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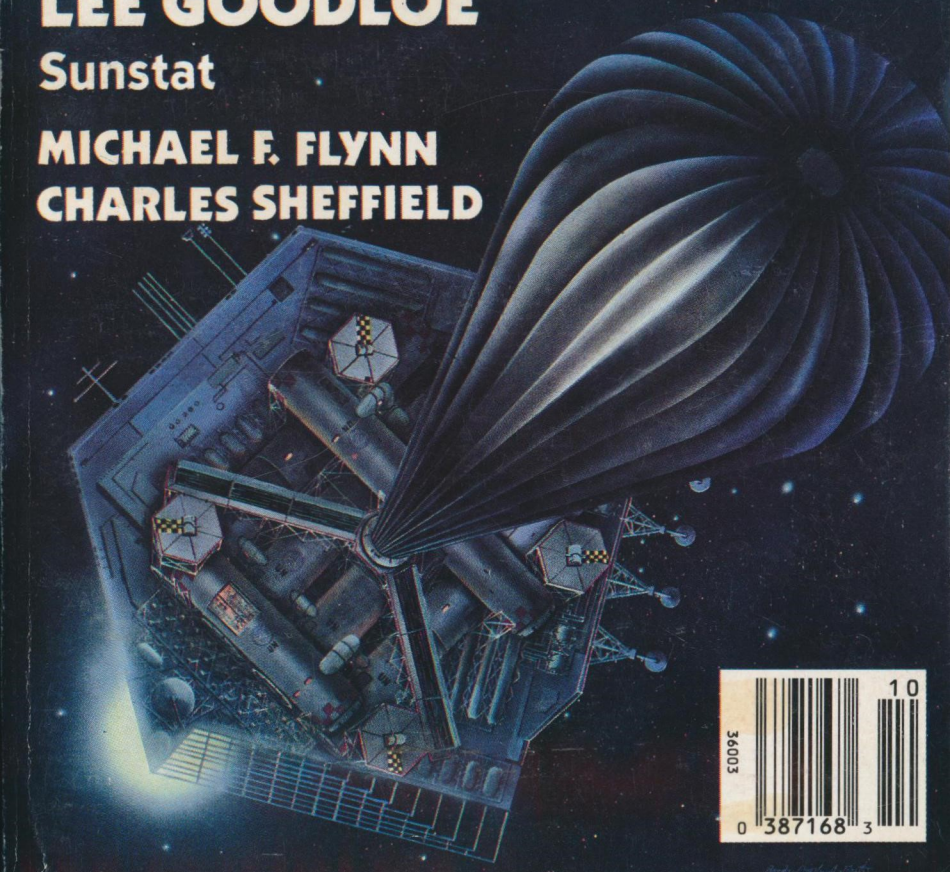

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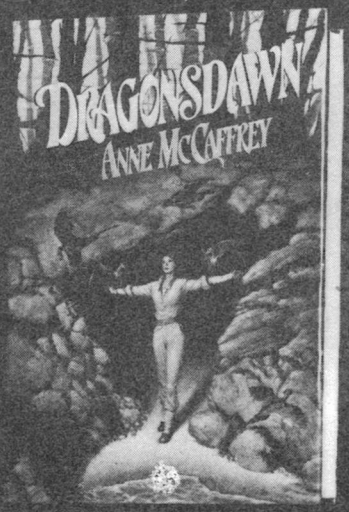

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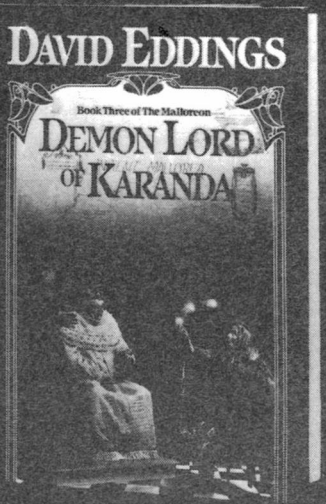

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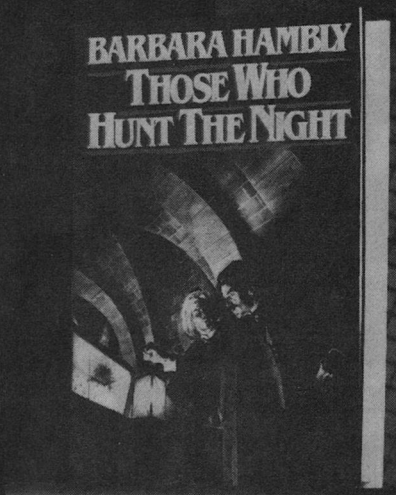

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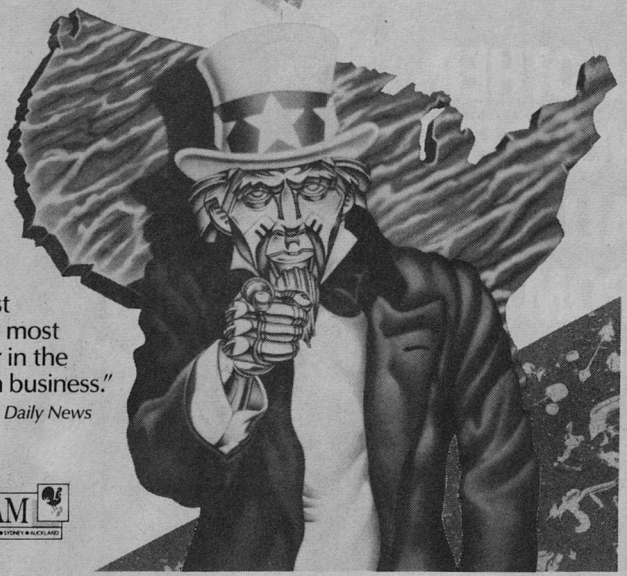

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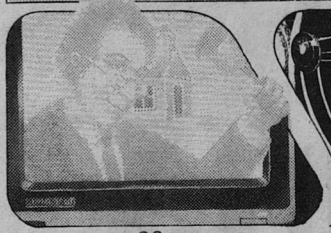

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Vol. CVIII No. 10
October 1988

Next Issue on Sale
September 20, 1988

$25.97 per year in U.S.A.
$2.00 per copy in U.S.A.

Cover by Randy Asplund-Faith

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Indicia on Page 6

Editorial

TRAINING MUZZLES

Stanley Schmidt

Back in January of this year there was a bit of a brouhaha, which we shall probably hear echoes of as the new school year begins this fall, over a U.S. Supreme Court decision in the case of *Hazelwood School District v. Kuhlmeier*. Several concerns have been expressed over possible dangers implicit in the decision and the thinking behind it, but it seems to me that the worst threat it raises is one so subtly insidious that it has been largely overlooked.

The case concerned a high school newspaper and a principal who demanded that two articles be deleted from it. Some of the students who worked on the paper sued, believing the principal's action violated their First Amendment right to free expression. The court, however—five members of it, anyway—disagreed, and ruled that that principal, and others like him, may indeed exercise quite broad editorial control over student publications. This naturally raised widespread fears that the ruling represented a serious erosion of First Amendment protection. The justices might choose to interpret the principal's action as somehow not infringing on the rights

allegedly protected, but it is such a clear case of outright censorship (subspecies "prior restraint") that the message sent loud and clear is that somehow those rights simply don't exist in such cases. A good many of us find that scary.

Some of the dissent came from within the Supreme Court itself. Justices Brennan, Marshall, and Blackmun explicitly rejected the idea that speech in a school paper is fundamentally different from and less subject to protection than speech anywhere else. The dissenting opinion pointed out that the ruling would, in effect, allow school officials to censor anything they found personally distasteful—and though the majority opinion attempted to justify itself in terms that sound vaguely educational, its effect is pretty clearly exactly that: to allow school officials to censor students whenever and however they like.

That was one of many concerns expressed by many others who commented on the ruling shortly after it was issued: that school officials, told by a higher and allegedly wiser power that it's all right for them to censor, will proceed to do so right and left. Opinions are far from unanimous about whether high school students are indeed a special group whose specialness makes it legitimate to do this to them; and it would be difficult to argue convincingly that what is said or not said in any high school newspaper is, in itself, profoundly important to the country at large. The legitimate fear, even among some who do think that school papers *are* a special case, is that officially condoning censorship of that special group may lead to extending the practice to others. If it's OK to censor high school students, why not labor union leaders, or science fiction editors?

Others are less afraid that school censorship will run rampant than that it won't have to, because student writers and editors who don't want to risk it will tend to avoid controversial issues and pussyfoot around the ones they get even close to. Watered-down stories calculated mainly to pass a principal's inspection would not, in the words of Jason Ward Gay, co-editor of a school paper in Massachusetts, "provide the true insights a high school paper should present."

Most of the responses to these concerns are fairly predictable. "Most administrators are responsible people who would not use this power unless absolutely necessary." Well, the principal who started this case is living proof that at least some *will* use it in cases which people cannot agree are "absolutely necessary." As for the ones who wouldn't use such power—if they're not going to use it, why should they have it?

"The argument that doing one thing opens the door to doing more without limit is a panic reaction and does not sufficiently justify doing nothing." OK, I can see some merit in that, in at least some contexts. Both surgery and chainsaw massacres are "cutting people," but we welcome and encourage one while nobody seriously suggests that we should tolerate the other. Nevertheless, whenever a potentially dangerous prac-

tice is introduced in a limited way, it's prudent to ask what assurances are provided that the limits won't keep spreading.

"What's said or not said in a school paper isn't important enough to make a big deal of. It is, after all, just a school paper." So why are all these people, up to and including the Supreme Court, making such a fuss over it? One might well get the impression that it's because many people believe that it *is* very important—not because the specific words that appear in this or that school paper matter much to the world at large, but because they do matter, on several levels, to the students who write and read them. And those students, some of them individually and all of them collectively, *are* very important to the society

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First issue of *Astounding* January 1930. ©

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(212) 557-9100

Analog Science Fiction/Science Fact (Astounding) is published 13 times annually by Davis Publications, Inc. at $2.00 a copy in U.S.A., $2.50 in Canada. Annual subscription $25.97 in the U.S.A. and possessions, in all other countries, $30.67 payable in advance in U.S. funds. First copy of new subscription will be mailed within eight weeks of receipt of order. When reporting change of address allow 6 to 8 weeks and give new address as well as the old address as it appears on the last label. Second-class postage paid at New York, NY, and at additional mailing office. Canadian 3rd class postage paid at Windsor, Ontario.

POSTMASTER: SEND to ANALOG SCIENCE FICTION/SCIENCE FACT (ASTOUNDING) P.O. BOX 1936, MARION, OH 43306
IN CANADA RETURN TO 871 JANETTE AVENUE, WINDSOR, ONTARIO N9C 3Z1
Editorial and Advertising: Analog Science Fiction/Science Fact, 380 Lexington Avenue, New York, NY 10017
Subscriptions: Analog Science Fiction/Science Fact, P.O. Box 1936, Marion, OH 43306 ISSN 0161-2328
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at large, even though their full importance will probably not be felt for several years.

And therein lies the *big* danger that I see in all this.

What if students become used to being censored, to pussyfooting when they write, to reading news and commentary that they know has been censored? What if they come to regard those things as such normal parts of The Way Things Are that it never occurs to them that they could be otherwise, or that they themselves might try to change things? Might they not then carry that attitude of docile acceptance into adulthood, and continue living by it when they're working on things that do have larger impact, like "real" newspapers and companies?

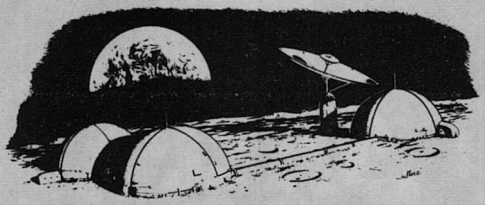
I would hate to suggest, or believe, that it was the majority justices' conscious intent to produce any such conditioning. But it does seem disturbingly plausible that their ruling could in practice have that effect, and that such conditioning would be awfully convenient for a government that wanted its governees easy to govern. But Americans are not supposed to be easy to rule. Their insistence on active participation and vigorous questioning of the government has historically been one of their main strengths as a people—and they're not going to need it any less in the future.

Of course, it does not inevitably and irrevocably follow that putting "training muzzles" on young journalists *will* produce a generation of adults who have forgotten how to bark. Ideally, student publications which try to practice real journalism by researching and reporting real issues—even controversial ones—should be a good training ground for everything from investigative reporting to analytical thinking to journalistic ethics and living with the consequences of one's decisions. If they are turned into something too insipid to serve any of those purposes, other ways to accomplish them may arise spontaneously. The most genuinely educational effects of a school are not always the things written into the curriculum. To paraphrase one of the dissenting justices in this very case, what will students *really* learn if their textbooks tell them that the Constitution guarantees freedom of the press, and the only living example close enough to them to mean much says it does not?

Aside from the obvious conclusion that the institutions entrusted with their education are lying to them, they may learn that if they really want to discuss controversial views and issues in print, they will have to do it somewhere else. If enough of them do not meekly accept the *Hazelwood v. Kuhlmeier* philosophy, and enough of them have taken to heart the lesson that a free press is worth having, we may see a resurgence of distrust of The Establishment, complete with underground newspapers. And those working on those clandestine papers may learn some of what they should have been learning on official papers—but without the benefit of the more experienced guidance they should have been able to get there.

A certain amount of distrust of The Establishment is probably always a

healthy thing. But it can be overdone. If a government is to serve any useful functions (and it should), it also needs a certain amount of respect from its people—and it needs to earn that. The direction suggested by this recent ruling, whether or not it had any hidden motivations such as those suggested above, seems less likely to earn respect than to fuel distrust and the predictable reactions that distrust leads to. Those reactions may ultimately be beneficial, but indulging in blatant censorship and counting on that to feed defiance seems a sadly cynical basis on which to pin our hopes for the future. ■



IN TIMES TO COME

● Our November issue is one of those peculiarly diverse ones, with lots of items of many types. Vincent di Fate's cover is for the conclusion of Charles Sheffield's *Proteus Unbound,* and there are novelettes by Stephen Kraus (about an ambassador of sorts, though not in the most obvious sense) and Brad Ferguson (about the legal problems that arise when death is just another clinical condition).

The fact article is "Extraterrestrial Intelligence and the Interdict Hypothesis," British astronomer Martyn J. Fogg's entry in the ongoing effort to resolve the Fermi Paradox. Others have suggested that we may not have been contacted by extraterrestrials because our planet has been posted as "off limits," but there's one important factor that Fogg has looked at more closely than most. That factor is *time. When* would an extraterrestrial civilization consider it wise to avoid contact with a planet—and why?

We also have a "State of the Art" piece by G. Harry Stine, involving time in another way. *"Star Trek* Revisited" is, on the most obvious level, a behind-the-scenes look at the new *Star Trek* television series—and a follow-up to Harry's 1968 article "To Make a *Star Trek,*" about the original series. Comparing the new and old series turns out to provide an illuminating reflection of how our own culture has changed in the intervening years.

Finally, of course, we'll have short stories by such writers as Thomas A. Easton and W. T. Quick, and all the usual features.

The surest way to develop
a real appreciation of something
is to almost lose it.

SUNSTAT

Jerry Oltion and Lee Goodloe

Randy Asplund-Faith

Andrea Nygren absently parked her stylus in the air above her desk and leaned back in a long, stretching, eye-rubbing yawn. She glanced over at the clock, saw it was seven minutes after two in the morning, and groaned softly. She'd done it again. This was the third time in as many weeks she'd let herself work into the wee hours.

It seemed more and more lately that her sleep time was the only time she could find to do science. The rest of her day tended to evaporate into the formless void of administrative paperwork: scheduling, filing reports, requisitioning supplies, *begging* for supplies, occasionally resorting to political blackmail for supplies when the countries supposedly supporting the station lagged in their support—all of the jobs necessary to keeping a scientific project running in a bureaucratic universe. And she wasn't even technically an administrator. She was Assistant Chief Scientist, and she had projects of her own to watch over. When she could find the time.

The noise that had distracted her came again: a low, almost subsonic thrum that seemed to come from everywhere at once. Andrea frowned in concentration, straining to hear, but the noise was gone almost as soon as she'd heard it. Had someone fumbled the wrong switch on their stereo, blasting dorm deck for a second? Not likely at this hour. Besides, it had felt as if the whole observatory were vibrating to a deep bass note, a note more powerful than any stereo could produce.

What could make the entire station ring like that? A meteor strike? Andrea smiled at that thought. A meteor up here was about as likely as—she struggled for a simile—as unlikely as a meteor out of the plane of the ecliptic, but there simply wasn't one. Space was *empty* up here.

That little reassurance was enough to make her shrug it off. She would find out what it was soon enough, probably in the morning when someone complained to her that the vibration had spoiled a delicate measurement.

She yawned again, reached down for her stylus, and missed. Surprised, she looked down at her desktop, but in her peripheral vision she saw the stylus still floating at eye level, just where she had left it.

What the—? She'd been distracted for at least ten seconds; even in Sunstat's feeble gravity the thing should have fallen by now. She stared at it for half a minute more, watching it drift slowly toward the ceiling instead of toward the floor where it belonged, before she connected the sound she had heard with the stylus's bizarre behavior.

She had heard a shroud parting. One of the shrouds that held the Mains'l. They were falling into the Sun.

The surge of atavistic fear that swept through her caught her completely by surprise. She had never felt it before, but she knew what it was just the same by her reflexive reaction: feet out wide (shins banging painfully against the lower edge of the desk) and arms flailing for balance while she searched frantically for something to grab. She was falling!

