a granite ridge; Wim glimpsed Hanaban high up on their left, paralleling the wagon. Red-faced with exertion, he waved briefly down at them, indicating no problems. Wim returned the signal, and returned to his thoughts about the peculiar little man who walked at his side. Somehow he kept remembering yesterday, Hanaban whining, "Wim, that there little man smells rotten to me. I say we should drop him," and the unease that had crept back into his own mind. Angry at himself as much as anything, he'd snapped, "You going yellow, Han? Just because a feller's strange don't mean he's got an evil eye." And known it hadn't convinced either of them . . .

Perhaps sensing the drift of his silence, or perhaps for some other reason, the peddler began to talk again. This time it was not of where he was going, however, but rather about himself, and where he had come from–a place called Sharn, a land of such incredible wonders that if Wim had heard the

tale from someone else he would have laughed.

For Sharn was a land where true magicians ruled, where a flying contraption of steel would be remarkable only for its commonness. Sharn was an immense land—but a city also, a city without streets, a single gleaming sentient crystal that challenged the sky with spears of light. And the people of Sharn by their magic had become like gods; they wore clothing like gossamer, threw themselves across the sky in lightning while thunder followed, spoke to one another over miles. They settled beneath the warm seas of their borders, the weather obeyed them, and they remained young as long as they lived. And their magic made them dreadful warriors and mighty conquerors, for they could kill with scarcely more than a thought and a nod. If a mountain offended them they could destroy it in an instant. Wim thought of his Highlands, and shuddered, touching the bone hilt of the knife strapped to his leg.

Jagit had come to Sharn from a land still further east, and much more primitive. He had stayed and learned what he could of Sharn's magic. The goods he brought to Sharn were popular and had brought high prices; during the time he had spent in the enchanted land he had acquired a small collection of the weaker Sharnish spells. Then he left, to seek a market for these acquisitions—some land where magic was known, but not so deeply as in Sharn.

As the peddler finished his tale, Wim saw that the sun had nearly reached the ridge of the hills to the west before them. He walked on for several minutes, squinting into the sunset for traces of lost Sharn.

The trail curved through ninety degrees, headed down across a small valley. Half hidden in the deepening shadow that now spread over the land, a precarious wooden bridge crossed a stream. Beyond the bridge the pines climbed the darkened hillside into sudden sunlight. Along the far ridgeline, not more than a mile away, ten or twelve immense, solitary trees caught the light, towering over the forest.

"Mr. Jagged, you're the best liar I ever met." Stubbornly Wim swallowed his awe, felt the peddler's unnerving eyes on his face as he pointed across the valley. "Just beyond that ridgeline's where we figure on putting up tonight. A place called Grandfather Grove. Could be you never seen trees that big even in Sharn!"

The peddler peered into the leveling sunlight. "Could be," he said. "I'd surely like to see such trees, anyhow."

They descended from the sunlight into rising darkness. Wim glimpsed Ounze's high felt hat as he walked out of the shadow on the other side of the valley, but none of the other gang members

were visible. Wim and the peddler were forced to leave Witch Hollow Trail, and the going became more difficult for horse and wagon; but they reached the edge of the Grandfather Grove in less than half an hour, passing one of the soaring trees, and then two, and three. The dwarfed, spindly pines thinned and finally were gone. Ahead of them were only the grandfather trees, their shaggy striated trunks russet and gold in the dying light. The breeze that had crossed the valley with them, the roaring of the stream behind them, all sounds faded into cathedral silence, leaving only the cool, still air and the golden trees. Wim stopped and bent his head back to catch even a glimpse of the lowest branches, needled with pungent golden-green. This was their land, and he knew more than one tale that told of how the trees guarded it, kept pestiferous creatures away, kept the air cool and the soil fragrant and faintly moist throughout the summer.

"Over here." Hanaban's voice came muted from their left. They rounded the twenty-foot base of a tree, and found Hanaban and Bathecar, setting a small fire with kindling they had carried into the grove—Wim knew the bark of the grandfather trees was almost unburnable. The struggling blaze illuminated an immense pit of darkness behind them: the gutted trunk of an ancient grandfather tree, that formed a living cave-shelter for the night's camp.

By the time they had eaten and rotated lookouts, the sun had set. Wim smothered the fire, and the only light was from the sickle moon following the sun down into the west.

The peddler made no move to bed down, Wim noticed with growing irritation. He sat with legs crossed under him in the shadow of his wagon; motionless and wearing a dark coat against the chill, he was all but invisible, but Wim thought the little man was looking up into the sky. His silence stretched on, until Wim thought he would have to pretend to sleep himself before the peddler would. Finally Jagit stood and walked to the rear of his wagon. He opened a tiny hatch and removed two objects.

"What's them?" Wim asked, both curious and suspicious.

"Just a bit of harmless magic." He set one of the contraptions down on the ground, what seemed to be a long rod with a grip at one end. Wim came up to him, as he put the second object against his eye. The second contraption looked much more complex. It glinted, almost sparkled in the dim moonlight, and Wim thought he saw mirrors and strange rulings on its side. A tiny bubble floated along the side in a tube. The peddler stared through the gadget at the scattering of pale stars visible be-

tween the trees. At last he set the device back inside the wagon, and picked up the rod. Wim watched him cautiously as the other walked toward the cave tree; the rod looked too much like a weapon.

Jagit fiddled at the grip of the rod, and an eerie whine spread through the grove. The screaming faded into silence again, but Wim was sure that now the front of the rod was spinning. Jagit set it against the moon-silvered bark of the cave tree, and the tip of the rod began to bore effortlessly into the massive trunk.

Wim's voice quavered faintly. "That . . . that there some of your Sharnish magic, Mr. Jagged?"

The peddler chuckled softly, finishing his experiment. "It ain't hardly that. A Sharnish enchantment is a lot craftier, a lot simpler *looking.* This here's just a simple spell for reading the Signs."

"Um." Wim wavered almost visibly, his curiosity doing battle with his fear. There was a deep, precise hole in the cave tree. *Just because a fellow's strange, Han, don't mean he's got an evil eye* . . . instinctively Wim's fingers crossed. Because it looked like the peddler might not be the world's biggest liar; and that meant— "Maybe I better check how the boys is settled."

When the peddler didn't answer, Wim turned and walked briskly away. At least he hoped that was how it looked; he felt like running. He passed Ounze, half-hidden behind a gigantic stump; Wim said nothing, but motioned for him to continue his surveillance of the peddler and his wagon. The rest stood waiting at a medium-sized grandfather tree nearly a hundred yards from the cave tree, the spot they had agreed on last night in Darkwood Corners. Wim moved silently across the springy ground, rounding the ruins of what must once have been one of the largest trees in the grove: a four-hundred-foot giant that disease and the years had brought crashing down. The great disc of its shattered root system rose more than thirty feet into the air, dwarfing him as he dropped down heavily beside Hanaban.

Bathecar Henley whispered, "Ounze and Sothead I left out as guards."

Wim nodded. "It don't hardly matter. We're not going to touch that peddler."

"What!" Bathecar's exclamation was loud with surprise. He lowered his voice only slightly as he continued, "One man? You're ascared of one man?"

Wim motioned threateningly for silence. "You heard me. Hanaban here was right—that Jagged is just too damn dangerous. He's a warlock, he's got an evil eye. And he's got some kind of knife back there that can cut clean through a grandfather tree! And the way he talks, that's just the least . . ."

The others' muttered curses cut

him off. Only Hanaban Kroy kept silent.

"You're crazy, Wim," the hulking shadow of Shorty said. "We've walked fifteen miles today. And you're telling us it was for nothing! It'd be easier to farm for a living."

"We'll still get something, but it looks like we'll have to go honest for a while. I figure on guiding him down, say to where the leaf forests start, and then asking pretty please for half of what he promised us back at the Corners."

"I sure as hell ain't going to follow nobody that far down toward the Valley." Bathecar frowned.

"Well, then, you can just turn around and head back. I'm running this here gang, Bathecar, don't you forget it. We already got something out of this deal, them silver balls he give us as first payment—"

Something went *hisss* and then *thuk:* Hanaban sprawled forward, collapsed on the moonlit ground beyond the tree's shadow. A crossbow bolt protruded from his throat.

As Wim and Bathecar scrabbled for the cover of the rotting root system, Shorty rose and snarled, "That damn peddler!" It cost him his life; three arrows smashed into him where he stood, and he collapsed across Hanaban.

Wim heard their attackers closing in on them, noisily confident. From what he could see, he realized they were all armed with crossbows; his boys didn't stand a chance against odds like that. He burrowed his way deeper into the clawing roots, felt a string of beads snap and shower over his hand. Behind him Bathecar unslung his own crossbow and cocked it.

Wim looked over his shoulder, and then, for the length of a heartbeat, he saw the silvery white of the moon-painted landscape blaze with harshly shadowed blue brilliance. He shook his head, dazzled and wondering; until amazement was driven from his mind by sudden screams. He began to curse and pray at the same time.

But then their assailants had reached the fallen tree. Wim heard them thrusting into the roots, shrank back further out of reach of their knives. Another scream echoed close and a voice remarked, "Hey, Rufe, I got the bastard as shot Rocker last fall."

A different voice answered, "That makes five then. Everybody excepting the peddler and Wim Buckry."

Wim held his breath, sweating. He recognized the second voice—Axl Bork, the oldest of the Bork brothers. For the last two years Wim's gang had cut into the Bork clan's habitual thievery, and up until tonight his quick-wittedness had kept them safe from the Bork's revenge. But tonight—how had he gone so wrong tonight? Damn that peddler!

He heard hands thrusting again among the roots, closer now. Then abruptly fingers caught in his hair.

He pulled away, but another pair of hands joined the first, catching him by the hair and then the collar of his leather jerkin. He was hauled roughly from the tangle of roots and thrown down. He scrambled to his feet, was kicked in the stomach before he could run off. He fell gasping back onto the ground, felt his knife jerked from the sheath; three shadowy figures loomed over him. The nearest placed a heavy foot on his middle and said, "Well, Wim Buckry. You just lie still, boy. It's been a good night, even if we don't catch that peddler. You just got a little crazy with greed, boy. My cousins done killed every last one of your gang." Their laughter raked him. "Fifteen minutes and we done what we couldn't do the last two years.

"Lew, you take Wim here over to that cave tree. Once we find that peddler we're going to have us a little fun with the both of them."

Wim was pulled to his feet and then kicked, sprawling over the bodies of Hanaban and Shorty. He struggled to his feet and ran, only to be tripped and booted by another Bork. By the time he reached the cave tree his right arm hung useless at his side, and one eye was blind with warm sticky blood.

The Borks had tried to rekindle the campfire. Three of them stood around him in the wavering light; he listened to the rest searching among the trees. He wondered dismally why they couldn't find one wagon on open ground, when they'd found every one of his boys.

One of the younger cousins—scarcely more than fifteen—amused himself half-heartedly by thrusting glowing twigs at Wim's face. Wim slapped at him, missed, and at last one of the other Borks knocked the burning wood from the boy's hand; Wim remembered that Axl Bork claimed first rights against anyone who ran afoul of the gang. He squirmed back away from the fire and propped himself against the dry resilient trunk of the cave tree, stunned with pain and despair. Through one eye he could see the other Borks returning empty-handed from their search. He counted six Borks altogether, but by the feeble flame-cast light he couldn't make out their features. The only one he could have recognized for sure was Axl Bork, and his runty silhouette was missing. Two of the clansmen moved past him into the blackness of the cave tree's heart, he heard them get down on their hands and knees to crawl around the bend at the end of the passage. The peddler could have hidden back there, but his wagon would have filled the cave's entrance. Wim wondered again why the Borks couldn't find that wagon; and wished again that he'd never seen it at all.

The two men emerged from the tree just as Axl limped into the shrinking circle of firelight. The stubby bandit was at least forty

years old, but through those forty years he had lost his share of fights, and walked slightly bent-over; Wim knew that his drooping hat covered a hairless skull marred with scars and even one dent. The eldest Bork cut close by the fire, heedlessly sending dust and unburnable bark into the guttering flames. "Awright, where in the motherdevil blazes you toad-gets been keeping your eyes? You was standing ever' whichway from this tree, you skewered every one of that damn Buckry gang excepting Wim here. Why ain't you found that peddler?"

"He's gone, Ax', gone." The boy who had been playing with Wim seemed to think that was a revelation. But Axl was not impressed, his backhand sent the boy up against the side of the tree.

One of the other silhouetted figures spoke hesitantly. "Don't go misbelieving me when I tell you this, Axl . . . but I was looking straight at this here cave tree when you went after them others. I could see that peddler clear as I see you now, standing right beside his wagon and his horse. Then all of a sudden there was this blue flash—I tell you, Ax', it was *bright*—and for a minute I couldn't see nothing, and then when I could again, why there wasn't hide nor hair of that outlander."

"Hmm." The elder Bork took this story without apparent anger. He scratched under his left armpit and began to shuffle around the dying fire toward where Wim lay. "Gone, eh? Just like that. He sounds like a right good prize . . ." He reached suddenly and caught Wim by the collar, dragged him toward the fire. Stopping just inside the ring of light, he pulled Wim up close to his face. The wide, sagging brim of his hat threw his face into a hollow blackness that was somehow more terrible than any reality.

Seeing Wim's expression, he laughed raspingly, and did not turn his face toward the fire. "It's been a long time, Wim, that I been wanting to learn you a lesson. But now I can mix business and pleasure. We're just gonna burn you an inch at a time until you tell us where your friend lit out to."

Wim barely stifled the whimper he felt growing in his throat; Axl Bork began to force his good hand inch by inch into the fire. All he wanted to do was to scream the truth, to tell them the peddler had never made him party to his magic. But he knew the truth would no more be accepted than his cries for mercy; the only way out was to lie—to lie better than he ever had before. The tales the peddler had told him during the day rose from his mind to shape his words, "Just go ahead, Ax! Get your fun. I know I'm good as dead. But so's all of you—" The grip stayed firm on his shoulders and neck, but the knotted hand stopped forcing him

toward the fire. He felt his own hand scorching in the super-heated air above the embers. Desperately he forced the pain into the same place with his fear and ignored it, "Why d'you think me and my boys didn't lay a hand on that peddler all day long? Just so's we could get ambushed by you?" His laughter was slightly hysterical. "The truth is we was scared clean out of our wits! That foreigner's a warlock, he's too dangerous to go after. He can reach straight into your head, cloud your mind, make you see what just plain isn't. He can kill you, just by looking at you kinda mean-like. Why"—and true inspiration struck him—"why, he could even have killed one of your perty cousins, and be standing here right now pretending to be a Bork, and you'd never know it till he struck *you* dead . . ."

Axl swore and ground Wim's hand into the embers. Even expecting it, Wim couldn't help himself; his scream was loud and shrill. After an instant as long as forever Axl pulled his hand from the heat. The motion stirred the embers, sending a final spurt of evil reddish flame up from the coals before the fire guttered out, leaving only dim ruby points to compete with the moonlight. For a long moment no one spoke; Wim bit his tongue to keep from moaning. The only sounds were a faint rustling breeze, hundreds of feet up among the leafy crowns of the grandfather trees—and the snort of a horse somewhere close by.

"Hey, we ain't got no horses," someone said uneasily.

Seven human figures stood in the immense spreading shadow of the cave tree, lined in faint silver by the setting moon. The Borks stood very still, watching one another—and then Wim realized what they must just have noticed themselves: there should have been eight Bork kinsmen. Somehow the peddler had eliminated one of the Borks during the attack, so silently, so quickly, that his loss had gone unnoticed. Wim shuddered, suddenly remembering a flare of unreal blue-white light, and the claims he had just made for the peddler. If one Bork could be killed so easily, why not two? In which case—

"He's here, pretending to be one of you!" Wim cried, his voice cracking.

And he could almost feel their terror echoing back and forth, from one to another, growing—until one of the shortest of the silhouettes broke and ran out into the moonlight. He got only about twenty feet, before he was brought down by a crossbow quarrel in the back. Even as the fugitive crumpled onto the soft, silver dirt a second crossbow thunked and another of the brothers fell dead across Wim's feet.

"That was Clyne, you . . . warlock!" More bows lowered around the circle.

"Hold on now!" shouted Axl. There were five Borks left standing; two bodies sprawled unmoving on the ground. "The peddler got us in his spell. We got to keep our sense and figure out which of us he's pretendin' to be."

"But Ax', he ain't just in disguise, we woulda seen which one he is . . .he—he can trick us into believing he's anybody!"

Trapped beneath the corpse, all Wim could see were five shadows against the night. Their faces were hidden from the light, and bulky clothing disguised any differences. He bit his lips against the least sound of pain; now was no time to remind the remaining Borks of Wim Buckry— But the agony of his hand pulsed up his arm until he felt a terrible dizziness wrench the blurring world away and his head drooped . . .

He opened his eyes again and saw that only three men stood now in the glade. Two more had died; the newest corpse still twitched on the ground.

Axl's voice was shrill with rage. "You . . . monster! You done tricked all of us into killing each other!"

"No, Ax', I had to shoot him. It was the peddler, I swear. Turn him over. Look! He shot Jan after you told us to hold off—"

"Warlock!" a third voice cried. "All of them dead—!" Two crossbows came down and fired simultaneously. Two men fell.

Axl stood silent and alone among the dead for a long moment. The moon had set at last, and the starlight was rare and faint through the shifting branches of the grandfather tree far overhead. Wim lay still as death, aware of the smell of blood and sweat and burned flesh. And the sound of footsteps, approaching. Sick with fear he looked up at the dark stubby form of Axl Bork.

"Still here? Good." A black-booted foot rolled the dead body from his legs. "Well, boy, you better leave me look at that hand." The voice belonged to Jagit Katchetooriantz.

"Uh." Wim began to tremble. "Uh. Mr. Jagged . . . is that . . .you?"

A light appeared in the hand of the peddler who had come from Sharn.

Wim fainted.

Early morning filled the Grandfather Grove with dusty shafts of light. Wim Buckry sat propped against the cave tree's entrance, sipping awkwardly at a cup of something hot and bitter held in a bandaged hand. His other hand was tucked through his belt, to protect a sprained right shoulder. Silently he watched the peddler grooming the dappled cart horse; glanced for the tenth time around the sunlit grove, where no sign of the last night's events marred the quiet tranquility of the day. Like a bad

dream the memory of his terror seemed unreal to him now, and he wondered if that was more witchery, like the drink that had eased the pains of his body. He looked down, where dried blood stained his pants. *He'd took care of the remains,* the peddler had said. It was real, all right—all of the Borks. And all of his boys. He thought wistfully for a moment of the jewelry that had gone into the ground with them; shied away from a deeper sense of loss beneath it.

The peddler returned to the campfire, kicked dirt over the blaze. He had had no trouble in getting a fire to burn. Wim drew his feet up; the dark eyes looked questioningly at his sullen face.

"Mr. Jagged"—there was no trace of mockery in that title now—"just what do you want from me?"

Jagit dusted off his leather shirt. "Well, Wim—I was thinking if you was up to it, maybe you'd want to go on with our agreement."

Wim raised his bandaged hand. "Wouldn't be much pertection, one cripple."

"But I don't know the way down through that there Valley, which you do."

Wim laughed incredulously. "I reckon you could fly over the moon on a broomstick and you wouldn't need no map. And you sure as hell don't need pertecting! Why'd you ever take us on, Mr. Jagged?" Grief sobered him suddenly, and realization— "You knew all along, didn't you? What we were fixing to do. You took us along so's you could watch us, and maybe scare us off. Well, you needn't be watching me no more. I—we already changed our minds, even before what happened with them Borks. We was fixing to take you on down like we said, all honest."

"I know that." The peddler nodded. "You ever hear an old saying, Wim: 'Two heads are better than one'? You can't never tell; you might just come in handy."

Wim shrugged ruefully, and wondered where the peddler ever heard that "old saying." "Well . . . ain't heard no better offers this morning."

They left the grandfather trees and continued the descent toward the Great Valley. Throughout the early morning the pine woods continued to surround them, but as the morning wore on Wim noticed that the evergreens had given way to oak and sycamore, as the air lost its chill and much of its moistness. By late in the day he could catch glimpses between the trees of the green and amber vastness that was the valley floor, and pointed it out to the peddler. Jagit nodded, seeming pleased, and returned to the aimless humming that Wim suspected covered diabolical thoughts. He glanced again at the round, stubby merchant, the last man in the world a body'd suspect of magical powers. Which was per-

haps what made them so convincing . . . "Mr. Jagged? How'd you do it? Hex them Borks, I mean."

Jagit smiled and shook his head. "A good magician never tells how. What, maybe, but never how. You have to watch, and figure how for yourself. That's how you get to *be* a good magician."

Wim sighed, shifted his hand under his belt. "Reckon I don't want to know, then."

The peddler chuckled. "Fair enough."

Surreptitiously, Wim watched his every move for the rest of the day.

After the evening meal the peddler again spent time at his wagon in the dark. Wim, sprawled exhausted by the campfire, saw the gleam of a warlock's wand but this time made no move to investigate, only crossing his fingers as a precautionary gesture. Inactivity had left him with too much else to consider. He stared fixedly into the flames, his hand smarting.

"Reckon we should be down to the valley floor in about an hour's travel, tomorrow. Then you say we head northwest, till we come to Fyffe?"

Wim started at the sound of the peddler's voice. "Oh . . . yeah, I reckon. Cut north and any road'll get you there; they all go to Fyffe."

"'All roads lead to Fyffe'?" The peddler laughed unexpectedly, squatted by the fire.

Wim wondered what was funny. "Anybody can tell you the way from here, Mr. Jagged. I think come morning I'll be heading back; I . . . we never figured to come this far. Us hill folk don't much like going down into the Flatlands."

"Hm. I'm sorry to hear that, Wim." Jagit pushed another branch into the fire. "But somehow I'd figured it you'd really been to Fyffe?"

"Well, yeah, I was . . . almost." He looked up, surprised. "Three, four years ago, when I was hardly more'n a young'un, with my pa and some other men. See, my granther was the smith at Darkwood Corners, and he got hold of a gun—" And he found himself telling a peddler-man things everyone knew, and things he'd never told to anyone: How his grandfather had discovered gunpowder, how the Highlanders had plotted to overthrow the lords at Fyffe and take the rich valley farmlands for themselves. And how horsemen had come out from the city to meet them, with guns and magic, how the amber fields were torn and reddened and his pa had died when his homemade gun blew up in his face. How a bloody, tight-lipped boy returning alone to Darkwood Corners had filled its citizens with the fear of the Lord, and of the lords of Fyffe . . . He sat twisting painfully at a golden earring. "And—I heard tell as how they got dark magics down there that we

never even saw, so's to keep all the Flatlanders under a spell . . . Maybe you oughta think again 'bout going down there too, Mr. Jagged."

"I thank you for the warning, Wim." Jagit nodded. "But I'll tell you—I'm a merchant by trade, and by inclination. If I can't sell my wares, I got no point in being, and I can't sell my wares in these hills."

"You ain't afraid they'll try to stop you?"

He smiled. "Well, now, I didn't say that. Their magic ain't up to Sharn, I'm pretty sure. But it is an unknown . . . Who knows—they may turn out to be my best customers; lords are like to be free with their money." He looked at Wim with something like respect. "But like I say, two heads are better than one. I'm right sorry you won't be along. Mayhap in the morning we can settle accounts—"

In the morning the peddler hitched up his wagon and started down toward the Great Valley. And not really understanding why, Wim Buckry went with him.

Early in the day they left the welcome shelter of the last oak forest, started across the open rolling hills of ripening wild grasses, until they struck a rutted track heading north. Wim stripped off his jerkin and loosened his shirt, his pale Highland skin turning red under the climbing sun of the Valley. The dark-skinned peddler in his leather shirt smiled at him, and Wim figured, annoyed, that he must enjoy the heat. By noon they reached the endless green corduroy fringe of the cultivated Flatlands, and with a jolt they found themselves on paved road. Jagit knelt and prodded the resilient surface before they continued on their way. Wim vaguely remembered the soft pavement, a bizarre luxury to Highland feet, stretching all the way to Fyffe; this time he noticed that in places the pavement was eaten away by time, and neatly patched with smooth-cut stone.

The peddler spoke little to him, only humming, apparently intent on searching out signs of Flatlander magic. *A good magician watches* . . . Wim forced himself to study the half-remembered landscape. The ripening fields and pasturelands blanketed the Valley to the limit of his sight, like an immense, living crazy-quilt in greens and gold, spread over the rich dark earth. In the distance he could see pale mist hovering over the fields, wondered if it was a trick of witchery or only the heat of the day. And he saw the Flatlanders at work in the fields by the road, well-fed and roughly dressed; tanned, placid faces that regarded their passage with the resigned disinterest that he would have expected of a plowmule. Wim frowned.

"A rather curious lack of curiosity, I'd say, wouldn't you?" The

peddler glanced at him. "They're going to make bad customers."

"Look at 'em!" Wim burst out angrily. "How could they do all of this? They ain't no better farmers 'n Highlanders; in the hills you work your hands to the bone to farm, and you get nothing, stones—And look at them, they're fat. How, Mr. Jagged?"

"How do *you* think they do it, Wim?"

"I—" He stopped. *Good magicians figure it out . . .* "Well—they got better land."

"True."

"And . . . there's magic."

"Is there now?"

"You saw it—them smooth-bedded streams, this here road; it ain't natural. But . . . they all look as how they're bewitched, themselves, just like I heard. Mayhap it's only the lords of Fyffe as have all the magic—it's them we got to watch for?" He crossed his fingers.

"Maybe so. It looks like they may be the only customers I'll have, too, if this doesn't change." The peddler's face was devoid of expression. "Quit crossing your fingers, Wim; the only thing that'll ever save you from is the respect of educated men."

Wim uncrossed his fingers. He walked on for several minutes before he realized the peddler spoke like a Flatlander now, as perfectly as he'd spoken the Highland talk before.

Late in the afternoon they came to a well, at one of the farm villages that centered like a hub in a great wheel of fields. The peddler dipped a cup into the dripping container, and then Wim took a gulp straight from the bucket. A taste of bitter metal filled his mouth, and he spat in dismay, looking back at the merchant. Jagit was passing his hand over—no, dropping something *into* the cup—and as Wim watched the water began to foam, and suddenly turned bright red. The peddler's black brows rose with interest, and he poured the water slowly out onto the ground. Wim blanched and wiped his mouth hard on his sleeve. "It *tastes* like poison!"

Jagit shook his head. "That's not poison you taste; I'd say farming's just polluted the water table some. But it is drugged." He watched the villagers standing with desultory murmurs around his wagon.

"Sheep," Wim's face twisted with disgust.

The peddler shrugged. "But all of them healthy, wealthy, and wise . . . well, healthy and wise, anyway . . . healthy—?" He moved away to offer his wares. There were few takers. As Wim returned to the wagon, taking a drink of stale mountain water from the barrel on the back, he heard the little man muttering again, like an incantation, "Fyffe . . . Fyffe . . . Dyston-Fyffe, they call it here . . . *District Town Five?* . . . Couldn't be." He frowned, oblivious. "But

then again, why couldn't it—?"

For the rest of that day the peddler kept his thoughts to himself, looking strangely grim, only pronouncing an occasional curse in some incomprehensible language. And that night, as they camped, as Wim's weary mind unwillingly relived the loss of the only friends he had, he wondered if the dark silent stranger across the fire shared his loneliness; a peddler was always a stranger, even if he was a magician. "Mr. Jagged, you ever feel like going home?"

"Home?" Jagit glanced up. "Sometimes. Tonight, maybe. But I've come so far, I guess that would be impossible. When I got back, it'd all be gone." Suddenly through the flames his face looked very old. "What made it home was gone before I left . . . But maybe I'll find it again, somewhere else, as I go."

"Yeah . . ." Wim nodded, understanding both more and less than he realized. He curled down into his blanket, oddly comforted, and went soundly to sleep.

Minor wonders continued to assail him on their journey, and also the question, "Why?"; until gradually Jagit's prodding transformed his superstitious awe into a cocky curiosity that sometimes made the peddler frown, though he made no comment.

Until the third morning, when Wim finally declared, "Everything's a trick, if'n you can see behind it, just like with them witches in the hills. Everything's got a—reason. I think there ain't no such thing as magic!"

Jagit fixed him with a long mild look, and the specter of the night in the Grandfather Grove seemed to flicker in the dark eyes. "You think not, eh?"

Wim looked down nervously.

"There's magic, all right, Wim; all around you here. Only now you're seeing it with a magician's eyes: Because there's a reason behind everything that happens; you may not know what it is, but it's there. And knowing that doesn't make the thing less magic, or strange, or terrible—it just makes it easier to deal with. That's something to keep in mind, wherever you are . . . Also keep in mind that a *little* knowledge is a dangerous thing."

Wim nodded, chastened, felt his ears grow red as the peddler muttered, "So's a little ignorance . . ."

The afternoon of the third day showed them Fyffe, still a vague blot wavering against the horizon. Wim looked back over endless green toward the mountains, but they were hidden from him now by the yellow Flatland haze. Peering ahead again toward the city, he was aware that the fear that had come with him into the Great Valley had grown less instead of greater as they followed the familiar-strange road to Fyffe. The dappled cart horse snorted loudly in

the hot, dusty silence, and he realized it was the peddler with his wagon full of magics that gave him his newfound courage.

He smiled, flexing his burned hand. Jagit had never made any apology for what he'd done, but Wim was not such a hypocrite that he really expected one, under the circumstances. And the peddler had treated his wounds with potions, so that bruises began to fade and skin to heal almost while he watched. It was almost—

Wim's thoughts were interrupted as he stumbled on a rough patch in the road. The city, much closer now, lay stolidly among the fields in the lengthening shadows of the hot afternoon. He wondered in which field his father—abruptly turned his thoughts ahead again, noticing that the city was without walls or other visible signs of defense. *Why?* Mayhap because they had nothing to fear— He felt his body tighten with old terrors. But Jagit's former grim mood had seemingly dropped away as his goal drew near, as though he had reached some resolution. If the peddler was confident, then Wim would be, too. He looked on the city with magician's eyes; and it struck him that a more outlandish challenge had most likely never visited the lords of Fyffe.

They entered Fyffe, and though the peddler seemed almost disappointed, Wim tried to conceal his gaping with little success. The heavy stone and timber buildings crowded the cobble-patched street, rising up two and three stories to cut off his view of the fields. The street's edge was lined with shop fronts; windows of bullseyed glass and peeling painted signs advertised their trade. The levels above the shops, he supposed, were where the people lived. The weathered stone of the curbs had been worn to hollows from the tread of countless feet, and the idea of so many people—5,000, the peddler had guessed—in so little area made him shudder.

They made their way past dully-dressed, well-fed townsfolk and farmers finishing the day's commerce in the cooling afternoon. Wim caught snatches of sometimes heated bargaining, but he noticed that the town showed little more interest in the bizarre spectacle of himself and the peddler than had the folk they dealt with on their journey. Children at least ought to follow the bright wagon—he was vaguely disturbed to realize he'd scarcely seen any, here or anywhere, and those he saw were kept close by parents. It seemed the peddler's business would be no better here than in the hills after all. *Like hogs in a pen . . .* He glanced down the street, back over his shoulder. "Where's all the hogs?"

"What?" The peddler looked at him.

"It's clean. All them folk living here and there ain't any garbage.

How can that be, less'n they keep hogs to eat it? But I don't see any hogs. Nor—hardly any young'uns."

"Hmm." The peddler shrugged, smiling. "Good questions. Maybe we should ask the lords of Fyffe."

Wim shook his head. Yet he had to admit that the city so far, for all its strangeness, had shown him no signs of any magic more powerful or grim than that he'd seen in the fields. Perhaps the lords of Fyffe weren't so fearsome as the tales claimed; their warriors weren't bewitched, but only better armed.

The street curved sharply, and ahead the clustered buildings gave way on an open square, filled with the covered stalls of a public marketplace. And beyond it—Wim stopped, staring. Beyond it, he knew, stood the dwelling of the lords of Fyffe. Twice as massive as any building he had seen, its pilastered green-black walls reflected the square like a dark, malevolent mirror. The building had the solidity of a thing that had grown from the earth, a permanence that made the town itself seem ephemeral. Now, he knew, he looked on the house for magic that might match the peddler and Sharn.

Beside him, Jagit's smile was genuine and unreadable. "Pardon me, ma'm," the peddler stopped a passing woman and child, "but we're strangers. What's that building there called?"

"Why, that's Government House." The woman looked only mildly surprised. Wim admired her stocking-covered ankles.

"I see. And what do they do there?"

She pulled her little girl absently back from the wagon. "That's where the governors are. Folks go there with petitions and such. They—govern, I suppose. Lissy, keep away from that dusty beast."

"Thank you, ma'm. And could I show you—"

"Not today. Come on, child, we'll be late."

The peddler bowed in congenial exasperation as she moved on. Wim sighed, and he shook his head. "Hardly a market for Sharnish wonders here, either, I begin to think. I may have outfoxed myself for once. Looks like my only choice is to pay a call on your lords of Fyffe over there; I might still have a thing or two to interest them." His eyes narrowed in appraisal as he looked across the square.

At a grunt of disapproval from Wim, Jagit glanced back, gestured at the lengthening shadows, "Too late to start selling now, anyway. What do you say we just take a look—" Suddenly he fell silent.

Wim turned. A group of half a dozen dour-faced men were approaching them; the leader bore a crest on his stiff brimmed hat that Wim remembered. They were unslinging guns from their shoulders. Wim's question choked off as they quietly circled the wagon, cut him

off from the peddler. The militiaman addressed Jagit, faintly disdainful. "The Governors—"

Wim seized the barrel of the nearest rifle, slinging its owner into the man standing next to him. He wrenched the gun free and brought it down on the head of a third gaping guard.

"Wim!" He froze at the sound of the peddler's voice, turned back. "Drop the gun." The peddler stood unresisting beside his wagon. And the three remaining guns were pointing at Wim Buckry. Face filled with angry betrayal, he threw down the rifle.

"Tie the hillbilly up . . . The Governors require a few words with you two, peddler, as I was saying. You'll come with us." The militia leader stood back, unperturbed, as his townsman guards got to their feet.

Wim winced as his hands were bound roughly before him, but there was no vindictiveness on the guard's bruised face. Pushed forward to walk with the peddler, he muttered bitterly, "Whyn't you use your magic!"

Jagit shook his head. "Would've been bad for business. After all, the lords of Fyffe have come to *me*."

Wim crossed his fingers, deliberately, as they climbed the green-black steps of Government House.

The hours stretched interminably in the windowless, featureless room where they were left to wait, and Wim soon tired of staring at the evenness of the walls and the smokeless lamps. The peddler sat fiddling with small items left in his pockets; but Wim had begun to doze in spite of himself by the time guards returned at last, to take them to their long-delayed audience with the lords of Fyffe.

The guards left them to the lone man who rose, smiling, from behind a tawny expanse of desk as they entered the green-walled room. "Well, at last!" He was in his late fifties and plainly dressed like the townsmen, about Wim's height but heavier, with graying hair. Wim saw that the smiling face held none of the dullness of their captors' faces. "I'm Charl Aydricks, representative of the World Government. My apologies for keeping you waiting, but I was—out of town. We've been following your progress with some interest."

Wim wondered what in tarnation this poor-man governor took himself for, claiming the Flatlands was the whole world. He glanced past Aydricks into the unimpressive, lamp-lit room. On the governor's desk he noticed the only sign of a lord's riches he'd yet seen—a curious ball of inlaid metals, mostly blue but blotched with brown and green, fixed on a golden stand. He wondered with more interest where the other lords of Fyffe might be; Aydricks was alone, without even guards . . . Wim suddenly remembered that whatever this man

wasn't, he was a magician, no less than the peddler.

Jagit made a polite bow. "Jagit Katchetooriantz, at your service. Merchant by trade, and flattered by the interest. This is my apprentice—"

"—Wim Buckry." The governor's appraising glance moved unexpectedly to Wim. "Yes, we remember you, Wim. I must say I'm surprised to see you here again. But pleased—we've been wanting to get ahold of you." A look of too much interest crossed Aydricks' face.

Wim eyed the closed door with longing.

"Please be seated." The governor returned to his desk. "We rarely get such . . . unique visitors—"

Jagit took a seat calmly, and Wim dropped into the second chair, knees suddenly weak. As he settled into the softness he felt a sourceless pressure bearing down on him, lunged upward like a frightened colt only to be forced back into the seat. Panting, he felt the pressure ease as he collapsed in defeat.

Jagit looked at him with sympathy before glancing back at the governor; Wim saw the peddler's fingers twitch impotently on the chair-arm. "Surely you don't consider us a threat?" His voice was faintly mocking.

The governor's congeniality stopped short of his eyes. "We know about the forces you were using in the Grandfather Grove."

"Do you now! That's what I'd hoped." Jagit met the gaze and held it. "Then I'm obviously in the presence of some technological sophistication, at last. I have some items of trade that might interest you . . ."