The instinctive response was so inappropriate she had to laugh. She pulled herself down into her chair again and shook her head in self-mockery, breathing deep to calm herself. Her heart still

pounded against her chest, but a simple adrenalin rush was something she could deal with. She laughed again, more softly, as she reached out and tapped the menu pad beside her desk screen. Reaching for the branch, was she? A better instinctive response in space would be to reach for food. A falling person would starve to death before she could hit anything at interplanetary distances.

All the same, they were still falling, and that was serious enough. Andrea cleared her throat and said, "Emergency. Priority E alarm."

PRIORITY E ALARM, the screen responded. CONFIRM?

She hesitated. The CYA response was practically instinctive by now, too. She *knew* they were falling, *knew*, what had to have happened, but just the same. . . .

Cursing her own self-doubt, Andrea touched the menu pad again, keyed the screen to video mode, and flipped to an external camera on top of the Sunstat, the one that watched the Mains'l. She swallowed hard at the sight: the immense silvery sail slowly peeling back, agonizingly slow, like a giant foil streamer in a river of molasses. As though to compensate, one of the two trims'ls, its stays severed by flailing monocrystal fibers, slowly crumpled off to the side.

Andrea blanked the screen with a stab of her finger, returning to the previous message.

"Confirm!"

A nerve-jangling two-tone siren wailed throughout Sunstat. Her desk screen blinked at her. NATURE OF EMERGENCY? it asked.

She shouted to be heard over the siren. "The Mains'l has torn loose!"

"THE MAINS'L HAS TORN LOOSE," the computer responded. CONFIRM MESSAGE?

"Confirm."

The siren cut off, and the computer's amplified voice repeated her words over the intercom. Behind the voice, Andrea heard muffled thumps and bangs as the station's crew vaulted out of bed, slammed airtight doors, groped for pressure suits, and did whatever else people did in an emergency.

Andrea still couldn't really believe it had happened. She had confirmed it for the computer with the monitor, but she had seen too many simulations in her life to believe everything she saw on a screen. She needed to see it with her own eyes. She got up and raced out of the room, kicking off down the corridor—kicking off in a trajectory that was fractionally too high now that they were in free-fall—toward the topside observation bubble.

Several others had already gathered there by the time she arrived. Wordlessly, she pushed her way into the crowd until she could see out the port with them. In stunned silence they watched the gigantic aluminum sheet, which so shortly before had held the entire Sunstat away from the Sun, stretch away into uselessness.

Andrea's beeper brought her back to the station. She knew without answering who it would be. She flipped the switch anyway, spoke: "Nygren here."

"Meeting immediately in Conference Room A, Andrea. See you there," Yelena said tersely.

* * *

Chief Engineer Yelena Ivanovna Sokolova was too beautiful to do her job competently. So she had been told over and over again as she clawed and struggled her way to the top of her field—a field still dominated by men in her homeland—and by now she acted as though she believed it herself. That Andrea was merely pretty seemed to fill her with more envy than the possibility that Andrea was also competent in her work. It was the craziest personal quirk Andrea had ever encountered in her own struggle to the top, but she had finally realized that, crazy or no, it was a *real* quirk, and she had learned how to deal with it. Before she entered the meeting room she spent an extra minute in the washroom washing her face in cold water until her cheeks glowed, brushing her hair out until it was silky smooth, and tugging the wrinkles out of her bodysuit. Only when she was suitably stunning to pose no threat to Yelena's authority would she enter the conference room to discuss engineering details with her.

Michel Ronner, the UN-appointed station director, was waiting in the conference room as well, but he was male enough to assume beautiful women were always beautiful even in the middle of the night, so Andrea wasn't afraid of his reaction either. A couple of the other senior scientific staff were already seated at the meeting table, along with Jaime Martinez, head of the computer section. Evidently they had believed the TV picture; she hadn't seen any of them on the observation deck. Andrea gave Jaime a quick smile in response to his openly appreciative one as she took her usual seat along the side of the table, strapping on the belt to keep from floating off, then gave her attention to Mike.

Fiftyish, white-haired, his image projecting calm as well as authority, he looked like Central Casting's idea of the family doctor. He spoke from the head of the table. "Well," he began, in his faintly Quebecois accent, "I suppose you all know what the problem is."

"Yes, sabotage!" Yelena hissed. "Attempt to embarrass Soviet Union!"

And embarrass Yelena Ivanovna, thought Andrea. Yelena was upset indeed, to be forgetting her articles. But the physical integrity of Sunstat—officially called the United Nations Joint Cooperative Solar Stationary Station—was, after all, Yelena's responsibility. And as the senior Sov on the station, Yelena could no doubt envision her government's reaction if the part of the station under Soviet responsibility failed.

Mike was diplomatic. "We don't know that, Yelena. It could be sabotage, but it could be a lot of other things. Sail-suspended stations are new to all of us; we could very easily have just overlooked something."

Yelena was not mollified. "Then why did failure happen right now, less than three days after supply ship departed?"

Andrea's eyes widened. She hadn't made that connection. The supply ship—the station's only link with civilization and at the same time its only lifeboat—had just left on its month-long round trip to Earth orbit, leaving them stranded until its return. Was Yelena just being paranoid, or was there really a connection?

Mike wasn't buying it. "Coinci-

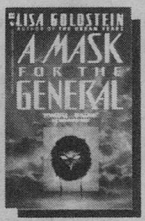
THE
TEAM SPECTRA
REPORT

We'd like to use this space this month to offer a sort of Public Service Announcement: a warning about Lisa Goldstein's work, specifically her latest novel, A Mask for the General. You see, it's very easy to be deceived into thinking that by picking up this novel, you will be providing yourself with a night or two of pleasant intellectual diversion. After all, the cover art is very mystical and beautiful and the basic story line is on an extremely human scale. You probably wouldn't know from picking up this book and holding it in your hands that it could shake you to your very core.

That's why we're here to warn you.

A Mask for the General is about rebellion and revolution. It's about awakening from an all-too-long sleep and *doing* something. It's about a sadly changed America of tomorrow, but there are an awful lot of resonances of today in it. As you read Lisa's marvelously subtle writing, you will find yourself slowly becoming more and more agitated, more and more compelled to talk about the things that she's talking about. You will find yourself moved in strange ways and not quite know why.

A Mask for the General might be one of the most powerful novels you will read this year. It is certainly what science fiction at its best should be. But it is *not* a bit of quick light reading. We just thought we should let you know.



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TEAM SPECTRA

LISA GOLDSTEIN

A MASK FOR THE GENERAL

dence," he said. "No one has managed to repeal Murphy's law, Yelena."

Yelena snorted and made a brushing-off motion with her hand. "Capitalist cop-out, Mike. Pseudo-spiritual nonsense. Animism is not appropriate for modern, rational society. Besides, shroud lines were cut."

That got the director's attention. "Cut? You're sure?" he asked.

"Cut, kinked, or otherwise damaged. Perhaps simply tied in knot. Monocrystal will cut itself if knotted. Whatever; we have already traced failure to shroud lines, and monocrystal does not break spontaneously."

Surprisingly, it was Junro Mikaro, sunspot specialist and chief scientist, who said, "that still doesn't rule out plain old everyday perversity. Accidents happen, especially on experimental space stations. Our immediate concern should be repairing the damage. How soon can we reattach the sail?"

Yelena shook her head. She took a deep breath, and when she spoke, her articles were back. "That is not possible. Two of the four main monocrystal strands holding the sail to the station are broken, and the sail is flapping in the solar wind. The pieces of shroud left are too short to reattach unless we already had the sail in place. And in any case we'd rip the sail trying. It is too thin to take the stress. It must be deployed from the egg and allowed to inflate gradually."

"Well, we have a spare sail egg," Mike said, smoothly interceding before Yelena's pronouncement of doom could smother the discussion. "It was intended for scheduled replacement at the end of the next supply cycle so we could ship the old one back for fatigue study, but there's no reason we couldn't hatch it now, is there?"

"It will take several days," Yelena said. "We must reel in the old sail, which is still valuable for study, then clear the old lines from the windlasses and check for damage before attaching the new ones. Also there is the matter of the missing trimsail. Stationkeeping will be difficult with just one."

"We have no spare trims'ls?" Junro asked. "That seems a major oversight."

Yelena bristled. "Not oversight! If UN would fund station properly, all possibilities could be allowed for. But criticality-one items that were very low probability had to be ignored. Unfortunately, shroud separation was considered very low probability. Which is why I suspect sabotage!"

Andrea shared Yelena's anger at the poor funding they'd received, but she knew it was the way space science had always been done. Military first, then national spectaculars, *then* use what's left over for science. Sunstat had been even worse than most projects because they'd had to coordinate their funding between half a dozen nations. Andrea had been in on it from the early days, when she was still a graduate student in the Settlements, the ring of colonies orbiting the Earth-Moon L-4 point, and even then it seemed as if she had put nearly as much effort into prying dollars out of reluctant governments as she had into the studies that would let her do research there once they got it built. It was a sad way to do science, but griping about it wouldn't keep them from falling into the Sun.

Jaime entered the discussion. As

usual, he had been tapping instructions on his desk screen throughout the meeting, seemingly absorbed in thought, but now he looked up at the group and said, "Stationkeeping won't be that big a problem. The program can account for the loss of a trims'l, and if it can't, I can. I've sailed before."

"We can probably coax the funding committee to send us another one on the supply ship anyway," Andrea put in. "We can't drift too far off course in a month, even with Martinez at the helm." She winked at Jaime as she said that last. Her tension was fading, now that a solution seemed in sight.

Mike nodded, ignoring her witticism. "Good. Then is there any reason why we shouldn't go ahead with the deployment?"

No one spoke.

"All right then, we might as well get on it. Every minute we wait, we have that much more sunward velocity to reverse. Yelena, you will be in charge of the effort. All other departments will cooperate fully with engineering. Anything else?"

"Security checks," Yelena said. "We should request Earth on the private line to run checks on all personnel. You may not suspect sabotage, but I do."

Mike considered for a moment, then nodded. "I guess it couldn't hurt. Okay, I'll send a request. In the meantime, everyone keep your eyes open, but let's not turn this into a witch hunt. Meeting adjourned."

Within an hour, Andrea found herself struggling into her skinsuit. The only member of the crew who had been raised in the L-4 colony, she had more free-fall and space-suit experience than everyone else combined, so Yelena had naturally chosen her to help with the outside work. Despite her experience, it had been nearly a month since Andrea had been in her suit. Had she really gained that much weight? she wondered as she worked it on over her hips, but a glance at Yelena, also cursing and tugging, allayed that fear. No, it was always harder than it seemed it should be.

She pulled it on the rest of the way, then checked it over for bulges and wrinkles with the diligent patience of one who *knows* her life depends on her equipment. She did not intend to get a hematoma, or worse, from an unnoticed suit wrinkle. Satisfied with her own suit, she helped Yelena check hers, smoothing out a twist wrinkle along her side with a firm two-handed rub. She smiled as she thought of Jaime's mock-innocent offer: "can I help you on with your suit?" Done properly, suiting up could be one of the most erotic activities yet invented for two, and Jaime knew it.

Maybe after they got the new sail up, she would take him up on his offer. Or maybe not. She still hadn't decided about Jamie. He was always offering to show her Earth, in his oh-so-casual way ("Hey, let's go catamaraning on the Columbia River," or "Why don't we blow this two-bit pop stand and go raft down the Grand Canyon?"), but she always begged off. "Too much to do now," she would say when he asked. "I've spent too much time working on Sunstat to take time off now. Maybe later." He kept asking, and she kept making excuses, not because she didn't like him, but because she really *was* too busy. She had spent years preparing for

Sunstat; she couldn't go off on a vacation to Earth now. She couldn't even afford the time for a date.

She half-suspected Jaime kept after her for the challenge as much as for anything else she had to offer, but she didn't know. If he was really out for the challenge, then why didn't he go after Yelena?

And why, if she was so busy and happy to be so, did that thought bother her so?

As usual, she didn't have time now to pursue it. Yelena held out her helmet, helping her on with it and with the rebreather. Then came mandatory accessories for direct-sun work: a brilliant silvery helmet cover with reflecting eyepieces, the loose-fitting "parka" with its insulated interior and silvered surface, then matching pants and boots. Over that went a diamond fiber mesh cloak and gloves, protection against accidental encounters with the monocrystal shroud lines. Next came the "white cane," the manipulator for intentional encounters with those same lines, and finally the personal propulsion unit, a wide waistband with four compact thrusters spaced evenly around it. The waistband had clips for still more tools, and Andrea's was full.

She looked like a monster now, and she knew it. But so did Yelena, so it was OK. "You ready?" she asked.

"Ready."

Andrea opened the door and pushed off toward the airlock, Yelena in tow, and there was Jaime waiting for her. "Hey, I like the togs," he said. "I bet that's big with the girls back home."

She brandished her cane at him, clicking its jaws, and he ducked back with a grin, but his eyes still betrayed his worry. He had the ground-bounder's fear of spacesuits to begin with, and their obvious precautions against sun and shrouds seemed to heighten his awareness of the dangers waiting outside.

Yelena had heard his comment. "You have here the Russian international formal evening wear," she said to him. "Proof against immoral capitalist advances, and also good in space. Clear the doorway, please."

Moments later they were in vacuum. Andrea stepped out onto the hull, waving her cane in front of her at every step. The shroud lines had been electrically charged, so they should be standing out away from the station like the hair of a person holding onto a charged Van de Graaf generator, but Andrea couldn't be sure the line hadn't tangled around the station a time or two first. Even to someone wearing a diamond fiber cloak, blundering into a monocrystal line could be deadly. If she caught it on the faceplate, for instance . . .

She worked her way toward one of the two windlasses whose shrouds had broken, her cane held vertically in front of her, while Yelena moved toward the other. She could hear the Russian's quiet, measured breathing over the radio and she hoped her own sounded as controlled. She looked out toward the sail, which had by now drifted edge-on to the station. It was a barely-visible silver line against black space. In the other direction was the Sun, visible now from the top of the station. Even as a streamer, the sail provided enough tug to pull them around so their center of gravity hung just below its points of attachment.

For the thousandth time she thought that the Sun didn't *look* any different here, from over the pole, at least to the shaded eye. It didn't even look bigger, despite its oblateness. But of course, with instruments, the solar pole looked very different indeed. That's why they were there.

She reached the windlass without encountering the shroud, breathing easier when she swung the cane gently over the spool and it stopped cold, without rebound, as if hitting a padded wall. The shroud was streaming away as it should. There was evidently a lot of it flying free, in order to provide so much resistance to her swing. Even without something attached to the end of it, a couple kilometers of line had mass of its own.

"OK here," she said aloud. "It should be OK to reel it in."

"I have a tangle," Yelena replied.

"Damn."

"As you say. Help me find the end of it."

"Right." Andrea worked her way back toward Yelena, encountering the line as it passed between an antenna and one of the radiator fins that helped cool the station. When her cane hit the strand, the tug pulled it clear through the antenna, sending the severed end tumbling into space. She waved the cane again, more gently, and encountered invisible thread again a few feet away.

"Looks like it's wrapped all around the radiators," Andrea said.

"Yes. See if you can find the upper end of the tangle."

Andrea began casting about overhead, moving slowly and testing her path at every step, and eventually she encountered the cable streaming away overhead. Another layer of cable had looped over it, pinning it down. Untangling it would be nearly impossible.

"We'll have to cut it loose," she said.

"Go ahead, then."

Andrea unclipped a tiny, gyroscopically-stabilized rocket from her belt, aimed it outward away from the other shroud lines, made sure her Velcroed feet were tight against the station, and turned on the gyro. It tried to twist out of her hands for a second until it came up to speed. Andrea moved it up to the line, the gyro holding it steady now, clipped it on by its nose clamp and set the timer, then reached out with the jaws at the end of her cane and snipped the line below the rocket. The rocket bobbed upward on the line, then ignited and slowly towed its invisible cargo out away from the station. There wasn't nearly enough thrust to put it in orbit around the Sun, but now the shroud would at least be falling separately, out of the way when they began to deploy the new sail.

They spent another hour and a-half cutting through the snarl around the windlass, freeing it and the radiators from the razor-sharp tangle of line, then removing the spool to be replaced with the new one that belonged with the new sail. By then the other windlass had finished reeling in, so they removed its spool as well and carried both back inside.

Now came the task of folding the sail. Fortunately, at least from Andrea's point of view, that job was too big to do by hand, so the means to do it automatically had been built in from the

start. It was quite simple, actually: the four main shrouds branched to many before they reached the sail, where they were woven intricately through their points of attachment with the ultra-thin aluminum sheet, all the way through the sail to the other side. At the right signal the clamps would let go one at a time, letting the sail collapse under the pull from alternate shroud lines, like twin drawstrings closing the top of a bag. With two of the four lines broken and the sail drifting edge-on to the Sun, they would have to let light pressure on the sail's collapsing edge substitute for the pull from the missing lines, but that would work just as well once the first fold formed.

When Andrea got back inside she asked Jaime, whose department was responsible for the folding program, what would happen if the sail remained perfectly edge-on and refused to fold?

"Then we charge the lines with opposite charges," he said with the grin of one who has just figured out the solution himself. "Two sections of sail suddenly develop an attraction for one another, and try to fold together. We reverse the charge on one line, the sail flattens out again, and a great big ripple spreads across the sail. Then the light catches the ripple and we're off and running. We're going to try it in an hour if it doesn't start by itself. Want to watch?"

Andrea shook her head. "Not a chance. It's five o'clock in the morning, and I haven't slept since *last* night. I'm going to bed."