"You may be sure they'll receive our attention. But let's just be honest with each other, shall we? You're no more a peddler than I am; not with what we've seen you do. And if you'd really come from the east—from anywhere—I'd know about it; our communications network is excellent. You simply appeared from nowhere, in the Highlands Preserve. And it really was nowhere on this earth, wasn't it?"

Jagit said nothing, looking expectant. Wim stared fixedly at the textured green of the wall, trying to forget that he was witness to a debate of warlocks.

Aydricks stirred impatiently. "From nowhere on this earth. Our moon colony is long gone; that means no planet in this system. Which leaves the Lost Colonies—you've come from one of the empire's colony worlds, from another star system, Jagit; and if you expected that to surprise us after all this time, you're mistaken."

Jagit attempted a shrug. "No—I didn't expect that, frankly. But I didn't expect any of the rest of this, either; things haven't turned out as I'd planned at all . . ."

Wim listened in spite of himself, in silent wonder. Were there worlds

beyond his own, that were no more than sparks in the black vastness of earth's night? Was that where Sharn was, then, with its wonders; beyond the sky, where folks said was heaven—?

". . . Obviously," the governor was saying, "you're a precedent-shattering threat to the World Government. Because this is a *world* government, and it has maintained peace and stability over millennia. Our space defense system sees to it that—outsiders don't upset that peace. At least it always has until now; you're the first person to penetrate our system, and we don't even know how you did it. That's what we want to know—*must* know, Jagit, not who you represent, or where, or even why, so much as *how*. We can't allow anything to disrupt our stability." Aydricks leaned forward across his desk; his hand tightened protectively over the stand of the strange metal globe. His affability had disappeared entirely, and Wim felt his own hopes sink, realizing the governor somehow knew the peddler's every secret. Jagit wasn't infallible, and this time he had let himself be trapped.

But Jagit seemed undismayed. "If you value your stability that much, then I'd say it's time somebody did disturb it."

"That's to be expected." Aydricks sat back, his expression relaxing into contempt. "But you won't be the one. We've had ten thousand years to perfect our system, and in that time no one else has succeeded in upsetting it. We've put an end at last to all the millennia of destructive waste on this world . . ."

Ten thousand years—? As Aydricks spoke, Wim groped to understand a second truth that tore at the very roots of his comprehension:

For the history of mankind stretched back wonder on wonder for unimaginable thousands of years, through tremendous cycles filled with lesser cycles. Civilization reached highs where every dream was made a reality and humanity sent offshoots to the stars, only to fall back, through its own folly, into abysses of loss when men forgot their humanity and reality became a nightmare. Then slowly the cycle would change again, and in time mankind would reach new heights, that paradoxically it could never maintain. Always men seemed unable in the midst of their creation to resist the urge to destroy, and always they found the means to destroy utterly.

Until the end of the last great cyclical empire, when a group among the ruling class saw that a new decline was imminent, and acted to prevent it. They had forced the world into a new order, one of patternless stability at a low level, and had stopped it there. ". . . And because of us that state, free from strife and suffering, the world has continued for ten thou-

sand years, unchanged. Literally unchanged. I am one of the original founders of the World Government."

Wim looked unbelievingly into the smiling, unremarkable face; found the eyes of a fanatic and incredible age.

"You're well preserved," Jagit said.

The governor burst into honest laughter. "This isn't my original body. By using our computer network we're able to transfer our memories intact into the body of an 'heir': someone from the general population, young and full of potential. As long as the individual's personality is compatible, it's absorbed into the greater whole, and he becomes a revitalizing part of us. That's why I've been keeping track of Wim, here; he has traits that should make him an excellent governor." The too-interested smile showed on the governor's face again.

Wim's bound hands tightened into fists—the invisible pressure forced him back down into the seat, his face stricken.

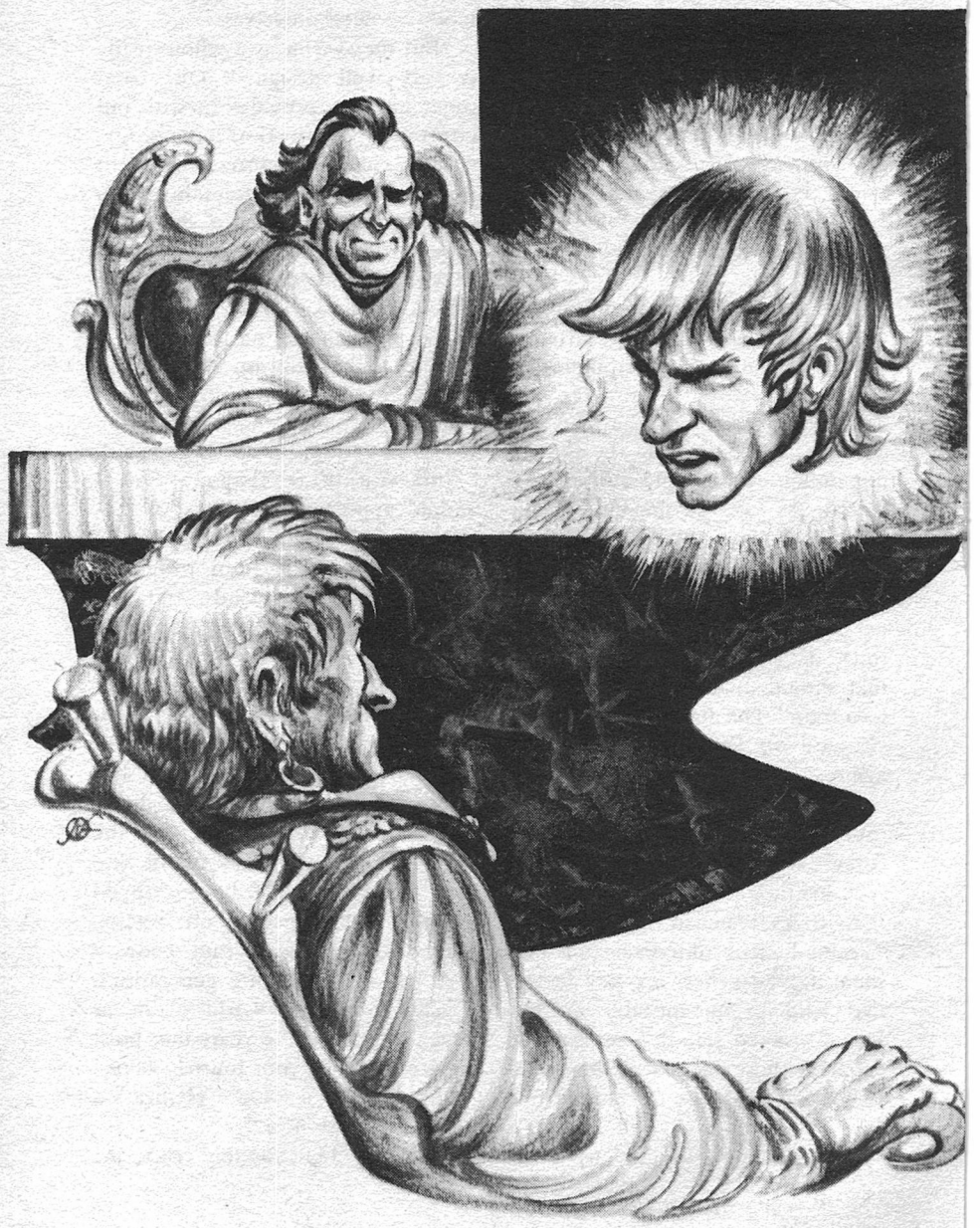
Aydricks watched him, amused. "Technological initiative and personal aggressiveness are key factors that lead to an unstable society. Since, to keep stability, we have to suppress those factors in the population, we keep control groups free from interference—like the hill folk, the Highlanders—to give us a dependable source of the personality types we need ourselves.

"But the system as a whole really is very well designed. Our computer network provides us with our continuity, with the technology, communications, and—sources of power we need to maintain stability. We in turn ensure the computer's continuity, since we preserve the knowledge to keep it functioning. There's no reason why the system can't go on forever."

Wim looked toward the peddler for some sign of reassurance; but found a grimness that made him look away again as Jagit said, "And you think that's a feat I should appreciate: that you've manipulated the fate of every being on this planet for ten thousand years, to your own ends, and that you plan to go on doing it indefinitely?"

"But it's for their own good, can't you see that? We ask nothing from this, no profit for ourselves, no reward other than knowing that humanity will never be able to throw itself into barbarism again, that the cycle of destructive waste, of rise and fall, has finally been stopped on earth. The people are secure, their world is stable, they know it will be safe for future generations. Could your own world claim as much? Think of the years that must have passed on your journey here—would you even have a civilization to return to by now?"

Wim saw Jagit forcibly relax; the



peddler's smile reappeared, full of irony. "But the fact remains that a cycle of rise and fall is the natural order of things–life and death, if you want to call it that. It gives humanity a chance to reach new heights, and gives an old order a clean death. Stasis is a coma–no lows, but no highs either, no *choice*. Somehow I think that Sharn would have preferred a clean death to this–"

"Sharn? What do you know about the old empire?" The governor leaned forward, complaisance lost.

"Sharn–?" Wim's bewilderment was lost on the air.

"They knew everything about Sharn, where I come from. The crystal city with rot at its heart, the Games of Three. They were even seeing the trends that would lead to this, though they had no idea it would prove so eminently successful."

"Well, this gets more and more interesting." The governor's voice hardened. "Considering that there should be no way someone from outside could have known of the last years of the empire. But I suspect we'll only continue to raise more questions this way. I think it's time we got some answers."

Wim slumped in his seat, visions of torture leaping into his mind. But the governor only left his desk, passing Wim with a glance that suggested hunger, and placed a shining band of filigreed metal on Jagit's head.

"You may be surprised at what you get," Jagit's expression remained calm, but Wim thought strain tightened his voice.

The governor returned to his chair. "Oh, I don't think so. I've just linked you into our computer net–"

Abruptly Jagit went rigid with surprise, settled back into a half-smile; but not before Aydricks had seen the change. "Once it gets into your mind you'll have considerable difficulty concealing anything at all. It's quick and always effective; though unfortunately I can't guarantee that it won't drive you crazy."

The peddler's smile faded. "How civilized," he said quietly. He met Wim's questioning eyes. "Well, Wim, you remember what I showed you. And crossing your fingers didn't help, did it?"

Wim shook his head. "Whatever you say, Mr. Jagged . . ." He suspected he'd never have an opportunity to remember anything.

Suddenly the peddler gasped, and his eyes closed, his body went limp in the seat. "Mr. Jagged–?" But there was no response. Alone, Wim wondered numbly what sort of terrible enchantment the metal crown held, and whether it would hurt when the computer–whatever that was–swallowed his own soul.

"Are you monitoring? All districts? Direct hookup, yes." The governor seemed to be speaking to his desk. He hesitated as though listening, then stared into space.

Wim sagged fatalistically against his chair, past horror now, ignoring—and ignored by—the two entranced men. Silence stretched in the green room. Then the light in the room flickered and dimmed momentarily. Wim's eyes widened as he felt the unseen pressure that held him down weaken slightly, then return with the lighting. The governor frowned at nothing, still staring into space. Wim began ineffectually to twist at his bound hands. However the magic worked in this room, it had just stopped working; if it stopped again he'd be ready . . . He glanced at Jagit. Was there a smile—?

"District Eighteen here. Aydricks, what is this?"

Wim shuddered. The live disembodied head of a red-haired youth had just appeared in a patch of sudden brightness by the wall. The governor turned blinking toward the ghost.

"Our reception's getting garbled. This data can't be right, it says he's . . ." The ghostly face wavered and the voice was drowned in a sound like water rushing. ". . . it, what's wrong with the transmission? Is he linked up directly? We aren't getting anything now—"

Two more faces—one old, with skin even darker than the peddler's, and one a middle-aged woman—appeared in the wall, protesting. And Wim realized then that he saw the other lords of Fyffe—and truly of the world—here and yet not here, transported by their magic from the far ends of the earth. The red-haired ghost peered at Wim, who shrank away from the angry, young-old eyes, then looked past to Jagit. The frown grew fixed and then puzzled, was transformed into incredulity. "No, that's impossible!"

"What is it?" Aydricks looked harrassed.

"I know that man."

The black-haired woman turned as though she could see him. "What do you mean you—"

"I know that man too!" Another dark face appeared. "From Sharn, from the empire. But . . . after ten thousand years, how can he be the *same* . . . Aydricks! Remember the Primitive Arts man, he was famous, he spent . . ." the voice blurred, ". . . got to get him out of the comm system! He knows the comm-sat codes, he can—" The ghostly face dematerialized entirely.

Aydricks looked wildly at the unmoving peddler, back at the remaining governors.

Wim saw more faces appear, and another face flicker out; *the same man* . . .

"Stop him, Aydricks!" The woman's voice rose. "He'll ruin us. He's altering the comm codes, killing the tie-up!"

"I can't cut him off!"

"He's into my link now, I'm losing con—" The red-haired ghost disappeared.

"Stop him, Aydricks, or we'll burn out Fyffe!"

"Jagged! Look out!" Wim struggled against his invisible bonds as he saw the governor reach with grim resolution for the colored metal globe on his desk. He knew Aydricks meant to bash in the peddler's skull, and the helpless body in the chair couldn't stop him. "Mr. Jagged, wake up!" Desperately Wim stuck out his feet as Aydricks passed; the governor stumbled. Another face disappeared from the wall, and the lights went out. Wim slid from the chair, free and groping awkwardly for a knife he no longer had. Under the faltering gaze of the ghosts in the wall, Aydricks fumbled toward Jagit.

Wim grabbed at Aydricks' feet just as the light returned, catching an ankle. The governor turned back, cursing, to kick at him, but Wim was already up, leaping away from a blow with the heavy statue.

"Aydricks, stop the peddler!"

Full of sudden fury, Wim gasped, "Damn you, you won't stop it this time!" As the governor turned away Wim flung himself against the other's back, staggering him, and hooked his bound hands over Aydricks' head. Aydricks fought to pull him loose, dropping the globe as he threw himself backward to slam his attacker against the desk. Wim groaned as his backbone grated against the desk edge, and lost his balance. He brought his knee up as he fell; there was a sharp *crack* as the governor landed beside him, and lay still. Wim got to his knees; the ancient eyes stabbed him with accusation and fear, "No. Oh, *no.*" The eyes glazed.

A week after his seventeenth birthday, Wim Buckry had killed a ten-thousand-year-old man. And, unknowingly, helped to destroy an empire. The room was quiet; the last of the governors had faded from the wall. Wim got slowly to his feet, his mouth pulled back in a grin of revulsion. All the magic in the world hadn't done this warlock any good. He moved to where Jagit still sat entranced, lifted his hands to pull the metal crown off and break the spell. And hesitated, suddenly unsure of himself. Would breaking the spell wake the peddler, or kill him? They had to get out out of here; but Jagit was somehow fighting the bewitchment, that much he understood, and if he stopped him now—His hands dropped, he stood irresolutely, waiting. And waiting.

His hands reached again for the metal band, twitching with indecision; jerked back as Jagit suddenly smiled at him. The dark eyes opened and the peddler sat forward, taking the metal band gently from his own head with a sigh. "I'm glad you waited. You'll probably never know how glad." Wim's grin became real, and relieved.

Jagit got unsteadily to his feet, glanced at Aydricks' body and shook his head; his face was haggard. "Said you might be a help,

didn't I?" Wim stood phlegmatically while the peddler who was as old as Sharn itself unfastened the cords on his raw wrists. "I'd say our business is finished. You ready to get out of here? We don't have much time."

Wim started for the door in response, opened it, and came face to face with the unsummoned guard standing in the hall. His fist connected with the gaping jaw; the guard's knees buckled and he dropped to the floor, unconscious. Wim picked up the guard's rifle as Jagit appeared beside him, motioning him down the dim hallway.

"Where is everybody?"

"Let's hope they're home in bed; it's four-thirty in the morning. There shouldn't be any alarms."

Wim laughed giddily. "This's a sight easier than getting away from the Borks!"

"We're not away yet; we may be too late already. Those faces on the wall were trying to drop a—piece of sun on Fyffe. I think I stopped them, but I don't know for sure. If it wasn't a total success, I don't want to find out the hard way." He led Wim back down the wide stairway, into the empty hall where petitioners had gathered during the day. Wim started across the echoing floor but Jagit called him back, peering at something on the wall; they went down another flight into a well of darkness, guided by the peddler's magic light. At the foot of the stairs the way was blocked by a door, solidly shut. Jagit looked chagrined, then suddenly the beam of his light shone blue; he flashed it against a metal plate set in the door. The door slid back and he went through it.

Wim followed him, into a cramped, softly glowing cubicle nearly filled by three heavily padded seats around a peculiar table. Wim noticed they seemed to be bolted to the floor, and suddenly felt claustrophobic.

"Get into a seat, Wim. Thank God I was right about this tower being a ballistic exit. Strap in, because we're about to use it." He began to push lighted buttons on the table before him.

Wim fumbled with the restraining straps, afraid to wonder what the peddler thought they were doing, as a heavy inner door shut the room off from the outside. Why weren't they out of the building, running? How could this— Something pressed him down into the seat cushions like a gentle, insistent hand. His first thought was of another trap; but as the pressure continued, he realized this was something new. And then, glancing up past Jagit's intent face, he saw that instead of blank walls, they were now surrounded by the starry sky of night. He leaned forward—and below his feet was the town of Fyffe, shrinking away with every heartbeat, disappearing into the greater darkness. He saw what the

eagle saw . . . he was flying. He sat back again, feeling for the reassuring hardness of the invisible floor, only to discover suddenly that his feet no longer touched it. There was no pressure bearing him down now, there was nothing at all. His body drifted against the restraining straps, lighter than a bird. A small sound of incredulous wonder escaped him as he stared out at the unexpected stars.

And saw a brightness begin to grow at the opaque line of the horizon, spreading and creeping upward second by second, blotting out the stars with the fragile hues of dawn. The sun's flaming face thrust itself up past the edge of the world, making him squint, rising with arcane speed and uncanny brilliance into a sky that remained stubbornly black with night. At last the whole sphere of the sun was revealed, and continued to climb in the midnight sky while now Wim could see a thin streak of sky-blue stretched along the horizon, left behind with the citron glow of dawn still lighting its center. Above the line in darkness the sun wore the pointed crown of a star that dimmed all others, and below it he could see the world at the horizon's edge moving into day. And the horizon did not lie absolutely flat, but was bowing gently downward now at the sides . . . Below his feet was still the utter darkness that had swallowed Fyffe. He sighed.

"Quite a view." Jagit sat back from the glowing table, drifting slightly above his seat, a tired smile on his face.

"You see it too?" Wim said hoarsely.

The peddler nodded. "I felt the same way, the first time. I guess everyone always has. Every time civilization has gained space flight, it's been rewarded again by that sight."

Wim said nothing, unable to find the words. His view of the bowed horizon had changed subtly, and now as he watched there came a further change—the sun began, slowly but perceptibly, to move backward down its track, sinking once more toward the point of dawn that had given it birth. Or, he suddenly saw, it was they who were slipping, back down from the heights of glory into his world's darkness once more. Wim waited while the sun sank from the black and alien sky, setting where it had risen, its afterglow reabsorbed into night as the edge of the world blocked his vision again. He dropped to the seat of his chair, as though the world had reclaimed him, and the stars reappeared. A heavy lurch, like a blow, shook the cubicle, and then all motion stopped.

He sat still, not understanding, as the door slid back in darkness and a breath of cold, sharp air filled the tiny room. Beyond the doorway was darkness again, but he knew it was not the night of a building hallway.

Jagit fumbled wearily with the restraining straps on his seat. "Home the same day . . ."

Wim didn't wait, but driven by instinct freed himself and went to the doorway. And jerked to a stop as he discovered they were no longer at ground level. His feet found the ladder, and as he stepped down from its bottom rung he heard and felt the gritty shifting of gravel. The only other sounds were the sigh of the icy wind, and water lapping. As his eyes adjusted they told him what his other senses already knew—that he was home. Not Darkwood Corners, but somewhere in his own cruelly beautiful Highlands. Fanged shadow peaks rose up on either hand, blotting out the stars, but more stars shone in the smooth waters of the lake; they shivered slightly, as he shivered in the cold breeze, clammy with sweat under his thin shirt. He stood on the rubble of a mountain pass somewhere above the treeline, and in the east the gash between the peaks showed pinkish-gray with returning day.

Behind him he heard Jagit, and turned to see the peddler climbing slowly down the few steps to the ground. From outside, the magician's chamber was the shape of a truncated rifle bullet. Jagit carried the guard's stolen rifle, leaning on it now like a walking stick. "Well, my navigation hasn't failed me yet." He rubbed his eyes, stretched.

Wim recalled making a certain comment about flying over the moon on a broomstick, too long ago, and looked again at the dawn, this time progressing formally and peacefully up a lightening sky. "We flew here. Didn't we, Mr. Jagged?" His teeth chattered. "Like a bird. Only . . . we f-flew right off the world." He stopped, awed by his own revelation. For a moment a lifetime of superstitious dread cried that he had no right to know of the things he had seen, or to believe—The words burst out in a defiant rush. "That's it. Right off the world. And . . . and it's all true: I heard how the world's round like a stone. It must be true, how there's other worlds, that's what you said back there, with people just like here; I seen it, the sun's like all them other stars, only it's bigger . . ." He frowned. "It's—closer? I—"

Jagit was grinning, his teeth showed white in his beard. "Magician, first-class."

Wim looked back up into the sky. "If that don't beat all—" he said softly. Then, struck by more practical matters, he said, "What about them ghosts? Are they going to come after us?"

Jagit shook his head. "No. I think I laid those ghosts to rest pretty permanently. I changed the code words in their communications system, a good part of it is totally unusable now. Their computer net is broken up, and their space defense system must be out for good, because they didn't destroy

Fyffe, I'd say the World Government is finished; they don't know it yet, and they may not go for a few hundred years, but they'll go in the end. Their grand 'stability' machine has a monkey wrench in its works at last . . . They won't be around to use their magic in these parts any more, I expect."

Wim considered, and then looked hopeful. "You going to take over back there, Mr. Jagged? Use your magic on them Flatlanders? We could—"

But the peddler shook his head. "No, I'm afraid that just doesn't interest me, Wim. All I really wanted was to break the hold those other magician sorts had on this world; and I've done that already."

"Then . . . you mean you really did all that, you risked our necks, for nothing? Like you said, because it just wasn't right, for them to use their magic on folks who couldn't stop them? You did it for us—and you didn't want *any*thing? You must be crazy."

Jagit laughed. "Well, I wouldn't say that. I told you before: All I want is to be able to see new sights, and sell my wares. And the World Government was bad for my business."

Wim met the peddler's gaze, glanced away undecided. "Where you going to go now?" He half expected the answer to be, Back beyond the sky.

"Back to bed." Jagit left the ballistic vehicle, and began to climb the rubbly slope up from the lake; he gestured for Wim to follow.

Wim followed, breathing hard in the thin air, until they reached a large fall of boulders before a sheer granite wall. Only when he was directly before it did he realize they had come on the entrance to a cave hidden by the rocks. He noticed that the opening was oddly symmetrical; and there seemed to be a rainbow shimmering across the darkness like mist. He stared at it uncomprehendingly, rubbing his chilled hands.

"This is where I came from, Wim. Not from the East, as you figured, or from space as the governor thought." The peddler nodded toward the dark entrance. "You see, the World Government had me entirely misplaced—they assumed I could only have come from somewhere outside their control. But actually I've been here on earth all the time; this cave has been my home for fifty-seven thousand years. There's a kind of magic in there that puts me into an 'enchanted' sleep for five or ten thousand years at a time here. And meanwhile the world changes. When it's changed enough, I wake up again and go out to see it. That's what I was doing in Sharn, ten thousand years ago: I brought art works from an earlier, primitive era; they were popular, and I got to be something of a celebrity. That way I got access to my new items of trade—my Sharnish mag-

ics—to take somewhere else, when things changed again.

"That was the problem with the World Government—they interrupted the natural cycles of history that I depend on, and it threw me out of synch. They'd made stability such a science they might have kept things static for fifty or a hundred thousand years. Ten or fifteen thousand, and I could have come back here and outwaited them, but fifty thousand was just too long. I had to get things moving again, or I'd have been out of business."

Wim's imagination faltered at the prospect of the centuries that separated him from the peddler, that separated the peddler from everything that had ever been a part of the man, or ever could be. What kind of belief did it take, what sort of a man, to face that alone? And what losses or rewards to drive him to it? There must be something, that made it all worthwhile—

"There have been more things *done,* Wim, than the descendants of Sharn have *dreamed.* I am surprised at each new peak I attend . . . I'll be leaving you now. You were a better guide than I expected; I thank you for it. I'd say Darkwood Corners is two or three days journey northwest from here."

Wim hesitated, half afraid, half longing. "Let me go with you—?"

Jagit shook his head. "There's only room for one, from here on. But you've seen a few more wonders than most people already; and I think you've learned a few things, too. There are going to be a lot of opportunities for putting it all to use right here, I'd say. You helped change your world, Wim—what are you going to do for an encore?"

Wim stood silent with indecision; Jagit lifted the rifle, tossed it to him.

Wim caught the gun, and a slow smile, filled with possibilities, grew on his face.

"Good-bye, Wim."

"Good-bye, Mr. Jagged." Wim watched the peddler move away toward his cave.

As he reached the entrance, Jagit hesitated, looking back. "And Wim—there are more wonders in this cave than you've ever dreamed of. I haven't been around this long because I'm an easy mark. Don't be tempted to grave-rob." He was outlined momentarily by rainbow as he passed into the darkness.

Wim lingered at the entrance, until at last the cold forced him to move and he picked his way back down the sterile gray detritus of the slope. He stopped again by the mirror lake, peering back past the magician's bullet-shaped vehicle at the cliff face. The rising sun washed it in golden light, but now somehow he really wasn't even sure where the cave had been.

He sighed, slinging his rifle over his shoulder, and began the long walk home.

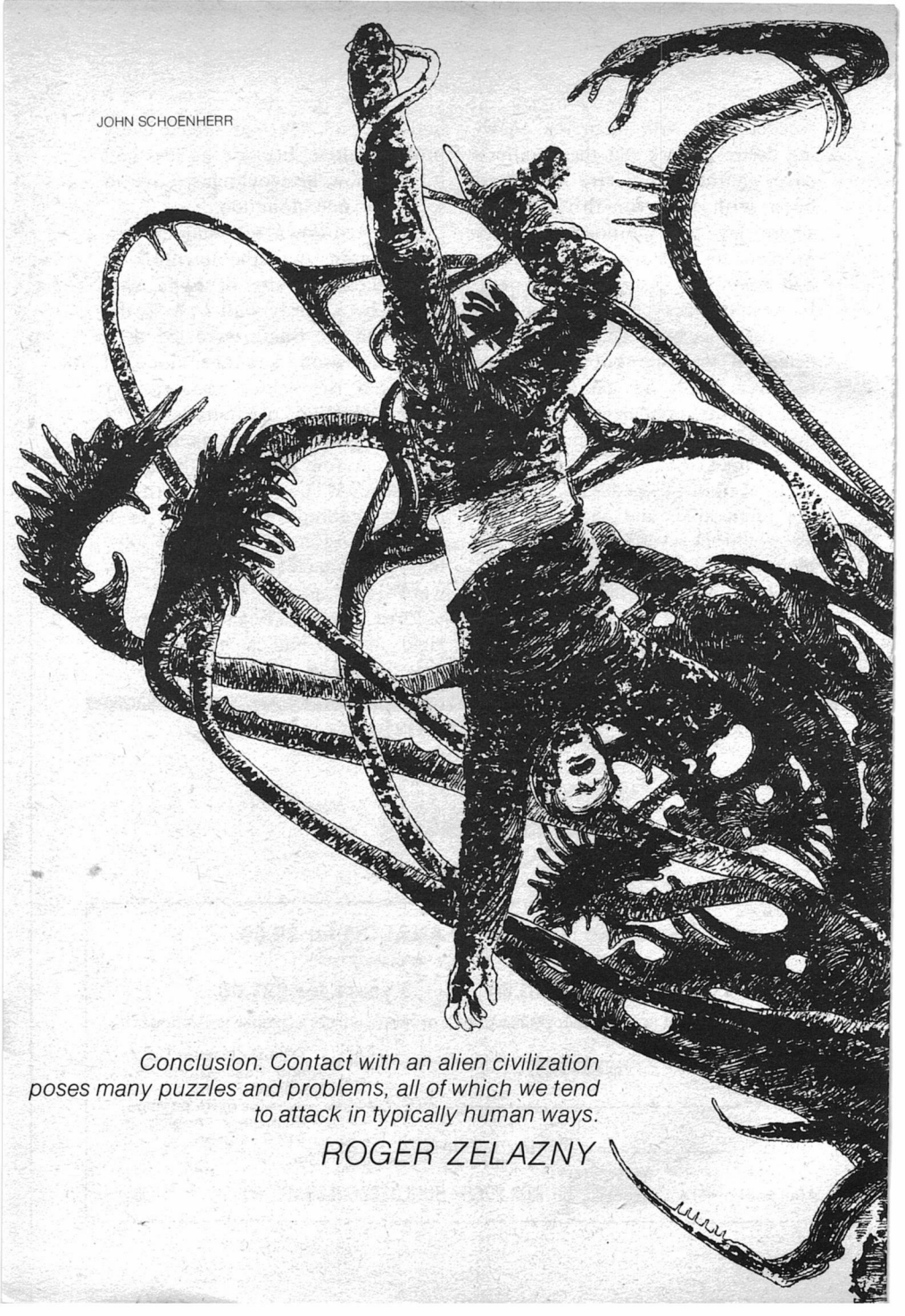
Lord Buckry sighed as memories

receded, and with them the gnawing desire to seek out the peddler's cave again; the desire that had been with him for thirty years. There lay the solutions to every problem he had ever faced, but he had never tested Jagged's warning. It wasn't simply the risk, though the risk was both deadly and sufficient—it was the knowledge that however much he gained in this life, it was ephemeral, less than nothing, held up to a man whose life spanned half that of humanity itself. Within the peddler's cave lay the impossible, and that was why he would never try to take it for his own.

Instead he had turned to the possible and made it fact, depending on himself, and on the strangely clear view of things the peddler had left him. He had solved every problem alone, because he had had to, and now he would just have to solve this one alone too.

He stared down with sudden possessive pride over the townfolk in the square, his city of Fyffe now ringed by a sturdy wall . . . So the West and the South were together, for one reason, and one alone. It balanced the scales precariously against plenty of old hatreds, and if something were to tip them back again— A few rumors, well-placed, and they'd be at each other's throats. Perhaps he wouldn't even need to raise an army. They'd solve that problem for him. And afterward—

Lord Buckry began to smile. He'd always had a hankering to visit the sea. ■



Conclusion. Contact with an alien civilization poses many puzzles and problems, all of which we tend to attack in typically human ways.

ROGER ZELAZNY

doorways in the sand

SYNOPSIS

A number of people seem to think that I know the whereabouts of a missing alien artifact—the star-stone, an item received as part of an interstellar cultural exchange program. Paul Byler, my former geology professor, had thought so, and he had tried to pressure me into returning the thing to him. Only I did not have it. The closest I had come to it was a replica of the stone which Byler had given to my ex-roommate Hal Sidmore, a thing we had used as a paperweight for a long while, a thing I assumed Hal had taken along with him when he had gotten married and moved into his own place. I learned later that Hal had switched the stone for one of several others in Byler's lab. I also learned that he didn't know where it was now either. Later, we began to suspect that it had been the real thing, that Byler might have been commissioned by the United Nations to create a duplicate stone for display purposes.

Two hoodlums, named Morton Zeemeister and Jamie Buckler, also thought I knew the whereabouts of the stone. They had dealt rather severely with Paul Byler and weren't any too easy on me either in their search for it. They staked me out in the Australian wilderness, to sweat and freeze the information out of me.

Charv and Ragma, a pair of disguised extraterrestrial cops, also believed I knew the whereabouts of the stone—at some unconscious level. They rescued me from the wilderness where Zeemeister and Buckler had bound me and took me with them in their vessel, to orbit the Earth and recover from my questioning and a couple of bullet wounds. They also wanted to take me offworld for purposes of having my mind searched by a telepathic analyst, to dig out the information they desired.

I got away from Charv and Ragma, whose language I somehow seemed to have picked up without benefit of Berlitz, by insisting on my rights under a Galactic Code I had not known existed moments before. Reluctantly, they released me. There was indeed a statute such as the one I had picked out of the air.

Returning to my home, I discovered it occupied by two individuals who were drinking a toast to the Queen with my booze and waiting for me to come in. Presumably, they also thought I knew the whereabouts of the stone. I decided to forego the encounter and went and spent the night at Hal's place.

During the night, I received a strange mental message advising me to proceed to New York, obtain access to the Rhennius machine, test its inversion program and then go and get drunk. The Rhennius machine was an item we had also received as part of the cultural exchange program—we had exchanged the Mona Lisa and the British Crown Jewels for it and the star-stone. The message told me how to

test the program. I already knew how to get drunk. So I went to New York and followed the instructions, getting shot at by a guard in the process.

Later, while drinking down in the Village, I ran into my old adviser Professor Merimee, who told me I was being followed and offered to spirit me away from my shadow. I accepted and wound up at a party back at Merimee's place. There I completed the final part of my instructions. I got drunk and went to sleep—but not before Merimee had told me he had been an old buddy of my Uncle Al, back when they had both been smugglers and students at the University of Paris. For old times' sake, he offered to have anyone who was troubling me killed, if I thought it was really warranted. I thanked him and went blotto.

The following morning, a telepathic donkey offered to probe my unconscious as soon as I got the booze out of my system. The donkey, as I suspected, was an associate of Charv and Ragma. I declined and departed via the bathroom window. I hadn't much liked the donkey's attitude and besides, I had gotten another message from my generally silent partner.

I followed my new instructions, which consisted of running myself through the Rhennius machine. Sure enough, it reversed me. Everything appeared backwards, some things tasted better, some things tasted worse. I still had no answers to any of my questions. I headed back home.

I spent the night at Ralph Warp's place, learned that he was also being pestered by people attempting to discover my whereabouts and was also informed that my adviser had told him I'd been graduated. The next morning I went over to the campus and learned that this was correct. They had found a seemingly legitimate way of slipping me a doctorate in anthropology, after being pressured by the government to do just this thing. Apparently the State Department also thought I knew the whereabouts of the stone and they had just effectively cut off my stipend. I slugged my ex-adviser and left.

I phoned Hal next and found him extremely agitated. Mary was not at her mother's. She had been kidnapped by someone who wanted the star-stone. I went with him to vouch for the authenticity of a phony stone he had picked up from Byler's lab. The trick didn't work, and I wished I were off climbing buildings somewhere as Zeemeister and Buckler prepared to torture Mary to force us to talk.

But lo! a resurrected Paul Byler entered the room from somewhere, with a big gun in his hand. All hell, to coin a phrase, then broke loose, and I found myself rushing Jamie Buckler who was, unfortunately, also armed. Give a man a sheepskin and it sometimes goes to his head. Jamie leveled his gun at my chest and fired.

Part Three

IX.

It is good to pause periodically and reflect upon the benefits to be derived from the modern system of higher education.

I guess it can all be laid at the feet of my patron saint, President Eliot of Harvard. It was he who, back in the 1870's, felt that it would be nice to loosen the academic straitjacket a bit. He did this, and he also forgot to lock the door when he left the room. For nearly thirteen years, I had granted him my gratitude once every month in that emotion-charged moment when I opened the envelope containing my allowance check. He it was who introduced the elective system, a modest tonic at the time, to a rigid course of forbidding curricula. And, as is sometimes the case with tonics, the results were contagious. And mutable. Their current incarnation, for example, permitted me to rest full-burnished, not grow dull in use, while following the winking star of knowledge. In other words, if it were not for him I might never have had time and opportunity to explore such things as the delightful and instructive habits of *Ophrys speculum* and *Cryptostylis leptochila,* whom I encountered in a botany seminar I would otherwise have been denied. Look at it that way. I owed the man my life style and many of the agreeable things that filled it. And I am not ungrateful. As with any form of indebtedness impossible to repay, I acknowledge it freely.

And who is Ophrys? What is she? That all our swains commend her? And Cryptostylis? I am glad that you asked. In Algeria there lives a wasp-like insect known as *Scolia ciliata.* He sleeps for a time in his burrow in a sandbank, awakens and emerges around March. The female of the species, following a fashion not peculiar to the hymenoptera, remains abed for another month. Her mate understandably grows restless, begins to cast his myopic gaze about the countryside. And lo! what should be blooming at that time in that very vicinity but the dainty orchid *Ophrys speculum,* with flowers which amazingly resemble the body of the female of the insect's species. The rest is quite predictable. And this is the fashion in which the orchid achieves its pollination, as he goes from flower to flower, paying his respects. Pseudocopulation is what Oakes Ames called it, the symbiotic association of two different reproductive systems. And the orchid *Cryptostylis leptochila* seduces the male ichneumonid wasp, *Lissopimpla semipunctata,* in the same fashion, for the same purpose, with the added finesse of producing an odor like that of the female wasp. Insidious. Delightful. Morals galore, in a strict philosophical sense. This is what education is all about. Were it not for my dear, stiff Uncle Albert and

President Eliot, I might have been denied such experiences and the light they constantly shed upon my own condition.