Yelena was waiting for her when she went for breakfast. *She* hadn't slept, that was obvious. She looked like her comrades' idea of the perfect female engineer as she confronted Andrea over a half-empty pot of coffee.

"I was wrong," she said simply when Andrea sat down beside her and began to eat. "It was not sabotage. It was the solar wind."

"Beg your pardon?" Andrea asked around a mouthful of reconstituted scrambled egg. The solar wind? Solar wind—the constant stream of particles blown outward from the Sun—provided drag on the sail just as light did, but it was a small fraction of the total amount. There wouldn't be enough thrust in the solar wind to snap a monocrystal shroud line unless the Sun went nova.

"The solar wind," Yelena repeated. "Not acting upon the sail, but upon the shroud. I analyzed the broken end we reeled in, and found it weakened."

"Weakened? How?"

"Monocrystal is strong as a direct result of its purity, in essence being one great molecule throughout its length. Collisions with solar-wind particles break chemical bonds, though, so after a while enough defects build up to weaken its structure."

Andrea let that information percolate in her head for a moment before saying, "so the new sail is eventually going to blow away too?"

"No. We will replace it before it can fail, and the *next* one will have a protective coating on the shroud lines. We learn from our mistakes."

Andrea wasn't sure whether Yelena's "we" meant the people on the station, the Soviet Union, or humanity in general, but it didn't seem the time to ask.


AJNYGREN

"So when do we deploy it?" she asked.

"As soon as we clear the old one, which is ready to be stowed, and attach the egg to the windlasses. All of which requires more EVA."

"I was afraid you'd say that."

Andrea spent the next three days in her suit, tugging the ponderously massive folded sail into place and packing it away for return to Earth, then unstowing the equally massive but more compact replacement, moving it into position, and hooking it up. It seemed to take forever, while all the while they fell toward the Sun, picking up velocity at barely a centimeter per second squared, but falling into the Sun just the same. They were following the same path their experimental probes followed, and Andrea knew from experience how long they had before disappearing into the solar photosphere. Just over a month.

But at last the new sail was ready to deploy. Opening one up was trickier than folding one, for if the sail inflated too suddenly the stress would rip it to shreds. That was why it came packaged in the egg, with its own dedicated microprocessor and softwear strictly for installation. Once Andrea and Yelena got it set up, with the cable ends that protruded from the egg attached to the four full spools of monocrystal on the windlasses, there was nothing to do but push the button and watch the show.

The entire crew, it seemed, had gathered on the topside observation deck to watch. Slowly, over the course of hours, the immense aluminum sheet spilled out of the egg and flattened out, like a butterfly emerging from its cocoon and stretching its wings to dry. People began drifting toward the floor as the station responded to the new sail's gentle pull, and just as the computer announced full deployment, Andrea heard the explosive pop of a champagne cork.

Four more pops followed in rapid succession, but these were not corks. They were much louder, ringing the whole station, almost like—

"No!" Andrea leaped to the window and looked out at the sail. Others crowded around, voices babbling in confusion, as they once again watched their mainsail blow away on the photon breeze.

"*This* time it was sabotage." Yelena stood at the end of the conference table, her eyes scintillating with fury as she spoke. She had gone far enough past simply mad that her speech was as precise as a diplomat's. "All four shroud lines parted as soon as full tension was applied. No coincidence, no Murphy's law, can account for that."

"That would seem to be stretching it a bit, wouldn't it?" Michel Ronner said. "Have you any idea who?" He looked tired, as if he wished he could just go to sleep and let somebody else be responsible for the station for a while. Evidently his delegated authority was once again under fire. The light speed lag made it impossible for Earth to micro-manage the station, but that didn't stop them from nagging.

"Someone not on the station," Yelena said. Several eyebrows rose around the table, and she continued. "The failure occurred very near the sail, at points which would have been inside the Egg until deployment. The Egg is a sealed

package; therefore the damage had to be done at the time of folding. I suspect that the saboteur simply tied knots in the lines leading to the external connectors."

"But why?" Andrea asked. "Why would anybody want our sail to collapse?"

Mike answered before Yelena could. "Very simple, actually. This is an international project; there is a lot of national prestige on the line here. The Soviet Union is responsible for station integrity; it could benefit any of a number of nations to see them take the blame for a major space disaster."

"Or take the credit themselves for a rescue," Junro Mikaro added.

"Rescue wouldn't have been their plan," Mike said. "The sabotage—if that's what it was, and I'm inclined to believe it was this time—was supposed to destroy the sail when we replaced the old one at the end of the next supply cycle. We would still have had our lifeboat then, so we could have abandoned ship easily enough."

"Leaving Sunstat to fall into the Sun!" Andrea exclaimed.

"Exactly. Starting political bickering over responsibility, which would almost certainly destroy the cooperation that made this station possible in the first place."

"But we don't have a lifeboat now," Jaime pointed out. "What's going to happen when we all fall into the Sun with the station? Besides us dying, I mean." He grinned nervously.

"The repercussions get uglier," Mike said. "Cooperation on other projects becomes even less likely. Nationalization of the Settlements might eventually be the result. Who knows?"

"We won't," Junro said flatly. "Not unless somebody *can* make a rescue. Is it even possible?"

"Just barely," Jaime said. He had been tapping out instructions to his screen as Mike spoke, and now he read from the display. "An Earth-to-Settlements shuttle with extra tanks boosting continuously at maximum thrust could match velocity with us when we were thirty million kilometers away from the Sun. Of course we'd still be headed straight for it, at—" he checked his figures "—at eighty kilometers per second, but if we thrust straight sideways we could whip around with our closest approach at about ten million kilometers . . . " He trailed off when he saw Yelena's expression.

"Ten million kilometers is well inside Mercury's orbit," she said.

"About five-sixths of the way to the Sun inward from it, yeah," Jaime said. "I told you, just barely, and that's assuming they launch now."

Andrea looked at the walls around her. They were talking about rescue, but if they couldn't save the station as well then she wasn't sure she wanted to be rescued. Ronner was right; international cooperation would die with the Sunstat, at least for a few years, and there almost certainly wouldn't be another Sunstat even if it didn't. And Sunstat, simply put, was Andrea's lifework, her career. If it fell into the Sun, she might as well go with it.

She dimly heard Yelena say, "That's too close. I don't think the shuttle could take that. The hull would melt, not to mention effects of hard radiation on

crew. Shuttles don't have storm cellars, as we do. We would have to stay more like fifty million kilometers away at perihelion."

The storm cellar was really nothing more than the topside dormitory deck, but even if it was on top they still called it the storm cellar because it was the place where the entire crew gathered for safety when the Sun flared. The mass of the station around them blocked most of the radiation from even the worst flares, but a shuttle wouldn't have more than a single bulkhead between its crew and the Sun. A shuttle could turn its engines toward the Sun, and it would because it would be thrusting away with them for all they were worth, but even shuttle engines wouldn't be massive enough to block the radiation at that distance.

Could they use the shuttle to nudge the station itself out of its direct plummet? If they could tow the station into a tight hyperbolic orbit, then shuttle crew and station crew could all ride it out together in the cellar past perihelion. That would save them and the station too!

"There isn't a ship in space that has enough delta-vee for that," Jaime said. He was addressing Yelena, but his words cut into Andrea's fantasy as if he had spoken to her. Of course there was no way a shuttle could tow something as massive as the station away from the Sun, not in the few short hours they would have left by the time it reached them. What they needed was thrust spread out over the entire drop. They needed to start moving sideways *now*.

"We need more time," Jaime went on, his words still uncannily paralleling Andrea's own thoughts. "Damn. We've got a month to fall, and we need six weeks."

Two thoughts clicked into place, one right after the other. Andrea, jumping to the final solution, shouted, "Jettison the probes!"

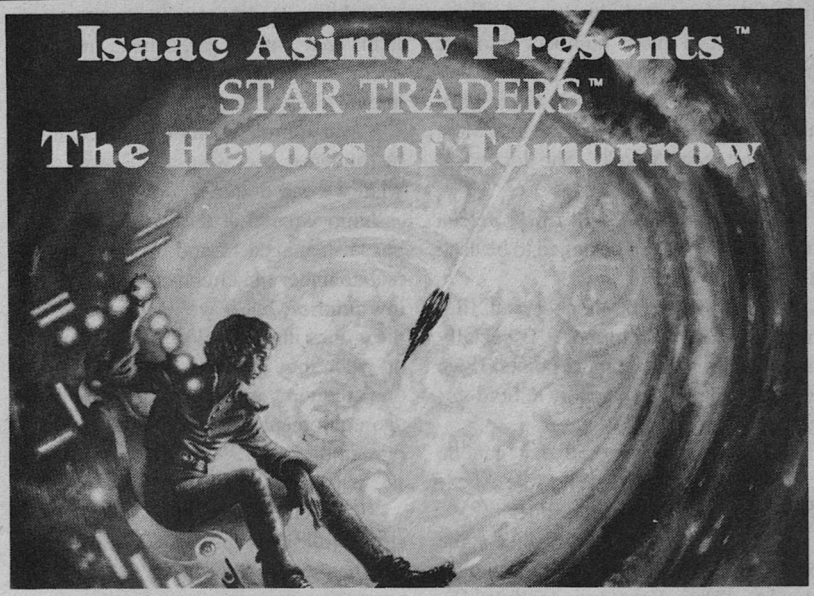
Jaime looked at her with concern in his expression. "You're skewed, Andrea. Dropping the probes won't make us fall any slower. Galileo proved that four hundred years ago."

"Yes it will," Andrea said. "And it'll do better than that. We've still got one trims'l, remember? It's still providing thrust. Not much, but a little. If we jettison all the probes, plus everything else we can do without, we cut down our mass, which raises our acceleration. But we don't just use it to hold ourselves back; we accelerate sideways, to clear the Sun."

"Would the trims'l be enough?" Jaime asked, but he was already at work on his screen finding out. He had a preliminary answer in a few minutes. "It'll work, if we get rid of about—Jesus—about a quarter of the station's mass, uh," . . . he tapped some more . . . "within a week. Of course, the more we jettison, and the sooner we do it, the more good it does."

"There is another problem," Junro pointed out. "We will overheat, even though the storm cellar could protect us from hard radiation."

Andrea's thoughts had leaped ahead to that point. She, too, had been keying numbers into her screen; now she looked up and said, "We can use the old sail for shielding. We'll have to build a framework to hold it around the station,



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but it shouldn't be too difficult since the frame can be very light."

She tapped more numbers into the heat-flow spreadsheet, peered at the result, and said, "It'll be hot, but it's doable. And we save the station, too! Most of it, anyway. Mike?" She looked at Ronner.

"The sail material will rip," Yelena objected. "It wasn't designed to be used as wrapping paper."

"It's ribbed with monocrystal filaments," Andrea retorted. "Especially near the shroud attachment points. If we use that part of it then it'll hold together."

"Do we have material that can be cannibalized for a frame?" Mike asked. The others looked at each other.

"I supposed we could dismantle some of the scientific antennas," Junro said slowly. "Their booms are modular."

Mike looked around the table again. "Any other comments? Ideas?"

"Yes," Jaime chimed in. "If we're going to be jettisoning items to reduce mass, *and* jury-rigging shielding, we'd better make damn sure we don't drop anything we'll need later."

The others nodded.

"Good point." Mike spoke again. He took a deep breath, and smiled for the first time that day. "An English author once wrote that it settles a man's mind wonderfully to know he is to be hanged on the morrow. It seems that we've no other choice, so that makes my decision very easy.

"Our first move, then, is to wring as much lateral acceleration out of the trims'l as we can. Jaime, that's your department. While he's doing that, Andrea and Yelena can work out requirements for the shielding. Then coordinate with Jaime to draw up an inventory of items that can be jettisoned, items to keep, and items we're currently not sure about.

"And Junro, inventory the scientific instruments; see what we'll need and what we can dump."

Junro winced at the word "dump," but he managed to nod. "Very well. I realize under the circumstances that it's low priority, but if we're jettisoning all the probes, they should at least be turned on when they go. Which means at least one receiving antenna and enough storage equipment to hold the data should remain on board."

"If possible."

"Of course if possible. I have no desire to follow the probes all the way in. But neither do I want to throw away everything we came here for."

"Neither do I. And you've raised a good point; if we have the moxie to save the station and do our jobs at the same time, then it'll go over better when we ask the UN to replace what we throw overboard." Mike grinned. "*Somebody's* going to come out of this looking bad, but it's not going to be us. Any more discussion before we get to work? No? All right, then, meeting adjourned."

Andrea climbed wearily back into her skinsuit. Sometimes she thought she might as well sleep in the damned thing at this point. She had no hammock any more; that had gone overboard with the first wave of personal belongings, along with most of her clothing and all of the things she had brought to make her room feel like home, so there was no point

in trying to sleep there. She had considered taking Jaime up on his offer to use his hairy chest for a pillow, but she didn't think he'd appreciate it when she actually fell asleep, as she knew she would. First too busy, then too tired for a boyfriend.

Too tired to be pulling more EVA, too, she thought, but at least this should be the last one. Then she flinched at her mental phrasing. Yes, if they screwed up this EVA, it would indeed be the last. For all of them.

Yelena met her at the airlock and they cycled through into space. Outside, Andrea looked again at the ungainly framework they had frantically assembled over the last two weeks. It looked a little like the unkempt scaffolding around a building undergoing renovation. Up forward, just beneath the surface that would support the reflective sail, the framework held several large water tanks. That had been Yelena's inspiration; water would both absorb heat and add shielding. And when it finally boiled, it would vent through nozzles aimed through the sail, adding precious sideways delta-vee. Of course the water came from the regular station supply, which meant everyone had taken their last bath until the supply shuttle caught up with them on the other side of the Sun.

Now, with the shield framework complete and the water tanks in place, Andrea and Yelena had to mount the storage module containing the folded sail with its broken shrouds. The plan then was simple, at least in concept; they had to unfold the sail just enough so it would wrap around the scaffolding. Jaime's team had redone the folding software so that the unfolding would just go part way, leaving the sail to collapse around the frame while only a bit larger than the station itself.

Carefully they eased the module out of the nearly empty cargo bay and herded it through the framework. The sail's inertia made it difficult to control, but they managed to get it moored to the sunward side without impaling it on a strut. Yelena plugged in the control line, and the two of them backed off to either side to wait in the framework while Jaime started the deployment. There was little they could do if problems developed, but if they *were* needed they would at least be suited and ready to do what they could.

"Ready, Andrea?" Yelena's voice came clear over the radio.

"Ready as I'll ever be."

"Then Jaime, you may proceed."

"Roger," Jaime said. There followed a long moment—perhaps thirty seconds—wherein nothing visible happened to the sail module, then as the charge built up and the folded layers began to repel each other it lurched up, sluggishly blossomed out, three meters across, then thirty, then— "Stop! Short the charge!" Almost instinctively, Andrea kicked off from the framework even as she shouted, but she hadn't yet cleared it when the disturbance she had noticed out of the corner of her eye caught up with her and yanked her legs sideways, tumbling her into space.

It was one of the invisible shroud lines, hung up in the sail and being dragged through the framework as it unfolded. Andrea had seen the struts parting as it cut through them on a path straight for her head.

Instincts born in the Settlements had saved her. Someone from Earth would have tried to duck, which in zero gee would only have lifted their feet and left their head right in the path of the shroud line, but Andrea had kicked upward instead. The line had still clipped her, but her legs were protected by the fiber mesh oversuit.

She risked a look down even as she halted her tumble with her suit jets. Yes, legs still there. She wished she could say the same for about fifty meters of scaffolding, but she supposed that could be welded.

Momentarily in a much more personal universe, she had completely ignored the babble of voices over the radio, but suddenly Jaime's voice cut through the din. "Andrea! Answer me, Andrea!"

"I'm—" she squeaked. She swallowed, tried again. "I'm all right. Yelena? Are you?"

"Fine, now. What happened?"

Andrea explained while she used the jets to bring herself back down to the station. From beyond it she could see the sail draped over almost all of the framework; only the corner fouled in shroud line hung back, pinned now under the rest of the sail. She ducked back into the framework and gingerly worked her way under the sail, turning on her headlamp to see in the sudden darkness and waving the white cane all the way until she found the monocrystal line. She clipped it with the cutter as close to the sail as she dared, then said, "OK, try it now."

"Not while you're out there," Jaime said.

"I'm being careful. I like my skin as much as you do."

"I doubt that." Andrea heard a chuckle over the radio and felt herself blush, realizing the whole station was probably listening in, but Jaime evidently didn't care. He said, "I'm not touching one button in here, except the abort, until you're back inside the station. You too, Yelena."

"I can take care of myself, Martinez!"

Surprisingly, Yelena cut in and said, "Andrea, be silent. Of course we will go in. Meet me at the airlock."

Andrea felt herself preparing for an explosion, but just as suddenly as it had come, her anger drained away. Jaime wasn't coddling her; he was trying to keep her alive, and so was Yelena. They were just watching out for her, like any friends should.

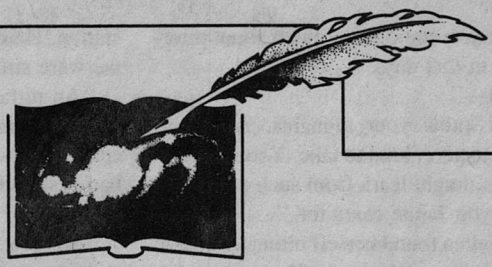
In the suit bay, as they stripped off their suits and toweled off the sweat before donning their only clothing, Yelena asked softly, "Is none of my business, but do you really dislike Jaime so much?"

"No," Andrea said. "Of course not. I like him a lot. Maybe even—oh, damn it, I don't know. I don't have *time* to fall in love."

"I thought so. Andrea, you are wrong. You have all the time there is, which almost ran out for you today. It may run out for all of us in another two weeks. Do you believe in reincarnation?"

"What?" The sudden shift in subject threw her.

"I ask if you believe in reincarnation, because if you do, and we fall into the Sun after all, you will come back as a mayfly. They have one day to live. I



Algis Budrys on
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— Algis Budrys

think you could learn much about priorities in that day."

"I—"

"I know your thoughts. Advice is easy to give, hard to take. You are right; I, too, might learn from such a day, but it is you Jaime cares for."

Andrea found herself biting a knuckle and staring at the door. Her contortions to towel off had left her pointing feet first toward it, slowly drifting toward the floor under the trims'l's feeble tug. She looked up at Yelena just as Yelena held out an arm to stop her fall, and before she knew it she was hugging the surprised Russian and crying against her shoulder.

Yelena held her until she stopped, then with a smile she reached down and scooped up Andrea's clothes. "Go," she said. "Hold him as you hold me, and you may yet escape your fate as a mayfly."

Andrea went, but Mike caught her before she made it halfway down the corridor.

"Andrea! I'm glad you're safe!" He gave her her second hug of the day, then said quietly, "I just got off the radio to Earth. They found the saboteur."

"What? Huh?" His words took a moment to register through Andrea's haze of confusion. But at last the news percolated in. "How? And why?" she asked, finally getting her interrogatives straight.

"It was a technician in the final egg assembly, as Yelena thought. A member of an ultra-nationalist group from the U.S.A. The Soviets had suspected he was a spy, but they thought he was trying to steal secrets, not sabotage the station. He cracked when they told him we were still on board."

"An ultra-nationalist American, objecting to international cooperation in space," Andrea said, making sure she had it straight.

"Right."

"So now his own country gets the embarrassment."

"Yes. Yelena will be happy about that," Ronner said dryly.

"I can imagine. She's still back in the suit bay."

"I'll go tell her." Mike made to push off down the corridor, then pulled himself up short. "Uh, probably shouldn't say anything to Jaime about this right away."

Andrea shook her head. "Don't worry. I've got other things to talk about with Jaime."

"Good, good." Mike smiled again and pushed off, oblivious.

"Twenty-four hours to perihelion," Yelena commented unnecessarily. They were in the storm cellar now, had been for two days already, and would be for another four. On the one remaining desk screen they watched the solar disk through the one surviving camera, and in the upper right-hand corner of the screen, the day's digit had just disappeared from the countdown. They were definitely going to miss the Sun, but whether or not they were going to be cooked anyway was still uncertain. The sail was already radiating strongly in the infrared, but there wasn't much they could do about it. Either it melted or it didn't.

"It's like running a rapid with a big raft," Jaime said. "You line up the boat

before you get there, but then you just have to hang on and ride it out. You can't back out, or even maneuver, once you're in the whitewater."

"Whitewater?" Andrea asked. Although she was sitting cross-legged on the deck in one of the biggest sailing vessels ever built, she had never seen a body of water bigger than a swimming pool, and she was vague about boats.

"Foaming water," Jaime explained. "In a river. The water usually just flows along, but if it's too steep the flow breaks up. It's like, uh . . . " he fumbled for an analogy . . . "like water rushing fast out of a faucet."

"I would say this is not so much like rafting as like going over Niagara Falls in a barrel," Yelena said.

Jaime looked at her in surprise. "Niagara Falls?"

Yelena looked at him. "Yes, Jaime, I have been to North America. I know about Niagara Falls."

"Then I hope the analogy is bad. Most of them didn't make it."

Six hours to perihelion. *It'll be hot, but it's do-able.* Andrea recalled her words about saving the station wryly. It was one thing to make brave pronouncements in a comfortable meeting room, confident of one's figures and abilities and anxious over the future of one's career, but it was another thing entirely to huddle, sweaty and stinking and helpless, in a tiny can while playing tug-of-war with a star. She was trying to sleep, itchy and anxious, and not succeeding. The entire crew was alternating watches, on the off chance they could do something if a major new mechanical crisis developed. Yelena, paradoxically, slept soundly. She knew nothing more could be done.

Three hours to perihelion. Andrea watched the display gages: time to perihelion, solar distance, integrated incident solar flux, shield temperature, station velocity . . . She concentrated especially on the last gage: pressure in the outboard water tanks.

The water had started to boil, and the pressure was rising rapidly. She was ready to override if the steam didn't start to vent automatically, but at precisely the appointed level the nozzles began to shoot steam. She heard a collective sigh of relief from behind her as the station accelerated slowly under the new thrust. She had found that a by-product of sabotage was a much deeper uneasiness about equipment reliability. Who knew what else had been vandalized?

Jaime, as usual, had an analogy: "it's like finding a rattlesnake when you're hiking. First you jump out of your skin. Then for the next hour and a half you think there's a rattlesnake under every bush, and you twitch at any movement. Finally you relax again, mostly by wearing yourself out."

Andrea *still* wasn't sure she liked the idea of tramping around on a planetary surface, not if things like rattlesnakes lived there. But Jaime hadn't asked her to go to Earth with him anyway, not since she had marched—as well as a person could march in microgravity—into the computer room and kissed him passionately while half the station's staff cheered her on. Maybe he didn't want to jinx anything. That was all right. Neither did she.

* * *

Perihelion.

"I'd offer champagne if we had any," Mike said. He looked every bit the administrator, stripped to his shorts and sweating buckets. Andrea, Yelena, and the other female crewmembers looked like winners of a wet T-shirt contest. Jaime looked like a sodden rug. Any of them would have killed for even a sip of cold champagne, but all that had gone overboard early on.

Jaime tapped a few numbers into the desk screen's keyboard, then announced, "Without the champagne, assuming seven hundred and fifty grams per bottle, we're about . . . uh . . . about 53 kilometers further out than we'd be with it."

The room erupted with laughter, with a faintly hysterical edge.

"What's so funny?"

Perihelion plus twenty-four hours. Jaime plotted the temperature reading by hand on his graph, and also punched it into the screen for a quick least-squares fit. Nobody ribbed him about his calculations now. The last reading could have been a statistical fluctuation, but this one could indicate a trend.

The screen blinked a number, and Jaime looked up into the expectant faces. "Exterior temperature has definitely started to decline," he said. Ragged cheers expanded through the storm cellar. Somebody whistled. Andrea found herself in the middle of a many-armed hug, and realized she was shouting as loudly as everybody else.

They had made it! The noise level died down as the news really began to sink in, and suddenly just being alive was more of a victory than Andrea would have thought possible. Her life stretched out ahead of her again, once more to be measured in years instead of hours, and the sudden stay of execution was the sweetest moment she'd ever felt. She exulted in it. It's *good* to have your mind unsettled, she thought, if only for the coming back.

Jaime hugged his way back through the room to Andrea. Relief was sinking into him, too, she could tell.

"Hey," she said playfully, "What say we blow this two-bit pop stand and go rafting down the Discovery?"

"Columbia."

"Wherever." ■

Acknowledgment.

The authors would like to thank Brian Tillotson, of the University of Washington, for bringing the possibility of solar-sail suspended stations to our attention.

● The only sense that is common in the long run is the sense of change—and we instinctively avoid it.

E. B. White

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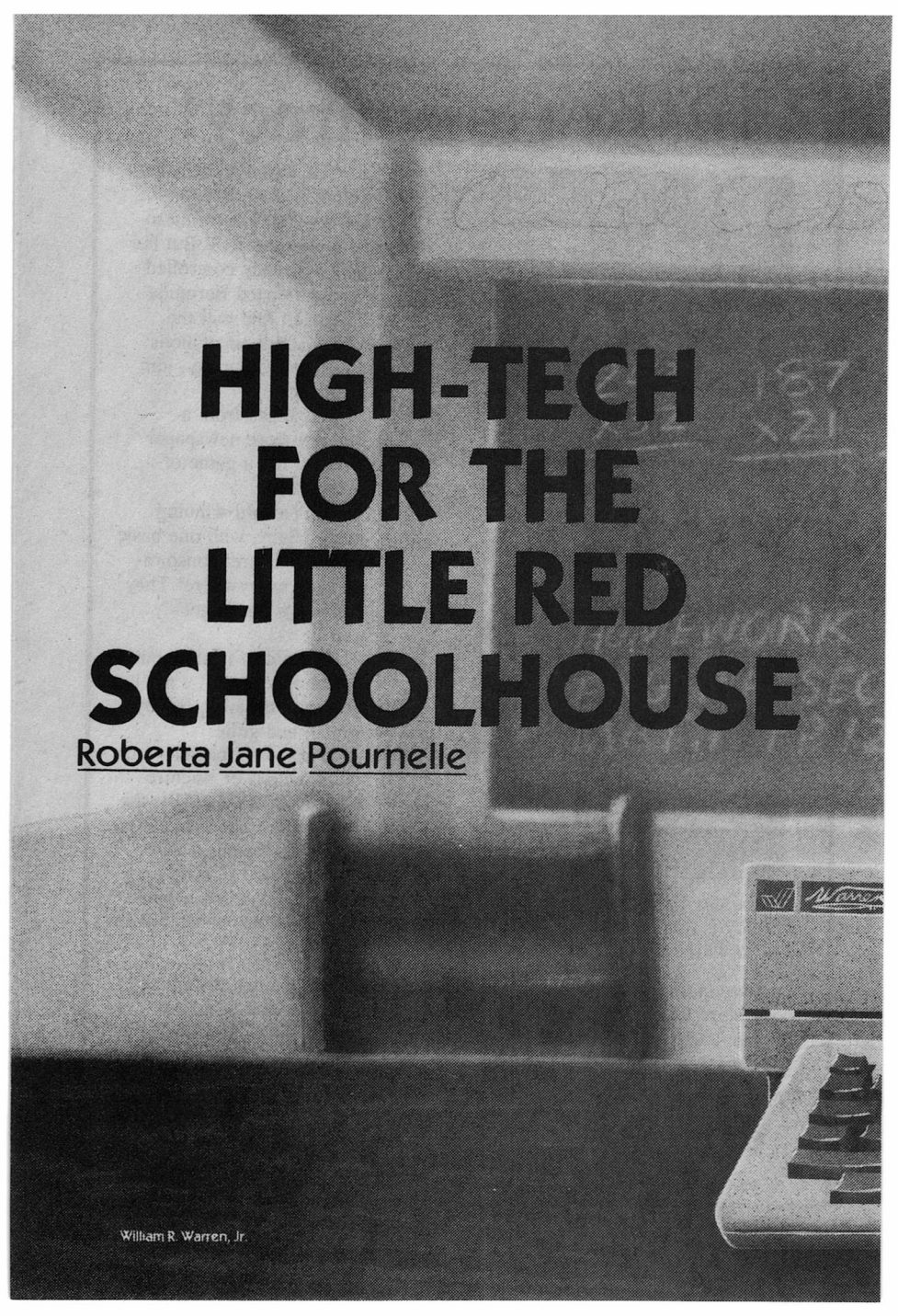
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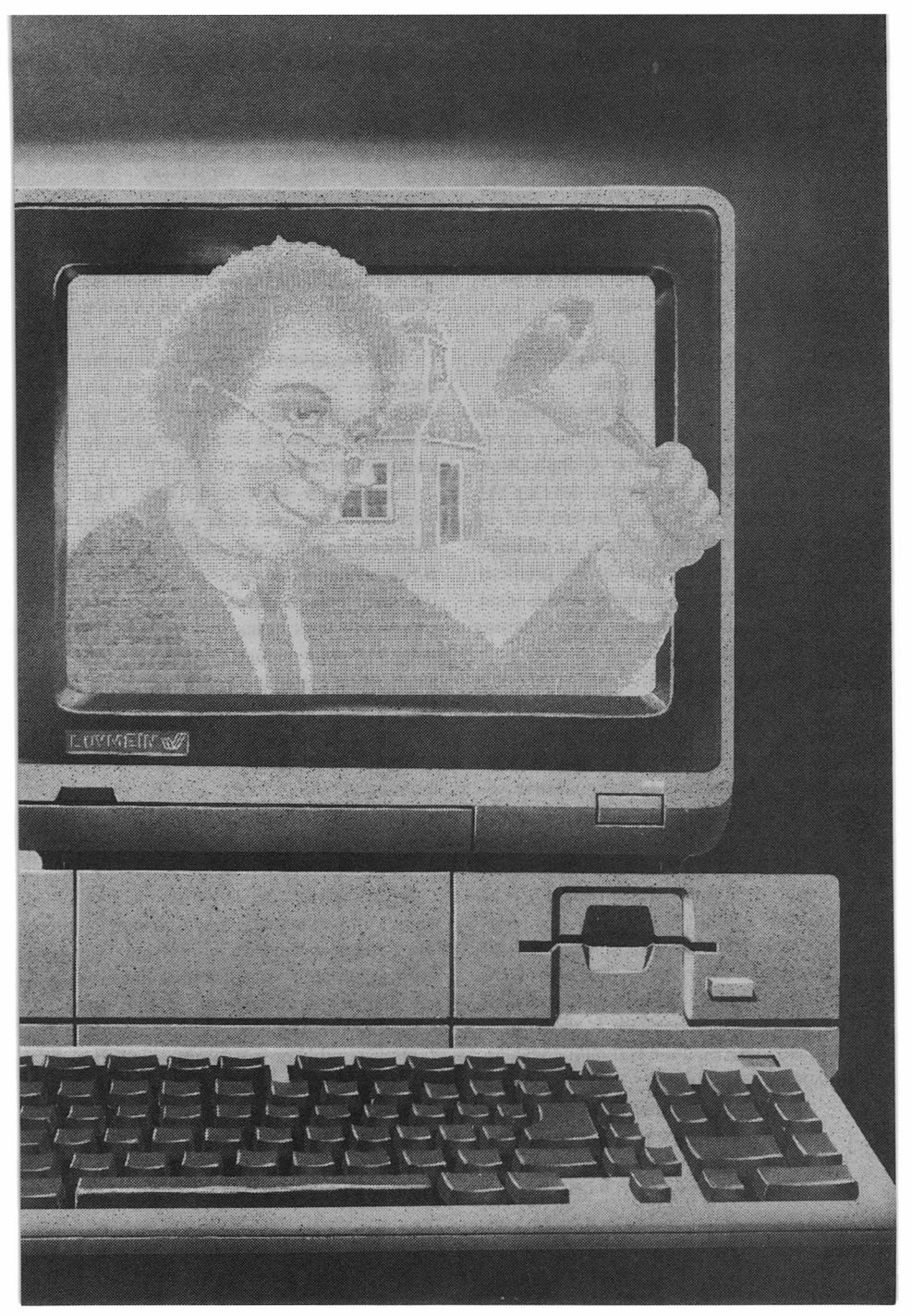

A Nation at Risk concluded, "If a foreign power had imposed this system of education on the United States, we would consider it an act of war." If our Nation is to continue as a world power our schools cannot afford to be at risk. Technology can help.

THINKING AND LEARNING WITH COMPUTERS

It could well be that developing the process of Artificial Intelligence may be more important than the AI applications themselves. As scientists develop AI, the world learns how non-artificial intelligence operates. When we examine how we approach and solve a problem, we see how the brain processes data. This, in turn, can help foster learning in students.

This whole cognitive area of AI opens up new views of learning as AI is refined. This is important to the schools because there is a stark contrast between what is happening in the cognitive sciences and what is happening in the classroom. Much of what happens in the classroom is a result of garbled educational theory or what the teachers' journals are saying.

Look for instance, at what the authoritative *Journal of Learning Disabilities*, said in 1986 about cognition:

> "Cognizing/cognition is thinking, and metacognition is thinking about your own thinking—being aware that you're thinking, noticing what you're doing as you think, and being able to control the process you're using so that you can switch from one kind of thinking to another."

The journal goes on to say: "researchers are finding difficulty on [sic] defining and assessing metacognition, and thus teachers can't be asked to teach the skills." Can't be asked to teach the skill of thinking or noticing how it is we reason and think? Balderdash!

With the advances being made in the cognitive sciences, why should our schools be held back? Why should the schools be geared to failure? Why more excuses for not doing the job?

Teaching is very hard work. The microcomputer can ease some of the needless burdens teachers face daily. A computer can offer teachers relief from mundane tasks: help prepare tests, score papers and tests, track results, point to new important resources and manage information systems, as well as help interpret results. Plus, it can stimulate and challenge the reluctant student.

Too many students become more and more reluctant to learn as they meet more and more indifferent instruction. Computers can help schools break out of these molds of failure.

As technology becomes more interactive, the reluctant student becomes more eager to involve himself in the learning process. The machine doesn't put him down; doesn't judge him on past performance; doesn't call him a "smart mouth" or a "dummy."

Each new disk or program can be a *tabula rasa*. Even if the student was in a stinking mood the day before, the computer doesn't know about the kid with an attitude problem. Each day is

truly new for him and he doesn't have to fear his reputation might precede him. Each time he sits down to the computer keyboard he has a new opportunity to prove himself.

TELECOMMUNICATIONS

Fine teachers eagerly share good ideas. Some hardworking and enterprising teachers already use computers to tap resources electronically: sometimes by contacting other teachers; sometimes by connecting to a professional database. Sharing information on small networks (Local Area Networks, or LANs) is an excellent way of economizing in time and money.

Information also can be accessed remotely, from another room, another building, even another city or conceivably another continent via satellite.

The advantages of Networking are:

1. being able to share software,
2. having access to multiple programs from a single disk drive, and
3. the potential control given the teacher.