For example, as I lay there, still uncertain as to where *there* was, a couple of the lessons of the orchid drifted through my mind, along with unclassified sounds and unsorted shapes and colors. I quickly achieved such conclusions as, Things are not always what they seem, and sometimes it doesn't matter; and, One can get screwed in the damnedest ways, often involving the spinal nerves.

I was testing my environment in a tentative fashion by then.

"Ooow! Ooww!" and "Owww!" I said—for how long, I am uncertain—when the environment finally responded by sticking a thermometer in my mouth and taking my pulse.

"You awake, Mr. Cassidy?" a feminine-to-neuter voice inquired.

"Glab," I replied, bringing the nurse's face into focus and letting it go back out of focus again after I had gotten a good look.

"You are a very lucky man, Mr. Cassidy," she said, withdrawing the thermometer. "I am going to get hold of the doctor now. He is quite anxious to talk with you. Lie still. Don't exert yourself."

In that I felt no particular urge to roll over and do pushups, it was not difficult to comply with this last. I did do the focus-trick again though, and this time everything stayed put. Everything consisted of what appeared to be a private hospital room, with me on the bed by the wall by the window. I lay flat on my back and quickly discovered the extent to which my chest was swathed with gauze and tape. I winced at the thought of the dressings' eventual removal. The unmaimed do not have a monopoly on anticipation.

Moments later, it seemed, a husky young man in the usual white, stethoscope spilling out of his pocket, pushed a smile into the room and brought it near. He transferred a clipboard from one hand to the other and reached toward my own. I thought he was going to take my pulse, but instead he clasped my hand and shook it.

"Mr. Cassidy, I'm Dr. Drade," he said. "We met earlier, but you don't remember it. I operated on you. Glad to see that your handshake is that strong. You are a very lucky man."

I coughed and it hurt.

"That's good to know," I said.

He raised the clipboard.

"Since your hand is in such good shape," he said, "may I have your signature on some release forms I have here?"

"Just a minute," I said. "I don't even know what's been done to me. I am not about to OK it at this point."

"Oh, it is not that sort of release," he said. "They'll get that when you are checking out. This

just gives me permission to use your medical record and some photos I was fortunate enough to obtain during surgery as part of an article I want to write."

"What sort of article?" I asked.

"One involving the reason I said you are a very lucky man. You were shot in the chest, you know."

"I had sort of figured that out myself."

"Anyone else would probably be dead as a result. But not good old Fred Cassidy. Do you know why not?"

"Tell me."

"Your heart is in the wrong place."

"Oh."

"Have you actually gotten this far along in life without becoming aware of the peculiar anatomy of your circulatory system?"

"Not exactly," I said. "But then, I've never been shot in the chest before either."

"Well, your heart is a mirror-image of an average, garden variety heart. The vena cavae feed from the left and the pulmonary artery receives the blood from your left ventricle. Your pulmonary veins take the fresh blood to the right auricle, and the right ventricle pumps it through an aortic arch that swings over to the right. The right chambers of your heart consequently have the thick-walled development other people have on the left side. Now, anyone else shot in the same place you were would probably have been hit in the left ventricle, or possibly the aorta. In your case though, the bullet went harmlessly past the inferior vena cava."

I coughed again.

"Well, relatively harmlessly," he amended. "There is still a hole, of course. I've patched it neatly, though. You should be back on your feet in no time."

"Great."

"Now, about the releases . . ."

"Yeah. OK. Anything for science and progress and all that."

While I was signing the papers and wondering about the angle of the bullet, I asked him, "What were the circumstances involved in my being brought here?"

"You were brought to the emergency room by the police," he said. "They did not inform us as to the nature of the, uh, situation that led to the shootings."

"Shootings? How many of us were there?"

"Well, seven altogether. I am not really supposed to discuss other cases, you know."

I paused in mid-signature.

"Hal Sidmore is my best friend," I said, raising the pen and glancing significantly at the forms, "and his wife's name is Mary."

"They were not seriously injured," he said quickly. "Mr. Sidmore has a broken arm and his wife has a few scratches. That is the extent of it. In fact, he has been waiting to see you."

"I want to see him," I said. "I feel up to it."

"I'll send him in shortly."

"Very good."

I finished signing and returned his pen and papers.

"Could I be raised a bit?" I asked.

"I don't see why not."

He adjusted the bed.

"And if I could trouble you for a glass of water . . ."

He poured me one, waited while I drank most of it.

"OK," he said, "I'll be in to see you later. Would you mind if I brought some interns along to listen to your heart?"

"Not if you promise to send me a copy of your article."

"All right," he said, "I will. Don't do anything strenuous."

"I'll keep that in mind."

He folded his smile and went away and I lay there grimacing at the ƆИIKOMS ON sign.

It wasn't too much later, I guess, that Hal wandered in. Another layer of dopiness and confusion had peeled away by then. He was dressed in his street clothes and his right arm—wait a minute—pardon me, left arm, was in a sling. He also had a small bruise on his forehead.

I grinned, to show him that life was beautiful, and since I already knew the answer was all right, I asked, "How's Mary?"

"Great," he said. "Real good. Shook up and scratched, but nothing serious. How about yourself?"

"Feels like a jackass kicked me in the chest," I said. "But the doctor tells me it could have been worse."

"Yes, he said you were very lucky. He's in love with your heart, by the way. If it were mine, I'd be a little uncomfortable—all helpless like that, with him writing the prescriptions . . ."

"Thanks. I'm sure glad you came by to cheer me up. Are you going to tell me what happened, or do I have to buy a paper?"

"I didn't realize you were in a hurry," he said. "I'll be brief then: We were all shot."

"I see. Now be less brief."

"All right. You jumped at the man with the gun—"

"Jamie. Yes. Go on."

"He shot you. You fell. Put a checkmark next to your name. Then he shot Paul."

"Check."

"But, while Jamie was turned toward you, Paul had gotten partly clear of the junk that had fallen on him. He fired at Jamie at about the same time Jamie fired at him. He hit Jamie."

"So they shot each other. Check."

"I went for the other guy just a little after you lunged at Jamie."

"Zeemeister. Yes."

"He had his gun by then and got off several shots. The first one missed me. Then we wrestled

around. He's damn strong, by the way."

"I know that. Who do I check next?"

"I am not certain. Mary had her scalp grazed by a shot or a ricochet, and his second or third shot—I'm not sure which—got me in the arm."

"Two checks, either way. Who shot Zeemeister?"

"A cop. They came busting in about then."

"Why were they there? How did they know what was going on?"

"I overheard them talking afterwards. They had been following Paul—"

"—who had been following us, perhaps?"

"It seems so."

"But I thought he was dead. It made the news."

"That makes two of us. I still don't know the story. His room is guarded and no one is talking."

"He is *still* alive then?"

"Last I heard. But that was all I could learn about him. It seems we all made it."

"Too bad—twice anyway. Wait a minute. Dr. Drade said there were seven shootings."

"Yes. It was sort of embarrassing to them: One of the police shot himself in the foot."

"Oh. That's all the checks then. What else?"

"What else what?"

"Did you learn anything from all this? Like, about the stone?"

"Nope. Nothing. You know everything I do."

"Unfortunate."

I began to yawn, uncontrollably. About then, the nurse looked in.

"I'm going to have to ask you to leave," she said. "We can't tire him."

"Yes, all right," he told her. "I'm going home now, Fred. I'll come back as soon as they say I can see you again. Can I bring you anything?"

"Is there any oxygen equipment in here?"

"No. It's out in the hall."

"Cigarettes, then. And tell them to take that damned sign down. —Never mind. I will. —Excuse me. I can't stop. —Give Mary my sympathy and such. Hope she doesn't have a headache. —Did I ever tell you about the flowers that lay wasps?"

"No."

"I'm afraid you will have to go now," the nurse said.

"All right."

"Tell that lady she's no orchid," I said, "even if she does make me feel waspish," and I slipped back down to the still soft center of things where life was simpler by far, and the bed got lowered there.

Drowse. Drowse, drowse.

Glimmer?

Glimmer. Also glitter and shine.

I heard the noises of arrival in my room and opened my eyelids

just enough to show me it was still daytime.

Still?

I totted up my times. A day and a night and a piece of another day had passed. I had eaten several meals, talked with Dr. Drade and been ausculated by the interns. Hal had come back, happier, left me cigarettes which Drade had told me I could smoke against his wishes, which I did. Then I had slept some more. Oh yes, there I was . . .

Two figures passed into my slitted field of vision, moving slowly. The throat-clearing sounds which then occurred were Drade's.

Finally, "Mr. Cassidy, are you awake?" he seemed to wonder aloud.

I yawned and stretched and pretended to come around while I assessed the situation. Beside Drade stood a tall, somber-looking individual. The dark suit and smoked glasses did that for him. I suppressed a wisecrack about morticians when I saw that the man's right hand was wrapped about a guide-harness attached to a scruffy-looking dog that tried to sit at attention beside him. In his left hand, the man held the handle of a heavy-looking case.

"Yes," I said, reaching for the controls and raising myself to sit facing them. "What's up?"

"How do you feel?"

"All right, I guess. Yes. Rested."

"Good. The police have sent this gentleman along to talk with you about whatever it is they are interested in. He has requested privacy, so we will hang a sign on the door. His name is Nadler, Theodore Nadler. I'll leave you alone now."

He guided Nadler to a visitor's chair, saw him seated and left, closing the door behind him.

I took a drink of water. I looked at Nadler.

"What do you want?" I said.

"You know what we want."

"Try running an ad," I suggested.

He removed his glasses and smiled at me.

"Try reading a few. Like 'Help Wanted'."

"You ought to be in the diplomatic corps," I said, and his smile went tight and his face reddened.

I smiled then, as he sighed.

"We know that you do not have it, Cassidy," he finally said, "and I am not asking you for it."

"Then why push me around the way you have? Just because I'm pushable? You've really shot me down, you know, forcing that degree on me. If I did have anything that you wanted there would be a big price tag on it now."

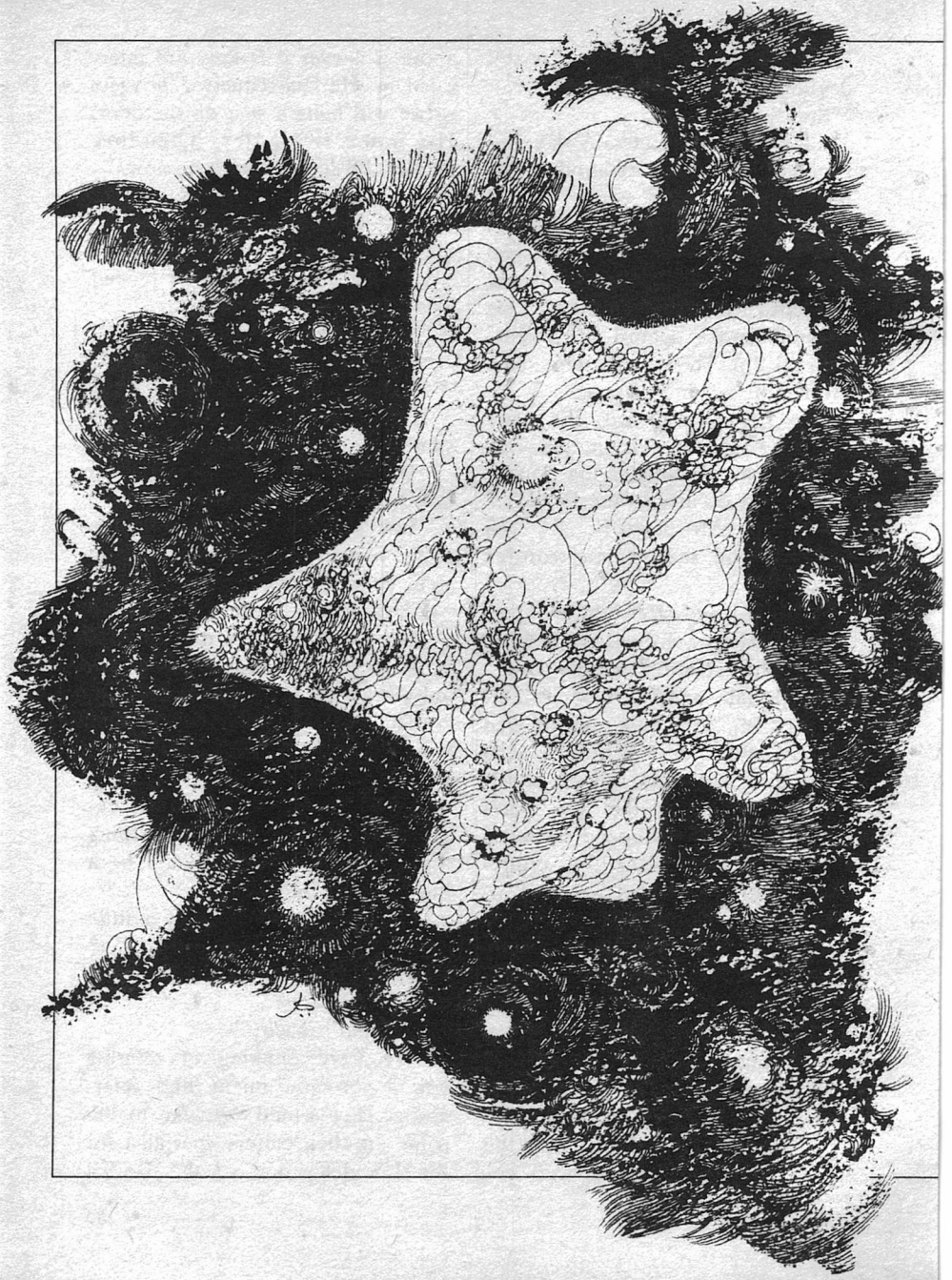
"How big?" he said, just a little too quickly.

"For what?"

"Your services."

"In what capacity?"

"We were thinking of offering you a job you might find interesting. How would you like to become an alien culture specialist for the US delegation to the United



Nations? The job description calls for a PhD in anthropology."

"When was the job description written?" I asked.

He smiled again.

"Fairly recently."

"I see. And what would the duties be?"

"They would commence with a special assignment, of an investigatory nature."

"Investigating what?"

"The disappearance of the starstone."

"Uh-huh. Well, I have to admit that the matter appeals to my curiosity," I said, "but not so much that I would be willing to work for you."

"You would not actually be working for me."

I got hold of my cigarettes and lit one before I asked, "For whom, then?"

"Give me one of those," said a familiar voice, and the scruffy-looking dog rose and crossed over to my bedside.

"The Lon Chaney of the interstellar set," I observed. "You make a lousy dog, Ragma."

He unsnapped several sections of his disguise and accepted a light. I could not make out what he looked like inside.

"So you went and got yourself shot again," he said. "It is not as if you had not been warned."

"That is correct," I said. "I did it with my eyes open."

"And reversed," he said, pushing aside my blanket and staring downward. "The scars are on the wrong leg for the wounds you sustained in Australia."

He let the blanket fall and went to hunker beside my table.

". . . Not that I needed to look," he added. "I overheard things about your wonderful reversed heart on the way in. And I sort of felt all along that you had to be the idiot who was fooling around with the inversion unit. Mind telling me why?"

"Yes," I said, "I would mind."

He shrugged.

"All right. It is still a bit early for malnutrition. I'll wait."

I looked back at Nadler.

"You still haven't answered my question," I said. "For whom would I be working?"

This time he grinned.

"Him," he said.

"Are you kidding? When did the State Department start hiring wombat impersonators and guide dogs? Nonresident alien ones, at that?"

"Ragma is not a State Department employee. He is lending his services to the United Nations. On coming to work for us, you would immediately go on loan to the special UN task force he heads."

"Sort of like a library book," I

said, looking back toward Ragma. "Do you want to tell me about it?"

"That is why I am here," he said. "As you are obviously aware, the artifact generally known as the star-stone is missing. You were apparently in possession of it for a time, and as a consequence you are the focus of interest for a number of parties concerned with its recovery—for a variety of reasons."

"Paul Byler had it?"

"Yes. He was commissioned to construct a display model."

"Then he was pretty careless with it."

"Yes and no. A most peculiar man, Professor Byler, and the subject of a coincidence that complicated matters in a fashion that could not have been foreseen. You see, he was approached to undertake the job because he was considered one of the best qualified persons about for that sort of work. He had done all manner of clever things involving synthetics and crystals and such in the past. And he produced a beautiful specimen, one that a reviewing board was actually incapable of distinguishing from the supposed original. A tribute to the man's skill? So it seemed, at first. I do not know how the deception could have been uncovered by your people in the ordinary course of events."

"He kept the original and gave them back a copy, along with a copy of the copy?"

"Nothing quite that simple," Ragma said. "As it turned out, the object they gave him to duplicate was not the star-stone. A substitution had actually taken place much earlier—within minutes, as we understand it now, of the formal receipt of the stone by the Secretary General of the United Nations. Perhaps you saw that event televised?"

"I guess everyone did. What happened?"

"One of the guards exchanged it for a false stone while conveying it to the vault. The exchange went undetected, he made off with the genuine item and Professor Byler received the counterfeit for duplication."

"Then how could Paul have any part in . . . ?"

"The coincidence," he said, "the one coincidence allowable in every story. I am surprised that you did not ask me where the guard obtained the ringer."

I sagged slightly. I wondered whether it would hurt my chest much if I laughed.

"Not—Paul?" I said. "Tell me he didn't make the first counterfeit."

"But he did," said Ragma. "Just from a few advance photos and a written description. Now *there* is a tribute to his skill. When it came to technique, he really was the best choice."

I mashed out my cigarette.

"So he got his own counterfeit back to counterfeit?"

"Precisely. Which placed him in

a very awkward position. There he was with the real thing, working on an improved counterfeit, now that he had something better than photos and descriptions to go on, and the UN approached him to duplicate his original work."

"Wait! He had the real one? I thought the guard had taken the real one."

"I was just getting to that. The guard removed it and transported it to Professor Byler. Byler was afraid that the first counterfeit would not stand close scrutiny, especially from some visiting alien who might have seen it elsewhere and known something concerning its physical makeup—something which perhaps only an alien could detect. At any rate, his intention was to produce a superior replica the second time around and then have the same guard try to exchange it for his earlier model. The second version, he believed, could stand scrutiny for a much longer while. So he was faced with a dilemma at that point: give them back the first one and a copy, or give them two of the second generation stones of which he was quite proud. He resolved it by returning the first one and a copy, as he feared the authorities might by then have done a detailed study of its properties and have them on record as its authentic specifications."

I shook my head.

"But why? Why go through the whole rigamarole in the first place?"

Ragma put out his cigarette and sighed.

"The man possesses a powerful emotional commitment to the British monarchy—"

"The Crown Jewels!" I said.

"Exactly. The star-stone came and they went. He was obsessed by their departure, by what he considered the unfairness of the deal, the insult to the sovereign."

"But they are, in effect, still theirs and still available. The British approved their indefinite loan under those terms."

"We both seem to see it that way," Ragma said. "He does not. Neither do some of those—such as the guard—who cooperated with him in the venture."

"What, specifically, did they plan on doing?"

"Their intention was to wait for a time, until your relations with the other races had broadened and the benefits of this association had become firmly fixed in the public mind. At that point, they would announce that the star-stone was a fake—a fact readily verifiable by extraterrestrial authorities—and then proclaim that they were holding the real one for ransom. The price, of course, was to be the return of the Crown Jewels."

"So a screwball group was behind it. That even explains a certain toast I overheard in my apartment. They were doubtless waiting

to question me, to learn where to go to steal it back again."

"Yes. They have been looking for you. But then, we have them under surveillance. They are more a nuisance than a threat, actually, and they might possibly even help us to locate the stone if we leave them unmolested. This seems enough to offset the inconveniences involved."

"What would have happened if everything had gone as they planned it?"

"If the scheme succeeded, then the Earth would be expelled from the trading cycle and probably be blacklisted from normal trade, tourism and cultural and scientific exchanges. It would also seriously impair your chances of eventually being invited to join the formal confederation we possess, an organization roughly equivalent to your own United Nations."

"And an intelligent man like Paul can't understand this? It makes me wonder whether we are ready for something of that scope."

"Oh, he does now. He is the one who gave us all the details as to what had occurred. And do not be too hard on him. Matters of sentiment are seldom mediated by the intellect."

"What happened in his case, anyway? I had heard that he had been killed."

"He had been attacked and severely abused, but police happened on the scene just as his assailants were departing. They possessed medical equipment to supply immediate emergency aid, and they rushed him to a facility where he underwent a number of organ implants, all of which proved successful. Thereafter, he contacted the authorities and told the entire story. His change of heart was prompted by the fact that his attackers had formerly been associates of his."

"Zeemeister and Buckler," I said, "did not strike me as the sort whose intellects are mediated by sentiment."

"True. They are, basically, hoodlums. Until recently, their major activities had involved organ procurement and smuggling. Before that, they had done many other illicit things, but organs seem to have been going well recently. They were involved in the theft of the star-stone for monetary rather than idealistic reasons. None of the other members of the conspiracy were criminals in the professional sense of the term. This was why they hired Zeemeister—to plan the theft for them. His ultimate design, however, involved a brace of roods—"

"Doublecross," I said, lighting another cigarette for him.

"Just so. He intended to appropriate the stone for himself somewhere along the line and restore it to the authorities in return for money and immunity from prosecution."

"If that were to happen, how would it affect our chances with respect to eventual membership in the confederation?"

"It would not be as harmful as the use of it for the recovery of the Crown Jewels," he said. "So long as you have it ready to pass along at the appropriate time, any intervening problems concerning its maintenance are your own concern."

"Then what is your real part in this affair?"

"I do not like to look at things so terribly strictly," he said. "You are new to the game, and I want to see that you get every break possible. I would like to see the stone recovered and the entire incident forgotten."

"Decent of you," I said, "so I will try to be reasonable. I assume that Paul retained the original stone and that he has told you he believes it passed into our custody during a certain card party in his lab."

"That is correct."

"So Hal and I possibly, even probably, had it in our apartment for a time. And then it vanished."

"So it would seem."

"What then, specifically, would you want me to do about it if I took this job?"

"Of first importance," he said, "since you do not wish to go off-world to be examined by a telepathic analyst and since Sibla's qualifications do not meet with your approval, I would like you to consent to the procedure in the case of my bringing a qualified person here to Earth."

"So you still think a clue might be locked away somewhere in my mind?"

"We have to admit the possibility, do we not?"

"Yes. I guess we do. What about Hal? Maybe he has something at some buried level, too?"

"There is that possibility also, though I am inclined to believe him when he insists as he does that he left the stone behind. However, he has just recently given his consent to Mr. Nadler to go along with any sort of mind-probing technique that may be of help."

"Then I do, too. Bring on your analyst. Just so he knows his business and is in no position to lock me away on another world."

"All right. That is settled, then. Does it mean you are accepting the job?"

"Why not? I might as well get paid for it—especially if the checks will be coming from the people who messed up my normal means of livelihood."

"Then we will leave it at that for now. It will require several days for the transportation of the analyst I have located. For now, Mr. Nadler has some forms and such for your signature. While you are dealing with these, I will be setting up a unit we have brought along."

"What sort of equipment is it?"

"Your leg healed up nicely, did it not?"

"Yes."

"I am prepared to do the same for your chest wound. You should be able to leave here this evening."

"That would be most welcome. Then what?"

"Then you have only to remain out of trouble for a few days. This can be achieved either by locking you up or by keeping you under reasonable surveillance, with the understanding that you will seek to avoid troublesome situations. I assume you would prefer the latter."

"You assume correctly."

"Then fill out the papers. I am going to warm up the unit and put you to sleep shortly.

Which is what happened.

Later, as they were preparing to leave—all the medical gear and Standard Forms stashed, Nadler in his shades, Ragma back in harness—Ragma turned and said to me, almost too casually, "By the way, now that we have achieved something of an understanding, would you care to tell me why you got yourself reversed?"

And I was about to. There seemed no reason for withholding any of that slice of affairs, now that we were together in this thing, so to speak. I decided that I might as well tell him.

I opened my mouth, but the words did not assemble themselves and emerge properly. I felt a tiny constriction in my throat, a certain thickness at the base of my tongue and a spontaneous flexion of various facial muscles as I smiled faintly, nodded slightly and then said, "I'd rather go into that a bit later, all right? Say tomorrow or the next day?"

"All right," he said. "No great urgency. When the time comes, we can reverse the reversal. Rest now, eat everything they give you and see how you feel. Mr. Nadler or I will be in touch later in the week. Good afternoon."

"So long."

"We'll be seeing you," Nadler said.

They left the door slightly ajar behind them. I did not doubt for a moment that I still lacked the entire story. But then, so did they. I had just been willing to level with them and my body had handed me a brace of roods. I found this especially frightening because in some ways it reminded me of my experience on the bus ride home. I could still see the marks of concern on the old man's brow as he asked me if I were feeling all right. Was it a similar thing that had taken me just now, a bizarre repercussion on my nervous system? An effect of the reversal? The timing was so smooth, though . . . I did not like it at all. Nothing I had ever come across in my checkered study of man and his manifold ways seemed of assistance at that moment.

President Eliot, we got problems . . .

X.

As the cable-like vines or tentacles seized me, thigh and shoulder, hoisting me into the air to a position where, wrenching my neck, I was afforded a view of the thing's massive trunk, down to where it emerged from the tub of slime in the center of the room, I reflected, as the enormous Venus's-fly-trap-type blades snapped open, revealing a reddish interior, that while it may be true that most accidents are caused by carelessness, I could in no way be held responsible this time. Since my departure from the hospital, I had been a model State Department employee, totally circumspect in thought and deed.

As it paused for an instant, perhaps debating the best disposition of the alkaloids my excess nitrogen would provide, the past couple of days flashed before me. No more than that, as I was still fresh on the earlier portions of my life from the last time I had been about to die . . .

I don't know whether it was that certain smile or morbid curiosity that manipulated me next. Dr. Drade had wanted to keep me hospitalized for further observation, despite the *prima facie* evidence of my healed chest. I disappointed him, however, and checked out around five hours after Nadler and Ragma had departed. Hal picked me up and drove me home.

Declining an offer to dine with Hal and Mary, I retired early that evening, first calling Ginny, who now seemed anxious to resume life where we had been interrupted at it back in my undergraduate days. We made a date for the following afternoon, and I turned in after a brief constitutional about the neighborhood rooftops.

Troubled, my sleep? Yes. External security there was, to the extent of a pair of drowsy cop-like stakeouts I had spotted from above while taking the air. Inside, though, I shuffled my deck of distresses and dealt myself bad hand after bad hand until I was cleaned out, mercifully, before six bells.

From then to morning was nine hours long for me and interspersed with short features, none of which I could get a pin through afterwards, save for the smile. I awoke knowing what I had to do and immediately set about rationalizing it so that it would not seem like another compulsion. And after a time I decided that perhaps it was not. Really, anyone would be curious about the place where he almost died.

So I phoned Hal and tried to borrow his car. Mary was using it, though. However, Ralph's was available and I hiked over and picked it up.

It was a crisp, clear morning with a hint of balminess to come. Driving seaward, I thought of my new job and of Ginny and of the smile. The job was to outlast the current

difficulty, Nadler had assured me, and the more I considered it the more it seemed that it might be worthwhile. If you have to do something, it is fortunate if it can be something interesting, something more than a little enjoyable. All those races out there, somewhere, concerning which we now knew next to nothing—I was going to have an opportunity to mine the unknown, hopefully to fetch forth something of understanding, to consider the exotic, to transform the familiar. I realized, suddenly, that I was excited at the prospect. I wanted to do it. I had no illusions as to why I had been hired, but now that I had my foot between door and jamb I wanted to push by the present obstructions and have a go at the real work. It seemed, just then, that alien anthropology (well, xenology, more correctly, I suppose) was really the sort of thing for which I had been preparing myself all along, in my own eclectic way. I chuckled softly. In addition to being excited, it occurred to me that I might be happy.

Having grown a bit more used to doing things in reverse, I found that driving a stereoisocar was not all that difficult. I came to a proper halt at every ϘOTƧ sign, and once I got out into the country there were very few traffic distractions. In fact, the only thing that had given me any trouble at all since the reversal was shaving. My traumatized nervous system had responded to the imaged reversal of a front-back reversal by jittering my hand to a bloody halt and waiting for me to dust off the electric shaver. This done, it was still a peculiar experience, but with the removal of the hazard it repaid me with confidence and a reasonably clean face.

And as I grinned and grimaced in the glass, I had thought of the only fragment of the night's dreaming that remained with me. There was this smile . . . Whose? I did not know. It was just a smile, somewhere a little over the line from the place where things begin to make sense. It remained with me though, flickering on and off like a fluorescent tube about to call it quits; and as I drove along the route Hal had taken earlier, I tried free-associating my way around it, Dr. Marko not being handy.

Nothing but the Mona Lisa came to pass. It did not feel quite right, in terms of analytic correspondence. Still, it was this famous painting that had gone out in exchange for the Rhennius machine. There could be some subtle connection—at least in my subconscious—or else a red herring born of coincidence and imagination, which sounds more like a caption for a Dali or an Ernst than a Da Vinci.

I shook my head and watched the morning go by. After a time I came to the side road and took it.

Leaving the car where we had parked before, I located the path and made my way down to the cottage. I observed it discreetly for a long while, saw no signs of life. Ragma had insisted that I seek to avoid troublesome situations, but this hardly seemed to qualify as one. I approached it from the rear, advancing upon the window through which Paul must have entered. —Yes. The latch was broken. Peering inside, I saw a small bedroom, quite empty. Circling the building then, I glanced in the other windows, saw that the place was indeed deserted. The fractured front door was nailed shut, so I returned to the rear and entered after the fashion of my former mentor and master rock-maker.

I made my way through the bedroom and on out the door from which Paul had emerged. In the front room, the signs of our struggles were unobliterated. I wondered which of the dried bloodstains might be my own.

I glanced out the window. The sea was calmer, with more green to it than was the case the last time I had passed this way. It lay cleaner scud-lines upon the beach, where no new doorways gaped that I could see. Turning away from it then, I studied the tackle and netting which had taken Paul so neatly where he stood, upsetting the balance of power and getting me punctured that day.

Some lines and a section of mesh were still snagged by a nail in one of the rafters, loosely leashing the junk on the floor below. To my right, a series of two-by-fours nailed between wall supports made a track up to that level.

I climbed it and crossed among the rafters, pausing every few paces to strike a light and examine the dust-coated wood. On the opposite side of the disturbed area where the equipment had rested, I came across a trail of small wedge-shaped smudges, leading in from a crossbrace which in turn bore them from the top of the side-frame itself. I descended then, and searched the rest of the cottage quite thoroughly, but came across nothing else that was of any interest. So I went back outside, smoked a cigarette while I thought about it, then headed back for the car.

Smiles. Ginny had many of them that afternoon, and we spent the rest of the day avoiding troublesome situations. She was more than a little surprised to learn that I had graduated and gotten a job. No matter. The day had fulfilled its promise, was balmy, stayed bright. We ambled about the campus and the town, laughing and touching a lot. Later, we wound up at a chamber music recital, which for some forgotten reason seemed the perfect thing to do, and was. We stopped at a nearby cafe afterwards, then went on up to my place so that I could show her it was only nor-

mally disarrayed, among other things. Smiles.

And the following day was a variation on the same theme. The weather varied, also, a bit of rain beginning in the afternoon. But that was all right, too. Made things seem cozier. Nice to be inside. Imagining a roaring fireplace across the room. Stuff like that. She had not noticed that I was reversed, and I made up such a lovely lie for my scar, involving initiation into a secret society within a tribe I had recently fielded, that I almost wished I had written it down. Alack! and more smiles.

About nine in the evening, my phone shattered the idyll. My premonition equipment printed out a warning, but like a Low Flying Aircraft sign failed to suggest anything I could do about it. I roused myself and answered the thing, a sigh followed by a "Yes?"

"Fred?"

"That's right."

"This is Ted Nadler. A problem has come up."

"Like what?"

"Zeemeister and Buckler have escaped."

"From where? How?"

"They had been transferred to a prison hospital later on in the same day they were brought in. They just left it a few hours ago, as nearly as we can tell. As to how they went about it, nobody seems to know. They left nine unconscious employees—medical and security—behind them. The doctors think it was some sort of neurotropic gas that was used—at least, the victims are all responding to atropine. But when the director called me, none of them had come out of it sufficiently to be able to say what had occurred."

"Too bad. But then, I guess we've seen the last of them for a time."

"What do you mean?"

"What did I just say? They are probably on their way out of the country. Kidnapping charges, attempted homicide charges—reasons like that."

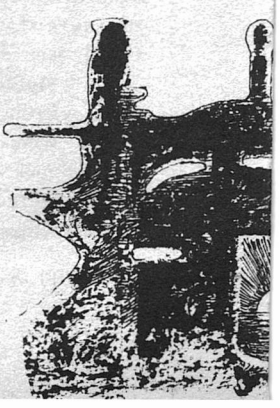
"We can't chance it."

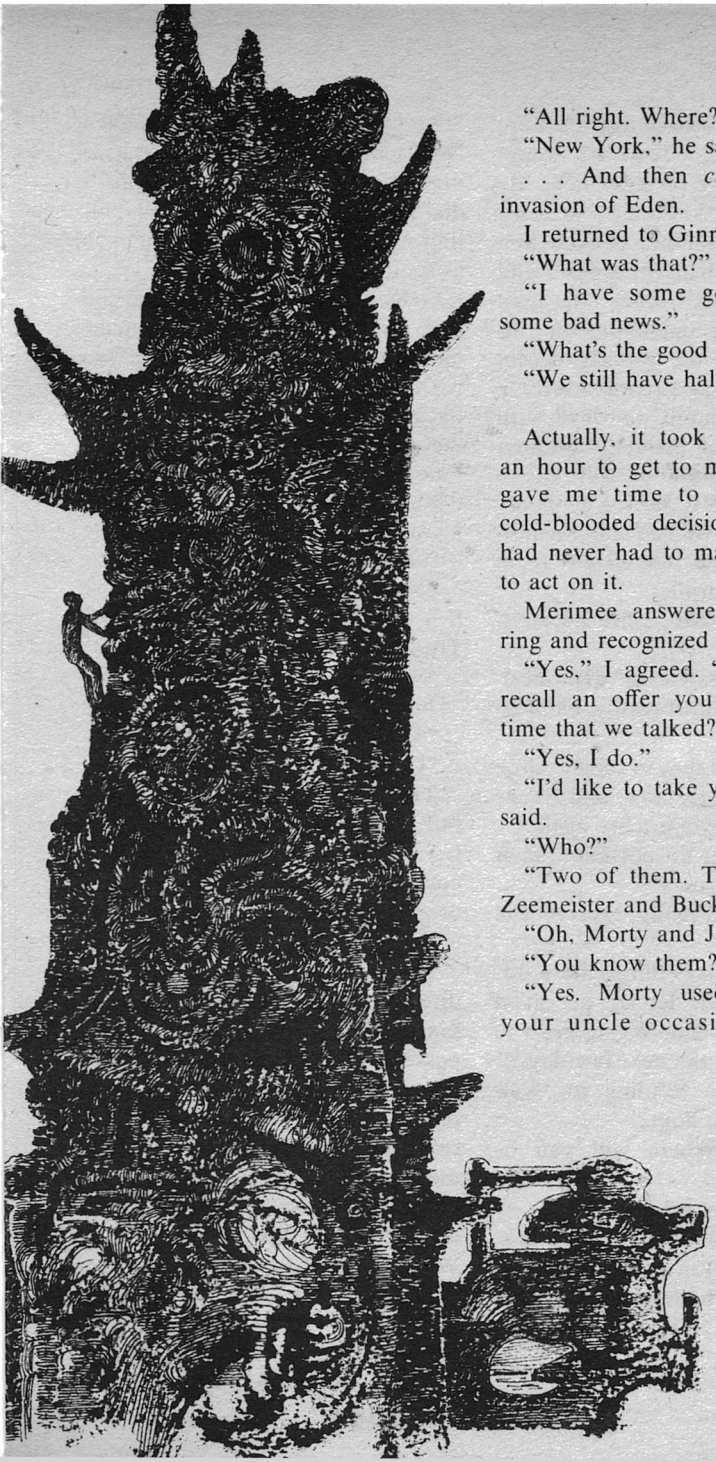
"What do *you* mean?"

"They just might head your way instead. So you had better send your girlfriend home and pack a suitcase. I will be picking you up in around half an hour."

"You can't do that!"

"Sorry, but I can, and that's an order. Your job now requires that you take a trip. So does your health, for that matter."





"All right. Where?"

"New York," he said.

. . . And then *click*. Thus, the invasion of Eden.

I returned to Ginny.

"What was that?" she asked.

"I have some good news and some bad news."

"What's the good news?"

"We still have half an hour."

Actually, it took him more like an hour to get to my place, which gave me time to make a nasty, cold-blooded decision of a sort I had never had to make before, and to act on it.

Merimee answered on the sixth ring and recognized my voice.

"Yes," I agreed. "Listen, do you recall an offer you made the last time that we talked?"

"Yes, I do."

"I'd like to take you up on it," I said.

"Who?"

"Two of them. Their names are Zeemeister and Buckler—"

"Oh, Morty and Jamie! Sure."

"You know them?"

"Yes. Morty used to work for your uncle occasionally. When

business was booming and we were swamped with orders, we sometimes had to hire on extra help. He was a fat little kid, eager to learn the trade. I never much liked him myself, but he had enthusiasm and certain aptitudes. After Al fired him, he began operations on his own and built up a fairly decent business. He acquired Jamie a couple years later, to deal with competitors and handle customer complaints. Jamie used to be a light-heavyweight boxer—a pretty good one—and he had lots of military experience. Deserted from three different armies—"

"Why did Uncle Al fire Zeemeister?"

"Oh, the man was dishonest. Who wants untrustworthy employees?"

"True. Well, they've come close to killing me twice now, and I have just learned they are loose again."

"I take it you do not know their present whereabouts?"

"That, unfortunately, is the case."

"Hmm. It makes things more difficult . . . Well, let us get at it from the other end. Where are you going to be for the next few days?"

"I should be heading for New York within the hour."

"Excellent! Where will you be staying?"

"I don't know yet."

"You are welcome to stay here again. In fact, it might facilitate—"

"You don't understand," I said. "I've graduated. Doctorate, in fact. Now I have a job. My boss is taking me to New York tonight. I don't know where he will be putting me up yet. I'll try to call you as soon as I get in."

"OK. Congratulations on the job and the degree. When you make up your mind to do something, you really move fast—just like your uncle. I look forward to hearing the whole story, soon. In the meantime, I will put out some feelers. Also, I think I can promise you a pleasant surprise before too long."

"Of what sort?"

"Now, it would not be a surprise if I told you, would it, dear boy? Trust me."

"OK, here's trust," I said. "Thanks."

"Till later . . ."

"Good-bye."

Thus, with premeditation and full intent, et cetera. No apologies. I was tired of being shot, and it is always a shame to waste any sort of gift certificate.

The hotel, as it turned out, was directly across the street from the same partly fleshed skeleton of a possible office building that I had used to gain access of the roof of the structure diagonally across the street—namely, the hall that housed the Rhennius machine.

I somehow doubted that this was a matter of pure coincidence. When I commented on it though, Nadler did not reply. It was after

midnight that we were checking in, and I had been with the man continually since he had picked me up.

Then, "I'm about out of cigarettes," I said, as we approached the desk, first noting of course that there was no cigarette machine in sight.

"Good," he replied. "Filthy habit."

The girl at the desk was more sympathetic, however, and told me where I could find one on the mezzanine. I thanked her, got our room number, told Nadler I would be up in a minute and left him there.

Naturally, I headed immediately for the nearest phone, got hold of Merimee and told him where I was.

"Good. Consider it staked out," he said. "By the way, I believe that the customers are in town. One of my associates thinks she saw them earlier."

"That was quick."

"Accidental, too. Still . . . be of good cheer. Sleep well. *Adieu.*"

"G'night."

I headed for the elevators then, caught one to my floor and sought our room. Lacking a key, I knocked.

There was no response for a time. Then, just as I was about to knock again, Nadler's voice inquired, "Who is it?"

"Me. Cassidy," I said.

"Come on ahead. It's unlocked."

Trusting, preoccupied and a trifle tired, I turned the knob, pushed and entered. A mistake anyone could have made.

"Ted! What the hell is—"and by then a vine had snagged me by the leg and another was slipping about my shoulder—"it?" I inquired, going airborne.

I struggled, of course. Who wouldn't? But the thing raised me a good five feet into the air, shifting me into a horizontal position directly above its less than attractive self. It then proceeded to turn me upside-down, so that my field of vision was dominated by its gray-green bulk, its tub of slime and its octopal members all a-writhe. I had a hunch it meant me ill even before its leafy appendages came open like switchblades, showing me their moist, spiny and suspiciously ruddy insides.

I let out a bleat and tore at the vines.

Then something that felt like a red-hot poker occurred behind my eyes and passed from side to side and back within my head. Stark terror poured forth, and I twisted convulsively within the living bonds.

Then came what seemed a sharp whistling noise, the stabbing sensation was gone from my cranium, the vines slackened, collapsed, and I fell, twisting, to the carpet, narrowly missing the bucket's rim. A bit of the slime slopped over onto me, and inert tentacles fell like holiday streamers about me. I

moaned and reached over to rub my shoulder.

"He's hurt!" came a voice that I recognized as Ragma's.

I turned my head to receive the sympathy I heard rushing toward me on little furry feet and big shod ones.

However, Ragma in his dog-suit and Nadler and Paul Byler in equally appropriate garb, rushed past me, squatted about the tub and began ministering to the militant vegetable. I crawled off into a corner, where I regained my feet if not my composure. Then I began mouthing obscenities, which were ignored. Finally, I shrugged, wiped the slime from my sleeve, found a chair, lit a cigarette and watched the show.

They raised the limp members and manipulated them, massaged them. Ragma tore off into the next room and returned with what appeared to be an elaborate lamp, which he plugged into an outlet and focused upon the nasty shrub. Producing an atomizer, he sprayed its vicious leaves. He stirred the slime. He dumped some chemicals into it.

"What could have gone wrong?" Nadler said.

"I have no idea," Ragma replied. "There! I think he is coming around!"

The tentacles began to twitch, like shocked serpents. Then the leaves opened and closed, slowly. A series of shudders shook the thing. Finally, it reared itself upright once again, extended all its members, let them go slack, extended them again, relaxed again.

"That's better," Ragma said.

"Anybody care how I'm feeling?" I asked.

Ragma turned and glared at me.

"You!" he said. "Just what did you do to poor Dr. M'mrm'mlrr, anyway?"

"Come again? My hearing seems to have been affected."

"What did you do to Dr. M'mrm'mlrr?"

"Thank you. That *is* what I thought you said. Damned if I know. Who is Dr. Murmur?"

"M'mrm'mlrr," he corrected. "Dr. M'mrm'mlrr is the telepathic analyst I brought to examine you. We made a good connection and got him here ahead of schedule. Then the first thing you do when he tries to examine you is incapacitate him."

"That thing," I inquired, gesturing at the tub and its occupant, "is the telepath?"

"Not everyone is a member of the animal kingdom, as you define it," he said. "The doctor is a representative of a totally different line of life development than your own. Anything wrong with that? Are you prejudiced against plants or something?"

"My prejudice is against being seized, squeezed and waved about in the air."

"The doctor practices a technique known as assault therapy."

"Then he should make allowance for the occasional patient who is not a pacifist. I don't know what I did, but I am glad that I did it."

Ragma turned away, cocked his head as if studying a gramophone horn, then announced, "He is feeling better. He wishes to meditate for a time. We are to leave the light on. It should not be overlong."

The vines stirred, moved to bunch themselves near the special lamp. Dr. M'mrm'mlrr grew still.

"Why does he want to assault his patients?" I asked. "It seems somewhat counterproductive to the building up of a good practice."

Ragma sighed and turned my way again.

"He does not do it to alienate his patients," he said. "He does it to help them. I guess that it is asking too much to expect you to appreciate the centuries of subtle philosophizing his people have devoted to this sort of thing."

"Yes," I replied.

"The theory is that any primary emotion can be used as a mnemomolecular key. Its skilled induction provides a telepath of his species with access to all of an individual's life experiences with resonance in that area. Now, it has been found that fear is a significant component of the problems most of his patients bring to him. Therefore, by inducing a flight response and frustrating it, he is able to sustain the emotion and keep the patient within range of therapy simultaneously. That way, he can review the emotive field in a single session."

"Does he eat his mistakes?" I asked.

"He has no control over his ancestry," Ragma replied. "Do you brachiate?" Then, "Never mind," he said. "*You* do. I forgot."

I turned to Nadler, who had just approached, and Paul, who was standing nearby, smirking.

"I take it all this sounds proper to you," I said, addressing them both.

Paul shrugged and Nadler said, "If it gets the job done."

I sighed.

"I suppose you are right," I said. Then, "Paul, what are you doing here?"

"Fellow employee," he replied. "I was recruited around the same time as yourself. By the way, I am sorry about that day back at your place. It *was* a matter of life and death, you know. Mine."

"Forget it," I said. "In what capacity have they got you on the payroll?"

"He is our expert on the stone," Nadler said. "He knows more about it than any other man alive."

"You've given up on the Crown Jewels then?" I asked.

He winced. He nodded.

"You know then," he said. "Yes, it was a belated youthful geste that

got out of hand. *Mea culpa.* We had not anticipated the involvement of criminals to this extent. After I recovered from their abuse, I realized the mistake we had made and set out to put things right. I told the UN people everything I knew. Had a hard time convincing them, but finally did. They were decent enough not to have me locked away somewhere. Even filled me in a bit concerning your difficulties down home. But making a clean breast of it was still not enough for me. I wanted to help recover the thing. You had just returned to the States, and I figured that they would try for you again. So I decided to keep an eye on you till they did, then spike their guns on the spot. I got onto your trail at Hal's and followed you as far as the Village, but I lost you in a bar there. Didn't catch up with you again till you were back home. You know the rest."

"Yes. Another small mystery resolved. Then you were hired in the hospital, too?"

"Correct. Ted here said that if I was that concerned about the way things were going, I might as well save some wasted motion and get paid for it, too. On the books, though, I am an extee-minerologist."

"It seems to me," I said, addressing all of them, "that my being brought here tonight represents more than the mere avoidance of a couple of thugs. I would guess that you have something else in mind, only just beginning with the telepathic probe."

"Nor would you be incorrect," said Ragma. "However, since it is all contingent upon the results of the analysis, it would be an exercise in redundancy to detail the various hypotheses which may have to be discarded."

"In other words, you are not going to tell me?"

"That pretty well sums it up."

Before I could submit my resignation or comment on any of a number of likely subjects which had occurred to me, I was distracted by a movement from across the room. Dr. M'mrm'mlrr was stirring again.

We all watched as he raised his snaky appendages and began his setting-up exercises. Stretch, relax . . . stretch, relax . . .

Two or three minutes of this—it was kind of hypnotic—and I realized that he was stalking me again, only with a much greater delicacy than he had previously employed.

I felt the touch again, within my head, as an unnatural stirring beneath my basal thoughts. Only this time there was no accompanying pain. It was just a sort of dizzy feeling and a sense of process not unlike the awareness of something being done under a local anesthetic. I guess that the others had somehow been made aware of this also, for they maintained their positions and their silence.

All right. If M'mrm'mlrr was going to be a little more civilized about it, he could have my cooperation, I decided.

So I sat there and let him rummage about.

Then, quite abruptly, he must have come across the big switchboard somewhere down there and pulled a plug, because I blacked out, instantly and without pain. Blink.

Blink again . . .

Weary, thirsty and with a feeling of having been broken down and reconstituted incorrectly, I raised my hand to rub my eyes and glimpsed the face of my watch as I did so. Then I swung it up and listened for ticks. As I already suspected, it was still tossing them off. Ergo . . .

"Yes, about three hours," said Ragma.

I heard Paul snore, snort, cough and sigh. He had been dozing in the armchair. Ragma was sprawled on the floor, smoking. M'mrm'mlrr was still upright and stirring. Nadler was nowhere in sight.

I stretched, unkinking muscle after muscle, hearing my frame creak like a floor that has been walked on overmuch.

"Well, I hope that you learned something useful," I said.

"Yes, I would say that we have," he replied. "How do you feel?"

"Wrung out."

"Understandable. Yes. Very. You were something of a battleground for awhile there."

"Tell me about it."

"To begin with," he said, "we have located the star-stone."

"Then you were right? Everyone was? I had the knowledge—somewhere?"

"Yes. The memory should even be accessible now. Want to try for it yourself? A party. A broken glass. The desk . . ."

"Wait a minute. Let me think."

I thought. And it was there. The last time that I had seen the star-stone . . .

It was the bachelor party I had given for Hal the week before his wedding. The apartment was crowded with our friends, the booze flowed, we made a lot of noise. It went on till around two or three in the morning. All in all, I would have to say that it was an effective party. At least, it seemed that everyone went home laughing and there were no injuries.

Except for one small accident of my own . . .

Yes. A glass was elbowed off a side table, shattered. It was empty, though. Nothing to mop up. And it was right near the end of things. People were saying good night, leaving. So I left the pieces where they had fallen. Later. *Mañana* maybe.

Still, I knew that I had had too much to drink, could guess how I would feel the next morning and what I would doubtless do.

I would growl and curse and bid the day depart. When it persisted, I would roll out of bed, stagger off to the kitchen to put the coffee over—my first act on any day—then lumber back to the bathroom for standard maintenance while it brewed. Invariably barefooted. Certainly not remembering that my path was strewn with shards. At least, for a brief while I would not remember.

So I fetched the wastebasket from beneath the desk, got down into a hunker and began policing the area.

Naturally, I cut myself. I leaned too far forward at one point, lost my balance, extended a hand to maintain it and located another shard as my palm struck the floor.

I began bleeding, but I wrapped my handkerchief around it and continued with the cleanup. I knew that if I stopped right then to take care of my hand I would be tempted to let things go afterwards. I was very sleepy.

So I got up all the pieces that I could see and wiped over the area with damp cocktail napkins. That done, I returned the wastebasket to its usual spot and dropped back into the desk chair because it was right there and I wanted to.

I unwrapped my hand and it was still bleeding. No sense doing anything at all until my thrombin earned its keep. So I leaned back and waited. My eyes did rest for a moment on the model of the star-stone we used for a paperweight. In fact, I reached out and turned it slowly, deriving a certain semi-sober satisfaction from the shifting light-patterns it displayed. Then I stretched out my arm full-length on the blotter because my head was heavy and it occurred to me that my biceps would do nicely for a pillow. Resting that way, eyes still open, I continued to play with the stone, feeling a small regret at having gotten blood on it, then deciding that it was all right, as it made for amusing contrasts here and there. Good-bye, world . . .

It was a couple hours later that I awoke, thirsty and possessed of a few muscle aches from the way I had been sleeping. I got to my feet, headed for the kitchen, where I drank a glass of water, then passed back through the apartment, switching off lights. When I got to my bedroom, I undressed slowly, sitting on the edge of the bed, letting my clothes lie where they fell, crawled in and did the rest of my night's sleeping properly.

. . . And that was the last time I had seen the star-stone. Yes.

"I remember," I said. "I have to hand it to the doctor. It comes back now. It was misted over by booze and fatigue, but I've got it again."

"Not just beverage and fatigue," Ragma said.

"What else, then?"

"I said that we had found the stone."

"Yes, you did. But no memories on that count have been shaken loose for me. I just recall the last time that I saw it, not where it went."

Paul cleared his throat. Ragma glanced at him.

"Go ahead," he said.

"When I worked with that thing," Paul told me, "I had to proceed along lines that were somewhat less than satisfactory. I mean that I was not about to knock a piece off a priceless artifact for purposes of analysis. Aside from purely esthetic reasons, it might be detected. I had no idea as to how detailed any alien analyses of its surface might be. Almost anything I did that would alter it might have caused trouble. Fortunately, though, it passed light readily. So I concentrated on its optical effects. I did an extremely minute topological light-mapping of its entire surface. With that and its weight, I developed some ideas as to its composition. Now, although I was not especially concerned at the time with anything other than duplicating it, it did strike me that the thing seemed like a mass of strangely crystallized protein—"

"I'll be damned," I said. "But . . ."

I looked at Ragma.

"Organic, all right," he said. "Paul did not really discover anything new in that, as this fact had been known for some time elsewhere. However, what nobody had realized was that it was still living, somehow. It was simply dormant."

"Living? Crystallized? You make it sound like a massive virus."

"I suppose that I do. But viruses are not noted for their intelligence, and that thing—in its own way—is intelligent."

"I do see what you are leading up to, of course," I said. "What do I do now? Reason with it? Or take two aspirins and go to bed?"

"Neither. I am going to have to speak for Dr. M'mrm'mlrr now, as he is occupied and you deserve an immediate explanation as to what he discovered. The first time that he attempted to penetrate your memories, he was thrown into a state of shock by an encounter with a totally unexpected form of consciousness coexistent with your own. In the course of his practice, he has treated representatives of just about every known race in the galaxy, but he never encountered anything like this before. He said that it was something unnatural."

"Unnatural? In what way?"

"In a strictly technical fashion. He believes it to be an artificial intelligence, a synthetic being. Such things have been produced by a number of our contemporaries, but all of them are fairly simple compared to this."

"What functions does mine perform?"

"We do not know. The second time that M'mrm'mlrr entered your mind, he was braced for the en-

counter. The creature is itself mildly telepathic, you see. Enough to translate for you back aboard our ship, under ideal conditions. I am told that this can provide additional complications, and apparently it did. However, he succeeded in subduing it and learned sufficient of its nature in the process so that we have an idea as to how to deal with it. He then went on to explore some of your memories touching on the phenomenon, which helped us piece together our line of attack. He is now occupied in holding the creature in a form of mental stasis until things are ready."

"Things? Ready? What things? How?"

"We should be hearing shortly. It is all tied in, though, with the nature of the thing. In light of M'mrm'mlrr's findings, Paul has worked out some ideas as to what happened and what can be done about it."

Paul took the pause that followed as a cue and said, "Yes. Picture it this way: You have a synthetic life-form that can apparently be switched on and off by means of isometric reversals. Its 'on' condition, characterized by life-functions, is a product of left-handedness. This, as you know, is the normal form amino acids take here on Earth, also: L-amino acids, as they are called. Turn them into their stereoisomer—D-amino acids—and in the case of our specimen, it goes into the 'off' position. Now, when I examined the star-stone, the optical effects indicated the dextral situation. 'Off.' All right. I was not thinking along these lines, but now we know a lot more. We know you were drinking the night you got blood on it. We know that grain alcohol has a symmetrical molecule, and that if it could react with the specimen in one isometric state it might do it in the other, also. Either it is a flaw in its design or an intentionally engineered capability. This we do not know. M'mrm'mlrr learned that it did its best communicating with you, however, in the presence of this molecule—so it does seem to stimulate conversation. Whatever, you excited it sufficiently to enable it to partially activate itself and enter your system by way of the incision in your hand. After this exertion, it lay dormant for a long while, as you are not much of a drinker. Every now and then it gained a little stimulation though, and tried to contact you via one sensory route or another. The medication Ragma administered to you after Australia revived it somewhat as it involved some ethyl alcohol. The night you were drinking with Hal, however, was the breakthrough. If it could persuade you to reverse yourself by means of the Rhennius machine, you would of course be backward, but it would be switched on. Which is what happened. So it is functioning normally at present, in you, but

your health is suffering, according to Ragma. What we have to do now is get it out of you and re-reverse you."

"Can you?"

"We think so."

"But you still have no idea what it does?"

"It is a very sophisticated living machine of unknown function that conned you into placing yourself in a dangerous situation. Also, it displays a predilection for mathematics."

"Some sort of computer, then?"

"M'mrm'mlrr does not think so. He believes it to be a secondary function."

"I wonder why it didn't get back in touch with me after it was switched on?"

"There was still the barrier."

"What barrier?"

"The matter of stereoisomers. Only this time you were the one reversed. Then, too, it had gotten what it wanted."

"Give it its due," said Ragma. "It did do one thing for him."

"What was that?" I asked.

"I did not do anything for you back at the hospital," he said. "When I removed the dressing and performed a number of tests, I found that you were already completely healed. Your parasite apparently took care of it."

"Then it seems as if he is trying to be a benign little guy."

"Well, if anything should happen to you . . ."

"Granted, granted. But what about the side-effects of the reversal on me?"

"I am not at all certain that he realizes what it could eventually lead to."

"It seems strange that if he is intelligent and he and M'mrm'mlrr were in contact, that he did not offer any explanation as to what has been going on."

"There was small time for amenities," Ragma said. "The doctor had to act quickly to freeze him."

"More of his assault philosophy? It hardly seems fair—"

The telephone rang. Paul answered it, and all of his responses were monosyllables. It lasted perhaps half a minute and then he hung up and turned to Ragma.

"Ready," he said.

"All right," Ragma replied.

"What is ready?" I asked.

"That was Ted," Paul told me. "He is across the street. He had to get authorization—and the key—to open up the place. We are all going over now."

"To re-reverse me?"

"Right," said Ragma.

"Do you know how to do it?" I asked. "That machine has several settings. I tested its program once, and I have a great respect for the variations it can toss off."

"Charv will be meeting us there," he replied, "and he is bringing along a copy of the operator's manual."

Paul moved off into the bed-

room, returned pushing a padded cart.

"Give me a hand with the leafy bloke, will you, Fred?" he said.

"Sure."

It was with very mixed feelings that I moved forward and did so, taking care the while not to get any more of the slop on me.

As we pushed Dr. M'mrm'mlrr through the lobby and out onto the sidewalk, the reflection of a neon sign seemed, in the after-image of a blinking, to read DO YOU SMELL ME DED?

"Yes," I muttered, under my breath. "Tell me what to do."

"Our Snark is a Boojum," came a whisper, as we were crossing the street.

When I looked around, of course, there was no one there.

XI.

I felt no real change with the disengagement that Ragma told me was taking place. I kept my eyes firmly fixed on Charv, who was going round and round, fiddling with the Rhennius machine, with frequent reference to a manual he carried in his pouch. It was not that I was squeamish . . . Well, maybe it was.

The incision in my left arm stung a bit, but was not especially painful. Ragma had wanted to avoid the introduction of additional chemicals of unknown effect to the area, which was understandable, and I was partially successful in setting up a biofeedback block. So my bared left arm rested on a previously white hotel towel, which I was brightening and darkening here and there beneath the area where he had swabbed alcohol, slashed me and applied more alcohol. I was resting in a swivel chair belonging to one of the guards we had relieved, trying not to think about the eviction of the star-stone from my premises. It was taking place, all right, I could tell that from the expressions on Paul's and Nadler's faces.

Situated right beside the base of the Rhennius machine, M'mrm'mlrr swayed and concentrated—or whatever he did—to cause what was taking place to take place. A bit of moon showed through the skylight. The hall echoed the least sound and was cold as a tomb.

I was not really certain that what was being done was the right thing. On the other hand, I could not be sure that it was not. It was not the same thing as doublecrossing a friend or betraying a confidence, or anything like that, both because my guest had been of the uninvited variety and because I had given him what he was after: *viz.*, namely & to wit, I had turned him on.

Still, though, echoing up from the chambers of my memory came the thought that he had given me the legal citation I had needed back when I was searching for something to keep them from spir-

iting me away. And he had put my chest together again. And he had promised to clarify everything, eventually . . .

But my metabolism meant a lot to me, and that spell on the bus and my experience of being controlled back in the hospital were also distressing. I had made my decision. Second thoughts were now a waste of time and emotion. I waited.

Our Snark is a Boojum!

There it was again, desperate-sounding this time, followed by the superimposition of massive teeth framed by upward curving lips on the far wall. Then fading, fading . . . gone.

"We have him!" said Ragma, slapping a pad of gauze onto my arm. "Hold that in place for awhile."

"Right."

It was only then that I ventured a look.

The star-stone was there on the towel. Not quite as I remembered it, for its shape was somewhat altered and its colors seemed more vivid—near to pulsing.

Our Snark is a Boojum . . . Anything from a distorted appeal for reconsideration to a euphemistic warning to a wasp concerning certain flowers—distorted as it was by the handedness barrier. I would have given a lot just then to know, though.

"What are you going to do with it now?" I asked.

"Get it to a safe place," he said, "after you've taken your little turnabout. Then it will be up to your United Nations for a time, since they are its current custodians. Still, a report on this new finding will have to be circulated among all our member worlds, and I would imagine your authorities will want to act under their advisement as to tests and observations that might now be in order."

"I'd imagine," I said, and he reached to pick it up.

"There's a good little fellow," came an all too familiar voice from across the hall. "Gingerly, gingerly now! Wrap it in the towel, please. I'd hate to have it chipped or scratched."

Zeemeister and Buckler had entered the hall, carrying guns, pointing them. Jamie, who was grinning, remained near the entrance, covering it. Morton, who looked pretty pleased himself, advanced upon us.

"So that's how you hid it, Fred," he observed. "Neat trick."

I said nothing, but rose slowly to my feet, nothing in mind but the fact that I could move faster from that position.

He shook his head.

"No need for trouble," he said. "This time you are safe, Fred. Everyone here is safe. So long as I get the stone."

I wondered, in a hopefully telepathic fashion, whether M'mrm'mlrr might reach out and

burn his brain as a contribution to domestic tranquility.

The suggestion was apparently accepted just as he came up beside me and hefted the stone. For he shrieked then and suffered a minor convulsion.

I grabbed for the gun with both hands. Jamie was far enough away to give me sporting odds on the attempt. I did not think he would take a chance on hitting his boss.

The pistol was fired twice before I tore it away from him. I did not get to keep it, however, as he jabbed me in the belly and caught me with an uppercut that knocked me to the floor. The weapon went spinning and skidding away to a place somewhere beneath the platform of the Rhennius machine.

He kicked Ragma, who had chosen that moment to attack, away from him. Still clutching the stone, he produced a long, shiny blade from somewhere in the vicinity of his forearm. Then he shouted to Jamie, but stopped in mid-cry.

I looked to see what had happened and decided that it must be another hallucination.

Jamie's weapon lay half a dozen paces behind him and he stood rubbing his wrist, facing the man with the neat beard and the amused expression, the man who held one hand in his pocket and twirled a shillelagh with the other.

"I'll kill you," I heard Jamie say.

"No, Jamie! No!" Zeemeister cried. "Don't go near him, Jamie! Run!"

Zeemeister backed away, pausing only to slash one of M'mrm'mlrr's tentacles, as if knowing the source of his mental anguish.

"He's not much," Jamie called back.

"That's Captain Al!" Zeemeister shouted. "Run, you fool!"

But Jamie decided to swing instead.

It was instructive to almost behold. "Almost," I say, because the cudgel moved a bit too fast for me to trace its passage. So I was not certain exactly where or how many times it touched him. It seemed only an instant after Jamie began his swing that he was falling.

Then, still twirling the stick, casually, jauntily now, the hallucination moved past Jamie's crumpled form and headed on toward Zeemeister.

Not taking his eyes from the advancing figure, Zeemeister continued to retreat, holding the knife low before him, edge upward.

"I thought you were dead," he finally said.

"Obviously you were mistaken," came the reply.

"What interest have you in this thing, anyway?"

"You tried to kill Fred Cassidy," he said, "and I've invested a lot in that boy's education."

"I did not associate the name," Zeemeister replied. "But I never really intended to harm him."

"That is not the way that I heard it."

Zeemeister continued to back away, passing through the gate in the guard rail, moving until the rotating platform of the Rhennius machine brushed the backs of his pantlegs. He spun then and slashed at Charv, who was passing by, brandishing a wrench. Charv bleated and fled the platform, dropping to the floor near M'mrm'mlrr and Nadler.

"What are you going to do, Al?" Zeemeister inquired, turning back to face the other.

But there was no reply, only a continued advance, a continued twirling of the club, a smile.

At the last instant, before he came into shillelagh-range, Zeemeister bolted. Raising one foot to the platform, he sprang back upon it, turning, and rushed forward all of two paces. Its rotation, however, had so positioned the apparatus that he collided with the central unit, which faintly resembled a wide hand cupped as in the act of scratching.

His momentum and angle of incidence were such that his stumbling rebound bore him down atop the belt. His knife and the towel-swathed star-stone flew from his hands as he tried to stay his fall. They bounced from the platform down onto the floor, as he was borne on into the tunnel. His scream was cut short with an ominous abruptness and I looked away, but not soon enough.

It apparently turned him inside-out . . .

Which of course delivered the contents of his circulatory and digestive systems to the floor . . .

Also, it seemed to have inverted all of the organs which were now exposed . . .

The contents of my own stomach sought egress, reinforced by the noises which had begun about me. Like I said, I looked away. But not in time . . .

It was Charv who finally managed to get up stomach enough to get to them and throw someone's coat over the remains, where they had fallen from the belt as it advanced toward the perpendicular. Then, and only then, did Ragma's practicality return, punctuated by his near-hysterical, "The stone! Where is the stone?"

Through watering eyes, I sought for it and then beheld the racing form of Paul Byler, bloody towel clutched beneath his arm, on his way across the hall.

"Once a jolly swagman," he called out, "always a jolly swagman!" and he was gone out the door.

Pandemonium reigned. Over the just and the near-just.

My hallucination then gave a final spin to his stick, turned, nodded in my direction and approached us. I rose to my feet, nodded back, found a smile and showed it to him.

"Fred, my boy, you've grown," he said. "I hear you have acquired a high degree and a responsible position. Congratulations!"

"Thank you," I said.

"How are you feeling?"

"Rather like Davy Copperfield," I told him. "I never realized what your export-import business was actually all about."

He chuckled. He embraced me.

"Tut, lad. Tut," he said, pushing me back to arms' length again. "Let me look at you. There. So that's how you turned out, is it? Could be worse, could be worse."

"Byler has the stone!" Charv shrieked.

"The man who just left—" I began.

"—shan't get very far, lad. Frenchy is outside to prevent anyone's departing this place with unseemly haste. In fact, if you listen you may hear the clatter of hoofs on marble . . ."

I did, and I did. I also heard profanity and the sounds of a struggle without.

"Who, sir, are you?" Ragma inquired, rising up onto his hind legs and drawing near.

"This is my Uncle Albert," I said, "the man who put me through school: Albert Cassidy."

Uncle Albert studied Ragma through narrowed eyes as I explained, "This is Ragma. He is an alien cop, in disguise. His partner is named Charv. He is the kangaroo." Uncle Al nodded.

"The art of disguise has come a long way," he observed. "How do you manage the effect?"

"We are *extraterrestrial* aliens," Ragma explained.

"Oh, that does make a difference then. You will have to excuse my ignorance of these matters. For a number of years and a variety of reasons have I been a man whose very blood is snow-broth, numb to the wanton stings and motions of the senses. Are you a friend of Fred's?"

"I have tried to be," Ragma replied.

"It is good to know that," he said, smiling. "For, extraterrestrial alien or no, if you were here to harm him, not all the cheese in Cheshire would buy your safety. —Fred, what of these others?"

But I did not answer him because I had chosen that moment to glance upward, had seen something just as he had spoken and was in the process of having the *1812 Overture*, smoke signals, semaphores and assorted fireworks displays simultaneously active within my head.

"The smile!" I cried, and tore off toward the rear of the hall.

I had never been past the door at that end of the place, but I was familiar with the reversed layout of the roof and that was all that I needed to know just then.

I plunged through and followed the corridor that lay behind. When it branched, I headed to the left.

Ten quick paces, another turn and I saw the stairway off to the right. Reaching it, I swung around the rail-post and took the steps two at a time.

How it all fit, I did not know. But that it did, I did not doubt.

I reached a landing, took a turn, came to another, took another. The end of things came into view.

There was a final landing with a door at the head of the stairs, all enclosed in a kiosk with small, meshed windows about. I hoped that the door opened from the inside without a key—it looked like that sort of handle-arrangement—because it would take a while to smash through a window and its grillwork, if I could do it at all. As I ascended, I cast my eyes about, looking for tools for this purpose.

I spotted some junk that might serve that end, as no one had apparently envisioned anyone wanting to break out of the place. It proved unnecessary, however, for the door yielded when I depressed the handle and threw my weight against it.

It was of the heavy, slow-opening sort, but when I had finally thrust it aside and stepped out I was certain that I was near to something important. I blinked against the darkness, trying to sort pipes, stacks, hatch covers and shadows into the notches my memory provided. Somewhere among them all, beneath the stars, the moon and the Manhattan skyline, was one special slot that I had to fill. The odds might be against it, but I had moved quickly. If the entire guess held true, there was a chance . . .

Catching my breath, I studied the panorama. I circled the kiosk slowly, my back to it, staring outward, scrutinizing every dark patch and cranny on the roof, on the ledges, beyond. It was almost a literally proverbial situation, only this was not a coal cellar and it was past midnight.

The object of my search might seem to have several advantages. Along with a growing certainty that I was right, however, I had persistence. I would not go away. I would outwait him if he were waiting. I would pursue him if I glimpsed his flight.

"I know you are there," I said, "and I know that you can hear me. There must be an accounting now, for we have been pushed too far. I have come for it. Will you surrender yourself and answer our questions? Or do you wish to make a bad situation worse by being difficult about it?"

There came no answer. I still had not caught sight of what I had hoped to find.

"Well?" I said. "I am waiting. I can wait as long as is necessary. You have to be breaking the law—*your* law. I am positive of that. The nature of the entire setup requires injunctions against activities of this sort. I have no idea as to your motives, but they are not especially

material at this point. I suppose that I should have caught on sooner, but I did not extend my recent awareness of the diversity of alien life-forms quite quickly enough. So you got away with a lot. Back at the shack? Yes, I guess that is where I should have made the connection, the second time around. There were a few earlier encounters, but I think I may be excused for missing their significance. Right here even, the night I tested the machine . . . Are you ready to come out? No? All right. My guess is that you are telepathic and that all these words are unnecessary, as I did not hear you say anything to Zeemeister. Still, I am not of a mind to settle for anything less than certainty, so I shall continue in this fashion. I believe you possess a tapetum, like your model. I saw the light from below. Keep your eyes closed or your head turned away, or I'll spot the light. Then, of course, you will not be able to see me. Your telepathic sense, though . . . ? I wonder now? It just occurred to me that you might betray yourself to M'mrm'mlrr if you use it. He isn't all that far away. It is possible that you are now at a disadvantage. What do you say? Do you want to be graceful about it? Or would you rather sit out a long siege?"

Still nothing. But I refused to let a doubt enter my mind.

"Stubborn, aren't you?" I went on. "But then, I would imagine you have a lot to lose. Ragma and Charv seem to have a bit of leeway in their work, though, being this far from the center of things. Perhaps they know some way to make it go a trifle easier for you. I don't know. Just talking. Worth thinking about, though. I believe the fact that no one has followed me up here indicates that M'mrm'mlrr is reading my thoughts and reporting the situation below. They must already be aware of everything that I have figured out. They must know that what tripped you up was no fault of your own. I do not believe that you or anyone else realized until just recently that the starstone was sentient, and that when I switched it on it began recording data, tabulating it, processing it. It had a rough time because of the handedness barrier which still persisted, though, because what turned it on pretty much turned me off—for purposes of communicating with it. So it could not simply come out and deliver its conclusions concerning yourself. It gave me a line from Lewis Carroll, though. Maybe it picked it up back in the book store. I don't know. It has had twisted versions of all my memories to play with, too. Wherever it got it, it did not click for me. Even though it was the second such attempt. The smile came first. Nothing there for me either. Not until Uncle Albert said 'Cheshire' and I looked up and saw the outline of a cat against the moon,

above the skylight. You dumped all that fishing gear on Paul Byler. Zeemeister was your creature. You needed human agents, and he was the perfect choice: venal, criminally competent and knowledgeable of the situation from the beginning. You bought him and sent him after the stone. Only the stone had other ideas, and at the last minute I caught them. You are in the form of a black cat who has crossed my path one time too many. Now I am thinking that if there are any lights up here, someone down below ought to go looking for the switch-box. Maybe they are already on their way to it. Shall we go below or wait for them? I'll nail you once they come on."

Despite the fact that I thought myself prepared for anything, I was taken by surprise in the next instant. I screamed when it hit, and I tried to protect my eyes. What a fool I had been!

I had looked everywhere but on top of the kiosk.

Claws dug into my scalp, scratched at my face. I tore at the creature, but could not get a hold that would dislodge it. Desperately then, I threw my head back toward the wall of the kiosk.

Predictably—by hindsight—it leaped away just as I did this and I brained myself against the wall.

Cursing, staggering, holding my head, I was unable for the moment to pursue the thing. Several moments, in fact . . .

Straightening finally, wiping the blood from my forehead and cheeks, I looked for it again. This time, I caught the movement. It was bounding toward the edge of the roof, it was up onto the low guard-wall . . .

It paused there. It glanced back. Mocking me? I caught the flash from those eyes.

"You've had it," I said, and I started forward.

It turned and raced along the wall then. Too fast, it seemed, to be able to stop when it reached the corner.

Nor did it.

I did not think it would make it, but I had underestimated its strength.

The lights came on just as it sprang into the air, and I had a full view of the black cat-shape, sailing, forelimbs extended, far out beyond the edge of the building. Then descending, dropping from view—no nine lives to fool with either, I felt sure—followed by a soft impact, a scratching, a clicking.

Racing forward, I saw that it had made it across. It was onto the skeleton of the building that stood beside the hall, onto it and already retreating across a girder.