The disadvantages are:

1. the difficulty of getting software licensed for LAN use,
2. the incompatibility of machines with the LAN,
3. the slow speed of access on network, and
4. the inability of LAN vendors to deliver needed products with desired features.

Historically, the Corvus Company has dominated the field of educational LANs, but many found it not very reliable for the money. Recently some smaller companies, such as Beckmeyer Company, have demonstrated very promising LAN equipment for the less expensive machines like the Atari ST. With the new equipment, time delays were not a problem for multiple users and the degradation of the signal for multi-tasking was hardly noticeable.

A modem encodes a computer signal across telephone lines for data transfer; then another modem decodes it for the computer at the other end. Some schools use Electronic Mail, called E-Mail, to transfer their school newspapers, outstanding research projects, Science Talent projects, and even plays written by the students.

A teacher calls up a bulletin board (NODE) and uses it to transfer student writing to a central office which acts as the GATE to other hubs (sites). It can be expensive, but some schools transfer information between midnight and 3 A.M. when phone rates are at their lowest, and some do it with no human intervention whatsoever.

Exciting information about science and math projects, sometimes supported by private foundation grants, is shared over the LAN. Sometimes the enterprising teacher passes it on to still another teacher over the electronic bulletin board. Commercial outfits help the local school district by running intern programs for entry-level jobs which train future employees while the company writes it off their taxes. The student is stimulated to learn and the employer benefits from the on-the-job training.

Social clubs such as Junior Achieve-

ment contribute to the exchange of information. This information can be put on the LAN and used in a Business Law class across town. Foreign language clubs offer comic books in Spanish and French written by the students; Future Farmers of America pass along what they have learned in their field work.

The Humanities have some promising software, with more on the way. The first type which comes to mind is word processing. High-schoolers produce their own Fanzines, D&D newsletters, and quarterly journals of science fact and fiction. Thanks to new desktop publishing programs, many of their products look very professional. Some are downloaded onto the District Network or even to other countries, such as to a Sister School in a foreign country.

One of the popular uses of modems is electronic gaming. Computer games, including those played by modem, demand you think on your feet. However, most of these games are simplistic and limited because few are played in real time.

Students love the games and smart teachers will find a way to integrate these games into the classroom lessons. Gary, an inner-city student, was playing a game and discussing a physics problem embedded in the game. He had studied the problem in school but had forgotten the solution. The ensuing exchange of ideas and reviewing of concepts exemplify the best kind of peer tutoring. Players teach each other how to apply logic. Happily, many bright teachers are involved in gaming conventions and the teachers carry the techniques learned over into their classrooms.

The game *MazeWars*, from MacroMind, can be played by two players on a modem attached to a phone, or up to 30 players with the networking system AppleTalk. *MazeWars* has another option—to play against a robot on a Macintosh.

ADVANTAGES OF COMPUTER ASSISTED INSTRUCTION

Instructional techniques in computer-aided instruction (CAI) tend to be either:

1. Drill and practice (skill practice)
2. Tutorial (skill instruction)
3. Instructional Game (motivational exercise)
4. Simulation (computer representation)
5. Problem Solving (student analysis)
6. Inquiry (supplementary information source)

The major advantages of Computer Assisted Instruction are that it is non-judgmental, self-pacing, and the management system keeps track of correct responses and error. Inner-city kids say they like working with the computers because they seem "color-blind." The students don't have to worry about keeping up or falling behind because their responses to the prompts on the computer screen pace how fast or how slowly the lesson will go.

SOFTWARE

Computer Literacy today means something different than it did just five years ago. Many schools in the past limited their Computer Literacy to the his-

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tory of computing, keyboarding functions, and simplistic applications. Now, some introductory classes modify already existing programs. High school classes examine present and future computer applications and programming languages including BASIC.

More and more programs are tied to outside resources. For instance, *Where in the World is Carmen San Diego*. from Broderbund. uses an atlas. *Science Toolkit*, also from Broderbund. uses sensors, thermometers, and scales which could be found in any science lab. This gives the student the chance to relate school work to real life through the use of a microcomputer.

All students need more opportunities to practice what they will face after leaving school and entering the job market. Simulating a realistic job situation is invaluable to them, and the student is more motivated and interested if it is obvious how he is going to use the skill. The microcomputer is an effective means to forge the connection between school and the world of work.

In mathematics the results of an equation can be fed back into that equation on the computer many times and can help students and scholars alike achieve a whole new set of abilities and links not seen or realized before. The user can see how things fit together when rotated, extended, shrunk, and altered. Voilà! A new definition or application may appear.

In math class you might hear, "Gee, Mr. Abato, where am I actually going to use this?" Mr. Abato might point out that even jocks are going to need math to calculate their football contracts. An engineer knows he will need math and uses the computer to do his proofs, but to others, it might not be so obvious and so they tend to neglect this essential skill. The computer removes some of this reluctance.

In one high school classroom, students play a game similar to Traveller once a week. The facts they learned that week are discussed in depth and are used as a springboard to see how they can be applied not only to the Traveller game but also to the real world. Role-playing gamers often say they hope the new, more powerful machines will make the scenarios more sophisticated and complex, and closer to life.

Richard and Phillip, two high-school students in a Computer Lab, were discussing micros: "When you were little you sat down to the Apple IIe and said, 'Wow, it is a computer,' but then you discovered you were still typing a, b, c. Logo isn't very good, but the high resolution graphics make it better."

Good simulations give you a chance to try out solutions to problems before they become critical. *The Factory*, out of Sunburst, shows the younger students (five to nine years) how to construct objects and see the results of their own building plans. For the older students, Monopoly, Diplomacy, and Trivial Pursuit are easily converted to computer games where the players advance along the board by answering questions.

There is a parallel between gaming conventions and microcomputer use. Gaming and micros attract the brighter kids and improve the skills of the less

able. The gaming format stimulates them to extend themselves and everyone benefits. For instance, *Type Attack* is fun because little letters come down from the top of the screen and points are given for shooting them down by pressing the correct keys.

Atari Corporation has started its own line of software. For their ST machines they have a line called the *Arrakis Advantage* which includes math and science tutorials. The colorful, animated graphics add a lot to the programs. They use simple commands to access information and tests. Each tutorial can be completed in three to six hours and in more than one session. You can quit at any time, and save your work, and it will give your score up to that point.

The Help screen shows a girl with her head down on crossed arms and a balloon over her head saying, "Help." Out of her monitor comes the upper body of a professorial looking man complete with receding hairline and horn-rimmed glasses. He pats the girl on the head and urges her to try the "Helps" printed on the screen.

Later, this same figure appears with a pointer to guide the user through the material. Humor is an integral part of the package. A teaching window presents subject material, graphics, review summaries as well as test questions. The answer line separates the teaching window from the directions window at the bottom of the screen. Each concept lesson ends with a test which is automatically scored.

The Arrakis line is for grades six through twelve, including algebra, geometry, statistics, trigonometry, biology, chemistry, and physics. The programs are not intended to be complete courses; however, they are good introductions to their topics. The appealing format could catch the interest of the student and the structure of lessons should hold that interest. With this example, more developers will realize the versatility of this new machine and capitalize on it.

The left brain has received a lot of attention by technology developers, but that doesn't mean the creative hemisphere has been ignored.

Music software is developed for two types of customers: the professional musician and the student. The professional musician, such as the composer, can play music, then alter, duplicate, or extend it. Orchestral composers now have a full 16-stave score program at an affordable price. The hardware itself is still expensive, but the advent of the Atari ST and the Amiga is altering that picture.

Most musicians think that if you're serious about your subject you ought to study theory. Many find music theory very dry to learn, but the interactive nature of the computer makes it at least bearable. Some firms, like Roland, have hired talented musicians to design their music software systems. New plans for future applications could eliminate still more of the drudgery.

Graphic artists now use micros to assist scientists in visualizing highly complex and complicated theories. Computer Assisted Drawing (CAD) programs are used to draw, then rotate the drawings,

expand and shrink the parts and change how these parts relate to each other. The expanded memory in the new machines allow for more flexibility and speed. Larger projects can be undertaken or miniaturized concepts can be visualized better by means of a zoom process.

THE LINK THAT MAY BE MISSING

Even distracted students can be motivated by good sound and graphics like those they grew up with on Saturday Morning television programs. They are usually more sophisticated than students of a decade ago, but the crowds around the monitors in the department stores are still excited.

The pleasure zone of the brain (the affective domain) reacts and motivates us to learn through our emotions. The brain rewards itself for completing the stimulus-response cycle of feedback and reaction to and from the computer.

The more positive and less threatening the stimulus-response cycle, the more willing the student is to take risks. The more risks he takes the more likely he is to synthesize information in a unique or more creative manner. A deeper understanding may result and new connections may be made to other knowledge. Thus, a "positive cycle" is completed.

How a student interprets his world depends upon what "models" of reality he uses. If his model is restrictive or unrewarding it can cripple his thinking and the way he relates to the world. If the computer offers new and different models, it may excite new neurological paths, causing the student to make new connections and possibly improve his models of the way the world works.

Since the world itself gives different answers according to the questions asked of it, the student has to compare his models to the databases in the computer. The student user can now raise new and different questions or even redefine his definitions.

The models become clearer as the student delves deeper into each discipline. The disciplines may coalesce and the user may discover still newer models.

The nature of the interaction between the human and the computer fosters a bond between the text and the reward systems of his brain. It is as if the student is getting normal brain rewards for work done by the microprocessor and thus the learner is stimulated to work harder.

The teacher shouldn't feel threatened by all this, but excited by the prospect of this fantastic tool. It doesn't have to add to his paper "snowstorm." He can rely upon the computer to monitor the student's progress.

With the increased power and memory in the new machine, more sophisticated approaches to learning will develop.

One exciting development is the development of windows. Windows are a way of having small screens pop up in a part of a big screen to offer help or explanation. When one is through with the window, it disappears with a press of a key.

When a student at the keyboard responds to prompts in a lesson, a window can open up on an unused part of the

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screen and explain why a response is correct or incorrect. When a key is pressed the window disappears and the lesson can resume; or a new loop can be offered to see if the concept has been cleared up in the student's mind.

More than one window can pop up. If the student needs to know the meaning of a word in a screen he can access a glossary, dictionary, or thesaurus.

NEW MACHINES, NEW OPPORTUNITIES

The new Ataris, Amigas (Commodore), and the second generation Apples with their awesome new graphics will make everything more exciting.

The video arcades attract because they offer excellent graphics. The Atari ST, Amiga, and the new Apples have arcade quality high resolution graphics and sound. Kids have become accustomed to the quality in the arcades and demand it in their homes and schools. The more sophisticated and challenging, the better.

The Atari ST is not expensive, well under $700, for a lot of machine. At a recent COMDEX, the Atari booth was like a honeycomb of retailers and developers. There were so many Atari exhibitors the owners of Atari had to schedule them in three shifts.

Developers are enthusiastic about the ST and it is easy to see why. The graphics are terrific and the machine affordable. Soon other hardware manufacturers will surely follow their lead.

Educators should establish standards to meet the needs of their students before computer engineers do it for them. When the engineers drive the market, sometimes it means problems for the user. As an example, the design engineers tend to type with two fingers and the touch typists find they have to remove their hands from the keyboard to backspace or sometimes even to use the carriage return. Ergonomics, or human engineering, is ignored.

WHERE ARE WE HEADED?

Traditionally the teachers' unions have been the primary lobbyists for money for schools. The newspapers are filled with disputes between the taxpayer and the teacher's union about how more and more money would solve the schools' problems.

Unfortunately, the teachers' unions often advocate throwing more money at the very problems they helped create. If their failed practices had not been fueled by Federal Aid to Education the country would not be "At Risk."

Some businesses and Senior Citizens' groups have "adopted" a local school. They are not necessarily investing more money, but offer guidance for the faculty. The experience these retired people and business executives offer the schools tend to make the schools more realistic about what the real world expects, even in kindergarten.

Many people are now educating their youngsters in their home through the home-school programs. I am not suggesting we all join the ever widening group of home educators, families which have chosen to teach their kids at home, though computers will feed this movement like tumbleweeds feed a California brush fire. I am suggesting that we be

realistic about our expectations for public education and that the expectations be raised.

Is it worth the student's time to use a piece of software? If so, does the software teach what it purports to teach? Or is the software merely another of those synthetic lessons educators use instead of direct teaching? Electronic pap is still pap. If it is arithmetic, have the student do arithmetic, with lots of computation and applications. If it's reading and writing, don't synthesize something which "looks and feels like" reading and writing.

One of the most basic skills is that of reading. A leading expert in the field of reading once said: "Computers can do very little directly to help children learn to read."

At a professional meeting I asked this "expert" if he had ever taught a class or an individual to read. His candid response was, "No, I have never taught a class to read. However, I supervised the teachers and compared reading techniques." It might be said his comment was shortsighted. The experts are only experts in comparing data, not in the teaching of reading.

Addison-Wesley Publishing Company is running Beta test on the school version of my program *Computers: The Reading Connection*. It combines learning theories which I have been investigating for the past twenty years. The emphasis in this program is "nothing breeds success like success." I have never failed to teach someone to read. My program will show people how to use the new microcomputers in an innovative way based on proven learning theories and practices, and some with no supporting research except that "it works."

The real "experts" are those who have taught thousands of people to read, even those labeled as "unteachable." Once a person can read the world opens up to them.

As Jerry Pournelle pointed out in the 1970s, "by the year 2000, anyone in Western society, who seriously wanted to, will be able to get the answer to any question that actually has an answer." Today, he says, "the only part of the prophecy in question is the year; it is already happening."

Soon, all of us will be able to tap multi-media resources. Right now, the specialists have instantaneous access to information not readily available to the general public.

The compact disk with read only memory (CD-ROM) can optically copy half a billion characters of digital information on a plastic five inch disk. The entire *Encyclopedia Britannica* can be stored on a disk which costs $3.95 to make and still leave room for more information. A veritable Library of the Month Club can be called up by modem.

Today, we use CD-ROMs in our home and students are using them in the University Libraries.

An exciting innovation is the combining of multiple media; combining the computer with a video disk, with overlays on top of that, and the windows which pop open to display more information or questions. The applications in education are enormous and may

change the whole concept of what can be learned and how to expedite this learning.

With the addition of huge data bases in ROM there will be enough memory left to operate games. The more choices offered the player, the more stimulating it will be. Of course these require creative programming.

The CD-ROM players will probably be down around $200 within five years and the disks will cost around one buck to produce. Universities and State Departments of Education will probably produce their own CDs to go with their curricula, then sell them at cost to school district subscribers.

The exciting thing about CD-ROMs is their ability to mix programs, text, data, voice, music, graphics, and animation. While showing a NOVA program you can import text from your microcomputer; include a window of graphics to explain a complicated idea; freeze a frame while you animate an illustration and add a voice-over from another NOVA program. The combinations are limitless and exciting.

Databases will be distributed by regular mail, then the contents can be accessed within seconds. Of course, time-sensitive data will still be distributed over telephone lines by modem.

If you don't score well on the SAT or ACT it can ruin your opportunities to get into the school of your choice, or your chances for that scholarship. Recall the relationship between our affective domain and motivation. If you show a student the relationship between the concepts in an SAT word problem by accessing a database, the student is usually hooked, and the standardized test becomes more than just an exercise.

In the near future good teachers will be able to create lesson plans and units not possible in 1988. The cost of both hardware and software will be much lower. Computers and technology will challenge educators across the Nation to address and meet their student's needs. Innovations will come from those bright, hard-working teachers who didn't give up and run to industry where they could make more money. Encourage them now and let the others know there are ways to catch up if they will take the time to "educate" themselves using all this technology.

The more we understand how the brain learns, the more we can develop technology to assist us, and the more we develop the technology, the more we will understand learning. It is clear that our schools need not be entropy driven. With the computer programs already developed we can halt entropy. By careful planning, our schools can use the technology on the drawing boards to eliminate the risk to our Nation. ■

ABOUT THE AUTHOR

Roberta Jane Pournelle has taught for over twenty years in private, public, and parochial schools, and until recently was the reading specialist and reading teacher of last resort in the Los Angeles's juvenile justice system. Last summer she presented a paper in Germany on CD-ROMs. A member of the National Association of Science Writers, she is married to best-selling novelist Jerry Pournelle.

on gaming

Matthew J. Costello

There was a time that I thought everyone should see Las Vegas once. After all, it's about as close as you can get to the Pleasure Parlors of Planet Stagor.

But after three treks there for the yearly bacchanalia of microchips and huxterism called the Consumer Electronics Show, I've begun to doubt my theory. To go to Las Vegas is to see a world devoid of culture and spirit, where the ebb and flow of life is reduced to the spin of a roulette wheel or a throw of the dice.

And, besides the neon, the glitz, and the other corporeal attractions, there are the games, especially the card games. Blackjack . . . poker . . . baccarat. And just as I'm sure that chess will be carried along, in some form, as we eventually explore our solar system, so I'm sure that a deck of cards will also be there.

Except maybe in won't be a deck. It might be a disc instead.

Recently, some novel card games have made their appearance on computer disk. One of the most useful, from the vantage point of someone who will be in Vegas come next January, is *Blackjack Academy* (Microillusions, Granada Hills, CA). The disk is devoted to one game and one game only — blackjack, or twenty-one. It deals the hands, to the player and the "bank," asks for bets, "hits" the player with a card when requested.

But it does a lot more than run a high-tech version of twenty-one. It is called, after all, *Blackjack Academy,* and it offers you a tutorial to teach you to play winning blackjack.