I did not break my stride.

I had taken an easier way across that night I had last visited the roof, but there was no time for such luxury now—at least, that was how I rationalized it after the fact. Actually, I suppose, those impetu-

ous spinal nerves should have the credit this time, too. Or the blame.

I estimated the jump automatically as I approached, leaped from what my body told me was precisely the proper spot, cleared the guard-wall, kept my eyes on my target and my arms ready.

I always worry about my shins on something like this. One bad bash to them and the pain could be sufficient to break the chain of necessary actions. And a close bit of coordination was required here—another bad feature. An ideal climbing situation involves one key action at a time. Two can still be OK. Too much to coordinate, though, and you get into the foolish risk area. At any other time, this one would be foolish. I seldom jump for handholds. If there is an alternative save, I may. But that is about all. I'm not one for the all-or-nothing feat. However . . .

My feet struck the girder with a jolt I felt in my wisdom teeth. My left arm hooked about the upright I-beam beside which I had landed, things of which Torquemada would have approved occurring within my shoulder. I fell forward then, but was simultaneously swung leftward as I lost my footing, thrusting my right arm across and around to catch hold of the same upright. Then I drew myself back onto the girder, caught my balance and held it. I released my hold on the upright as I sighted my quarry.

It was heading for the platformed section where the workmen kept their things in barrels and tarp-covered heaps. I started for that place myself, running along girders, plotting the shortest route, ducking and sidestepping where necessary.

It saw me coming. It mounted a heap, a crate, sprang to the floor above. I took hold of a strut and the side of a beam, swung myself up, found purchase for my left foot at the head of the strut, raised myself, caught hold of the girder overhead, pulled myself up.

As I came to my feet, I saw it vanishing over the edge of the platform on the next floor above. I repeated my climb.

It was nowhere in sight. I could only assume that it had continued on upward. I followed.

Three floors above that I glimpsed it again. It had paused to peer down at me from a narrow width of planking that served as an elevator landing for workmen. The light from below and behind caught its eyes once more.

Then movement!

I clung to my support and raised an arm to shield my head. But this proved unnecessary.

The clatter and the bouncing, pinging, ringing that spilled from the bucket of bolts or rivets it had pushed over the edge came to me, passed by me, echoed on down to the ground where it ended/ended/finally ended.

I saved the breath I might have

used on curses for purposes of climbing, and resumed my vertical trek once more as soon as the air was clear. A cold wind began to tug at me as I went. Glancing back and down, I saw figures on the still-illuminated rooftop next door, looking upward. How much they could see, I was not certain.

By the time I reached the place from which the flak had fallen, the subject of my pursuit was two floors higher and apparently catching its breath. It was easier for me to see now, as the platforms had dwindled down to a precious few bits of planking and we were coming into a realm of hard, straight lines and cold, clean angles as classic and spare as a theorem out of Euclid.

The winds pushed and pulled with a bit more force as I mounted higher, slowly surrendering their randomness and growing constant. Starting at my fingertips and entering into the rest of me came a sense of the slight arhythmic swaying which possessed the structure. The sleep-sounds of the city grew indistinguishable in terms of isolated noises. It was a snoring, then a humming and finally the winds ate it and digested it. The stars and the moon traced the geometry through which we maneuvered and all the surfaces were dry, which is really about all that a night climber can ask for.

I kept on after it, up. Up. Up the two levels that separated us. Then one more.

It stood one level above me then, glaring down. There were no more stories. This was as high as things had gotten. And so it waited.

I paused and glared back.

"Ready to call it quits?" I shouted. "Or do we play it out all the way?"

There was no answer. No movement either. It just stood there and watched me.

I ran my hand upward along the beam that rose beside me.

My quarry grew smaller. It had crouched, bunched up, tensed itself. As if to spring . . .

Damn it! I would be at a disadvantage for several moments when I reached that level. My head exposed, my arms and hands occupied as I drew myself up.

Yet, it would be taking quite a chance itself, springing at me, up there, bringing itself into range . . .

"I think you are bluffing," I said. "I'm coming up."

I tightened my grip on the upright.

A thought came into my mind then, of the sort that seldom entered there:

What if you fall?

I hesitated—it was such a novel notion—an idea one simply does not entertain. Of course I was aware that it could occur. It had happened to me a number of times, with varying results. It is not the sort of thing one dwells upon

to the point of preoccupation, however . . .

Still, it is a long way down. Do you ever wonder what your final thought will be, just before the lights go out?

I suppose that everyone has, at some time or other, for a moment or so. It is hardly worth prolonged cerebration, however, and would probably be classifiable as a symptom of something that ought to be sacrificed on the smudgy altar of mental health. But . . .

Look down. How far? How great a distance? What does it feel like to fall? Is there a tingling in your wrists, hands, feet, ankles?

Of course. But again—

Vertigo! It swept over me. Wave upon wave . . . A thing I had never before experienced with such intensity.

Simultaneously, I realized the unnatural source of my discomfort. It would require a superfluity of naiveté not to.

My furry little enemy was broadcasting the sensation, trying to create an acrophobic attitude, succeeding . . .

But some things must go beyond the physical, the somatopsychic. At least, those small shreds of mysticism which make up the only religion I know kept insisting it wasn't all that simple to turn love into hate, passion to fear, to overcome the will of a lifetime with the irrationality of a moment.

I beat my fist against the beam, I gnawed at my lip . . . I was scared. Me. Fred Cassidy. Scared to climb it.

Falling, falling . . . Not the drifting of a leaf or a stray bit of paper, but the plummeting of a heavy body . . . The only interference, perhaps, the bars of our cage . . . A bloody print here, there . . . That is the only statement you may record on your passage, down . . . As from the trees where your not-so-distant ancestors clung, fearfully—

I saw it then. It had just given me what I needed, what I had been groping for while trying to bear the assault: an object outside myself upon which I could focus my attention fully. It had allowed a patronizing attitude toward the whole human race to slip through just then. Sibla had irritated me with a touch of the same sentiment back at Merimee's place. It was all that I needed.

I allowed myself to get mad as hell. I encouraged it, stoked it.

"All right," I said. "Those same ancestors used to poke things like you off limbs just for laughs—to watch you spit and fall, to see whether you always landed on your feet. It's an old game. Hasn't been played properly in ages. I am about to revive it, in the name of my fathers. Behold the giant anthropoid, beware its crooked thumbs!"

I seized the beam and pulled myself up.

It backed up, paused, advanced, paused again. I felt a growing ela-

tion at its indecisiveness, a sense of triumph over the halting of the bombing of my mind. When I reached its level, I ducked my head low and thrust both hands up onto the girder far enough apart so that whichever got clawed the other would still be sufficient for support.

It made as if to attack, apparently thought better of it, then turned and ran.

I pulled myself up. I stood.

I watched it scamper away, not halting until it was on the opposite side of the square of steel we held. Then I moved to the nearest corner and it moved to the farthest corner. I started up the next side. It started down the opposite side. I halted. It halted. We stared at one another.

"OK," I said, taking out a cigarette and lighting it. "With a stalemate you lose, you know. Those folks below aren't just sitting on their hands. They're calling for assistance. Every route down will be covered before long. I'm betting someone will be by soon in a chopper, too—with a mercy gun with infra-red sights. I have always understood it to be a little better thing to surrender than to resist arrest when you are in trouble. I am a bona fide representative of both my country's State Department and the United Nations. Choose whichever one you prefer. I—"

Very well, the thought came into my mind. *I will surrender to you in your capacity as a State Department employee.*

It immediately moved to the next corner, turned there and advanced along that side at a steady pace. I turned back, moving toward the corner I had recently quit. It reached that point before I did, however, turned and continued on toward me.

"Hold it right there," I said, "and consider yourself in custody."

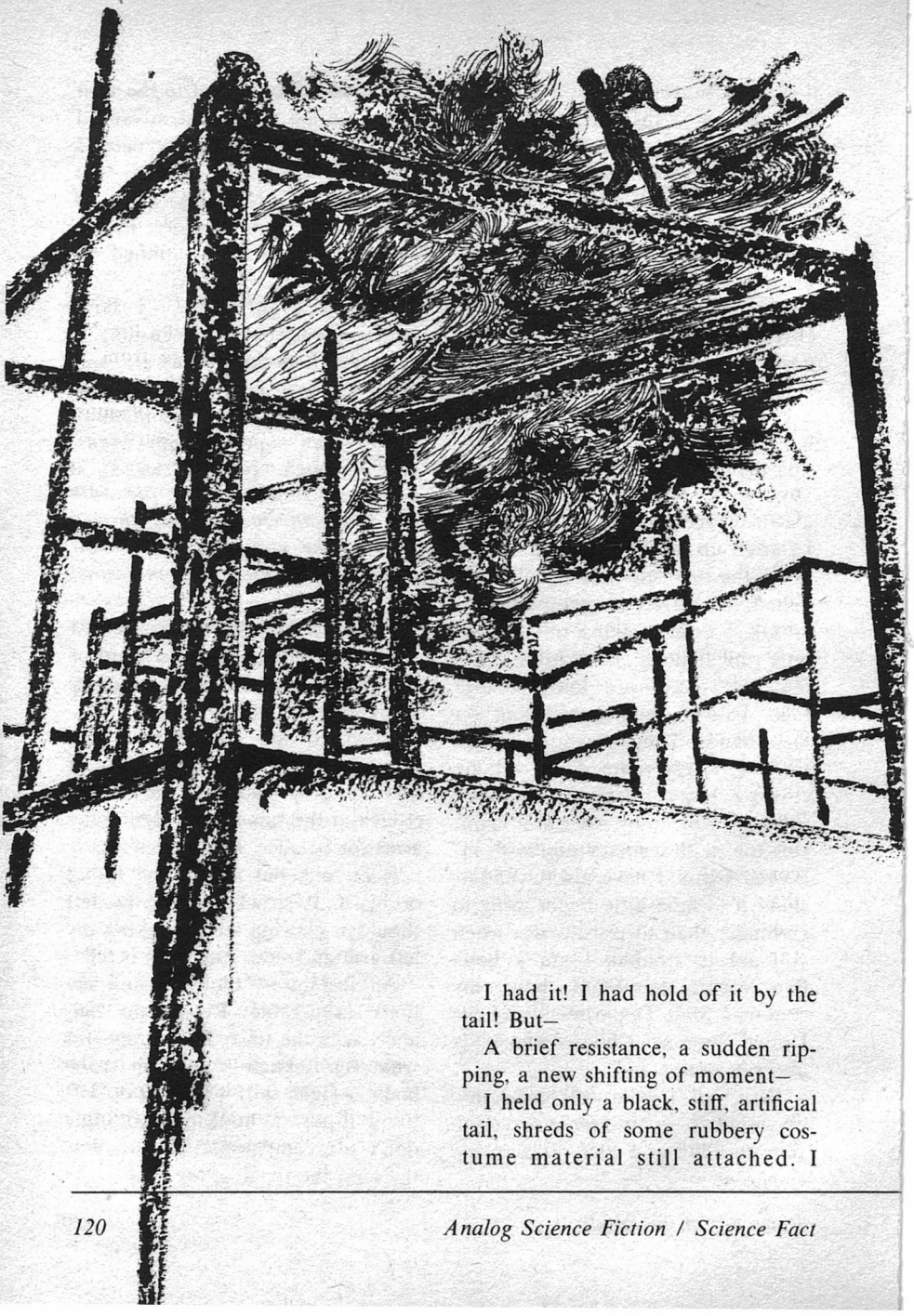
Instead, it bounded forward and sprang toward me, my mind instantly filling with something which, when supplied with words, came through, roughly, as, *It is more satisfying/noble to die with your teeth in/claws at the throat/heart of the enemy of nest/totem/civilization! Die, nest-molester!*

My hand had shot forward just as it was springing, and for want of any other weapon I had flipped my cigarette into its face.

It twisted and slapped at it just before its feet left the girder. I tried to drop back and go into a crouch at the same time, raising my arms for balance, for protection.

It hit me, but not in the throat or heart. It struck against my left shoulder, clawing wildly, raking my left arm and side. And then it fell.

An instant of thoughts and actions inseparable: Regain my balance, save the nasty little thing—for whatever it knew—right arm crossbody, weight shift to left foot, left hand dipping, hooking, seizing—don't overcompensate!—comes now the jerk, the tugging, the pull—



I had it! I had hold of it by the tail! But—

A brief resistance, a sudden ripping, a new shifting of moment—

I held only a black, stiff, artificial tail, shreds of some rubbery costume material still attached. I

caught a glimpse of the small, dark form as it passed through the area of greater illumination below. I don't believe that it landed on its feet.

XII.

Time.

More fragments, pieces, bits . . .

Epiphany in Black & Light, Scenario in Green, Gold, Purple & Gray . . .

There is a man. He is climbing in the dusky daysend air, climbing the high Tower of Cheslerei in a place called Ardel beside a sea with a name he cannot quite pronounce as yet. The sea is as dark as the juice of grapes, bubbling a Chianti and chiaroscuro fermentation of the light of distant stars and the bent rays of Canis Vibesper, its own primary, now but slightly beneath the horizon, rousing another continent, pursued by the breezes that depart the inland fields to weave their courses among the interconnected balconies, towers, walls and walkways of the city, bearing the smells of the warm land toward its older, colder companion . . .

Climbing from hold to green stone hold on the seaward side of the structure, he has contrived to race with the last of the day as it flees upward, tilts, prepares to jump. In the antic light of evening the top of the Tower of Cheslerei is the last spot touched by the day-gold before its departure from the capitol. He has given himself the time from the beginning of sunset to race the final light from bottom to top, to be on hand to take the night as it comes into the last place.

He is racing with shadows now, his own already diffuse about him, his hands darting like fish above the darkness. In the great high places above him the night continues with the minting of stars. Through atmosphere's crystal mask, he glimpses their englossment as he goes. He is panting now, and the spot of gold has diminished. The shadows begin to pass him as he mounts.

But it lingers, that tiny touch of gold on the green. Thinking, perhaps, of another place of green and gold, he moves even faster, pacing his shadow, gaining on it. The light fades for an instant, returns for another.

During that instant, he catches hold of the parapet and heaves himself upward, like a swimmer departing the water.

He draws himself up and stands, turning his head toward the sea, toward the light. Yes . . .

. . . He catches the final fleck of gold that it tosses. For a moment only, he stares after it.

He seats himself then on the stone and regards the night's other thousands, as he had never seen them before. For a long while, he watches . . .

I know him well, of course.

Portrait of Boy & Dog Romping on the Beach, Tick-Tock and Tempest Past, Fragment–

"Fetch, boy! Fetch!"

"Damn it, Ragma! Learn to throw a frisbee properly if you want to play! I'm getting tired of going after it!"

He chuckled. I recovered it and sailed it back. He caught it and threw it, to lose it again in the bushes upshore.

"That's it," I said. "I quit. It's hopeless. You catch fine, but you throw lousy."

I turned and headed back toward the water. A few moments later, I heard a scuffing noise and he was at my side.

"We have a game somewhat like that back home," he said. "I was never very good at it there either."

We watched the waves foam in, green to gray, crowding and frothing as they ran.

"Give me a cigarette," Ragma said.

I did, taking one myself also.

"If I tell you what I know you want to know, I will be breaking security," he said.

I said nothing. I had already guessed as much.

"But I am going to tell you anyhow," he went on. "Not details. Just the general picture. I am going to exercise my discretion. It is really pretty much an open secret, and now that your people are beginning to travel to other worlds and entertain visitors from them, you will hear about it sooner or later anyway. I would rather you heard it from a friend. It is a factor you should have in mind to make a better decision on the proposition you have been offered. I think we owe you that much."

"My Cheshire cat . . ." I began.

". . . Was a Whillowhim," he said, "a representative of one of the most powerful cultures in the galaxy. Competition among the various peoples who make up the total of civilization has always been keen in terms of trade and the exploitation of new worlds. There are great cultures and massive power blocs, and then there are–developing worlds, shall we say?–such as your own, newly arrived at the threshold of the big world. One day your people will probably have membership in our Council, with the right to a voice and a vote. What sort of strength do you think you will wield?"

"Not a whole big hell of a lot," I said.

"And what does one do under such circumstances?"

"Seek alliances, make deals. Look for someone else with common problems and interests."

"You might ally yourself with one of the big power blocs. They would do handsome things for your people in return for your support."

"There would seem a danger of becoming a puppet. Of losing a lot on something like that."

"Perhaps, perhaps not. It is not so simple a thing to foresee. On the other paw, you might throw in with the other smaller groups whose situations are, as you said, similar to your own. There are dangers in that, too, of course, but then the choices are never really this clear-cut. Do you begin to see what I am getting at, though?"

"Possibly. Are there many—developing worlds—such as my own?"

"Yes," he said. "There is quite a crop of them. New ones keep turning up all the time. A good thing, too—for everybody. We need that diversity—all those viewpoints and unique approaches to the problems life serves up wherever it occurs."

"Am I safe in assuming that a significant number of the younger ones stick together on major issues?"

"You are safe in assuming that."

"Is there a sufficient number to really swing much weight?"

"It is beginning to get to that point."

"I see," I said.

"Yes. Some of the older, more entrenched powers would not mind limiting their force. Curtailing their number is one way to go about it."

"If we had messed up badly with the artifacts, would it have kept us out permanently?"

"Permanently, no. You exist. You are sufficiently developed. You would have to be recognized sooner or later, even if you were blackballed initially. Still, it would be a mark against you, and it would necessarily be later for you then. It would delay things for a long while."

"Did you suspect the Whillowhim all along?"

"I suspected one of the major powers. There have been a number of incidents of this sort—which is why we keep an eye on beginners. In your case, it was easy for them—finding a ready-made situation that might be exploited. Actually though, I guessed wrong as to who was behind it. I did not really know until that night at the hall when Speicus got its message across and you pursued the Whillowhim. Not that it matters now. If we presented our findings to them and requested an explanation—which we will not do—the Whillowhim would of course simply reply that their agent was not their agent, but a private individual of unbalanced nature acting without sanction, and they would regret the inconvenience he had caused. No. Their awareness of failure will be suf-

ficient. We've scotched them here. They know that we are on the job and that you are alert—as your officials now are. I doubt that you will ever be faced with anything this overt in the future."

"I suppose that the next time they will come bearing gifts."

"This is quite likely. But again, your people are now advised. Others will come, too. It should not be so difficult to balance them off against one another."

"So it still comes back to the smoke-filled room . . ."

"Or methane. Or many other things," he said. "I don't quite follow . . ."

"Politics. It's a gas, too."

"Oh, yes. One of life's little essentials."

"Ragma, I would like to ask you a personal question."

"You may. If it is too embarrassing I will simply not answer it."

"Then tell me, if you would, how you would characterize your own culture, race, people—whatever term your social scientists apply to your group, you know what I mean—in terms of the greater galactic civilization."

"Oh, we would call ourselves quite practical, efficient, flat-headed—"

"Level-headed," I said.

"Just so. And at the same time idealistic, inventive, full of cultural diversity and—"

I coughed.

"—and possessed of great potential," he said, "and the dreams and vigor of youth."

"Thank you."

We turned and began walking then, along the beach just out of reach of the tide.

"Have you been thinking about the proposal?" he finally asked.

"Yes," I said.

"Reach a decision yet?"

"No," I said. "I am going to go away for a while to think about it."

"Have you any idea as to how long it will take you?"

"No."

"Just so. Just so. You will of course notify us immediately, whichever you decide . . ."

"Of course."

We passed a faded NO SWIMMING sign, and I paused to reflect upon the improvement over the ƆИIMMIWS OИ one I would have seen earlier. My scar collection was back in place too, and cigarettes tasted normal once more. I would miss the backward versions of the soggy French fries, greasy hamburgs, day-old salads and Student Union coffee, though, I decided. Most of all, however, the memory of the stereoisobooze, mystic nectar, *Spiegelschnapps* would haunt me, like a breeze from the stills of Faerie . . .

"I guess we had better be getting back into town," Ragma said. "Merimee's party will be starting soon."

"True," I said. "But tell me something. I was just thinking about inversions that proceed as far

as the molecular level but stop short of the atomic, the subatomic . . ."

"And you want to know why the inverter does not deliver neat little piles of antimatter for you?"

"Well, yes."

"It can be done, but you lose a lot of machines that way, among other things. And this one is an antique. We want to hang onto it. It is the second N-axial inversion unit ever built."

"What happened to the first one?"

He chuckled.

"It did not possess a particle-exceptor program."

"How does that work?"

"There are some things that man is not meant to know," he said.

"That's a hell of a thing to say at this stage of the game."

"Actually, I don't understand it myself."

"Oh."

"Let's go drink Merimee's booze and smoke his cigarettes," he said. "I want to talk to your uncle some more, too. He has offered me a job, you know."

"He has? Doing what?"

"He has some interesting ideas concerning galactic trade. He says that he wants to set up a modest export-import business. You see, I am about ready to retire from the force, and he wants someone with my sort of experience to advise him. We might work something out."

"He is my favorite uncle," I said, "and I owe him a lot. But I am also sufficiently indebted to you that I feel obligated to point out that his reputation is somewhat less than savory."

Ragma shrugged.

"The galaxy is a big place," he said. "There are laws and occasions for all sorts and situations. These are some of the things he wants me to advise him about."

I nodded slowly, apocalyptic pieces of family folklore having but recently fallen into place in light of Merimee's revelations and some of Uncle Albert's own reminiscences during our small family reunion the previous evening.

"Dr. Merimee, by the way, will be a partner in the enterprise," Ragma added.

I continued to nod.

"Whatever happens," I said, "I am certain that you will find it a stimulating and enlightening experience."

We continued on to the car, into it, cityward, away. Behind me, the beach was suddenly full of doorways, and I thought of ladies, tigers, shoes, ships, sealing-wax and other lurkers on the threshold. Soon, soon . . .

Variations on a Theme by the Third Gargoyle from the End: Stars and the Dream of Time—

It was in a small town in the shadow of the Alps that I finally caught up with him, brooding atop

the local house of worship, regarding the huge clock high up on the city hall across the way.

"Good evening, Professor Dobson."

"Eh? Fred? Goodness! Mind the next stone over—the mortar is a bit crumbly . . . There. Very good. I hardly expected to see you tonight. Glad you happened by, though. I was going to send you a postcard in the morning, telling you about this place. Not just the climbing, but the perspective. Keep your eye on the big clock, will you?"

"All right," I said, settling back onto a perch and bracing one foot against an ornamental projection.

"I've brought you something," I said, passing him the package.

"Why thank you. Most unexpected. A surprise . . . It gurgles, Fred."

"So it does."

He peeled away the paper.

"Indeed! I can't make out the label, so I had better sample it . . ."

I watched the big clock on the tower.

After a moment, "Fred!" he said. "I've never tasted the like! What is it?"

"The stereoisomer of a common bourbon," I said. "I was permitted to run a few bottles through the Rhennius machine recently, as the UN Special Committee on Alien Artifacts is being particularly nice to me these days. So, in this sense, you have just sampled a very rare thing."

"I see. What is the occasion?"

"The stars have run their fiery courses to their proper places, positioned with elegant cunning, possessed of noble portent."

He nodded.

"Beautifully stated," he said. "But what do you mean?"

"To begin with a departure, I have graduated."

"I am sorry to hear that. I was beginning to believe they would never get you."

"So was I. But they did. I am now working for the State Department or the United Nations, depending on how one looks at these matters."

"What sort of position is it?"

"That is what I am thinking about at the moment. You see, I have a choice."

He took another sip and passed me the bottle.

"Always an awesome moment," he reflected. "Here."

I nodded. I took a sip.

". . . Which is why I wanted to talk with you before I made it."

"Always an awesome responsibility," he said, recovering the bottle. "Why me?"

"Some time ago, when I was being tormented in the desert," I said, "I thought about the many advisers I have had. It only recently occurred to me what made some of them better than others. The best ones, I see now, were those who did not try to force me to go the prescribed routes. They

did not simply sign my card either, though. They always talked to me for a time. Not the usual sort of thing. They never counseled me in the direct manner ritual prescribes for such occasions. I don't even remember much of what was said. Things they had learned the hard way usually, things they considered important, I guess. Generally non-academic things. Those were the ones who taught me something, and perhaps they did direct me in an indirect way. Not to do what they wanted, but to see something they had really seen. A piece of their slant on life, take it for whatever it is worth. Anyhow, while you are one of the few who escaped the formal assignment, over the years I have come to consider you my only real adviser."

"It was never intentional . . ." he said.

"Exactly. That was the best way to do it in any case. The only way, probably. You have shown me things that have helped me. Often. Now I am thinking particularly of our recent conversation, back on campus, right before you retired."

"I remember it well."

I lit a cigarette.

"The entire situation is rather difficult to explain," I said. "I will try to simplify it: The star-stone, that alien artifact we have on loan, is sentient. It was created by a now extinct race somewhat similar to our own. It was located among the ruins of their civilization ages after its passing, and no one recognized it for what it was. This is not especially strange, because there was nothing to distinguish it as the SPEICUS referred to in some of the writings which survived and were subsequently translated. It was assumed that the references indicated some sort of investigating committee or some process or program employed in the gathering and evaluation of information in the area of the social sciences. But it was the star-stone they were talking about. To function properly, it requires a host built along our lines. It exists then as a symbiote within that creature, obtaining data by means of that being's nervous system as it goes about its business. It operates on this material as something of a sociological computer. In return for this, it keeps its host in good repair indefinitely. On request, it provides analyses of anything it has encountered directly or peripherally, along with reliability figures, unbiased because it is uniquely alien to all life forms, yet creature-oriented because of the nature of the input mechanism. It prefers a mobile host with a fact-filled head."

"Fascinating. How did you learn all this?"

"By accident, I partially activated it. It got inside me then and persuaded me to bring it to full function. Which I did. In the process, however, I rendered myself incapable of all but the most rudi-

mentary communication with it. Later, it was removed and I was returned to normal. It is currently functioning though, and telepathic analysts are capable of conversing with it. Now, both the Galactic Council and the United Nations would like to see it employed once more. What has been proposed is that it continue on as a special item in the *kula* chain setup, providing each world it visits with a full report on itself. Moving on, over the years, across the generations, this base would be broadened. Eventually, it would be able to supply the Council with reports encompassing whole sectors of the civilized galaxy. It is a living data processor, mildly telepathic—for it has been absorbing bits and pieces over the centuries it has been circulating, so that it knew to advise me on the Galactic Code and knew of the function of a certain machine. It represents a unique combination of objectivity and empathy, and because of this its reports should be of more than a little value."

"I begin to see the situation," he said.

"Yes. Speicus seems to have taken a liking to me, wants me to do the honors."

"An enormous opportunity."

"True. If I decline though, I will still get to study many of these things as an alien culture specialist right here on Earth."

"Why should you settle for that when you can have the other?"

"I got to thinking about the petty pace, then the acceleration. A while ago we were there, now we are here. Everything in between is a bit unreal—the time between the tops of our towers. Up here, looking down, looking back, I notice for the first time that my towertops are coming closer and closer together. There is a noticeable increase in the tempo of time and the times. Everything down there, between, grows more and more frantic, absurd. You told me that when I finally thought of it I should remember the brandy."

"Yes, I did. Here."

I disposed of my cigarette. I remembered the brandy, drank to it.

"If the distance were not so great you could spit into the face of Time," he observed, as I passed it back. "Yes, I did say all that, and it was true at the time. For me."

"And where is it taking us?" I said. "To the top of a particularly tricky spire which we already know to have been long occupied by others. They consider us a developing world, you know—primitive, barbaric. They are most likely right, too. Let's face it. We've been beaten to the top. If I take the job, I will be more of a display item than Speicus."

"Speaking statistically," he said, "it was unlikely that we would be at the top of the heap, just as it is also unlikely that we are at the bottom. I believe everything that I said when I said it, and some of it

still. But you must remember the circumstances. I was speaking from the end of a career, not the beginning, and I spoke at a moment when one is preoccupied with such matters. There are other thoughts I have entertained since then. Many of them. Such as Professor Kuhn's notions on the structure of scientific revolutions—that a big new idea comes along and shatters traditional patterns of thought, that everything is then put together again from the ground up. Petty pace, bit by bit. After a time, things begin looking tidy once more, except for a few odd scraps and pieces. Then someone throws another brick through the window. It has always been this way for us, and in recent years the bricks have been coming closer and closer together. Not quite as much time for the cleaning up. Then we met the aliens and a whole truckload of bricks arrived. Naturally the intellect is staggered. Whatever we are, though, we are different from anyone else out there. We have to be. No two people or peoples are alike. If for no other reason than this, I know we have something to contribute. It remains to be found, but it must be found. We must survive the current brick-storm, for it is obvious now that others have done it. If we cannot, then we do not deserve to survive and take our place among them. It was not wrong of me to wish to be the first and the best, only perhaps wrong to wish to be alone. The trouble with you people in anthropology, for all your talk of cultural relativism, is that the very act of evaluation automatically makes you feel superior to whatever you are evaluating, and you evaluate everything. We are now about to be evaluees for a time, anthropologists included. I suspect that has hit you harder than you may be willing to admit, in your favorite area of thought. I would then say, bear up and learn something from it. Humility, if nothing else. We are on the threshold of a renaissance if I read the signs right. But one day the brick-fall will probably let up and Time will shuffle its feet and the sweeping of the floors will commence again. There will be opportunity to feel alone in ourselves once more. When that day comes for you, what sort of company will you have?"

He paused. Then, "You have come for my advice," he said, "and I have probably offered more than was wanted. I owe it to the good company and the perfect beverage. So I drink to you now, and to the time that has transfigured me. Keep climbing. That is all. Keep climbing, and then go a little higher."

I accepted a sip. I stared out at the building across the way. I lit another cigarette.

"Why are we watching the clock?" I asked.

"For the chimes at midnight.

Any moment now, I should think . . ."

"It seems an awfully obvious moral, even if it is well-timed."

He chuckled.

"I didn't script the thing," he said, "and I've used up all my morals, Fred. I just want to enjoy the spectacle. Things can be interesting in themselves."

"True. Sorry. Also, thank you."

"Here they come!" he said.

A little door on either side of the clock popped open. From the one a burnished knight emerged. From the other, a dusky fool. The one bore a sword, the other a staff. They advanced, the knight straight and stately, the fool with a skip or a limp—I was not certain which. They moved toward us, bobbing, frozen in frown and grin. They reached the ends of their tracks, pivoted ninety degrees and proceeded once more, to a meeting before a bell that occupied a central position on that lateral way. Arriving before it, the knight raised his weapon and delivered the first blow. The sound was full and deep. Moments later, the fool swung his staff for the second. The tone was slightly sharper, the volume about the same.

Knight, fool, knight, fool . . . The strokes came quite smartly at that range, so I felt them as well as hearing their tones. Fool, knight, fool, knight . . . They cut the air, they killed the day. The fool delivered the final blow.

For an instant then, they seemed to regard one another. Then, as by agreement, they turned away, moved back to their corners, pivoted, continued on to their doorways and entered. The doors closed behind them and even the echoes were dead by then.

"People who don't climb cathedrals miss some good shows," I said.

"Keep your damn morals for another day," he said. Then, "To the lady with the smile!"

"To the rocks of empire!" I replied, moments later.

Bits & Pieces Lost in Hilbert Space, Emerging to Describe Slow Symphonies & the Architecture of Persistent Passion—

He regards the night as he had never seen it before, from atop the high Tower of Cheslerei in a place called Ardel beside the sea with the cryptic name. Somewhere, Paul Byler is chipping pieces off a world and doing remarkable things with them. Ira Enterprises, under the directorship of Albert Cassidy is about to open offices on fourteen planets. A book called *The Retching of the Spirit,* by a shadowy, Traven-like author who lists as collaborators a girl, a dwarf and a donkey, has just achieved best seller status. *La Gioconda* continues to receive critical acclaim with tacit good humor and traditional poise. Dennis Wexroth is on crutches as the result of a broken leg sustained

while attempting to scale the Student Union.

He thinks of these and many other things behind the sky, within it. He recalls his departure.

Charv had said, "You smoke too much, you know. Perhaps you can cut down on this trip, or quit entirely. At any rate, have a lot of good, clean fun. Along with hard, honest work, it makes the worlds go round."

Nadler had shaken his hand firmly, smiled perfectly and said, "I know you will always be a credit to the corps, Dr. Cassidy. When in doubt invoke tradition and improvise. Always remember what you represent."

Merimee had winked and said, "We'll be opening a string of cat houses around the galaxy, for traveling Earthmen and adventuresome extees. It won't be long. Cultivate philosophy in the meantime. And if you get into any trouble, remember my number."

"Fred, my boy," his uncle had said, flipping his blackthorn aside to squeeze his shoulders, "this is a great day for the Cassidys! I always knew that you would meet your fate somewhere among the stars above. Second sight, you know. Godspeed, and a copy of Tom Moore here for company. I'll be in touch about the Vibesper office, and maybe be sending Ragma along later. You've been a proud investment, boy!"

He smiles at the absurdity, the traditions, the intentions. He feels the emotions.

I am sorry about that spasm back on the bus, Fred. It was just that I was trying to learn how your body worked in case I had to do any repairs. I was handicapped by the handedness barrier.

"I guessed as much—later."

This world is an interesting place, Fred. We have only been here a day and I can already predict, with high reliability, that we are going to have some unusual experiences.

"What sort of satisfaction do you get out of all this, Speicus?"

I am a recording and analyzing device. The best comparison, I suppose, is that I am a combination of the tourist and his camera. At those moments when they function together, I imagine that their sensations are akin to my own.

"I suppose it feels good to know yourself so thoroughly. I doubt that I ever will.

He lights a cigarette. He gestures.

"Well, was it worth the trip?" he asks.

You already know the answer to that.

"Yes, I guess that I do."

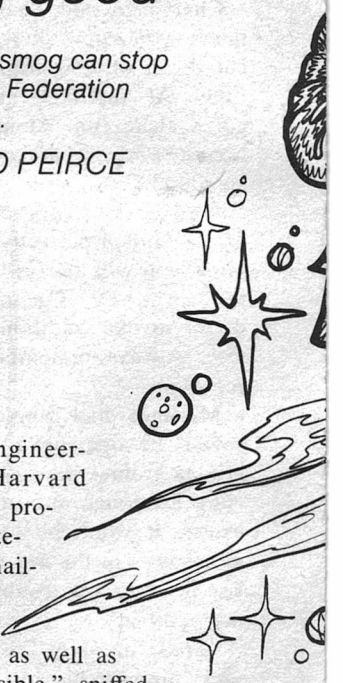
The people who climbed up and decorated all those rocks and cave walls had the right idea, he decides. Yes, they did.

Why he decides this, I am not certain. I know him well, of course. But I doubt that I will ever know him thoroughly either. I am a recording . . . ■

Doing well while doing good

Neither rain nor hail nor smog can stop the Galactic Federation Mail Service.

HAYFORD PEIRCE



From the unassuming Lexington Avenue offices of Rider Factoring, Ltd., Chap Foey Rider managed, in his spare time, his family's investment portfolio. In late November he called his broker with orders to sell all transportation securities: General Motors, Exxon, United Aircraft, Braniff Airlines, Norfolk & Western Railways, the proceeds going into 90-day Treasury Bills. Calling a second broker, he gave instructions to sell short a broad range of transportation stocks.

So. In for a penny, in for a pound, he reflected. He then sat back and waited, a plump, middle-aged, Anglo-Chinese merchant of nondescript features. If he was apprehensive, he gave little sign of it, beguiling the time by smoking an occasional cigarette.

At 3:14 the intercom buzzed.

"Mailroom, Mr. Rider. A large package just arrived. The return address says Sagittarius. Official Service of the Mandator?" The voice trailed off in a rising note of hysteria.

"Splendid," said Chap Foey Rider, making a note to overhaul the mailroom personnel, "I shall be there directly."

He gathered his four sons, John, Chong, Chan, and Wong, graduates respectively of Cal Tech, MIT, Stanford Engineering, and Harvard College, and proceeded sedately to the mailroom.

"This is ridiculous, as well as being impossible," sniffed the son from Harvard. "A vulgar hoax."

Chap Foey Rider did not reply.

A parcel some four feet around sat on the floor. His sons unwrapped the paper and twine. Chap Foey Rider was unsurprised to find that the transparent crating revealed a living being sprawled at ease in a comfortable-looking easy chair. The alien, humanoid save for light golden down on the unclothed

portions of his body, nodded tolerantly and waited patiently for the crate to be dismantled.

He stood up and stepped forward. There was a slight, pleasant odor, as of cinnamon. Chap Foey Rider inclined his head a measured two inches. It was a moment of high emotion: the stars had come to mankind.

"I am Xanthil, Ambassador Plenipotentiary," said the alien benignly. "You, sir, are the Mr. Rider who has been in communication with the Mandator of the Galactic Confederation?"

"Yes, Excellency. On behalf of Rider Factoring, Ltd., may I welcome you to Earth, Ambassador Xanthil."