You can select Optimal Play, and the computer will give you the best play for your hand. It will also teach you basic strategy, and you'll learn the difference between a "hard" 13, and a "soft" 13. (The softie uses an ace, easily converted to a one.) There's a Betting Strategy tutorial, and you can find out the current card count.

Up to five players can try their luck, and the sleek, very entertaining game offers everything from Las Vegas Rules to Atlantic City Rules.

Less educational, but even more amusing is Accolade's *Card Sharks* (Accolade, 20813, Stevens Creek Blvd., Cupertino, CA 95014). *Card Sharks* offers a choice of games (blackjack, poker, or even hearts), and something more. You can select whom you play against, ranging from Ronnie, Maggie, and Gorb to Milton and Luigi. And as you play them, they make wisecracks, in character.

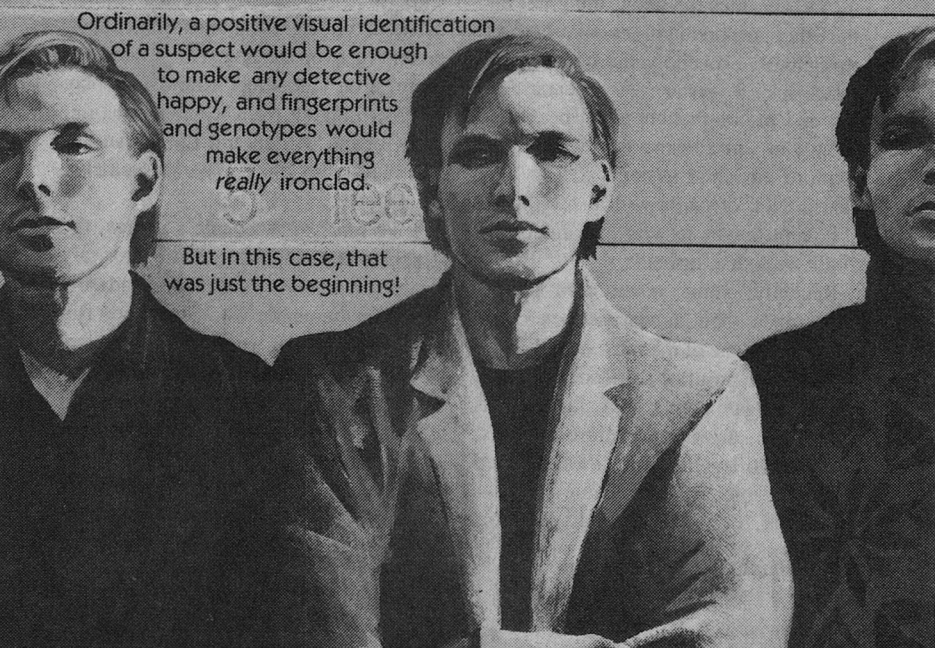
Like most of Accolade's games, the graphics are superior. The cards are dealt by a smoothly animated hand, and you hear the gentle whoosh as they flip down in front of you. The characters you play against grimace, reacting to their winning or losing, and the mechanics of playing couldn't be simpler or more user-friendly.

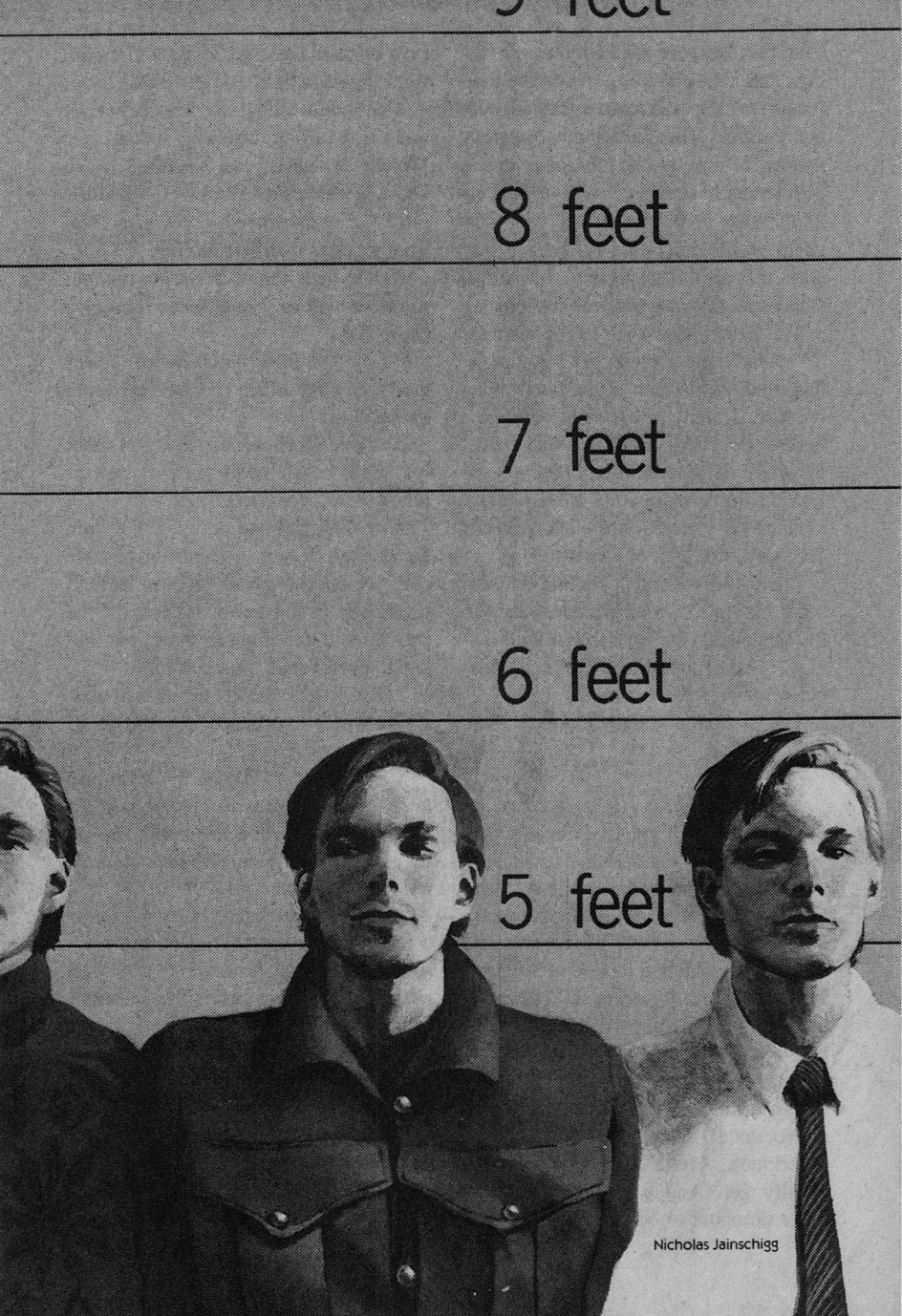
Spectrum Holobyte are known for

(continued on page 101)

THE ADVENTURE OF THE LAUGHING CLONE

Michael F. Flynn




9 feet
8 feet
7 feet
6 feet
5 feet
Nicholas Jainschigg

The first suspect walked through the door into the line-up room and the lieutenant saw the little man beside him suddenly stiffen. Then, as the other suspects walked in one by one, the little man's countenance changed, first to uncertainty then to bewilderment. The sergeant on the other side of the one-way glass told all the suspects to face front, stand straight, and take off their hats.

The lieutenant turned to the witness. "You have my assurances, Mr. Lewis, that none of the men in the line-up can see you. I want you to take your time before deciding, and be very sure. Which of these men, if any, did you see leaving the apartment of Beverly Higgins at two o'clock on the afternoon of Saturday, the 17th of October?"

The witness stared at the line-up, nibbling his lip like a rabbit. He turned to the lieutenant, his eyes round with dismay. "All of them!" he said in a whisper of disbelief.

The lieutenant sighed. He'd been afraid of that.

MONDAY A.M., 19 OCT 2026

"So. How'd it go, Lieutenant?"

"Like I expected." Police Lieutenant Morris Brumbaugh threw himself into his chair and stared morosely at the accumulated paperwork. He folded his hands into a ball and looked at Sergeant Maginnis. "An eyewitness," he complained to no one in particular. "A friggin' eyewitness saw the killer clear as day leaving the apartment. Not only that, but the man's an artist; he has an eye for detail. So he gives us a top-notch description, better than the crap we usually get. And what happens? The killer turns out to be a goddamn clone! Five of them, as alike as peas in a pod, right down to their friggin' DNA."

Mac knew about the case, but he hadn't read the briefing sheets yet. "Well, at least," he ventured, "we know it was one of them who killed the girl. We've narrowed it down to five. That's better than five million."

Brumbaugh threw his arms up. "It might as well be five million, for all we can prove."

"Toss 'em all in jail. One of them's guilty and the other four are covering up for him."

Brumbaugh shook his head. "I think we might be on shaky grounds constitution-wise, if we tried that."

Mac shrugged and pulled a pen from his pocket. It was a cheap disposable pen, which was good because he was constantly losing them. He twirled the pen around his fingers using his left hand. Brumbaugh watched him.

"Give it up," the lieutenant told him. "You won't ever teach yourself to be ambidextrous."

Mac sighed. "I'd give my right arm to be ambidextrous." He thought silently for a moment watching his fingers juggle the pen. "I suppose we got prints and genotypes and all."

"Yeah. And so what? Forensics found a fairly decent thumbprint on the bathroom doorknob. Matches the suspect perfectly. But it matches the suspect's four clonebrothers, too. So does the DNA print of the skin particles we vacuumed off the bedsheets and the semen the coroner found on the victim."

"Hunh. Usually it's the genotype that nails 'em. At least when we have tissue samples and a Jimmy to match them with. Hasn't been more than a handful

of unsolved murders in this town for, what? The past five years? Since genotyping came into use."

Brumbaugh scowled and worried a thumbnail. "Screw genotyping. It's going to be good old-fashioned police work that solves this one."

"Do we know how it was done? The murder, I mean." Mac reached over and searched through the papers on the lieutenant's desk, looking for the briefing screen.

"Yeah. And this creep's a real scumbag." Brumbaugh's face twisted in distaste. It was an unsavory crime, even in a city noted for unsavory crimes. "According to the old couple who live downstairs, they were in bed together, screwing up a storm. The victim and the Jimmy were. Not the old couple." He smiled sourly. "The coroner confirms the fact that the victim was 'engaged in standard heterosexual copulation' at the time of her death."

Mac shook his head. "At two in the Pee-Em? Jeez." He found the briefing screen and began scrolling through it. The briefing screen was a CRT flatscreen with all current cases in memory. There was a vocoder and touchpad for the addition and editing of new information. He held the screen in his right hand, working the scroll bar with his thumb, and continued to twirl the pen in his left.

"Apparently, he strangled her at the height of passion," continued Brumbaugh. "Then, he kept going until he was finished."

Mac looked up from the sheet. "That explains the rape charge, then. A corpse sure as hell can't give consent." He thought for a moment, scratching the side of his nose with the pen. "You know, I heard some people get off on that. I mean choking off the blood to the brain right when they climax. Not screwing corpses. They say it makes it ten times better. Do you think they were just engaged in rough sex and he accidently went too far? Maybe he didn't know right off that he'd killed her."

"Manslaughter instead of Murder One?" Brumbaugh shook his head. "Not with the neck bruised the way it was." He reached over and jabbed a forefinger at the briefing screen. "See here? His thumbs didn't choke off the carotid arteries. They crushed the windpipe. Doc said it might have taken a minute or more for her to die."

Mac shivered and dropped his pen.

"Yeah," said the lieutenant. "Can you imagine what it must have been like? To lie there dying, *knowing* that you were dying, with your killer lying on top of you getting his jollies?"

Mac had picked up the pen and stuck it in his pocket. He dropped the briefing screen back onto the desk. "Christ, Lieutenant! We've got to nail this slimebucket. If he kills for kicks, ain't no one else in the City safe."

"I know. And one other thing."

"What's that?"

"It's a pretty kinky killing, right? What if he did it because of some genetic flaw? Broken chromosomes, or some defect in his hormones. Remember, he's got four identical clonebrothers."

Mac winced. "Sure, I needed to hear that. I knew I was feeling too good when I woke up this morning."

"You understand," the police pa-

thologist told Brumbaugh, "that clones are no different than, say, identical twins. Or quintuplets, in this case. Identical twins are simply a case of Mother Nature doing the cloning." The pathologist was a youngish man, long and lanky, with a wash of cynicism in the twist of his mouth. Brumbaugh had never especially liked him, but he performed his job with workmanlike precision and generally gave good advice.

"How does that help me?" Brumbaugh asked him.

The doctor shrugged. "It doesn't." He was leaning back in his desk chair, his feet propped up. His white lab coat was stained here and there with the mementos of previous cases. He pulled a piece of paper off his memo pad and rolled it into a ball. "It's just that some people have weird ideas about clones. You know. They all think alike; or they have secret powers. Shit." He threw his arms up and made a set shot toward the waste basket in the corner. The wad of paper missed, and the doctor pulled another one off his pad. "Just laboratory twinning, is all."

"I was hoping you could tell me something I might be able to use. Some way of telling them apart. We have an eyewitness, you know."

The pathologist paused in the middle of his next set shot. "Do you? Lucky you." He shot. It bounced off the rim and fell in. "I don't know," he admitted. "I'm just a pathologist. I cut up dead meat to see how it got that way. I'm no geneticist, let alone a bio'neer." He wadded up another ball. "Have you talked to their designer or their parent?"

"We're still tracking them down."

"Hunh. Well, maybe one of them can tell you something. One thing, though. Clones are like other twins. They're only identical biologically."

"Is that all?" asked Brumbaugh sourly.

"No. What I mean is, from the time they're decanted, they grow up like anybody else. Their personalities are shaped by their experiences, and even growing up in the same household, they would have different experiences."

The doctor went for another two points, but the lieutenant stabbed out his hand and blocked the shot, snagging the wad in mid-air. "Explain that."

The doctor started to reach for another sheet of paper, but seeing the look on Brumbaugh's face, he decided against it. "Think about it, Lieutenant," he said. "Alpha falls off his bike and breaks his collarbone. Beta gets stuck in a tree and develops a fear of heights. Gamma gets mugged in Central Park and has a scar on his head. Delta gets turned down for a date and turns shy and introverted." He gestured awkwardly as he answered, as if he didn't know what to do with his hands. "I'm exaggerating, but you know what I mean. Twins have remarkably similar behavior patterns. Even twins raised apart often grow up with the same habits, hobbies, and occupations. *But they can't be absolutely identical.* Nothing in nature is. If nothing else, there's always random variation in cell division."

"And what does that mean?"

The doctor solved his hand problem by shoving them into the pockets of his lab coat. He looked at him. "Have you ever seen two items that came off an assembly line? Even consecutive items?

If you measure them carefully enough and closely enough, you can always find some difference. Even though they were made in the same dies on the same machine from the same material. It's the same with Mother Nature. In fact, Mother Nature invented random variation. That's why Darwin works. If you check your clones carefully, you'll find one has a slightly longer femur, say. Or one has a mole on his back that the others don't."

"All right," Brumbaugh said nodding. "I'm not sure how that might help me. The witness sure wouldn't know from a short femur or a hidden mole. But scars or behavior patterns . . . Maybe, I don't know. Like you say, there's gotta be *some* differences among them."

The pathologist eyed his memo pad longingly. "Glad to be of help, Lieutenant."

Brumbaugh opened his fist and jiggled the paper ball he had caught. "Don't mention it." He flipped the ball across his left shoulder. It hit the corner of the room, bounced off two walls, and fell into the waste basket. The doctor looked from Brumbaugh to the basket and back to Brumbaugh.

"And watch that set shot, doc. You're pulling to the left."

Mac and the lieutenant paused outside the interrogation rooms. The lieutenant consulted his notes. "Let's start with the first one. Barry Kavin." He shook his head. "Barry, Benny, Billy, Bobby, and Hank."

Mac looked at him. "Hank?"

Brumbaugh shrugged. "What else was left?"

"Buddy," Mac suggested. "Bubby. Bunny. Bucky."

Hank. The lieutenant wondered how anyone could give their kids such an outlandish sequence of names. But then, what would possess a man to make love to a petri dish instead of a woman? He glanced again at his notes. Rudolph Kavin, the father, lived in Milwaukee. If anyone would know about any differences or distinctions among the five clones, the father would.

"Any luck finding the father yet?" he asked Mac.

"No. No answer at his apartment. We keep getting his answering machine. We'll keep trying."

"Maybe the local fuzz can look in on him."

"The Kavins called him when we picked them up this morning. He could be flying into the City by now."

"Uh-huh. What about their designer? This . . ." He scrolled the display on his briefing screen. "Constantin Adamides, *Dr. Gen.?* He's supposed to be at the University of San Francisco now, according to the people at CCNY."

"We left a message with the University switchboard. He's not in yet. Don't forget it's three hours earlier out there."

"Yeah." Brumbaugh twisted his shirt collar, loosened his tie some more. The older a case got, the less likely it was to be solved. This one was already close to forty-eight hours old. It had taken a full day to identify and round up the five clones. With genotyping, the rounding up was usually enough to solve the case. At that point, positive identification was always possible. This one was the ex-

ception; the kind of case that separated cops from lab technicians.

Sherlock Holmes and Sonny Crockett notwithstanding, Brumbaugh knew that most police work was neither fancy deduction nor high speed car chases and shoot outs. It was more like trawling. You had to hit the streets and start dragging your net around. You'd pick up a ton of junk that way. Irrelevant information; contradictory information; uncertain information. And, buried in it somewhere, a few pearls of surpassing price. Maybe. Collecting the evidence, sifting through it, fitting it together into a meaningful pattern needed patience and determination, not brilliance or quick reflexes.

Sometimes—more often than he liked to admit—no pattern ever emerged. No matter how he turned and twisted the pieces; they just wouldn't fit together. And people he *knew* were guilty as sin had walked. But there had been times, times in the not-too-distant past, when Brumbaugh had been struck by some intuition, some flash of insight, when the pieces had suddenly fallen together of their own accord. At those times, Brumbaugh really had felt like a detective.

More than anything else, Brumbaugh wanted to crack this case. To prove that five years of reliance on genotyping to solve cases had not softened his wits. He cleared his briefing screen. "OK, Mac. Let's get this over with."

Mac jerked a thumb at the interrogation rooms. "Think we'll learn anything from those creeps?"

"Hell, no."

The interrogation rooms were small and dim and smelled of the sweat and body odors of a thousand nervous suspects, which the marvels of modern air conditioning had done nothing to dispel. Barry Kavin, if looks could be relied on, was doing nothing to add to the miasma. He sat behind the table with his lawyer at his side, the picture of unconcern and nonchalance. If he was nervous, he gave no sign of it.

Brumbaugh seated himself across the table from Barry. Mac leaned against the wall to the side. The lieutenant studied the suspect's features, looking for any telltale marks that might distinguish him from his brothers.

The clone was thin and angular, like Ichabod Crane. His face was narrow and his eyes sat too close together. It was a face you would have to work hard to trust. One that only a mother could love.

Which might be significant, because the Kavins didn't have a mother, unless you counted the agar that they grew in.

Barry Kavin wore a smile so slight that Brumbaugh had to look twice to be sure it was there. The smile irritated him. It was smug, as if the clone knew the game was already won and he was just going to dance a few waltzes with the police.

The clone nodded to the lawyer. "This here's my lawyer. Myron Kasabian." The lieutenant did not take the lawyer's hand, which didn't matter, since Kasabian did not offer it.

The lawyer was a fleshy man in an expensive three-piece suit and a tie with a below-the-knot design. A perfectly folded handkerchief peered over his breast pocket, like Kilroy in those old WW II drawings. He wore—of all things in this day and age—pince-nez.

Brumbaugh took an instant dislike to him.

They got the preliminaries over with quickly. Barry Kavin, aged twenty-seven, son of Rudolph Kavin, formerly of New York, now of Milwaukee; designed by Constantin Adamides, *Dr. Gen*. Brumbaugh asked Barry what he did for a living, and Barry said he was a financial consultant with an office on 52nd and Park, and he lived in a co-op in the East Eighties, and was well-regarded in his circles, and why was he being grilled by the cops?

Brumbaugh didn't answer him. Could Barry account for his actions on the afternoon of the 17th, say between noon and three P.M.?

The clone squinted his eyes and looked at the ceiling. His tongue moved from cheek to cheek. "Gee, Lieutenant. I dunno. I was in my office making calls until a little after one. My secretary was there. Does that count?"

"Is it usual for you to work Saturdays?"

"Sure. I get a lot of tips during the week, and I like to get in position so I can hit the markets first thing Monday morning."

"When did you leave the office?"

"I toldja. About 1:15. I went to meet my brother for lunch."

"Which brother was that?"

Barry shrugged. "Search me. They all look alike." He snickered, then looked at Brumbaugh's face and shrugged. "OK, so it was Billy."

"And where did you have lunch?"

"A Spanish restaurant at 42nd and Lex. I forget the name. We never ate there before."

"When was that?"

"I got there about quarter after one. Stayed until three, three-thirty."

"Long lunch."

"I like to savor my food."

"Yeah? What'd you have?" asked Mac.

Barry turned his head and looked at the sergeant. "*Paella Barcelona*. Billy and me, we split a pot." Barry flashed him a smile.

"Was Billy there when you arrived or did you come in together?" asked Brumbaugh.

"He came in about a quarter hour after I did and left at two."

"Yeah?" asked Mac. "Why'd you stay?"

The clone grinned again, even more broadly. "I met a coupla business acquaintances there and we shmoozed a little."

Brumbaugh probed the story. Could the restaurant's maitre d' verify those times? Kavin shrugged. Maybe. He didn't know. What about the time he had spent in his office? His secretary kept a telephone log, recording who he had talked to and when. Brumbaugh asked if he could check the log and Barry said, sure, go ahead.

"Now, what about the deceased, Beverly Higgins? You were seen leaving her apartment at two o'clock on the afternoon of the 17th."

"Not me, Lieutenant. Musta been someone else who looked like me." He grinned again and Brumbaugh had to suppress an urge to punch his face in. Kavin was mocking him, mocking the investigation.

"Did you know the deceased?"

"No. I never heard of her until your

guys picked me up. Ask Hank, he likes that sort of thing."

"What sort of thing is that?"

Kavin's eyes flickered left, then right. "Whores," he said.

"You think Beverly Higgins was a whore?" asked Mac from the corner where he lounged.

Kavin shrugged. "How many boyfriends did she have?"

"We're asking the questions here."

"Do *you* have any girlfriends, Barry?" asked Brumbaugh.

Kavin looked back at him. "Is that any of your business?"

"It might be. Why don't you let us decide that. We're police, not morality proctors."

Kavin sucked his teeth and looked at his lawyer, who wiggled a hand in a kind of manual shrug. "No. None at present."

Brumbaugh scratched his chin and made a note on his pad. "Do you have a family doctor, Barry?"

"Sure."

Brumbaugh looked at him. The clone was smiling broadly. All his teeth showed. "Do you want to tell me his or her name?" Brumbaugh asked him.

"Why not? It's Benny."

"Benny? Your clone-brother, Benny?"

"Right. *Doctor* Benny, if you please."

"Uh-hunh." Brumbaugh stuck his pen behind his ear and stood up. "That will be all for now. We'll be checking out your alibi and getting back to you. Meanwhile—"

"Yeah, yeah. I know. Don't leave town."

In the hallway, he and Mac compared notes. Kasabian, the lawyer, lingered nearby until a glance from Mac sent him scurrying for the washroom.

"I suppose that creep's the lawyer for all five of them," he commented.

"Wouldn't surprise me," said Brumbaugh. "Maybe they get a package deal."

Mac shrugged and glanced back at the interrogation room. "Financial consultant," he said.

"Right. Ten gets you one, Barry's clientele is just as sleazy as he is."

"Any chance of collaring him on that?"

"Ah, why bother? Arrest one guy for financial hanky-panky and you'd have to arrest half the City. Besides this is the big M-One, we're talking about, not stock swindles or touting horse races." He tapped his screen with his forefingers. "You want to have Jersey Wilks check up on the restaurant? Have him talk to the maitre d' and contact the two guys Barry met there."

"Can't. Jersey called in today. He'll be late. The PATH tubes are down—the whole friggin' loop from the airport to the Trade Center—and he has to catch the transit train from Elizabeth."

"Wilks should move to the City," Brumbaugh complained. "What was it, temperature problem again?"

"Yeah. Fire on the tracks. The ceramics lost their superconductivity. They don't figure to have the trains floating again until the Pee-Em rush."

Brumbaugh shrugged it off. "Hell with him, then. He can work late. No, wait. Call him up. Have him work from his house. Contact Milwaukee, Frisco, anything he can handle by phone or Net. Feed him any codes he'll need."

Mac jerked a head at the interrogation room. "Y'know, if Barry *was* at the restaurant having lunch at the time of the murder that would let him off the hook."

"Yeah, him *and* his brother."

"Too bad about the doctor, though."

"You figured that out? I was hoping their doc could clue us if there were any physical differences among the suspects. Something the witness might recall under hypnosis, maybe. No chance of getting accurate medical records, though, if *Doctor* Benny is keeping them. Nuts."

"You wanta talk to Benny next?"

Brumbaugh looked at his notes. "No. Let's check out Billy. See if he remembers going to the same restaurant."

"I've got a sawbuck says he does."

Brumbaugh sighed. "No bet."

The interviews all went the same way. The brothers all had the same ferret-like habits. The same way of rubbing their chin or sucking their teeth. The same air of nonchalance.

The same secret laughter.

Billy was a sharp dresser. His suit was obviously more expensive than Barry's and he wore a showy Yomatsu watch. His nails were buffed. He worked in an ad agency on Madison and told Brumbaugh that a dozen co-workers could vouch for his presence there between nine and one. The agency was conducting a crash campaign for a new brand of gene-tailored vegetables ("Delicious and Nutritious—on Purpose!"), and management had scheduled a Saturday morning brainstorming session. He had reached the restaurant at one-thirty and left at two. Yes, they ate *paella*. He stopped back in his office around 2:20, just to clear his desk. You know how some bosses are about clean desks. Brumbaugh said he knew how some bosses were about clean desks. Two co-workers were still there, plus the cleaning woman. They could vouch for him. Brumbaugh took their names without comment. What about the deceased? Never heard of her. She wasn't his type anyway, judging by the pictures in the papers. What about his brothers? What about them?

"We know it was one of you that did it. Shut up, Kasabian. We were wondering if you had any ideas."

Billy Kavin pursed his lips. "Do you know anything about clones, Lieutenant?"

"I'm learning."

"Well, we do stick together. Even if I thought that, oh, Hank, say, was a worthless sonuvabitch, I'd never turn him over to you. I might work him over myself, but I wouldn't let you have him."

"I've heard that about clone-sibs."

"Well, don't believe everything you hear."

"Like what?"

Billy smiled. "Like clones are so close to each other that they're telepathic. That our brains are so much alike that our minds resonate to the same frequencies and we can talk to each other whenever and wherever we want."

Brumbaugh looked at him for a long time. "No, I wouldn't believe a thing like that."

Bobby was a bartender in a Forty-third Street gin mill called Hanson's,

not far from Times Square and had a bartender's personality. He was superficially friendly, but guarded. He told Brumbaugh that he had had a burger and beer at a nearby Blarney Stone, and he was back behind the bar before twelve-thirty. He ducked out again sometime around 1:30, to mail a letter. Things get slow right after noon. You know how it is. Brumbaugh knew how it was. There were a couple of the regulars there, passing time. Did Brumbaugh want their names? They'd tell him ol' Bobby was there. Big as life and twice as mean. Beverly Higgins? Sure, he knew her. She was one of his regulars. In the bar, he meant. Regular customer. No, not that particular day. Did she ever come there with men? Yeah, sometimes. Anyone in particular? Bobby figured she played the field, but he thought he had seen her with a couple of guys more than once. What about his brothers? Had he ever seen her with any of his brothers? Bobby grinned crookedly. "No," he said, "and I'd sure remember it if *that* happened."

"Nice ring," commented Mac.

Bobby held up his hand and looked it over. It was a heavy ring. A man's ring. A snake eating its own tail. "Yeah, I like it. I'm not much for jewelry. That's Billy's schtick. But these rings, they were a gift from Dad. He had a set made for our eighteenth birthday."

"Barry and Billy weren't wearing theirs."

Bobby shrugged. "It ain't exactly a wedding ring. Sometimes I don't wear it either. Maybe they should wear theirs more often." He turned his hand and the ring caught the light from the wire-screened window.

* * *

"Doctor" Benny was all smiles. His face seemed a trifle softer than the others. Perhaps a tad pudgier. He was well-dressed, but his clothes did not have the sharpness of Billy's. His watch was plain and utilitarian and he wore the snake on his finger. He told Brumbaugh he had seen six patients in his office in the Chanin Building that day. Saturday hours? Sure, sometimes. That way working people could see him without taking time off from work. Mac told him he was a real Samaritan. Brumbaugh asked for the names of the patients. The lawyer humphed and reminded everyone that that was confidential information, as if anyone needed reminding. Did Dr. Kavin realize this was a murder investigation, and it was proven beyond a reasonable doubt that one of the Kavin brothers was responsible?

The lawyer objected to that and Brumbaugh told him to shut up because they weren't in court yet and Kasabian said it would never come to court.

His nurse was there, too, Doctor Benny told them. Did that help? Mac and Brumbaugh exchanged glances. The nurse's name wasn't confidential, was it? Doctor Benny laughed. No, of course not. She was there the entire afternoon and could vouch for his every move.

Did he know the deceased, Beverly Higgins? Yes, as a matter of fact, he did. She was a patient of his. Brumbaugh reminded him that *her* medical records could be subpoenaed and the doctor said he would be glad to cooperate in any way he could and Brum-

baugh said that was nice and the doctor said he was only doing his public duty.

Hank was different. Whether it was the psychological effect of his name or whether it was just coincidental Brumbaugh didn't know, but Hank Kavin was definitely more mellowed and laid back than his brothers. It wasn't anything in his face that showed it. It was the same, rat-sharp face that Brumbaugh had grown so tired of looking at all morning. But his voice and attitude were more pleasant. Altogether, he was more cooperative.

Brumbaugh was immediately suspicious.

Hank ran an art shop in the East Village. He was there from 10:00 A.M. until 2:00 P.M., when he closed up and walked home. His apartment was just a couple blocks away. Did he leave the shop at any time during the afternoon? Well, yes. He brownbagged his lunch in Washington Square. No, no one he knew saw him there. Brumbaugh asked if anyone saw him in the shop. There were a couple of artists from Alphabet City and NoHo who stopped in a lot. He carried a special line of acrylics tailored by SingerLabs and he had an exclusive contract on some special modeling clay that could only be found in Brunei. Some of the sculptors swore by his clay and came to his shop from all over the island and even from Brooklyn. He thought he remembered a couple of them from Saturday. Brumbaugh took their names.

Did he know Beverly Higgins? Sure, he did! Such a tragedy! A great loss to the art world. She was doing some *very* interesting work in clay and chips, what the critics were archly calling IA, Intelligent Art. She'd been exhibited at Greenfeld's and The Parting Shot. In fact, she was one of those who came in for the Brunei clay. He always called her, and a few other friends, whenever a shipment arrived.

Was she in his shop on the 17th? Yes, about ten-thirty. She bought some clay. She was going to make a life mask, she said. Brumbaugh asked him whose face and Hank said he didn't know. How did she seem to Hank that day? Worried? No. Excited, maybe. Like she was on the verge of a big breakthrough. Artists are like that, you know. Excitable. Brumbaugh said he didn't know and asked him his personal opinion about Higgins.

Hank sagged back in his chair. "I liked her," he admitted. "I know my brothers didn't. Especially Barry and Billy. At best, they tolerated her. But you know how that type is."

Mac asked if Hank had ever dated the victim and Hank said he had.

"We did a few shows together. Had some fun. Nothing serious, you know. I'm not into that scene. But, shit, she was good folks. I hope you catch whoever killed her, Lieutenant. I really do."

Brumbaugh blinked in surprise. "You realize that the genotyping shows the killer was one of you. You or one of your brothers."

The lawyer began to sputter but Hank waved him silent. "Sure, Lieutenant, I know it looks that way, but I just can't figure it myself. I mean, I *know* those guys. You know what I'm saying? I know those guys as well as I know myself. And I can't see any of them as a

killer. I don't mean that Barry wouldn't bilk an old lady out of her last dime; or that Benny wouldn't find the right pills for you; or that Bobby doesn't rake off the till at Hanson's; but Jesus, Lieutenant, those aren't in the same league as murder."

The lawyer looked about to have apoplexy and Hank laughed. "Ah, don't worry, Myron. I never said my brothers *did* any of those things. I only said I could imagine that they *could*. But not murder. No way. There's gotta be a mistake somewhere."

At the water cooler afterward, Brumbaugh asked Mac what he thought of Hank.

"The most cooperative one of the bunch. Certainly more likeable. More . . . normal."

Brumbaugh scratched the back of his head and stretched his muscles. "I know what you mean. The others are whaddaya call 'em? They don't like women. Not gay; but they just got no use or interest in the ladies."

"Misogynists."

"Misogynists, right. That's what they are. But not Hank. He likes 'em."

"Or he acts like he does."

"Yeah. This whole City's full of friggin' actors. What do you think? A man needs a woman every now and then, unless he's gene-gay and hasn't been retailored. That's a physical fact. What happens inside a guy's head if he needs women but despises them?"

Mac tossed off his drink and crumpled the paper cup and threw it in the basket. "He holds it in for a while. Until he has to explode. Then he does what he has to do, and afterwards he's disgusted."

"At who? The woman, or himself?"

"Mac shrugged. "Could go either way. If he's an introvert, he might crawl off and slit his own throat in loathing because he's so despicable. If he's an extrovert . . . Well, 'the woman tempted me, so it's her fault.' "

Brumbaugh smiled grimly. "That's an old excuse."

Mac laughed. "The oldest one in the Book. Genesis, Chapter three, verse twelve."

"Uh-hunh. What do you make of Hank? He's the only one who admits he had a relationship with the Higgins woman."

"Yeah, could be. And Barry and Billy both mentioned Hank, too. But don't forget Dr. Benny. He gets to see her naked all the time, or whenever she comes in. Maybe after a while, he wants to do more than look."

Brumbaugh sighed in frustration. "A lot of maybes. Try this. Hank's the odd one out, and he says he liked Higgins. Maybe we can work on him; get him to rat on his brothers."

Mac fingered his ear. "I dunno, Lieutenant. Clones have pretty strong sibling bonds. Even stronger than most twins. It's the look-alike thing. My brother is myself. Or my sister is. And they bond to the parent, too—at least when they're the same sex. The parent is just an older version of themselves. Sure, they go their own ways as adults. Everyone does. But they keep in closer touch than most sibs and they support one another when they're in trouble. I don't think you'll break their fraternity, Lieutenant."