"It is most kind of you." The Ambassador coughed delicately. "Your air," he murmured apologetically. "Its level of pollutants is somewhat higher than on my native planet. No, no, do not concern yourself. This capsule is a quite efficient internal filter." He swallowed, then inhaled deeply. "Ah. Splendid."

Chan and Wong, the two younger sons, failed to keep their eyebrows from rising slightly.

"If his Excellency would care to step this way," suggested Chap Foey Rider, "he might deign to join us in a cup of tea, that is, an herbal infusion of mildly stimulating but non-hallucinatory and non-toxic nature."

"I should be delighted."

"And may I apologize for the foulness of—"

"Not a word, my dear sir. Indeed, 27,000 members of the Galactic Postal Union stand ready to serve you. Air-scrubbing equipment of worldwide capacity is readily available." His spaniel-like eyes glanced keenly at Chap Foey Rider.

"One could expect no less," replied the factor politely, absorbed in directing the Ceremony of the Teapot. "A matter of mere financial detail, one would suppose. Sugar, Excellency?"

"A sweetener? Two, please. As you say, a matter of minor but tiresome details of finance. But no doubt your world has experts in the matter of commodity exchange?"

"Oh, no doubt," said Chap Foey Rider. "No doubt at all."

The second cup of tea was interrupted by the intrusion of four Treasury Department agents. An imperturbable Chap Foey Rider heard them out, bade his farewells to Ambassador Xanthil, and accompanied them to the elevator. "You'll be hearing more from us, pal," muttered one of the Secret Servicemen under his breath. "Trying to keep a deal like this under the table, for Chrissakes, is like practically treason."

Chap Foey Rider inclined his head a quarter-inch in curt dismissal and marched back to his office.

"Let me call the lawyers, sir," said the Harvard son excitedly. "Illegal entry, unauthorized—"

"A moment, Wong," said Chap Foey Rider, raising a palm. "A moment's reflection first. Surely an obvious corollary suggests itself?"

"Huh? You mean they've got lawyers too?"

Chap Foey Rider sighed. "I advise you to leave such twaddle to the ACLU. Rider Factoring is a business concern. Ah, Miss Zielonka, step right in. A letter, please."

He rubbed his chin thoughtfully, then leaned back in his chair.

"Galactic Chamber of Commerce," he dictated, "Galactic Center, Sagittarius. Attention: Department of Comparative Ecology and Biochemistry. Gentlemen: I have been referred to you by Ambassador Xanthil, who assures me that—"

"Ah-*hah!*" ejaculated the Stanford Engineering son.

"I *see,*" hissed the MIT son.

"Cunning old devil," muttered the Cal Tech son.

"See *what?*" cried the Harvard son plaintively. "What's there to—"

Chap Foey Rider waved them to silence. "John, if you would be so good as to finish this letter for me. Chong, kindly advise the newspapers of our visitor's arrival, not neglecting the *Wall Street Journal.* Chan, you might find it worthwhile to begin spreading rumors around the market. There is much to do and little time to do it in. Oh, and Wong," he added kindly, "you might . . . well, you might bring us another cup of tea."

The news of an intragalactic Postal Union comprising 27,000 member worlds utilizing faster-than-light delivery equipment was received on Earth with mixed emotions. From that segment of the population which actually believed the news (14.6 percent), praise and opprobrium were heaped on Chap Foey Rider in equal amount.

"This great innovator," began the Hong Kong *South China Morning Post.*

"This further proof of Chinese-American collusion," roared *Tass.*

"This is a disturbing example of the abuses of unregenerate and unregulated entrepreneurialism at its worst," chided the *Washington Post.* "Although Mr. Rider is clearly to be commended for the initial astuteness by which (apparently) he alone has given Mankind the universe, the furtive, almost criminal, fashion in which Mr. Rider allegedly attempted to sequestrate the Galactic Ambassador for motives which surely can only be construed as furthering his own selfish . . ."

Chap Foey Rider snorted, tossed the newspapers into the wastepaper basket, and returned to his desk. An initial reply had been received from the Chamber of Commerce and this time there was no officious mailroom meddler to tip off the government busybodies. Work was already under way.

John was in Atlanta, talking with officers of the Coca-Cola Bottling Company.

Chong was in Los Angeles, negotiating with hotel and apartment house owners and managers.

Chan was in Tokyo, dickering with city officials.

Wong was in the mailroom, drawing up a mailing list and brewing tea.

And he himself was waiting for the New York Stock Exchange to reopen after a three-day suspension in trading. He was genuinely curious as to whether American Airlines, previously at 62, would open at a nominal ⅛ or if it would be as high as ¼. Not that it was a purely intellectual curiosity, of course: his forthcoming expenses would be enormous. Every additional dollar that could be milked from his far-sighted move of selling the market short would be welcome. That 360 computer promised for installation tomorrow, for instance—even leas-

ing it took a substantial amount of money. What would his branch managers in Bangkok and Calcutta think of such profligacy: they, who still ran their offices with abaci?

He shook his head. One must simply move with the times. This mailing list, for example. Without the computer it would be impossible. And as for his projected activities . . . which reminded him. He made a neat note. Somewhere among 27,000 worlds there must exist a more compact, a more efficient, a *cheaper* computer. A useful agency to pick up. He smiled infinitesimally: how fortunate his subconscious had urged him to lease the 360 for a single month only. And, all things considered, this might be the best time to sell the portfolio's 1,000 shares of IBM.

After calling his broker, he turned on the radio for the noontime news. It was much as he expected.

Ambassador Xanthil had been welcomed in Moscow by tumultuous applause and a medal: Hero of the Soviet Union, First Class.

There was consternation in Washington, whence the alien had managed to extricate himself for a worldwide tour without having made a single commitment to the furtherance of the economic or military well-being of the United States. A Democratic President and Republican Congress, recently each so eager to claim total credit for the diplomatic coup of the century, were now engaged in acerbic partisan bickering.

"Who lost us the universe?" cried the Democrats.

"Who sold us down the starstream?" riposted the Republicans.

From there the dialogue degenerated to shrill cries of Yalta and Watergate.

The single common ground was the unanimous decision to reactivate the House Un-American Activities Committee for the purpose of investigating Chap Foey Rider.

"But why you, sir?" asked Wong, setting a cup of tea at his father's elbow. "You'd think they'd be grateful to you?"

"Hell hath no fury like an industrialist scorned," replied Chap Foey Rider drily.

"So?"

"Ambassador Xanthil has made it abundantly clear that whereas the Galactic Confederation has nothing but the highest esteem for Earth and its aspirations, it is, nevertheless, an association bound together exclusively by trade and commerce. It is not interested in theological discussions of the free-enterprise system versus godless communism, not does it indulge in Marshall Plans or foreign aid for undeveloped or emerging planets. Its 27,000 members are eager to provide us with unlimited amounts of goods and services, philosophies and technologies, but—and this is the key point, Wong—but only

through the intermediary of the Postal Union and in exchange for equivalent value of goods or services rendered. In other words, they expect us to pay for what we order."

"Well, gee," said Wong, frowning deeply, "that *sounds* OK, I guess, but golly, is that really the way things are run these days? I mean, you can't expect undeveloped and disadvantaged nations or worlds to pay for *every*thing, can you? Why," he exclaimed, making a broad gesture, "just look at our entire government policy!"

"Exactly," said Chap Foey Rider. "Your argument is most cogent, and will have certainly been brought forcefully to the attention of Ambassador Xanthil. Unfortunately, he professes to reflect a universal ennui at the prospect of trading Edsels, the Penn Central, F-111's, or Lockheed overruns for controlled fusion plants, death rays, or transmutation machines.

"Nor, on a higher plane, does he believe that the galactic demand for the philosophic thoughts of Billy Graham or Jonathan Livingston Seagull will generate sufficient revenues to maintain even a fourth-class postal service between here and Alpha-Centauri."

"But that's Robber Baronism," protested Wong hotly. "Like that *Post* editorial said, that's unregenerate and unregulated—"

"Kindly spare me," said Chap Foey Rider wearily.

"Well, anyway, whatever happened to Good Old American Can-Do?"

"Can-Do, I am afraid, appears to have sailed off with his pal Know-How in a beautiful pea-green boat," sighed Chap Foey Rider. "They were last sighted approaching Japan."

"Why, that's the most cynical thing I've ever heard," snapped the Secretary of State. "You mean to say that *you* alone—out of all the billions of the world—appear to have exclusive intercourse with the unspeakable rulers of this preposterous Galactic Confederation?"

Chap Foey Rider spread his hands in protest. "It is not I who imposed the circumstance, sir. Nor do I know to my own knowledge that the situation is as you describe it. I merely mentioned that my own correspondence with various galactic contacts remains uninterrupted. A question of prepaid postage on the other end, perhaps? Have you yourself," he inquired ingenuously, "tried addressing a letter and slipping it into a mailbox?"

"Of course I have, you fool!" roared the Secretary of State, his face a fiery red. "I and 200 million other people. And it comes back from the post office marked unpaid postage.'"

"Interesting," mused Chap Foey Rider. "But you did hear Ambassador Xanthil's speech in Paris, didn't you? The one in which he said a

temporary embargo had been placed on postal service to this world while he studies the mutual benefits and feasibility of actually establishing permanent relations."

"I heard it, all right," grumped the Secretary. "Damned impertinence, if you ask me: saying that on second thought it appears that Terra has nothing at all worth exchanging with the rest of the universe."

"He was not impressed, I take it, by the Russian offer of 2,000 Marxist-Leninist dialecticians and a ten-year supply of Siberian timber against assistance in establishing worldwide Soviet hegemony?"

The Secretary of State's jowls quivered. "No," he snapped, "nor by the joint Chinese-Indian offer of 500 million field hands, nor by the English offer of the Royal Family and Sten guns, nor the Danish offer of unlimited Greenland icecap, the Chilean offer of unlimited Pacific Ocean, the Australian offer of unlimited sand and rabbits, or the French proposal of Algerian wine and left-over maxis."

He pounded the table. "I tell you frankly, these short-sighted chauvinists have gummed up the works! If only they'd had the decency, the common sense, the . . . the *fair-mindedness,* to let a single party, such as the United States, represent mankind . . ."

His voice trailed off for a moment. "And you, Rider," he gritted between clenched teeth, "*you,* you continue your treasonable, seditious—"

"Oh, come, sir. Has an Iron Curtain suddenly been rung down? I must review my copies of the Congressional Record. In the meanwhile, I am certain my legal counselor will find your remarks to be of interest." Chap Foey Rider rose to his dignified height of five and a half feet.

"For heaven's sake, Rider, don't play the fool. If it weren't for your new-found notoriety you'd have been locked up long ago. You've virtual immunity and you know it. Even your letters—"

"Ah. I wondered about that. Have you found the agents from the Galactic Postal Union who are so obviously working somewhere within our own postal services? No? I *am* rather curious about them, you know. Are there vast numbers of agents infiltrated throughout the Earth, rather as a Peace Corps, happily speeding the mail on its appointed rounds, or are there just a few of them to speed up an occasional item in the hope that some Earthling would draw the correct conclusion and apply for Galactic membership? An interesting speculation, don't you think?"

"Don't rub it in, Rider, your immunity won't last forever. In the meantime, every Secret Service in the world is following your business career with fascination. Your real estate acquisitions in Los An-

geles and Tokyo are proceeding smoothly, I hope?"

"Cosi-cosa."

"And your take-over of American Bottled Gas?"

"The last stockholders gave their approval this morning."

"Your killing on the market?"

"Reinvested, Mr. Secretary, reinvested. Consolidated Aerosol, Inc."

"And your negotiations with Coca-Cola, hmmm?"

Chap Foey Rider waggled a finger. "One perceives that to you my life is an open book, from you there is nothing hidden." Smiling, he stood up a second time. "If I may be of further assistance at any future time, sir . . ."

Throughout December and January Rider Factoring's 360 hummed busily. Stacks of print-outs piled up, were scanned, hidden away in strongrooms guarded by armed Pinkerton operatives.

Chap Foey Rider paid personal visits to Phoenix, Gary, Pittsburg, Tokyo, the Ruhr, Djakarta, and São Paulo. The worldwide legal expenses of Rider Factoring rose sharply.

The stock market also began to rise as the likelihood increased that the Ambassador from the Galactic Confederation would recommend against diplomatic and commercial ties with Earth. The specter of instantaneous displacement booths replacing the automobile and the 747 began to fade. On the big board Boeing jumped from 3⅞ to 17¼. Lobbyists in Washington and Bonn grew cheerful.

Already glutted with American dollars, the Arab oil-producers made a half-hearted attempt to sell crude oil to the stars, then reverted to their long-range goal of purchasing controlling interests in Ford and General Motors.

France withdrew its offer of Algerian red and proposed the establishment in Paris of Galactic Postal Union and diplomatic headquarters in return for 74 million liters of unsaleable '76 Bordeaux wine (a rainy spring, followed by an August drought).

Pekin aired a violent attack on Galactic Adam-Smithism and Running-Dog Laissez-Faireism; and made a final, take-it-or-leave-it offer: a six-month lecture tour by the Chairman himself in return for exclusive distribution rights to matter transmitters, anti-gravity devices, and purely-self-defensive war materiel.

More pragmatic, Moscow proposed a cultural exchange: the Bolshoi Ballet (supplemented by an additional 4,000 blonde standby ballerinas) in return for 4,000 scientists and technologists. It being well-known that the Soviet postal service was the most efficient on Earth, it was only logical that in addition the USSR be granted sole rights to administer all postal commerce between the stars and Earth.

Jack Anderson reported from

Washington that Ambassador Xanthil planned a speech to the General Assembly on February 1. He would regretfully report that as there appeared to be no mutually beneficial articles of exchange between Earth and the rest of the Galaxy, he would have to recommend that postal service to the third planet be postponed for the indefinite future. Someday, perhaps, when global unity was achieved and priorities ordered, business relations would prove worthwhile. In the meantime, the enormous costs of instantaneously transmitting matter to a postal branch of a galactic backwater could not be seriously contemplated. The final decision, naturally, must be that of the Mandator himself, but . . .

Chap Foey Rider pursed his lips. Even in middle age he retained his youthful capacity for astonishment at the antics of trained statesmen and diplomats. The prospect of world government he found dismaying: any state larger than Andorra was intrinsically incapable of—

"Pop! Sir!" It was Wong, rushing into the office. "Turn on the TV! Xanthil's been kidnapped, being held as hostage!"

Scarcely surprised, Chap Foey Rider clicked on the small portable discreetly hidden away in a filing cabinet.

It was true. For reasons best known to himself, Xanthil had elected to swing through Central Africa. The newly-emerged nation of Xenophobia was locked in the throes of civil war: supported by the West were the Arab Blacks; supported by the East were the Black Arabs. They had joined sides long enough to mount a joint commando operation to Chad, where the commandos had gunned down the Ambassador's entourage and taken refuge with their hostage in the American Embassy. The Arab Blacks demanded 100 million dollars and the release of seven commandos convicted in Johannesburg of exploding a DC-10 in full flight; the Black Arabs demanded 100 million dollars and the release of three commandos convicted in Teheran of firebombing a hospital.

The images relayed by satellite were sharp and clear: the dust-colored American Embassy; the broken windows; the tanks and milling soldiers surrounding the building. A figure stumbled through a window and onto a second-story balcony: Xanthil, grasped by three of his captors. Moments later he was pulled back into the building.

The hours dragged by. An ultimatum by the commandos was released. They were not barbarians: mere foot-soldiers in the fight for freedom. Xanthil was unharmed and comfortable in the code room. If, on the other hand, their most reasonable requests were not acceded to within the next three hours . . .

The world was informed by CBS that the finest military minds of sixteen nations were working on the problem of securing Ambassador Xanthil's safe release.

Chap Foey Rider's lips tightened, and his gaze fell upon his four sons. They were young, well-coordinated, husky; all had fought in various of his country's wars. He sighed.

Four unregistered pistols were found in the filing drawer marked Miscellaneous. Chap Foey Rider led the way to the mailroom. The transparent carton from the stars was still there. It was a tight fit, but John, Chong, Chan, and Wong were crushed in and the lid replaced.

Using a red Magic-Marker, Chap Foey Rider carefully addressed the package on its transparent surface: Code Room, American Embassy, Chad. Fragile, Emergency Routing Via Mandator's Office, Sagittarius. Official Service of the Mandator, Prepaid.

As he drew the final "d" there was a soft implosion and the package vanished. So. His reasoning *had* been correct. Displacement equipment *was* focused on the mailroom. Psionically activated? Possibly. Who cared?

Chap Foey Rider paced the mailroom nervously, lighting and stubbing out cigarettes in rapid succession.

Forty-seven minutes later the package reappeared. His four sons emerged.

"Xanthil?" snapped Chap Foey Rider.

"No sweat, sir," said John. "He's fine. There was a guard in the code room we had to take care of, which alerted the others. It took twenty minutes to mop them up, by which time the army had broken in. Xanthil's diplomatic skills were needed to dissuade them from shooting us on the spot. Eventually he quite kindly readdressed the package for us, and here we are. The Ambassador expresses his most sincere thanks and will tender them personally before returning to Sagittarius. In the meantime, *noblesse oblige* requires him to carry on with his sightseeing tour of Central Africa."

Chap Foey Rider mopped his brow with a silken bandanna pulled from his right sleeve. "Excellent. Well done. And now, if you will straighten your garb, there is a gentleman from Caracas . . ."

". . . and so," said Ambassador Xanthil to the General Assembly, "I must confess that second thoughts are frequently wrong; that one's initial impression is the most trustworthy and reliable . . .

"The unfortunate Xenophobian incident is, of course, irrelevant. Personal feelings must not be allowed to intrude into the smooth workings of commerce and trade, of course . . .

"It is my pleasure to inform you that I shall shortly be recommending to His Excellency the Mandator that a permanent postal branch be established on Earth, one which will promote . . .

"You may find it odd, perhaps, that the initial contracts are not with any of the great sovereign members of this splendid body . . .

"I am sure, however, that as trading skills are honed, worldwide participation in intragalactic commerce will shortly follow and . . ."

"Well, Rider," rasped the Secretary of Commerce, "are you quite content?" State merely glared, too choked with emotion to utter.

"Content?" said Chap Foey Rider, his brow furrowed. "Of course I'm content. I have achieved a lifelong ambition."

"Grrrr," said Transportation, inarticulately but forcefully. Boeing had fallen back to 2¼.

"A lifelong ambition, I say. Everybody talks about the weather, and now I've done something about it."

"The weather!" cried State. "What are you raving about?"

Chap Foey Rider blinked. "You haven't heard the details of the small trade I've worked out? Why, it's simplicity itself. Not only does it provide for the cost of installing the Postal Union, it generates sufficient foreign exchange to permit the purchase of goods and services—"

"Kindly get on with it," sighed Treasury. "You can crow later."

"Since you insist. You may have noticed that Ambassador Xanthil initially found our air unpleasantly full of pollutants? No? Ah. In any case, worldwide air-scrubbing machinery was mentioned, which implied that our own smog is by no means a phenomenon confined to Earth. A corollary immediately suggested itself: surely, out of 27,000 galactic members, some worlds have solved their problem of air pollution not by scrubbing, but by evolution. The air-cleansers came too late: the inhabitants *enjoy* breathing smog."

"What!" cried Environment. "That's ridiculous!"

"Not at all," disclaimed Chap Foey Rider. "The Galactic Chamber of Commerce was kind enough to place me in contact with reputable businessmen and financiers on 2,600 such worlds. With the help of my computer, we have mailed out some 89,000 aerosol cans and bottled samples of choice *grand cru* smogs from Los Angeles, Tokyo, São Paulo, and dozens of others of our magnificently polluted cities. Mostly to travel agencies and purveyors of gourmet foods and choice wines, of course. The response has been overwhelming, if I may say so. The first tours to hotels and resorts will be starting shortly. The revenue derived will—"

"Hotels and resorts and apartment houses which *you* own,

Rider!" shouted CIA. "All over the world you've been—"

"Well, certainly," said Chap Foey Rider, puzzled. "How else could I generate capital to—"

"Battening on the miseries of the world," hissed State. "*Hyena* is the word generally—"

"—generate capital to purchase the anti-pollution controls and devices which within the decade will enable the world to scrub its air and keep it forever clean?" concluded Chap Foey Rider blandly. "The equipment *is* expensive, you know. And, no doubt, I've been sadly overcharged by unscrupulous traders. Ah, well, a businessman's plaint: I won't pass my own commercial shortcomings along to the rest of the world. No, a modest one percent service charge is all that Rider Factoring will add to the landed CIF price. Look upon it as a gift, gentlemen, to the world."

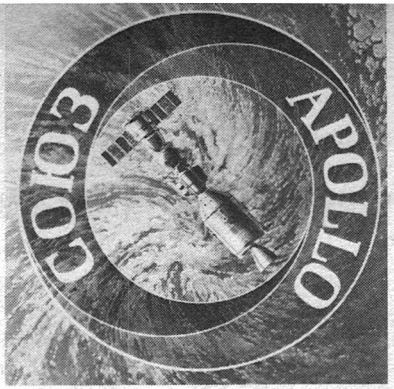
"A gift! One percent of how many billions comes to what? And what about the millions you'll make with your guided tours and your bottles of"—Treasury shuddered—"of canned smog for the fine food trade?"

Chap Foey Rider sniffed delicately at an aerosol can. "Ah, Bangkok, City Hall Plaza, 3:30 PM, February 13. A vintage day, gentlemen, a vintage day. A choice connoisseur's item, would you care for a sniff. No? To answer your question. Is it not obvious that my small, temporary windfall is self-liquidating in nature? Modest to start with, as the air-cleansing machinery is put into operation it will become ever more modest. Two or three years from now the skies of Los Angeles will be so clear that only the most undiscriminating lover of smog will be visiting. In ten years the trade will be gone forever. Likewise the bottled and canned exports of smog. No more raw material."

Chap Foey Rider spread wide his hands. "Frankly, gentlemen, your opprobrium oppresses me. I, a small, insignificant trader, a benefactor of mankind even, some might say, in an unassuming and humble—"

"Oh, very well," sighed the President of the United States, waving Chap Foey Rider toward the door. "What's done is done. I can see you plainly lack the makings of a statesman."

That was true, Chap Foey Rider reflected, as he left the White House by the East Entrance. A statesman he would never be. Fortunate it was that in his old age he would be able to fall back upon his carefully laid-down cellars of millions and millions of bottles and cans of the choicest *grands crus* of fine smog and pollution. And as the winds of Earth were remorselessly cleansed, surely their value on the galactic market, ten or fifteen years from now, would be, well, (he smiled apologetically) astronomical. ■



In the spirit of international cooperation fostered by the Apollo-Soyuz orbital mission, our cover painting for this issue is the work of a well-known Russian artist, Andrei Sokolov. The following article by Fred Durant explains the birth and growing interest within the USSR of "space art." Sokolov also painted the two illustrations accompanying this article in black-and-white reproduction. Jerry Pournelle's cover story, "Consort," was written after Pournelle saw a proof of Sokolov's cover painting.—THE EDITOR

SOVIET SPACE ART

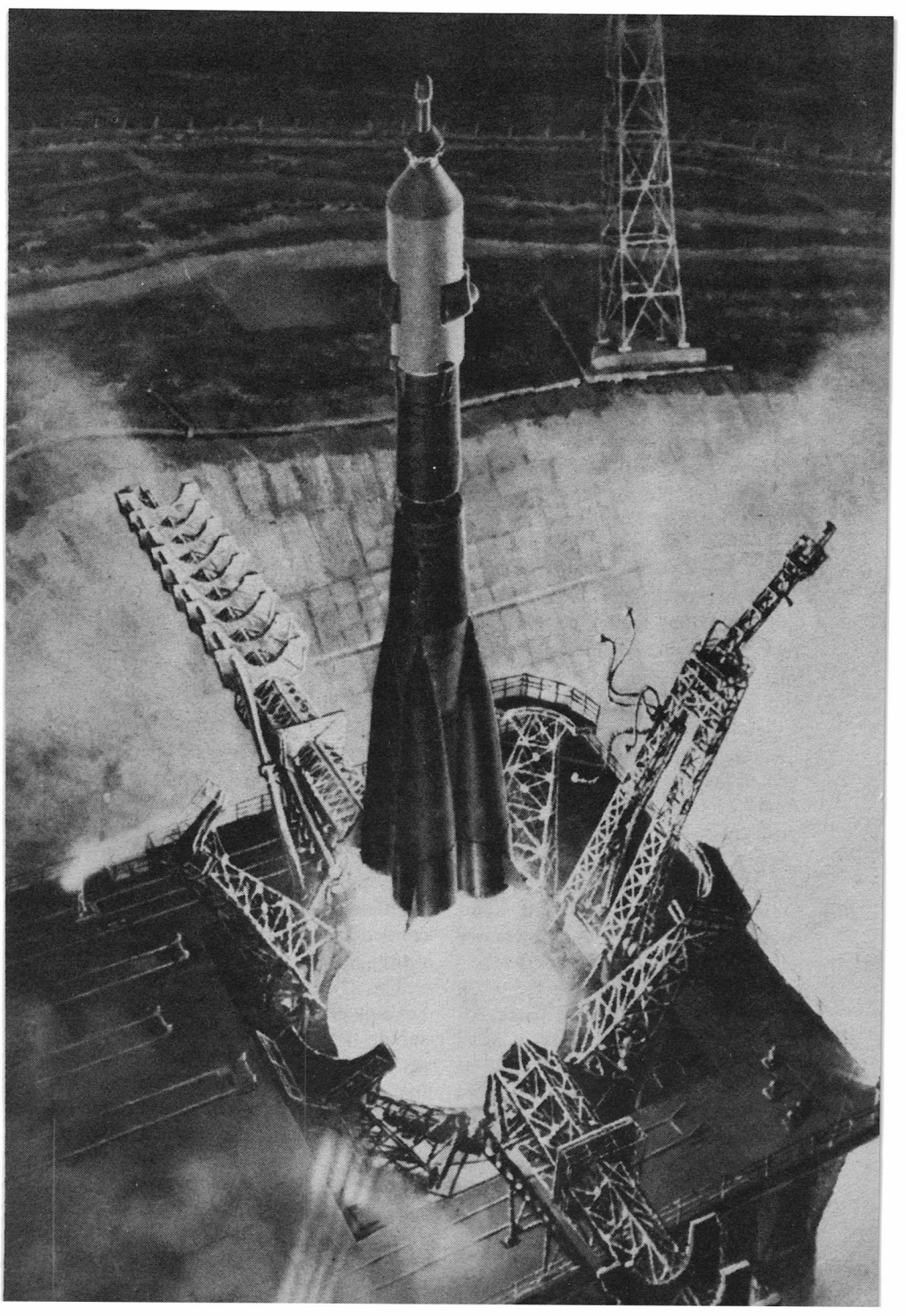
F.C. Durant, III

As a form of communication, art is a valuable adjunct to space-related science fiction. Fiction dealing with new technological concepts, far-out extrapolations of today's world, and "what if" scenarios of space exploration and extraterrestrials, requires the reader to exercise his imagination. The mental pictures described in prose are aided greatly by an artist attuned to the author's visualization. The skillful artist can heighten the reader's pleasure and appreciation. Good astronomical artists, though, are rare, since a thorough knowledge of astronomy and perspective are required, as well as artistic skill. All of the above kinds of art may be termed, loosely, space art.

Having been deeply interested in such art for many years, I was delighted to discover that there were a significant number of space artists in the Soviet Union. In October, 1973, my wife and I attended the Twenty-fourth Annual Congress of the International Astronautical Federation at Baku (Azerbaijan), USSR. During the same period an exhibition of Soviet space art was held in Baku. The exhibition was called "The Future of Cosmonautics."

I'd known, of course, of the work of cosmonaut Alexei Leonov, who is an amateur artist. He created his first space painting, "Vostok 1 in Orbit," from cosmonaut Yuri Gagarin's post-flight descriptions. Four years later Leonov made sketches as a crew member of Voskhod 2, during which flight he also made the world's first EVA. (Cosmonaut Leonov is commander of the Soyuz spacecraft scheduled to

Andrei Sokolov



link with the Apollo spacecraft in July, 1975. It may be expected that his experiences will be the subject of new post-mission paintings.) In the past ten years a number of space art books have been published in the USSR, and in each of them are reproductions of works not only by Leonov, but also by Andrei Sokolov, a professional artist.

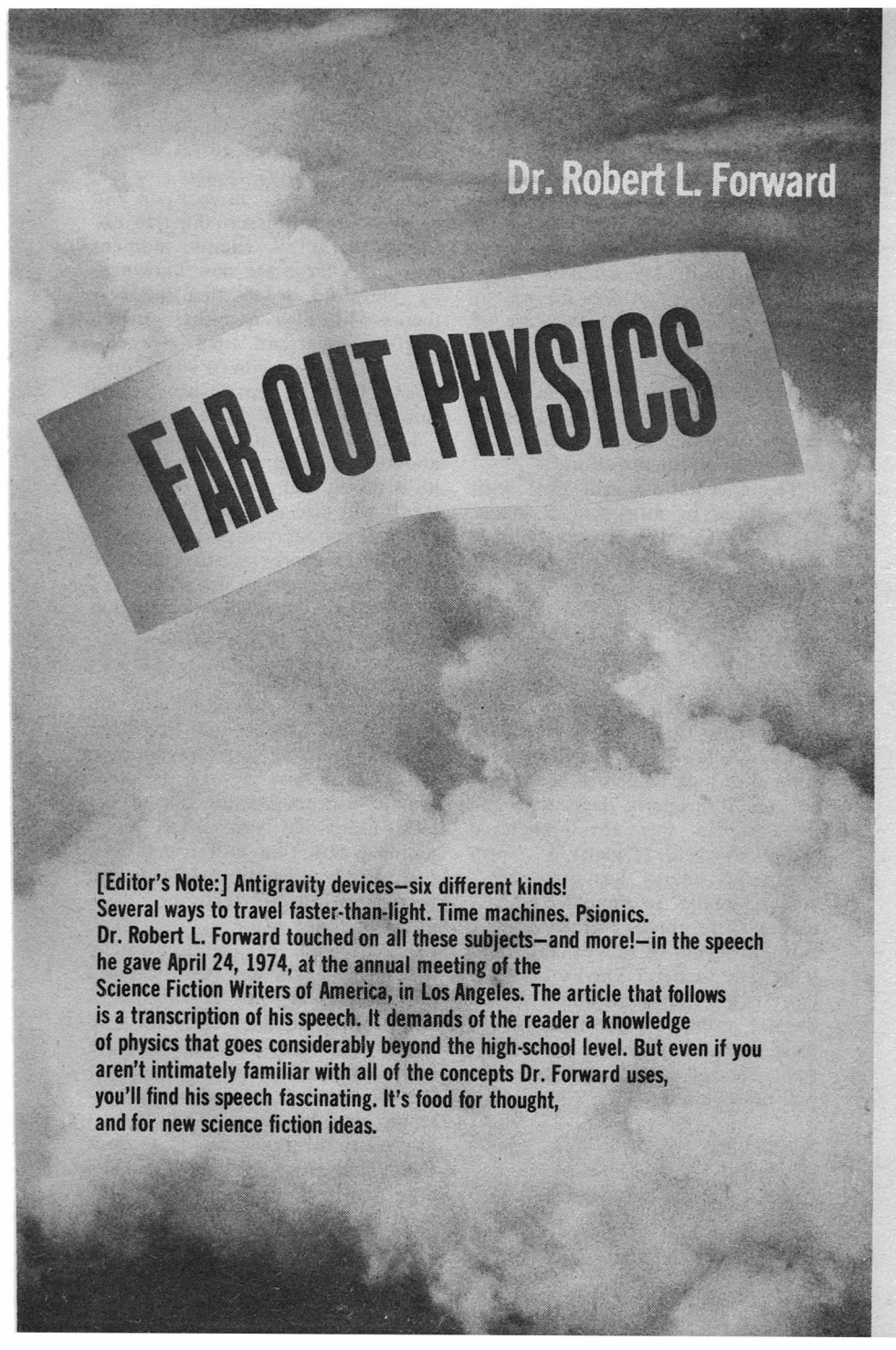
At the Baku exhibit I met Sokolov. He had graduated from the Moscow Institute of Architecture in 1955 and, while working as an architect, had been captivated by Ray Bradbury's *Farenheit 451.* Visualizing scenes from the book, he did a number of paintings, his first in this genre. The launch of Sputnik 1 further heightened his interest in space art, on which he now works full time.

Leonov and Sokolov have collaborated on nearly fifty works. Together they have published four albums of reproductions, a series of postcards, and designs for about twenty Soviet postage stamps—including a series of six-kopek stamps issued in 1972 to commemorate the fifteenth anniversary of the launching of Sputnik 1.

The opportunity to see the work of these and other Soviet space artists was stimulating. Taken as a whole their work impressed me as quite different from space art I've seen in the United States. To date, there has been little contact or interchange between Soviet and US artists. In July, 1975, however, during the Apollo-Soyuz joint mission, the Soviet Artists Union is arranging an exhibit of works of US space artists in Moscow. The exhibit is expected to be shown also in other cities in the USSR during its six-month loan.

An exchange show of the work of Soviet space artists has been arranged for the July, 1976 opening in Washington, DC of the Smithsonian Institution's new National Air and Space Museum. The Museum commenced collecting space art more than six years ago. Since then over one hundred illustrative and impressionistic works of space art have been accepted for the national collection. In addition to US artists, works have been received from France, Germany, Yugoslavia, Mexico, Italy, The Netherlands, and others. There is also art work produced by professional technical illustrators commissioned by aerospace contractors as well as NASA. The Museum collection includes two Aubusson tapestries, plastic sculpture, paper sculpture, a batik print, needlepoint, kinetic art, and constructive collages as well as conventional paintings.

The cover painting by Andrei Sokolov on this issue of Analog should whet the appetite of space art enthusiasts. It is to be hoped that such works of art from both of these major spacefaring nations will become more widely known and shared. ■



Dr. Robert L. Forward

FAR OUT PHYSICS

[Editor's Note:] Antigravity devices—six different kinds! Several ways to travel faster-than-light. Time machines. Psionics. Dr. Robert L. Forward touched on all these subjects—and more!—in the speech he gave April 24, 1974, at the annual meeting of the Science Fiction Writers of America, in Los Angeles. The article that follows is a transcription of his speech. It demands of the reader a knowledge of physics that goes considerably beyond the high-school level. But even if you aren't intimately familiar with all of the concepts Dr. Forward uses, you'll find his speech fascinating. It's food for thought, and for new science fiction ideas.

I'm going to put forth for your consideration speculative ideas about futuristic possibilities in physics. However, as a scientist in a reputable research organization, I have to make it very clear that these are *only* speculations. They have been a lot of fun for me to dream up, and I hope they are of use as story ideas. I read a lot of science fiction and I like good stories with "hard" science in them. If out of these ideas there come one or two good stories, then it will have been worth the effort.

The speculations will deal with possibilities in four general areas: Gravity/Inertia, Space/Time, Mass/Energy, and Information/Communication.

FUTURISTIC POSSIBILITIES IN GRAVITY/INERTIA

Let's take a look at the present status of gravitational theory. Newton's theory is still good. Einstein's Special Relativity is better because it handles high velocities better and because it properly deals with the nonlinearities that are implicit in the gravity field. (Gravity is a form of energy, energy has mass, mass creates gravity, so therefore gravity makes more gravity.) However, the Einstein theory of gravity has problems. The General Theory of Relativity is not quantized and does not handle inertia well. Because of these faults, I believe that the Einstein Theory of General Relativity will be replaced.

Speculations About a New Theory of Gravity

What will this new theory—which will be called the "Unified Field Theory"—be able to do? It will interrelate gravity, inertia, space, time, mass, energy, momentum and charge. The important thing to notice is that mass, energy, momentum and charge are now known to be quantized. I feel that the new theory will also quantize gravity, inertia, space and time. Speculations about a quantized space/time could lead to very interesting stories.

I think the most important thing about the emerging theory of gravity is that it will explain inertia better. It will also explain the quasars, and will probably explain other astrophysical energy sources that we know exist, such as the sources of Joe Weber's gravitational radiation events.

Gravitational Radiation[1]

Gravitational radiation was the topic of my thesis, and I've been working actively on gravitational radiation sensors as well as other gravity instruments for ten to fifteen years. To summarize, gravitational radiation will bring us a new communication band all the way from dc to terrahertz frequencies, only made up of gravity fields instead of electromagnetic fields. We can do point-to-point communication with gravity fields, because normal mass does not stop it. If you want to communicate with someone at the other end of the world, you just point the antenna straight down. The present gravitational receivers (the ones that I and everyone else have been able to dream up) are very crude.

TYPE	MASS (kg)	RADIUS (m)	DENSITY
SELF FORMING BLACK HOLES			
UNIVERSE	10^{52}	10^{25}	10^{-26}
GALACTIC	10^{41}	10^{14}	10^{-4}
STELLAR	10^{30}	10^{3}	10^{18}
HAWKING BLACK HOLES			
ASTEROIDAL	10^{18}	10^{-9}	10^{42}
BOULDER	10^{5}	10^{-22}	10^{68}
QUANTUM	10^{-8}	10^{-35}	10^{94}

Table 1. Black Holes

They are noisy, they are lossy, they are narrow band and they are short stubs. The typical antenna length is 10^{-5} of a wavelength. To work in gravitational astronomy is like trying to do radio astronomy with a small piece of carbon for an antenna and a cat's whisker and crystal for a receiver. Or like trying to do optical astronomy with a pinhole for a lens and blueprint paper for film. In the field of gravitational receiving antennas, I predict improvements of 10^{6} to 10^{18}.

Our real problem is that we have no transmitters for gravitational radiation yet. To make a gravitational transmitter, we not only need mass (lots of it), we need that mass in a form that's extremely dense and we must move that dense mass very rapidly (near the speed of light) in order to make significant amounts of gravitational radiation. The reason we can make radio waves is that we have a wire which has many loose electrons. When we push on the end of that wire with an electric or magnetic field, we can move electrons back and forth in the wire at the speed of light. Where can we get the mass, density and speed necessary for gravitational radiation? I hope by finding and using small black holes.

Black Holes

Black holes were predicted by the Einstein field equations of gravity. Astronomers have detected interstellar X-ray sources that are probably black holes. They form when the mass of an object divided by its radius is equal to c^2 over G. ($\frac{GM}{c^2R} \approx 1.$) Table 1 outlines the properties of black holes of different size. One outstanding characteristic of black holes is that, although they have mass, angular momentum and charge, they have nothing else! More about that later.

In Table 1, we first list the self-

forming black holes—those which form due to their self-gravitational attraction. I think the significant thing for story purposes is that we are probably living in a black hole—the universe. The universe is massive, so therefore it doesn't have to be very dense to form a black hole, only one atom per cubic centimeter. In the next line of the table is something that has not yet been used in a science fiction story. It is a black hole of galactic size. The core of a galaxy can be a black hole (with all the magic things that occur in and around the black hole) and yet its density is only that of air.

The "normal" black hole one reads about is a dense collapsed star that is only one kilometer across. These ordinary black holes are already in science fiction, so we will skip by them and speculate about more thought-provoking phenomena. One curious discovery to ponder is the Hawking black holes.

Hawking Black Holes

Small black holes were first speculated about in the scientific literature by Steve Hawking.[2]. He postulated that although amounts of matter smaller than about twice the size of the sun cannot form black holes all by themselves, they could have been formed by the Big Bang at the beginning of the universe. In addition, they could be any size—all the way down to 10^{-8} of a kilogram, about 10 micrograms.

These small black holes are very dense. You might be able to use them as tools, if you could find them. Even though they are very small—much smaller than atomic sizes, perhaps—they could be attracted by the Earth, the other planets, and by the sun into orbital trajectories. These trajectories can go right through the planet because the black holes are so dense and have such small cross sections. However, powerful tidal forces at Angstrom ranges will cause drag to take place and allow them to be captured; after bouncing around inside the planet for a while, they will slow down. There should be swarms of them in the centers of the suns and planets.

If this whole concept of small black holes holds up, I propose that we go out to the asteroid belt and mine the asteroids for the black holes that are trapped in them.[3] The black holes are so

	RADIUS	SPECIFIC DENSITY	SURFACE GRAVITY	SURFACE GRADIENT
NORMAL DENSITY	1 m	2.5	10^{-8} g's	10^{-10} g's/cm
HIGH DENSITY	1 μm	2.5×10^{18}	10^{5} g's	10^{9} g's/cm

Table 2. Ten Tons of Matter

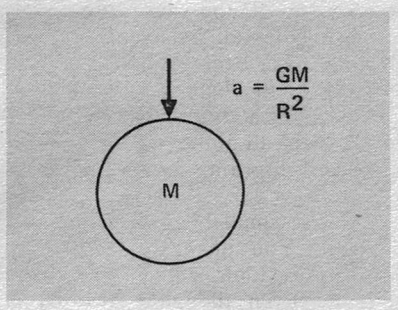


Figure 1. Newton's Law for a Sphere

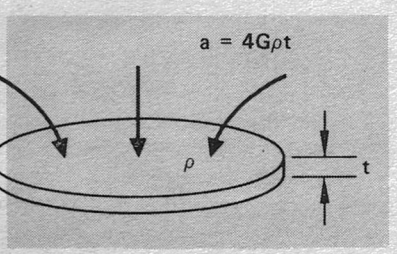


Figure 2. Newton's Law for a Disc

loosely coupled by gravitational attraction that we should be able to go up to an asteroid and push it away. The asteroid will leave and, where the center of the asteroid was, we will find a black hole. We will be able to detect it with a rotating mass detector and can then put some charge on it (a difficult maneuver unless it's already charged). Once we have it charged, however, there will be such a strong coupling between the charge and the black hole that we will be able to pick up and manipulate this dense mass with electric fields. Once charged, such black holes could be used for gravitational radiation, as a catalyst for low-temperature fusion and probably for both gravity and time control.

The reason black holes may lead to gravity control is that they are dense. I think the most important thing I have learned from my gravitational research is that the key to gravity control is density.[4] Table 2 shows the different gravitational effects obtained by changing only the density of a mass. If we have only 10 tons of matter at normal density, then the surface gravity fields we have to work with are very small, 10^{-8} G's. However, if we take that same 10 tons and make it very dense, say only a micron across, then the surface gravity in a few microns around that object is 10^5 G's. So that high density allows moderate amounts of matter to exert very strong gravitational fields. These concepts and others are the key to antigravity.

Antigravity—Six Ways[5]

Three of the following ways of building an antigravity machine are conventional in that they are based on known laws of physics. The other three are quite speculative and are based on possible ways of

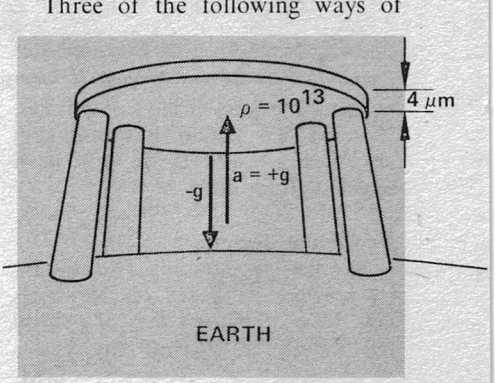


Figure 3. Newtonian Antigravity Machine

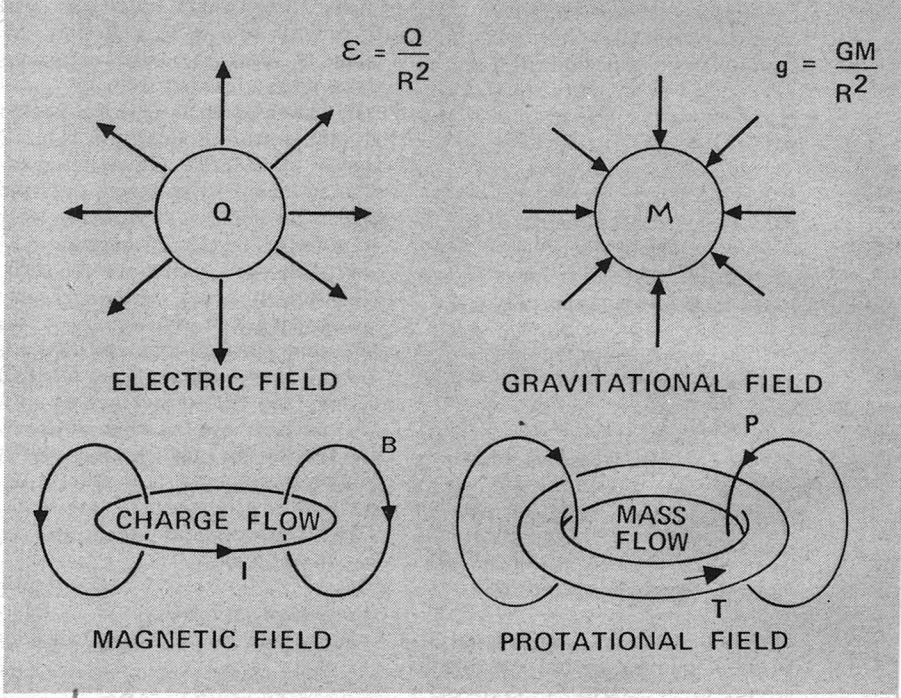


Figure 4. Gravitational Analogs To Electromagnetism

bending the known laws of physics. (For science fiction purposes you are often allowed to do this; as a scientist, I am not.)

Newtonian Antigravity

The first "conventional" antigravity machine is based on Newton's law. Now, Newton's law of gravity for a sphere is that the gravitational acceleration $a = \frac{GM}{r^2}$. (See Figure 1.) However, Newton's law for a flat disc of matter does not have a $1/r^2$ law. The gravity field is uniform in the region near the center of the disc and depends upon the density and thickness of the massive disc. (See Figure 2.)

I call this antigravity machine after Newton because he could have invented and described it, although no one can build one yet.[6] First you make a very thin disc—about 4 microns thick—with a density of 10^{13} grams/cc, out of nuclear matter. (See Figure 3.) In the flat regions under the middle of this disc would be a 1G upward field which would cancel the Earth's field, creating a free-fall region. Elementary physics, but difficult engineering. Once we have small black holes, you might not laugh.

Special Relativistic Antigravity

If you examine Newton's law of gravity, you will find it does not obey special relativity. If you start with Einstein's law of gravity and take out the nonlinearities, you will find that what is left is a version of Newton's law which obeys Special Relativity.[7] This linearized version of the Einstein theory of gravity shows that there is a great deal of similarity between the gravitational field and the electric field. In electromagnetism, there is a thing called charge. Around it is a spherically symmetric field called an electric field. In gravitation, there is a thing called mass surrounded by a spherically symmetric field called a gravity field. (It is attractive rather than repulsive, however.) The Newtonian gravity field is the gravitational analogy to the electric field. (See Figure 4.)

The linearized Einstein theory of gravity also contains an analogy to a magnetic field. A magnetic field is due to the flow of a charge or a current. Now, many people think that magnetic fields and electric fields are different things. They are not. If I have a charge, it has an electric field around it. If I move that charge, there is a magnetic field; a moving charge is a current. If, however, I move along with the charge, I see no relative motion, no current and no magnetic field. You, who are sitting there, see motion, current and magnetic field, but I don't. A magnetic field is not a different field, it's an electric field looked at in a moving frame of reference. In the same way, if we have a mass with a gravity field around it and we move this mass and have a mass current, a new field is created. It is a different kind of gravity field with no source and no sink. This new field I call the "Protational field." It is also called the "Lense-Thirring effect." Scientists hope to measure this field produced by the rotating Earth in some future satellite experiments.

The Special Relativistic Antigravity Machine[8] based on this new field is a torus with a tube wrapped around it, filled with very dense matter. If we started accelerating that mass flow through the tube around the torus, we would get a constantly increasing protational field, inside the torus. A changing protational field will create a gravity field just as a changing magnetic field will create an electric field. If we did it right, we would have an upward gravity field that could be used to cancel the field of the Earth. (See Figure 5.)

General Relativistic Antigravity

Now, in addition to Special Relativity in Einstein's General Theory of Relativity, there are many other effects. I've generalized it by saying that any mass with a velocity and an acceleration exerts many different forces on a test mass.[5] In addition to the Newtonian gravity attraction, there are other forces in the direction of acceleration and in the direction of the velocity of the originating mass.

These new forces can be used to make the General Relativistic Antigravity Machine. (See Figure 6.) Imagine a rotating torus of dense

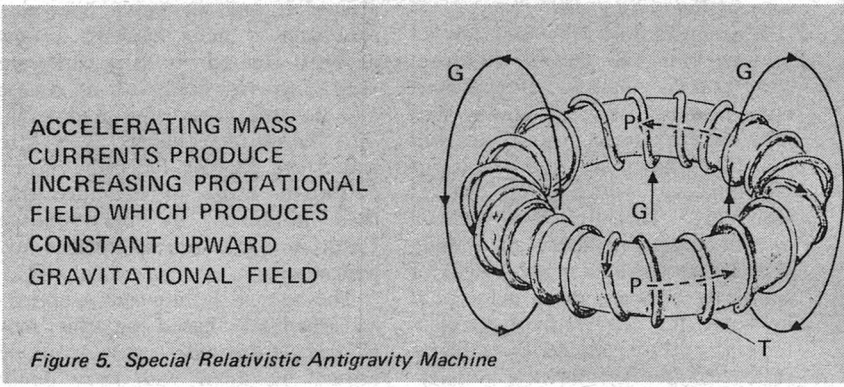


Figure 5. Special Relativistic Antigravity Machine

mass, turning inside out like a smoke ring.[9] An inside-out turning ring of very dense mass will create a force in the direction of the motion (a "dragging of the metric" is what it is sometimes called). There will be general relativistic forces in the direction of the velocity of the mass. These forces are equivalent to a gravity field which again, theoretically, can be used to cancel the gravity field of the Earth.

Antinewtonian Antigravity

The previous three antigravity machines are based on known theories. Now let's speculate about some unusual antigravity machines, of which the first is Antinewtonian Antigravity. The real problem with the Newtonian Antigravity Machine is that not only would we have to make it out of very dense matter, but we'd have to have legs to support it. However, if it's made of negative matter (which is not antimatter), then the disc would repel other masses, and we could just lay this dense mass on the Earth. We wouldn't have to have legs to support it. This is much easier for the engineers. Then we could stand on top of the dense negative matter disc and its repulsion would cancel the Earth's attraction.

Inertia Reversal Antigravity

In the Einstein field equations, inertia and gravity are very closely coupled. Yet that doesn't have to be true. There have been excellent science fiction stories written about the idea of actually changing the inertia of a body. If we had a machine capable of converting inertial mass from positive to negative, it is obvious that we could not only use it as an antigravity machine, but also as an excellent propulsion unit.

Inertia Redistribution Antigravity

There is one other concept that I have speculated about, but which I don't think has been used in a story. Instead of changing the inertia from positive to negative, let's assume that inertia is a tensor. (It has been proved by Drever and

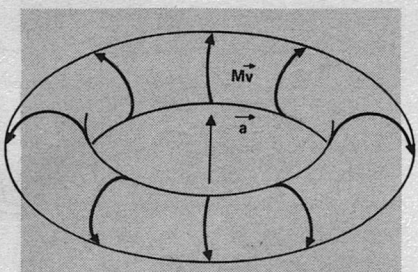


Figure 6.
General Relativistic Antigravity Machine

Hughes that inertia is not a tensor to one part in 10^{23} by some excellent experiments. However, let's suppose it is anyway.) Then let's assume we have a machine that is not allowed to violate the laws of inertia by getting rid of inertia, but instead, redistributes it. (See Figure 7.) The machine makes the mass heavier in the horizontal direction and proportionately lighter in the vertical direction. As with inertia reversal, this concept could be used not only for antigravity but for propulsion.

FUTURISTIC POSSIBILITIES IN SPACE/TIME

Now we're going to speculate about methods of space travel (subrelativistic, hyperrelativistic and space warps); and time travel (conventional, unconventional, and really far out).

Space Travel

As far as science fiction writers and readers are concerned, there are a lot of space travel techniques. Some of these, such as chemical, electrical and fission propulsion, are so old-hat they aren't even mentioned in science fiction any more. Then there are some other conventional methods that are still popular in the literature, such as fusion, nuclear pulse, photon rockets, interstellar ramjet and laser beam

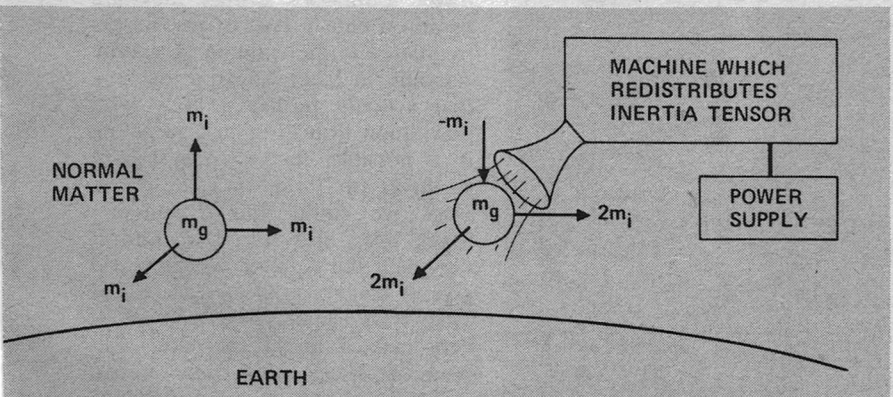


Figure 7. Assume Inertia Tensor Components Can Be Changed Provided Sum is Constant

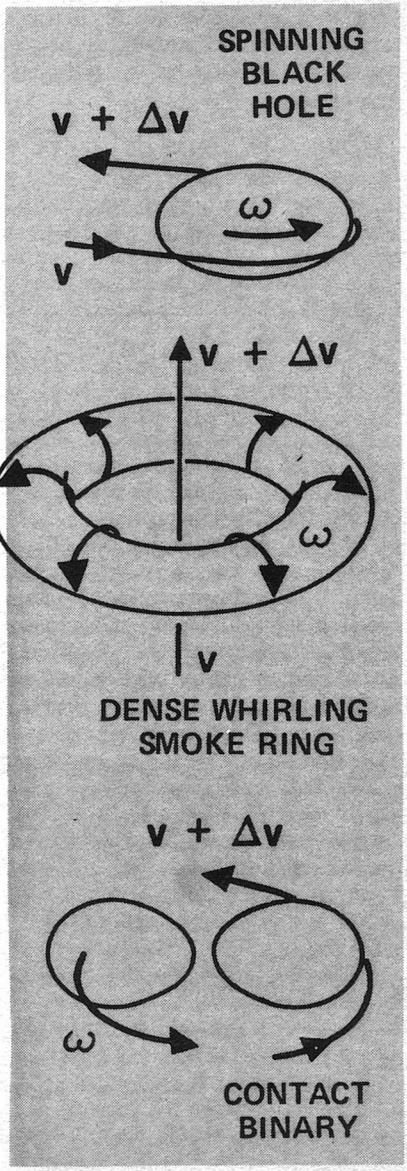


Figure 8. Gravity Catapults

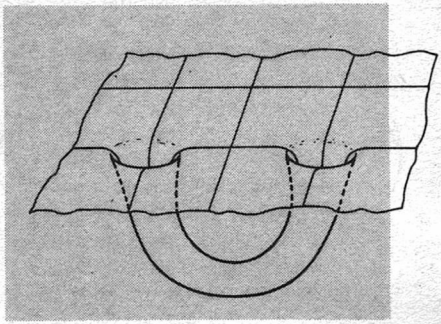


Figure 9. Wheeler Wormhole Space Warp

power propulsion. We're not going to discuss these conventional techniques here; we're going to discuss the more unconventional ones, such as gravity catapults, space warps, tachyon tunneling, and the really speculative ones, such as those using inertia control, negative mass and the fifth dimension.

Gravity Catapults

The important thing to remember about the unconventional space travel techniques is that they are based on known laws of physics extrapolated to the extreme. A gravity catapult—in other words, a machine that actually pushes a body with gravitation instead of just attracting it—is possible. As shown in Figure 8, there are three ways to do it. First, we could find a spinning black hole and travel around it very near the equator, which would give us a substantial increase in velocity.[5] Of course, we'd have to be very careful about the tides. But there are tricks using dense masses in a space vehicle to cancel the tides which I'd be glad to tell any-

one who wants to use the idea in a story.

A more conventional gravity catapult technique which would also give us a change in velocity is to use a contact binary and come very close to the binary stars. Here, we are getting not only the Newtonian gravity whip that we use in our present space probes when we go by a moving planet, but, in addition, if these stars are moving relativistically and are very dense, we get extra forces due to the gravity nonlinearities.[5]

Or we might use inside-out whirling dense mass smoke rings as a propulsion technique or gravity catapult.[9]

Gravity catapults, now space warps. I have two for you, both based on solutions to the Einstein field equations.

Space Warps

The first is the *Wheeler Wormhole Space Warp,* which was first postulated by John Wheeler as a warpage of free space predicted by geometrodynamics[10] (his version of Einstein's theory) that would allow point-to-point travel *within* our universe without having to go *through* it. (See Figure 9.) Wheeler's wormholes are quite small, 10^{-35} meters; they were just formed due to the quantization of space. For his thesis one of Wheeler's students calculated the time it would take to travel through one of these wormholes; unfortunately, he found that you could not violate causality by getting there faster than by traveling over the surface. Still, it is an interesting way, energetically, to get from here to there.

The second space warp technique is the *Kerr Metric Space Warp.* The Kerr metric[11] is one solution (and probably the only solution) to the Einstein field equations for a dense, spinning mass. The Kerr metric applies to the outside of the spinning mass. However, if we assume the star is spinning very rapidly and gets very, very dense, then we find that what the Kerr metric is describing is a torus of very dense mass whirling around. (See Figure 10.) The entire mass is in the torus. There is no mass near the middle, so there is no tide there. And yet there is a singularity across the center of the torus. According to the various papers on the subject in *Physical Review,*[12] if we went through the center of this massive

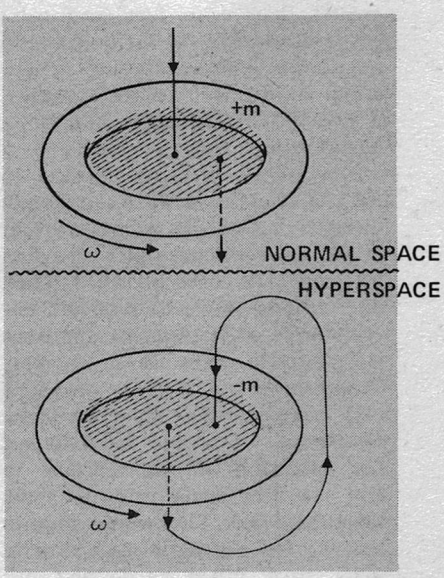


Figure 10. Kerr Metric Space Warp

ring, we would enter into a hyperspace which has different properties from normal space. Mass is negative and time is running backward in this hyperspace. To get back to normal space we would have to go back through the space warp again. These space warps are theoretically possible, so we will probably find them someday. But it will be a long time from now; we have to get out there first.

Tachyon Tunneling

Feinberg's paper on tachyons[13] has been out since 1967; I think everybody has heard about tachyons by now, at least everybody in the science fiction world, so I'll just summarize briefly what a tachyon is. A tachyon has imaginary mass, not negative. Its velocity is always greater than c—in fact, you can't get it down to c (to do that would require an infinite amount of energy). As the tachyon loses energy, it goes faster and faster because it has imaginary mass.

Now, if we could get up close to the c barrier, then we could tunnel through that barrier using quantum mechanics (or some other idea that we'll have to come up with). Then our tachyons have to dissipate energy to go faster. Another approach is to define mass as a complex "something" in a massive space and, since we want the mass to be imaginary, we would have to get our spaceship off the real-line in that complex space and onto the imaginary line. This would require that we make a right angle turn in mass space. When we do that, our ship becomes a tachyon.

Inertia Control

Using inertia control for propulsion has been suggested in many stories. The important point is that when the inertia of a mass is decreased, the acceleration is the force over the inertial mass. So as the inertial mass is brought close to zero, the acceleration increases dramatically, but we mustn't let the inertia go below zero! Negative inertia would mean we were decelerating.

Negative Mass Propulsion

I've yet to read a story which used the fact that negative matter repels all other matter, whereas positive matter attracts all other matter. If we took a negative mass and a positive mass and put them side by side, they would immediately start accelerating, with the velocity constantly increasing. (See Figure 11.) The negative mass would keep pushing the positive mass and the positive mass would keep attracting the negative mass and they'd keep on going. There'd be no violation of the conservation of momentum since one mass is negative and the other is positive, $(-m)v + (+m)v = 0$. Nor would there be a violation of the conservation of energy, $\frac{1}{2}(-m)v^2 + \frac{1}{2}(+m)v^2 = 0$. To make the negative mass, all we really have to do is take empty space and rip out the negative mass and the positive mass at the same time. We'd have created both negative and positive energy and it wouldn't have cost any net energy to do it, $(-m)c^2 + (+m)c^2 = 0$. But to really use this concept, we don't want to use a

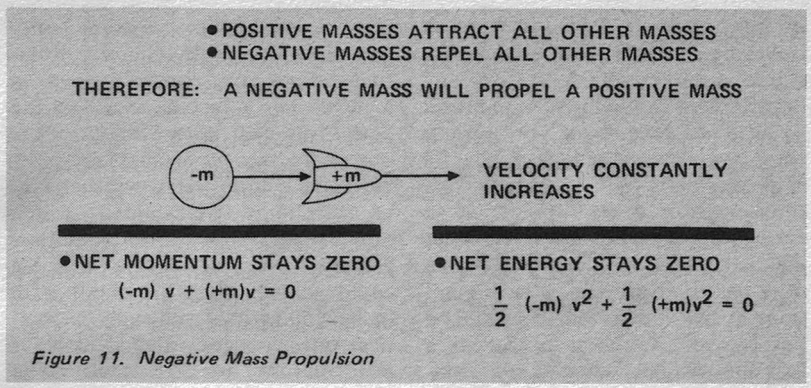


Figure 11. Negative Mass Propulsion

normal mass with its low density, for its gravity, and therefore the acceleration, is going to be 10^{-6} G's. What we really want to do is make a dense negative mass and a dense positive mass down in the engine room. We'd just pull them out of empty space, put a charge on the positive one and couple it with the spacecraft with electric fields. Now we have the two masses down in the engine room; they're probably about 10^{-23} cm across and they weigh a little more than the spacecraft. The positive one is coupled to the spacecraft and the negative one pushes the positive one which pushes the spacecraft. Thrust control is just a matter of manipulating the masses down in the engine room. Because of their density, these two tiny masses now have such high gravity fields that our vehicle's acceleration can be very high, as high as we can tolerate. If it gets too high, we just take more negative mass and put it up in front near the crew quarters for gravity control.

Fifth Dimensional Hypervelocity

At last, we get to the fifth dimension. Now this is speculative, but people have looked into what Einstein's field equations would look like in five dimensions. But first let's look at the concept of dimensions.

In three dimensions, the ones that we are used to, we have x, y and z. They are different directions, but they basically have the same characteristics. Then came Einstein with his Special Relativity Field Theory where time was brought in as a fourth dimension. Einstein showed that space could be turned into time and time could be turned into space. Space and time are equivalent and the equivalence is the speed of light.

That is, in the theory they are equivalent. Physically, however, it has always seemed to me that the time dimension was "different" from the space dimensions. I feel it is "bigger" or "longer." If we go to five dimensions, we can speculate on what kind of a dimension this

fifth dimension will be and whether it will be smaller or bigger than the other dimensions. More importantly, what is the new dimension going to be related to? One idea is spin. I've always thought that a spin one-half particle is really a phenomenon that happens in a very thin extra dimension. Another idea is charge. In fact, there is a solution to Einstein's field equations in five dimensions for charged particles. C. Gregory conceived a five-dimensional version of Einstein's theory.[14] He found a velocity in this new 5-D space proportional to the charge, and the mass of an electron is 10^{21} times the velocity of light. What would be the velocity of a charged spacecraft in that dimension? I've thrown some numbers in and it looked like it was 1,000 *c*. I don't know if that's true or not. And, of course, whether the dimension exists at all is still speculation.

Time Travel

Every SF writer knows the old-hat method for one-way time travel. By using the Special Relativistic Twin Effect, you can get older slower by going faster. That's so old, I'm not going to talk about that. I will, however, discuss the conventional way of using General Relativistic Effects to get one-way time travel, then we will deal with some of the unconventional techniques.

General Relativistic Time Contraction

Like the Special Relativistic Effect, the General Relativistic Time Contraction Effect provides one-way time travel. In General Relativity, times runs slower near or in a mass. The effect depends on the density as well as the mass of the object. So, near a small black hole, we'd get a time delay which could be quite large (we'd have to watch out for tides). But if we went to a galactic core (see Figure 12), we could get our time delay either in or near it without suffering destructive tides because the density is now that of air. We could even make a time machine on Earth if we had lots of dense matter—by making a hollow shell of that dense matter and going inside. There are no tides inside a hollow shell. These ideas are all based on General Relativity and are theoretically possible. Unfortunately, we could only use them to go one way in time.

Tipler Two-Way Time Machine

While I was preparing my talk to the Science Fiction Writers of America, I read in the abstracts of the *Physical Review* that a paper was about to be published by F. J. Tipler in which he said that General Relativity can be used to make a two-way time machine.[15] (See Figure 13). If we had a dense spinning cylinder with a very high spin speed (a peripheral velocity over one-half the speed of light), there would exist a very unusual region of space-time caused by this mass (a region which is outside of the mass itself). This space-time is so unusual that space and time are all mixed up together in a multiply connected space-time. According to

Mr. Tipler any event in the universe (past or future) could be reached by first passing through a region near the middle, but outside, the matter. If we started at any point *x, y, z, t* and traveled a time-like line (that means we would not be moving at a high velocity), and if we went into this unusual region and came out in the right way, we could return to the same point *(x, y, z)* either in the past or the future. This is a brand new idea. I think the most important thing about it is that if this concept holds up, causality is dead! This fact will have a profound influence on philosophy—as profound or maybe more profound than Godel's proof or the Russell paradox about sets. We may end up having to throw General Relativity away, I don't know.

Negative Matter Time Machine

Now let's speculate about time travel that doesn't use the known theories. Suppose we had negative matter which is very dense. Time would run faster near or in the negative mass, and we could make a hollow sphere of dense negative mass to speed up time. (See Figure 14.) If we were in a real hurry to get something done, we could go inside the sphere to do it. Say we had ten weeks to get a manuscript written and it's going to take fourteen weeks to write it. We'd jump inside the sphere and spend the fourteen weeks writing it, but when we came out, only ten weeks would have passed.

FUTURISTIC POSSIBILITIES IN MASS/ENERGY

Now let's look at some new

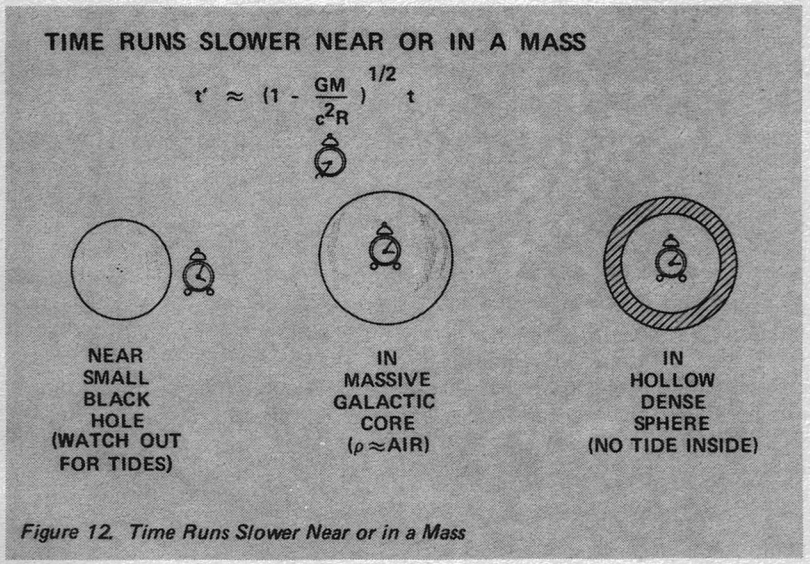


Figure 12. Time Runs Slower Near or in a Mass

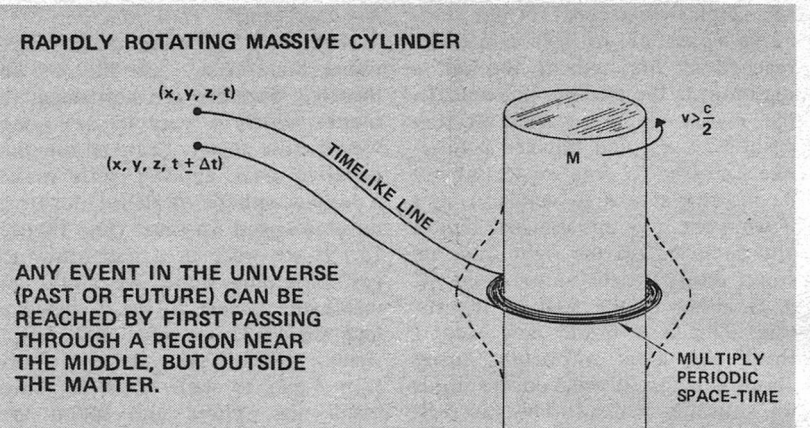


Figure 13. Tipler Two-Way Time Machine

forms of matter that might be useful in stories; unconventional nuclear reactors; superperformance organic materials (one of the research programs in my department); and (non)conservation laws which can get very speculative.

New Forms of Matter

The Hawking black holes are one example of new forms of matter. Condensed cold neutrons are another. I've done extensive analytical research on condensed cold neutrons. We should be able to get neutrons to collect together because they don't have a repulsive charge.[16] The problem is that they are fermions, but the fermi repulsion effect will not dominate if we have some kind of collective interaction.

If, however, we had a very dense neutron gas and we put a piece of plutonium in it, the plutonium would rapidly absorb a lot of neutrons and jump over the unstable Z region to form a stable high-Z element, a new form of matter. Another form of matter that I found in literature a long time ago and have never been able to use is a trapped neutrino gas. If we wanted to keep neutrinos around, we'd design a box that would hold them by lining the box with a beta emitter.

What would we do with these new forms of matter? I don't know, but they are ripe for speculation.

Unconventional Nuclear Reactors

In my work on condensed cold neutrons, I ran into a number of ideas for unconventional nuclear reactors. The normal fission reactor is a pile of uranium with neutrons wandering around. A neutron fis-

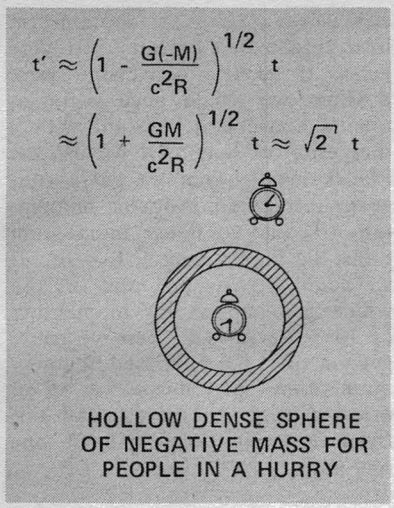


Figure 14.
Negative Matter Time Machine

sions a uranium atom and we get two neutrons out. The fast neutrons go shooting out to a moderator (which is usually hydrogen in some form or other), bounce around, slow down and some of them come back in to maintain the chain reaction. We have to make the pile big enough so that it will blow up, if it's a bomb, or react, if it's a reactor. So there is a minimum size for a fission reactor. If, however, we had a nonstatistical method of controlling neutrons (we do have some ideas for doing this), we could build subcritical reactors. These unconventional reactors would still use the usual fuels. However, not only uranium and plutonium fission, but berylium and lithium as well. We could build unconventional nuclear fission reactors using these light elements. Unconventional fusion reactors could use either pi mesons (this has been demonstrated experimentally) and/or a black hole as a catalyst for fusion. Another unconventional approach to nuclear effects is to control the rate of natural radioactive decay. We could make such things as gamma ray lasers[17] which would dump a lot of radioactive energy all at one time, or we could optically pump electrons in a k-capture type of element and prevent their decay for a while.

Superperformance Organic Materials

There is a new phenomenon showing up in special organic compounds—very high conductivity.[18] We have in our labs organic materials which are almost as conductive as copper although the usual organic material is a good insulator. These new materials conduct by a completely new mechanism—something like what happens in a superconductor. We have found that these materials conduct only in one direction. The conductivity in one direction is almost that of copper and, in the other two directions, it's a very good insulator. It's like having a one-dimensional metal. We expect to get a great deal from these new materials.

The least we'll get is supraconductivity, a conductivity probably higher than that of copper. We may get superconducting (or perfect conductivity) behavior; of that, we're not sure. If we do, it will be at higher temperatures than the usual superconductor, making them much more useful. This new field may also produce supramagnets,

supraferrites, suprastrength and supraenergy storage.

(Non)conservation Laws

Once we start talking about matter, we have to talk about conservation; specifically, for our purposes here, about the possible violation of the usual conservation laws. I must re-emphasize that what follows is just speculation. I have almost nothing to back up these speculations except the fact that black holes exist and do very interesting things.

To reiterate, black holes have been getting a thorough theoretical analysis. What emerges from these analyses again and again is that black holes have mass, angular momentum, charge and nothing else! They do not conserve baryon number, nor do they conserve lepton number. They probably don't conserve parity. Since they warp space and time, they don't conserve space and time either. I'm pretty sure that they are not going to conserve spin. If black holes can violate conservation laws, then we ought to be able to do it too. All we have to do is learn how to be as powerful as a black hole.

Interconversion of Momentum

One of the fundamental constants of nature is the Planck length.[10]

$$\Lambda = \left(\frac{hG}{2\pi c^3}\right)^{1/2} \approx 1.6 \times 10^{-35} m$$

It's based on the Planck constant, the gravity field and the speed of light. I've speculated that if things in nature could be interconverted, one of the things that might get converted is angular momentum into linear momentum and vice versa. If such a conversion were possible, we would need a fundamental conversion constant with a dimension of length. If we use the Planck length, then we get a conversion equation. Angular momentum is equal to linear momentum times the Planck length, $L = p\Lambda$. If we could destroy one unit of spin which has an angular momentum of 10^{-34} kg-m^2/sec, then we could get out of it 6.6 kg-m/sec of linear momentum. That means 6.6 kg of mass moving at 1 m/sec. All this from destroying one spin of one tiny atom.

Interconversion of Mass-Energy-Momentum Tensor

The speculations about nonconservation of momentum led me to speculate even further. The interesting thing about the Einstein General Relativity Theory is that the source of gravity in the Einstein field equation is what we call the stress-energy-momentum-mass tensor. (There are many names for it.) The important point here is that the source of the gravity field in Einstein's theory is not only mass, but also kinetic energy, linear momentum, stress energy and angular momentum. All of these besides mass create gravity. We know that we can convert mass to kinetic energy and back again, $E = mc^2$. Now suppose that we could interconvert everything in the stress energy tensor[19] and, therefore, have an equation $E = mc^2 = pc = Lc/\Lambda$. If we took one unit of spin which is 10^{-34} units of angular mo-

mentum (very small), we would get 6.6 kg-m/sec of linear momentum or 10^{-8} kg of mass or, equivalently, 10^{9} joules of energy—all from one spin. Whether this speculation will prove to be true, I don't know, but it should be very useful in science fiction.

FUTURISTIC POSSIBILITIES IN INFORMATION/COMMUNICATION

Here we're going to speculate about ESP—or rather, what ESP has got me looking into—communication media. To me, the significant question about ESP is, "If it exists, what physical mechanism does it use?" I don't care whether or how people use it. If they use ESP, they must use some physical mechanism. As a physicist, my job is to find and understand that physical medium.

Communication Media

The kinds of media we presently use to communicate include acoustic media (conduction, radiation); electromagnetic (wires, radio and light); physically transported matter patterns (letters); mechanical techniques (typewriters); particle beams (TV tubes) and particle diffusion (smells). We also have plasmas, spin waves, et cetera (active elements in amplifiers). There are other media that we don't use. We don't use gravitational radiation. We don't use the strong nuclear force (too short-range) or the weak force (not only is it short-range, it's weak—but not as weak as gravity). We do use Fermi repulsion in charged matter (wires), however we have never used Fermi repulsion in neutral matter.

We have never used super fluid waves such as those in liquid helium. But there have been intriguing experiments showing that the electric scalar potential and the magnetic vector potential—not their derivatives, the electric field and the magnetic field, but the potentials themselves—have a direct effect on the phase of quantum waves and are observable directly.[20] This is a possible medium for effecting phenomena, but nobody has yet used it for communications.[3] The beauty of the potentials is that when you first look at them, you find that you cannot shield the electromagnetic potentials, only the electromagnetic fields.

What we've discussed so far are things we know exist. What about other communication media? Einstein's gravity field is a tensor field. Robert Dicke has proposed a scalar field.[21] In his theory there might be scalar field radiation. If gravitational radiation is looked at from a mathematical point of view, it is radiation of curvature in space/time. Why can't we have just space radiation or just time radiation? How about inertia radiation? Or spin radiation? (Is that a neutrino?) How about tachyons?

Communication Without Media

Do we need communication media? Communication is the transfer of information by modulation of some form of mass/energy or space/time. But information has the dimensions of negative entropy. It is not energy by itself.

It is carried on energy.

Let's speculate that it might be possible to transfer information without using any form of mass/energy to transmit it. This is of interest because special relativity only limits the velocity of mass/energy, not information. (Some theorists will argue with this.) But still, this leads to a speculation that we might someday have faster-than-light information transfer even though mass/energy cannot go faster than *c*. However, if we could send information faster than light, we could violate causality, which would cause philosophical problems. But we have already found that the solution to a spinning cylinder violates causality, so we already have problems.

CONCLUSION

The upshot of all these speculations is this: it looks as if causality is in trouble. The fact that we might someday build a machine to go back and forth in time will have a profound effect on our thinking even though it may be many centuries before we can actually do it. What really irks me is why we couldn't have learned how to go back and forth in time before I gave the lecture from which this article is taken. Then I could have been sitting out there in the audience with all those science fiction writers, with a camera, taking pictures of all those slides I used in my talk, and I wouldn't have had to spend all that time the week before working on them! ■

[1]W. H. Press and K. S. Thorne, *Annual Review of Astronomy and Astrophysics,* Vol. 10, p. 335 (1972).

[2]S. Hawking, *Monthly Not. Royal Astronomical Society,* Vol. 152, p. 75 (1971).

[3]R. L. Forward, NASA Forum for Speculative Technology, St. Simons Island, Georgia (May 1972).

[4]R. L. Forward, 1963 Second Award Essay, Gravity Research Foundation, Gloucester, Mass. 01930. *Abst. American Physical Society Meeting,* Chicago, Ill. (23-24 Oct. 1964).

[5]R. L. Forward, *American Journal of Physics,* Vol. 37, p. 166 (March 1963).

[6]G. P. Field, 1968 Essay, Gravity Research Foundation, Gloucester, Mass. 01930.

[7]R. L. Forward, *Proceedings IRE,* Vol. 49, p. 892 (May 1961).

[8]R. L. Forward, *Proceedings IRE,* Vol. 49, p. 1442 (September 1961).

[9]G. P. Field, *Galaxy,* Vol. 21, No. 2, p. 78 (December 1962).

[10]J. A. Wheeler, *Geometrodynamics,* Academic Press, N.Y. (1962).

[11]R. P. Kerr, *Physical Review Letters,* Vol. 11, p. 237 (1963).

[12]B. Carter, *Physical Review,* Vol. 141, p. 1242 (1966).

[13]G. Feinberg, *Physical Review,* Vol. 159, p. 1089 (1967).

[14]C. Gregory, *Physical Review,* Vol. 125, p. 2136 (1962).

[15]F. J. Tipler, *Physical Review,* Vol. D-9, p. 2203 (1974).

[16]A. G. Doroshkevich, *Soviet Physics–JETP,* Vol. 16, p. 56 (1963).

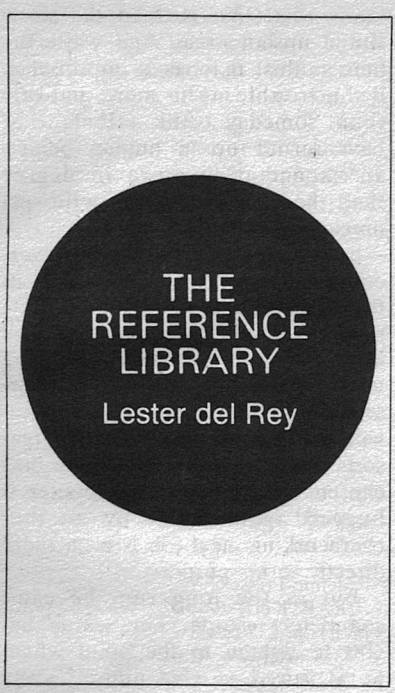
[17]V. Vali and W. Vali, *Proceedings IRE,* Vol. 51, p. 182 (January 1963).

[18]L. B. Coleman, M. J. Cohen, D. J. Sandman, F. G. Yamagishi, A. F. Garito and A. J. Heeger, *Solid State Commun.,* Vol. 12, p. 1125 (1973).

[19]R. L. Forward, 1968 Essay, Gravity Research Foundation, Gloucester, Mass. 01930.

[20]Y. Aharanov and D. Bohm, *Physical Review,* Vol. 115, p. 485 (1959).

[21]C. Brans and R. H. Dicke, *Physical Review,* Vol. 124, p. 925 (1961).



FUTURE–SHOCK OR SHLOCK? It has been several years since Alvin Toffler's *Future Shock* was published, and one might expect that by now science fiction should show a number of works influenced by that book. There has certainly been enough talk among writers and readers about the subject. And since the book appeared, the future has come in upon us with unexpected speed for most of the world, and the shock from that future-turned-present has more than justified Toffler's thesis.

Detroit has been shocked by events it had felt to be impending only in the distant future–though they were predicted in science fiction and elsewhere twenty years ago. So far the response to the change shows the inability to accept facts that Toffler indicated. Washington hasn't been so much shocked as benumbed. Like a cat put into a strange room, Congress seems to be creeping about on its belly, sniffing at every possibility, hostile to all, and totally disoriented. And the tools to predict the future, having proved wrong, are still being used in the same old way to locate some future that will really be the vanished past.

The future simply isn't coming in 2000 anymore. It's coming on Monday–maybe every Monday. And the major factor to a great many of our leaders, as well as our simple workers and consumers, is not what form it may take, but the shock of seeing it take any form except that of yesterday's past.

Yet while there are plenty of gloomy science fiction and mainstream books that predict doom in every stock and shlock (junk, if your Yiddish is rusty) form, only one science fiction writer seems to have concentrated on the salient point–shock itself.

This is the basic idea for **The Shockwave Rider,** by John Brunner (Harper & Row, 8.95, 288 pp.), with thanks acknowledged to Toffler by the author. As the first book to deal thoughtfully with the problem of such shock, Brunner's story deserves serious attention, even if for no other reason.

As it happens, there are other excellent reasons for reading the book. There are plenty of ideas

here and a generally fascinating story to bring them to life and add interest to them.

Briefly, the story deals with a man who was once chosen to be schooled into a genius—of sorts—for the world; and as always, "the world" means those in power and what they think is good for the people. Well, he turns out to be a genius—but not exactly as the Establishment expected. He can deal with computers and computer networks to a degree shown by no other human.

This is a world totally and overly computerized, among other things. It's cradle to the grave records. Privacy doesn't exist. Anything about anyone is available on the network. (And generally, nobody really knows what to do with all that "information," except to use it in a sort of betting game which supposedly shows the will of the people.) Obviously, in that setup, nobody can escape complete surveillance, nobody can cheat on his credit balance, et cetera.

But our kid is a genius. Hooked into the school network terminal, he finds ways to get out information that seems restricted to the upper echelon Establishment. He finds a code that empowers him to do pretty much as he wants—for a time, until the records of his activities catch up with him. He can do the one impossible thing—disguise his identity. He can become a "great imposter"—and he can and does escape from the school.

He can also bug the network with a "computer tapeworm," with all kinds of results. If you want to know what that is, read the story. But it makes sense. And while the hero's talent may seem improbable, it's not that much more unlikely than some genuine talents that have turned up in human beings, an exaggeration more in degree than kind. There's no wild psi magic here.

So we meet the hero as Reverend Lazarus, preaching in one of the many odd religions of the day; religions, wild "psychiatry" and all kinds of other things are being used to dull the shock of the crescendoing futures upon the populace. He has his own excellent reasons for the occupation he has chosen. And when the computer is bugged against him by another character, his next job is even more directly to his purpose.

But in the long run, he can't completely escape. The search begins to tighten to the point where he is forced to give himself away while under the persona of Sandy Locke. And from there on, things get more than slightly hectic for him and for Kate, a girl who has picked him up (because of her own talent) along the way.

In the end, as should be the case, he has to discover for himself just what the limits of his talent are and where this shocked, psychotic world is heading.

This is a serious book, obviously; and happily, Brunner has given it a lucid presentation, unlike some of the more involved experimental methods he's used in other serious work. No map or memory guide is necessary here, even when the story is necessarily episodic in places.

The experimenting Brunner has done becomes transparent until it seems to disappear into the success of his achievement.

My own unhappiness came from something that probably can't be helped. It was necessary to set up a small Utopia of sorts for some fixed point in this world. And Utopias always bother me, even when reasonable and necessary. I can't quite believe in them—probably because, like most others, I have my own idea of Utopia, and nobody else presents the same one. Anyhow, they all seem so rosy, so loving. Of course they do—but it still bothers.

Brunner also has unhappiness, according to his advice to reviewers. In editing it, someone at Harper & Row used a very heavy hand, combining two characters into one, and doing sundry other damage. This is, of course, unforgivable without the author's permission. Unfortunately, I never saw the original version, which will doubtless be restored in other editions. But it speaks well for Brunner's work that even in butchered form, this is a book that I recommend highly. It's an ugly future we find in the story, but an interesting and well-explored one.

Zach Hughes, in **The Stork Factor** (Berkley Medallion Books, 95¢, 156 pp.), also sets up an ugly future, though a lot more conventional one. This is a world where the fundamentalist religious sects have gotten their hands on an "ultimate weapon" and have successfully overthrown the government. Now the most bleak and ugly of their beliefs dominate America. Stock, but fairly convincing; the early sections of the book are handled rather well. And the point of view from which we approach the story is good.

Luke is a sort of street-corner religious mendicant, kicked out of the seminary by the trickery of a boy higher in government circles—in the Brotherhood, that is. He has a license to heal by faith. And once in a while, he can feel a kind of power and believes he really can heal, though most of the time he has to depend on the will to believe and the wish to be deceived into fake cures. But when an onlooker tries to protect Luke, the mob turns on the onlooker and literally rips his guts out. Everyone flees, and there Luke stands beside the dying man who tried to befriend him.

But the power to heal doesn't come to him, much as he tries to use it. And finally, in a futile fury at his own impotence, he begins to curse and swear at God, demanding the power! Zap, there's a tremendous explosion in the sky, a brilliant light, and Luke feels the genuine healing power flood over him. Before his eyes, as he frantically shoves back the intestines, the wound heals and the man who was a second from death gets up and runs off, fully restored.

But the Brotherhood doesn't immediately embrace our healer. Instead, they cart him off to be tortured for practicing medicine without the right. He can't convince them the healing was by faith, even

though no known medical help could have saved the man. Luke is almost killed as they "interrogate" him.

Fine. Good beginning. But after that, things begin to go sour. The next development is the stock one. There is an underground (literally and figuratively) composed of real doctors and others. They rescue Luke and restore him. But, having saved him, they naturally want to learn a lot more about his healing of the wounded man. So, instead of setting him up somewhere safely in their underground to become sure of himself and begin minor healing attempts, they quickly send him out onto the old streets above with a nurse of sorts to watch him. (Their excuse, of course, is that they have to put him in the same situation, pretty much, as his first success required.)

And from there, everything seems to become a mishmash of familiar shlock plot devices. There's an "angel" who turns out to be an alien critter—really, sort of an antediluvian super-ancestor of mankind—who is exploring Earth because the big flash triggered an interstellar alarm when combined with his healing. (That big explosion, however, is fairly well explained and tied in to the story.) And of course she has tremendous psi abilities, and Luke finds out all about his own tremendous abilities, and they fix things up in the best possible way, and Luke opens the way to the planets around half of the galaxy, and we all fade out to that big hallelujah chorus in the sky.

Too bad. It was a very promising beginning.

And finally, there's the past—not by time travel, but by biography. And sometimes, it seems more improbable and entertaining than fiction could be. **Lovecraft,** by L. Sprague de Camp (Doubleday, $10.00, 448 pp), reveals more about the strange father of the Cthulhu Mythos than most of us believed could be discovered. And the character that emerges is far more complicated and strange than many of the stories Lovecraft wrote. (And don't forget that Lovecraft was a science fiction writer, as well as a fantasy-horror master. Some of his best work was published in this magazine when it was still Astounding Stories.)

I enjoyed this more than any biography I've read for a long time. The book is being reviewed favorably in most of the media, and it deserves the praise. Lovecraft may have been the first man to experience future shock and present shock at the same time. And yet, there's a lot more man in de Camp's portrait than is shown by the distorted stories previously circulated. In the end, it seems, he wasn't a hermit and he had caught up with the present and could face the future. A fascinating book. ■

"Children of Dune" by Frank Herbert will begin in our January 1976 issue.

BRASS TACKS

We've received a number of letters in response to James Albus' "The Economics of the Robot Revolution." The rebuttals that follow are examples of the incisive thoughts of the Analog reader. Mr. Albus' reply may provide some answers and elicit new questions.

Dear Mr. Bova:

. . . Mr. Albus suggests doubling total investment in corporations by the year 2000, by making the new investments of the NMF equal to all private investment now. He appears to regard this as a large rate of growth in investment. A quick look at an almanac will show it is not. Without any such mechanism as NMF, total corporate investment is almost certain to more than double by 2000. This point is crucial, for Mr. Albus is assuming that investment growth will provide the large growth in profits, and thus dividends needed to produce the guaranteed annual income for each citizen.

. . . Total profits are never paid out to stockholders. There is first a deduction for taxes, those paid by the corporations. This takes up close to half of the profits. Is Mr. Albus assuming the Federal Government and the States will repeal corporate taxes as a part of the new arrangement? This would indeed make much more available for dividends but the tax revenues would presumably have to be made up elsewhere. Where else but from the individual taxpayer in the form of higher income taxes?

Another deduction from total profits is always that for retained earnings, or funds re-invested in the business. Currently this is roughly equal to the amount paid out in dividends. I don't see how Mr. Albus could change the rules of business so that corporations would no longer need to retain some profits.

. . . Assuming constant dollars, a *profit* level of 9,000 dollars per capita by the year 2000 would require profits of 100 percent each year on invested capital, assuming total investment doubled. And this is assuming no deductions for taxes or retained earnings.

. . . The data given here, as difficult as they make the goal appear, assume the NMF owning essentially all of American corporations, which would be what Mr. Albus rejects: state control.

Also, he refers to the increased capital for investment being obtained by borrowing from the Federal Reserve system, but there is no mention of repayment. Either the loans are not to be repaid at all, in which case they are a forced contribution, or the repayments would have to be deducted from the profits available for dividends. If the

loans are not repaid to the Federal Reserve, either the losses will be made up by absorbing capital from the private market (thus reducing private investment in corporations) or they will be made up in a decreased value of the dollar, due to increasing supply.

. . . However, as Mr. Albus recognizes, if this scheme he proposes is to work, the payments must be large enough to make a real difference in people's lives. There cannot be large deductions for DRP, corporate taxes, and the like. It has been found by those companies where profit-sharing was tried, that if the profits shared amounted to what the employees perceived as "chicken-feed," there was no incentive to change behavior. To be workable and accepted psychologically, the scheme has to produce fairly large payments right away, and continuously.

Another psycho-political point: Mr. Albus sees the directors of the NMF as being both elected popularly, and making investment decisions for the best long-term return. Yet we know already, by the example of others who have been elected to office, that it is a very strong temptation to retain one's office by producing short-term payout at the expense of the future. Not only public officials, but private corporate officers are known to act in this way. Surely the director of the NMF will not be cut from any different kind of genetic cloth than the rest of us?

RINEHART S. POTTS
Glassboro State College
Glassboro, New Jersey 08028

Dear Mr. Bova:

I think Mr. Albus' article . . . is poor economics, and not very revolutionary . . .

But the most cogent argument against the NMF idea is simple arithmetic. Let's assume 150 million adults in America. Let's disregard all start-up costs, staff expenses, research and development money and assume an immediate cash return of three percent per year. (This is quite high for new industry. The 10 percent to 15 percent returns you read about are caused primarily by an increase in the value of the stock itself, and with all dividends reinvested. Since NMF owns the stock, capital gain is not available.)

Given a ten million dollar investment (Mr. Albus' figure), we would each get two mills at the end of the year. After ten years, with an additional ten million a year invested, we'd each get two cents. God and Mr. Albus may know how this will cause rampant inflation. I do not. I'm tempted to say I wouldn't give two cents for the chance of an inflation caused by NMF dividends.

Even if the annual investment were ten billion a year, rather than ten million, we'd still get only twenty dollars at the end of the tenth year. This is not quite enough to cause a shortage of yachts.

I hope the foregoing has proved that the DRP is not needed. Because there is one final figure to conjure with. To provide each of us with 12,000 dollars a year would take about 60,000,000,000,000 (sixty trillion) dollars of producing assets. That's a lot of money, even in

these days. Without galloping inflation, I don't think we can do it.

. . . Given our zero population growth and increasing use of raw materials as we mechanize, how do we intend to handle the rest of the world? I submit that this alone might be the most important question of all. To assume that we in America can do anything we wish within our own borders and ignore the rest of the world is not only arrogant, it is dangerous.

For those who are interested in a more practical way to make us all owners of the various businesses in the country, I suggest you read up on the Employee Stock Option Plan, now being debated in Congress. It has many faults, but it is still more realistic than Albus.

JOHN KANE
6568 Beachview Dr #235
Palos Verdes, California 90274

Dear Mr. Bova:

. . . There is no doubt that we shall see many advances in the field of automation. Machines are more tractable and tireless than humans. However, the complete robot society projected by Mr. Albus is another matter. It would destroy itself and its human directors through its own productivity.

. . . The real barriers appear at this time to be insurmountable. These are: First, the rapid exhaustion at exponential rates of basic raw materials—gold, lead, mercury, silver, tin, zinc, iron and so on, to mention a few; some may vanish in practical amounts quite soon. Second, a similar exponential exhaustion of fossil fuels, which, with the exception of coal, will become precious in less than 50 years at present rates of use.

Third, the exponential growth of life-destructive pollution in various forms, including waste heat, which sets a limit on the use of nuclear and thermonuclear power. And last, the exponential growth of population and the inadequacy of food resources to feed it.

Mr. Albus' robot society, though providing plenitude in our time, would quickly multiply these scarcities and their problems. His robots are themselves programmed machines which . . . require immense amounts of raw material and even greater amounts of high-energy gadgetry and electronic components. They are in themselves units which divert from human use a very large percentage of scarce material and energy.

Additionally, Mr. Albus seems to have the common and erroneous notion that capital (money) and productivity in the fabrication of goods are in themselves capable of adding to our store of fundamental wealth . . . In fact, they are but tools and instruments through which existing or obtainable resources are upgraded into useful or desirable products. More often than not, we misconstrue this "added value" as a basic wealth creation. The illusion is augmented by this ephemeral thing we call money. Although its value in real terms cannot exceed the basic raw materials and energy inputs it represents, we have been conned into the novel idea that it is in itself productive and a measure of wealth.

. . . The advocates of unlimited growth offer us fun and frolic in our time (and unlimited profits) if we will consent to whooping it up on our resources in one or two delirious generations. How the wealth of his short-lived, industrialized robot revolution would be distributed is incidental to the resulting catastrophe . . .

TED BROOKS
643 N. Broadview
Wichita, Kansas 67208

Dear Ben:

Albus' article in the April issue was extremely . . . thought-provoking. The idea is indeed attractive (especially to me, as I've just been laid off because of business conditions).

I'm no economist, but I hope economists will write in about the piece. Because I think I see a slight snag in getting the system going. Albus cites a beginning figure: a modest ten million dollars. The figure he doesn't cite is the thirteenth-year one, which turns out to be ten *trillion* dollars. Roughly an order of magnitude greater than the present Gross National Product, as I recall.

Presumably, that money has to come from somewhere. Also, presumably, it can only come from The General Revenues (euphemism for taxes). Said revenues would be extracted from corporate earnings and from individual incomes—but is there that much of a tax base?

Maybe a lesser rate of increase, and a longer period of time, would be feasible . . . the whole program could be viewed as a system of enforced savings. Not that I like the idea of enforced anything; but—again presumably—the payback would be certain.

CHARLES CHANDLER
1296 Worcester Rd.
Framingham, Massachusetts 01701

And Albus replies . . .

Dear Ben:

. . . I must say the critiques of my proposals are as cogent and to the heart of the central issues as those raised by any trained economist who has reviewed the idea. However, they . . . have failed to recognize the potential impact on the real GNP that doubling the investment rate would have. Data from the National Commission on Productivity comparing investment rate versus productivity for eleven industrialized countries strongly suggests that doubling the investment rate of the US from 18 percent to 36 percent of the GNP would raise the annual productivity growth rate from its 25-year average of three percent per year to about ten percent per year. If this were to happen by the year 1988, the GNP in the year 2000 would be about 4.9 times its 1975 level and National Mutual Fund investment would total 10.4 trillion dollars. Assuming that present population trends continue, the US population will total 225 million by 2000. For each of these persons to receive 6,000 dollars per year would require a NMF return on investment of about 13 percent. Real return on ordinary stock investments over the 1947-1965 period was only about 11 percent, but this was a period of three percent annual real

growth, not the ten percent which could be expected from an economy in which the investment rate was doubled. Thus, annual dividends of 6 dollars per capita from the NMF by 2000 does not seem over optimistic.

Admittedly 12,000 dollars per capita yearly income is optimistic by conventional standards. However, computer technology applied to industrial production is a fundamentally new concept. There is no reason to assume that the production possibility frontier is going to be limited to what has been observed in the past. Data on profits from cottage industries prior to 1770 does not extrapolate reliably into the era following the invention of the steam engine. Neither is there any reason to think that profits from totally automatic factories can operate four shifts per week without any overtime costs. Secondly, production line speeds will not be restricted to human limitations. Data from a Rand Corporation Study (R-1073-ARPA) shows that computer-based automation promises immediate increases in over-all manufacturing productivity of 100 to 300 percent. The same report estimates that computer-controlled factories may actually be cheaper to build than conventional facilities by a factor of two. Over a period of years the reproductive nature of robot factories building equipment for other robot factories promises to multiply these cost reductions again and again.

Finally, it must be realized that robot factories will have few labor costs such as those that make up the major portion of operating expenses for most firms today. Thus, profits from robot industries, and all productivity increases in robot factories will be translated directly into increased dividends instead of wages.

It was correctly observed that corporate taxes are levied on profits and that corporations typically retain about the same as they pay out in dividends. In conjunction with the NMF, I suggest that both practices be modified by legislation. The first causes dividends to be taxed twice, once as profits, and again as personal income. I would propose that corporate income paid out as NMF dividends be accounted the same as wages, *i.e.* as a business expense. Dividends paid to the public would, of course, be taxed as personal income.

Concerning retained earnings, I would suggest that this practice be discouraged as much as practical. As a method of capital financing it gives an enormous competitive advantage to big corporations and tends to increase the concentration of wealth and power. Increased availability of equity financing through the NMF would reduce the need for heavy reliance on retained earnings. As for the concern over the NMF owning essentially all corporations, it is hard to see how this could occur so long as the NMF is limited to 49 percent of the total capital investment.

As for the concern about payback to the Federal Reserve Bank—there would be none. This, of course, means that NMF borrowing is merely a euphemism for creat-

ing money. How this affects the value of the dollar depends on how this money is used. If newly created money is spent for consumable items, naturally it is inflationary. However, investments in plants and equipment are an entirely different matter. In the short term, of course, investment spending is inflationary. That is why the Demand Regulation Policy is proposed to sop up demand in the short term. In the mid-term, creation of new money for investment is neither inflationary or deflationary so long as the net stock of real wealth is increased by the same amount as the money supply. In the long run, investment spending, even of newly created money, is deflationary. This is because eventually increased production of real wealth will exceed the increase in money.

Finally, in reply to the shortcomings of organizations run by elected officials, I will admit that democracy is the worst form of government in the world, except for all the others. Surely elected officials must be capable of some good, otherwise how can one explain the fact that we have more wealth and freedom in America today than any people who ever lived?

JIM ALBUS

The key to EVERY proposal about future industries is the availability of energy and raw materials. Hopefully, automated industries will help to extend our industrial base into interplanetary space. ■

in times to come

The spectacular successes of NASA's space probes to Mercury and Jupiter have been the result of long years of careful planning and preparation. Ten years from now, Halley's Comet will renew its periodic acquaintance with the inner domains of the Solar System. Richard C. Hoagland leads off next month's issue with "Rendezvous in 1985," an explanation of what we must do *now* if we want to send a successful probe into Halley's Comet. He also tells why such a probe is an important space mission, perhaps more important—from the standpoint of learning about the primeval history of the Solar System—than probes to any of the planets. Rick Sternbach has painted a knockout of a cover, showing what it's like to be *inside* a comet, close to the nucleus, with all those fluorescing gases streaming past.

Gordon R. Dickson's latest novelette, "Pro," heads up next month's fiction. And the Editorial is by none other than John W. Campbell, Jr.! It's titled "How to Get Away with Murder," and the circumstances of its posthumous publication will be explained in next month's issue.

Production has begun for the serialization of Frank Herbert's third *Dune* novel, "Children of Dune." John Schoenherr is working on a cover painting.

EDITORIAL

continued from page 7

break your theory. Several thinkers have pointed out that Einstein was dead wrong, and Relativity is a Zionist plot to destroy the minds of Western man. However, every test of Einstein's theories seems to confirm his ideas, often to many decimal places. Instead of writing counter-theories, why not produce an experiment that *shows* Einstein's wrong?

Curiously,
K. Throop

Dear Friend:

According to the cover letter atop your 250,000-word manuscript, you are doing the Editor the enormous favor of letting him see this novel before any other magazine editor gets it. I'm sure they'll all enjoy reading it, eventually. While it's perfectly true that Analog could serialize this work in only ten or twelve installments, some of our readers might have nervous breakdowns waiting to amass all the issues.

On the other hand, a long novel written from the point of view of a micro-organism that lives in the hero's intestinal tract is—to say the least—a novel idea. Too bad that this photocopy of the original manuscript is very faint, and the paper is battleship gray. I doubt that the Editor's ophthalmologist will allow him to read more than two pages of the manuscript per day. At that rate, you can expect his decision sometime next year. Or the following one.

Good luck,
Kelvin T.

Dear Mr. Vermeer:

I'm sorry, but it's impossible for us to work with artists who can't come into the office for face-to-face ~~fights~~ discussions with the Editor, Art Director, and Circulation Manager. You paint beautifully, as everyone in your family does, but until color picturephone service is initiated between New York and The Hague, we'll have to struggle along with the likes of Freas, Schoenherr, Gaughan, *et al.*

Visually,
K. Throop

Dear Writer:

I can assure you that the Editor did indeed read your manuscript the first time you sent it in.

He also read it the second and third times, just to see if you had changed anything except the cover letter.

The reason he sent it back with a form rejection slip rather than a personal letter is that there was nothing he could say about the story except that it is poorly written, abysmally typed, lacking in invention, drama, suspense, and interest, and generally left him feeling sick to his stomach.

Satisfied?
Kelvin Throop

P.S. The plot worked fine when Heinlein used it, but it doesn't work so well when the invading extraterrestrials tie strings to the humans' wrists and ankles and turn them into puppets *literally*.

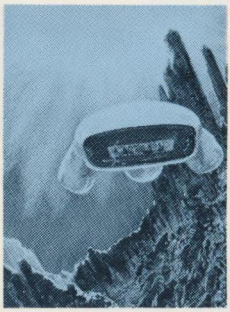
Dear Mr. Smith:

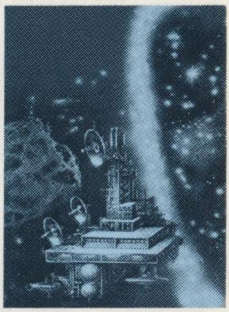
I realize that the current Editor is a left-wing crypto-communist bleeding-heart tool of the ADA. But your suggestion that welfare mothers be shot and their children sold to the dogfood industry strikes me as a bit harsh. True, this would lower grain prices somewhat, and make filet mignon slightly more affordable. Bully for you. The real problem with the nation's economy, however, is not too many poor people; it's too few rich. Get the distinction?

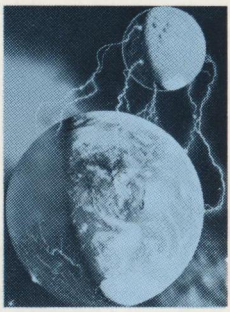
Economically,
K. Throop

And that's what Throop wrote. He must have answered about a dozen other letters that were also on the Editor's desk, but which have since disappeared. If you should receive a missive from him, try to track down the Post Office from which it was mailed. A computer-based analysis of his peregrinations indicates that Throop is heading westward, possibly toward Hollywood. The thought of him popping up in the motion picture or TV industry is shattering. But it feels *right*.

THE EDITOR







Analog covers available

Thanks to your great interest and demand, we now have available for sale a limited number of reprints of our 1974 covers. The reprints are in the same colors as originally published, without the printed material overlaying them. The reproductions are bordered with white stock, suitable for framing. Size is 9″ x 12″. Individual covers will cost $1.75. A set of two covers will be $2.50; three-cover sets, $3.25; all four covers, $4.00. Order now! (A limited number of 1973 covers also available.)

READ IT SLOWLY.

You'll want to. It's that good . . . it's The Hugo Winners: 23 speculative fiction stories that have won the science fiction equivalent of the Oscar —Arthur C. Clarke's superb story, "The Star," Jack Vance's classic, "The Dragon Masters," and Poul Anderson's award-winner, "No Truce With Kings," plus 20 more.

This fabulous 864-page anthology of speculative fiction sells for $15.45 in the original publisher's edition. It's yours, if you wish, as one of 4 books for just 10¢ (plus shipping and handling) when you join The Science Fiction Book Club.

Here's how the Club works:

When your application for membership is accepted, you'll receive your introductory package of four books for just 10¢. You may examine them in your home, and if not completely satisfied, return them within ten days—membership will be cancelled and you'll owe nothing.

About every 4 weeks (14 times a year), we'll send you the Club's bulletin, *Things to Come*, describing the 2 coming Selections and a variety of Alternate choices. If you want both Selections, you need do nothing; they'll be shipped automatically. If you don't want a Selection, or prefer an Alternate, or no book at all, just fill out the convenient form always provided, and return it to us by the date specified. We try to allow you at least ten days for making your decision. If you do not receive the form in time to respond within 10 days, and receive an unwanted selection, you may return it at our expense.

As a member you need take only 4 Selections or Alternates during the coming year. You may resign any time thereafter, or remain a member as long as you wish. Most books are only $1.98 plus shipping and handling. Some extra value selections are slightly higher but always much less than Publisher's Editions. Send no money. But do send the coupon today.

ANY 4 SCIENCE FICTION BEST SELLERS FOR JUST 10¢ with membership

Science Fiction Book Club 45-S131

Dept. HR031, Garden City, New York 11530

I have read your ad. Please accept me as a member in the Science Fiction Book Club.

Send me, as a beginning, the 4 books whose numbers I have indicated below, and bill me just 10¢ (plus shipping and handling). I agree to take 4 additional books during the coming year and may resign anytime thereafter.

Mr.
Mrs.
Miss _____
Please print

Address _____ Apt. _____

City _____ State _____ Zip _____

8532. **The Hugo Winners,** Vol. I & II. Giant 2-in-1 volume of 23 award-winning stories, 1955 to 1970. Asimov introduces each. Pub. ed. $15.45

1297. **Before the Golden Age.** Isaac Asimov, ed. 26 classic stories of the 1930s, from vintage SF pulps, now in one huge volume. Pub. ed. $16.95

6221. **The Foundation Trilogy.** By Isaac Asimov. The ends of the galaxy revert to barbarism. An SF classic. Comb. Price $16.85

2527. **Swords of Mars/Synthetic Men of Mars.** By Edgar Rice Burroughs. Two novels of unparalleled adventure in one superbly illustrated volume. **Illus. by Frank Frazetta.** Spec. Ed.

6049. **Science Fiction Hall of Fame, Vol. 2A.** Ben Bova, ed. Eleven all time great novellas chosen by Science Fiction Writers of America. Pub. ed. $9.95

6072. **Science Fiction Hall of Fame, Vol. 2B.** Ben Bova, ed. Eleven more great novellas, by Asimov, Simak, Pohl, others. Pub. ed. $9.95

8037. **Again, Dangerous Visions.** Harlan Ellison, ed. Short stories and novels. 46 in all. **Explicit scenes and language may be offensive to some.** Pub. ed. $12.95

2402. **The Day of Their Return.** By Poul Anderson. Superbeings from outer space and eons past threaten to destroy the Terran Empire. Spec. Ed.

6759. **The Shockwave Rider.** By John Brunner. By early 21st century, a data information net threatens the people as privacy becomes obsolete. By Hugo Award winning author. Pub. ed. $8.95

2782. **The 1974 Annual World's Best S.F.** Donald A. Wollheim, ed. Ellison's Hugo Winner, **The Deathbird,** plus 9 top tales by Pohl, Simak, others. Spec. Ed.

3897. **The Mote in God's Eye** by Larry Niven & Jerry Pournelle. Man's first contact with an intelligent alien species. Pub. ed. $9.95

1032. **Rendezvous with Rama.** By Arthur C. Clarke. Hugo and Nebula Award Winner. Dazzling visionary novel of a self-contained world in space. Pub. ed. $6.95

The Science Fiction Book Club offers its own complete hardbound editions sometimes altered in size to fit special presses and save members even more. Members accepted in U.S.A. and Canada only. Canadian members will be serviced from Toronto. Offer slightly different in Canada.