Brumbaugh grunted and pulled on his ear. "What did you make of Billy's remark? About clones being telepathic."

Mac made a face. "You hear stories, you know what I mean? Some people say they do and some say they don't. Me, I think when guys are as alike as that, they can't help thinking the same things now and then."

"Yeah, I know what you mean. Sometimes Tillie does that to me. Answers my questions before I ask them."

"You been married too long, Lieutenant. That's your problem."

"Maybe. You did notice one thing about their alibis, didn't you, Mac?"

Mac pulled up his briefing screen and thumbed the scroll. "Sure. I even made myself a little Gantt chart. Take a look. They all got alibis for the afternoon. Not for the whole afternoon, but for enough of it that, if the alibis hold up, they're all off the hook."

Brumbaugh studied the little timelines as they crawled across the screen. There was one for each clone. The intervals were annotated with references to location and witnesses. Each clone could account for enough of the afternoon to make it impossible for him to be the killer. Brumbaugh smiled a little smile of satisfaction. "People with alibis," he said, "have something to hide."

MONDAY P.M., 19 OCT 2026

The maitre d' looked down his nose at the hologram. He turned it, first one way, then another, checking it from all angles. Then he handed it back to the lieutenant.

"Yes," he said. "That is the man. There were two of them."

"You are positive about the identification?"

"Absolutely. I have seen him in here many times before." He blinked rapidly. "That is, I have seen one of him in here before." He seemed to be confused regarding the proper syntax.

Brumbaugh was about to correct him. Both Barry and Billy had said it was their first visit to this restaurant. Then he remembered that Doctor Benny's office was only a short distance away, in the Chanin Building. He probably ate here occasionally. "Could you tell me what time they arrived?"

The maitre d' consulted his reservation book. "We normally do not take reservations for lunch, but I remember that this one called ahead and insisted. Ah, yes. Here it is: Barry Kavin, party of two, for 1:30. He arrived quite early, about 12:30, I should think, and waited in the bar for his . . ."

"Brother."

"Of course. His brother. One of them left after lunch, sometime around 2:00, I think; but the other encountered some acquaintances and spent the remainder of the afternoon in our bar."

"Your memory is pretty good."

The maitre d' shrugged. "One does not normally see twins of such exacting likeness. It was a sight to remain in one's memory."

Mac rang the buzzer and waited. After a few moments, a voice answered from the grill over the buzzer. "Yes?" It was a harsh voice, made more harsh by the ancient wiring and speaker.

"Sergeant Maginnis of the NYPD. Are you Karen Jo Lincoln, Benjamin Kavin's nurse?"

"Yes," the voice admitted cautiously. "Why?"

"I'd like to ask you a few questions."

There was a long silence. Then the door lock buzzed and Mac, taken by surprise, missed grabbing the latch. Irritated, he pressed the buzzer again.

It was a four story walk-up and Lincoln had the rear apartment on the third floor. When he reached it, the door was partway open on its chain. An eye looked at him from the crack. Mac pulled out his wallet and held the shield up. The door closed, then it opened again, this time unlatched.

Karen Jo Lincoln was middle-aged and brown-skinned. She wore a pair of 'round-the-house overalls, the baggy kind that covered her from wrists to ankles and hid whatever sort of shape she might have had. It was the style rage for the last several years, since the Reverend won the election; but Mac had never cared for it, nor for the sort of woman who wore it. Lincoln cut her hair in mannish fashion, parted and combed over, and wore no make-up of any sort. In fact, except for the curves of her face and neck, she might almost be taken for a fine-featured man.

All in all, she was exactly the sort of woman that a Kavin might hire.

Mac learned that "Doctor Benny" did indeed schedule Saturday appointments twice a month. The appointments on the 17th were routine, no emergency work. Two of the appointments had failed to show up. And Nurse Lincoln could vouch for Doctor Kavin for virtually the entire afternoon.

Mac asked her if she had left the office at any time during the afternoon. She admitted she had, but only between 12:15 and 12:45, when she ate lunch at a deli across from Grand Central Terminal, and again around 1:30, when the doctor had sent her on an errand to the pharmacy on the ground floor of the office building. During the remainder of the afternoon in question, the doctor had been with her or with a patient.

As far as the victim went, Nurse Lincoln had very little use for that sort of woman. Constantly flaunting and exposing herself to men, in direct contradiction to God's commandments. Lead us not into temptation. Whenever Higgins had come in for an examination, Lincoln had been present in the examining room. Otherwise, there would have been a potential for scandal. Yes, she did that for all of Doctor's female patients.

Was she herself a patient of Doctor Kavin? Well, certainly! Doctor Kavin was a gentleman. She would never trust her virtue to some stranger. Mac didn't ask her if she insisted on another nurse being present during her examination.

After leaving the restaurant, Brumbaugh walked to Grand Central Station and took the Number 7 to Woodside. The ride over was slow and rattling, since the Queensboro line had not been converted to magnetic floaters. Which was just as well, he thought, since the PATH tubes, which *were* converted, were frequently down due to temperature problems with the superconducting ceramics.

The neighborhood he found himself in was shabby and run-down. At one time, it had been Irish and Italian, and not too safe. Now it was largely Haitian and Filipino, and not too safe. Some

things were constant, at least; although he supposed that a policeman's view was likely to be cynical, at best. The row houses had probably been decent when new, but time, neglect, and the weather had taken their toll. Children played in the wreckage of one of the buildings. Their laughter seemed out of tune with their surroundings. The autumn wind seemed colder than it had in Manhattan, and Brumbaugh turned his jacket collar up.

The house he sought was neither better nor worse than the other buildings in the block. Keeping up a house needed money and the residents didn't have it and the landlords wouldn't spend it. He walked up the porch and rang the bell.

An old woman answered.

"Mrs. Genata? I'm Police Lieutenant Brumbaugh from Manhattan Midtown. I'd like to ask you some questions about some former neighbors of yours." He showed her his badge and she studied it. Then she studied him and thought about letting him in. Maybe it was his craggy good looks or maybe she was just resigned to fate, but she finally decided in his favor and opened the door.

Mrs. Genata was seventy-four years old and looked it. She was dressed in a "granny" dress and "earth" shoes. Psychedelic posters adorned the walls; pictures of the Beatles and Joplin and the Stones and others that Brumbaugh didn't recognize. Faint odors of pot and sandalwood clung to the curtains and carpet. She sat him down in a chair that was every bit as uncomfortable as it looked and offered him a cup of herbal tea.

Brumbaugh didn't care for tea, herbal or otherwise, and he wasn't sure what Granny Genata might have put in it, but he accepted politely. He set the steaming, earthenware cup down without tasting it and got down to business.

"You were once a neighbor of Rudolph Kavin and his children," he suggested.

Mrs. Genata screwed up her face. "That fascist? That chauvinist? Sure, he used to live in the house next door, on the right. But I wouldn't call those clones his children."

"Oh? Why not?"

"Because they were *artificial, unnatural.* Humans shouldn't interfere with nature like that." She shook her head slowly from side to side.

"I understand your feelings, Mrs. Genata; but what I want to know is how well you knew the children. Could you tell them apart?"

The old lady cocked her head, giving his question serious thought. "Police, hunh? I suppose you got the goods on one of them but you don't know which one. That's a real bitch, all right. Those brats were as alike as peas in a pod. They used to play tricks on me. Not just on me. On everyone in the old neighborhood. They'd pretend to be each other. Trade places, you know. I'd say, 'Now, Benny, you stop that.' And he'd say, 'I'm not Benny, I'm Billy.' And it was really Bobby all along." She shook her head, remembering. "It was enough to drive everyone crazy."

"Surely there must be something. No two people are exactly alike. Perhaps their behavior, or some personality trait. I realize it was a long time ago, but it would be a great help to us if you could recall something. We have an eyewitness we could autoregress, *if* we knew

what questions to ask his subconscious."

She shushed him impatiently. "Now it seems to me," she said, "that one of them—was it Hank?—was friendlier toward me than the others. The others were real pests. That son-of-a-bitch Kavin was a real chauvinist piggy. Hated women. Opposed the ERA. And he taught his kids to be the same way."

"Perhaps it was a genetic tendency they inherited from him," Brumbaugh suggested.

"Bullshit. That's fascist hereditary bullshit. It's environment and upbringing that makes people behave the way they do. You young folks should listen to your elders more often. Besides, if it were genetic the way you say, why was Hank friendlier than the others? He used to come to the house and do chores for me and I'd give him granola or wheat germ snacks." She sighed, remembering small kindnesses. "He didn't do it often, and *never* when his brothers or his father were around."

"What about the others? Do you remember any other habits or traits? Broken bones?"

She thought about it for a long time. Then she shook her head. "I heard something about one of them breaking an arm in a bicycle accident." She looked at him shrewdly and added, "that's just hearsay. I didn't see it myself. Let's see, though." She looked into the distance. "Was it Benny or Barry? One of those two, I'm sure." She shook her head. "What names! It was hard enough telling them apart without giving them sound-alike names, too."

* * *

Mac stepped into Hansen's and looked around. It was a typical neighborhood bar in the west forties. Old, splintered wood and plastic lamination. The smell of stale beer and liquor. The mirror behind the bar was fogged and a crack ran diagonally across it. Business was slow. Monday afternoons, it was always slow. There were five customers, one of them semi-comatose, huddled over their drinks. Mac wondered what drove some people to spend their lives in places like this. The bartender was cleaning a glass with a bar towel and watching Mac suspiciously. He could smell fuzz a mile away.

Mac stood up to the bar and flashed his shield. The bartender looked at it and shrugged. He'd seen them before.

"Bobby Kavin work here?"

The bartender put the glass away. "Yeah, but he ain't here now. Monday and Tuesday are his days off. Come back Wednesday P.M." He turned away.

"Nice place you got here," Mac said, watching a cockroach run along the molding at the bottom of the bar rail. "Board o' health been here lately?"

"Yeah. An' they gave me a clean bill."

"Yeah? And how many bills did you give them? You know . . ." He looked around the room. "You know, this looks like a bad place. A hangout, you know what I mean? Maybe you could use some extra police surveillance. To keep it safe, like."

The bartender sighed. "You made your point. Waddaya wanna know?"

Mac asked him about Bobby Kavin's Saturday stint.

"Yeah, we was both here Saturday. Saturday's a busy time, you know. Peo-

ple going out, they stop here for a quick one. People coming home, from wherever they were Friday night, stop here, too. Right after noon is the only slow time. You know how it is. Bobby was on from eight 'till three. I came on at one. So I know he was in here from one to three."

"He says he went out at 1:30."

"Did he? I don't remember. Yeah, I guess he did. More like 1:15. Had a letter to mail or something. He was out about half an hour."

Mac nibbled his lip. If the bartender placed Bobby here between one and three, he could not have committed the murder, no matter where he went between 1:15 and 1:45. Well, that eliminated another brother. At least they were narrowing the list down. He showed the bartender the names of the regulars Bobby had claimed to be present on Saturday.

The bartender told him that one of them was in the bar now and Mac asked him who, afraid it would be the comatose one, and the bartender pointed to a man in the corner scowling into a shot and beer.

The man was surly, but grudgingly cooperative. Sure, he was here Saturday. He was here *every* Saturday. He was here every single goddamned day. Like, sitting here was his only job since he got laid off, see? Bobby Kavin? Sure, the geek was here. He was a sunuvabitch. He always watered the drinks when he thought you couldn't see what he did behind the bar.

Mac thanked him insincerely. Bobby's story had checked out; but he would be sure to chase down the other witnesses, too. Like the lieutenant always said, you had to touch all the bases. Check out all the stories five ways from Sunday. Find the loose thread that would unravel the whole thing.

He snapped his notescreen shut and stepped out onto Eighth Avenue and took a deep breath of air that, while not precisely fresh, at least did not smell of beer. A huge billboard atop the building across the street reminded everyone that God saw everything. In the poster, God looked suspiciously like the Reverend President Sawyer. Mac wondered if God would come forward as a witness. He hoped the lieutenant was having better luck.

MONDAY EVENING, 19 OCT 2026

By coincidence, they met on the steps of the precinct house. Brumbaugh waited at the door for Mac to catch up with him. "How'd it go?" he asked the sergeant.

"Depends."

"On what?"

"Well, both stories I checked out are holding up. That's bad news, because we can't pin it on Bobby or on *Doctor* Benny. But it's good news, because that narrows it down to three."

"One," said Brumbaugh. "Barry and Billy were definitely at lunch together during the time Higgins was being murdered. We'll check out the rest of their stories in the morning, at their offices; but hell, we know the killer went into Higgins's apartment about 12:30 and left at two. So if they've got alibis for any part of the afternoon . . ." He finished with a shrug.

"So that leaves Hank. The one who doesn't mind girls."

"Yeah. Odd man out. The different

brother with the different name. That's so damned pat it stinks."

"Yeah. And you know what I think?"

"What?"

"*His* alibi is gonna check out, too."

When Brumbaugh entered the bullpen to clear his desk for the day, he experienced a shiver of *déjà vu*. Seated in the wooden chair beside his desk was one of the Kavins. For a split second, he wondered if the clone had come to confess; or to rat on one of his brothers. Then he realized that it was a different person entirely, because this particular individual had gray hair, cut short in what they used to call a "buzz."

He walked to his desk and stuck out his hand. "You must be Rudolph Kavin, from Milwaukee. I'm Lieutenant Brumbaugh, in charge of the case. I'm glad you're here, because you can help us clear up—"

"Why are you holding my boys?" the visitor demanded. "You've got no right to do that. I talked to them, and that lawyer of theirs, while I was waiting for you. They were all somewhere else when that tramp was getting her desserts. You know that and I know that."

Instinctively, Brumbaugh shifted his mental gears. The acorns had not fallen too far from this particular tree. This man had not come to help, but to get his sons off. While behaving as offensively as possible.

He studied Kavin closely. Aside from the buzz cut and the grey coloring, the man looked surprisingly youthful. Brumbaugh noticed the telltale, face-lift scars behind the ears. The natural diamond stickpin. The Yomatsu watch. The carefully manicured nails. *Vain,* thought Brumbaugh. Here was a fellow who thought highly of himself; and felt everyone else should, too.

"We have probable cause," he said without amplification. "We can hold them for another forty-eight hours." *After which, they walk,* he thought disgustedly. He had never been in a situation where he had such positive identification, yet no grounds to hold a particular individual.

"Nonsense. You're picking on them because they're clones. Naturalistic chauvinism. You think you can pander to the prejudice of the public. Of the Men Born of Women."

The scornful way Kavin uttered that last remark made Brumbaugh wonder. Chauvinism could run both ways. The Men Born of Women. And who were The Men *Not* Born of Women? he wondered. The new *Übermenschen?*

"Things may be different out in Milwaukee, Mr. Kavin," he told him, "but here in the City, no one cares about clones. Here, *everyone's* a minority. We've got people in every conceivable size, shape, color, and birth. Homo and hetero. Black and white. Natural and gene-tailored. Hell, we've got a detective on the force who . . . Well, never mind. Just rest assured that, if your sons are under arrest, it's because of reliable evidence and not birthism."

Kavin grunted and looked unconvinced.

"In the meantime," Brumbaugh persisted, "you can help us find grounds to release those of your sons who *are* innocent. Is there any way at all of telling them apart?"

Kavin looked at him and something

new came into his eyes. Brumbaugh wasn't sure what it was. He couldn't place the look. He only knew he didn't like it.

"Is that all? Some way of telling them apart? Lieutenant, they are clone-children. Do you know what that means? It means that they are exactly alike."

"Didn't one of them break an arm one time, in a bicycle accident?"

"Who told you that? No, never mind. It was a leg, not an arm. The damn fool driver ran right into my boy. Smashed the bike."

"Which boy was that?" Brumbaugh asked. *Maybe one of them still walks with a slight limp. Some way of carrying himself that the witness' subconscious might have noticed.*

Kavin looked at him for a moment, as if making up his mind whether to cooperate or not. "That was Bobby," he said at last. "He was eight at the time."

"Are there any other distinguishing behaviors? Any nervous tics, or habits?"

"Nervous ticks or habits. Not that I . . . No, wait. Benny, He always drops his eyes when he talks to you. I wanted my boys to look me straight in the eye when they answered, but he always dropped his eyes first. And Billy, whenever he's nervous, he runs his left hand through his hair. Like this." Kavin demonstrated, running his fingers front to back. He chuckled. "Of course, it's different when you wear long hair, like my boys."

"Anything else?"

Kavin paused and seemed to think. "No, nothing that I can think of off hand."

"Could you think about it some more? We'll talk again tomorrow."

"I'll do my best, Lieutenant. I'm staying at the Holiday Inn Midtown. Room 104."

He stood to leave, hesitated, then stuck out his hand. "Sorry to be so hostile at first; but you know how it is when your own flesh and blood is at stake. It's even more so when they're clone-children. We have a very special feeling and relationship for each other. I'm sure this is all some gruesome mistake."

Brumbaugh shook his hand and watched him leave. He became aware of Mac standing behind him. He turned and saw Mac twirling a pen between his fingers and lounging up against Jersey Wilks's desk.

"How did you like that performance?" he asked him.

Mac grinned. "I liked the Jekyll and Hyde act."

"Yeah. Turned real cooperative all of a sudden. Something I said made him happy."

Mac made a long face. "A happy Kavin is not a good thing."

TUESDAY A.M., 20 OCT 2026

The next day, Brumbaugh sent his team out to comb the city. He told them to check everything they could think of; then to check everything they couldn't think of; then to check it all again.

Jersey Wilks was in and gave his report. The PATH tubes were up at last and he had floated in early, to make up for yesterday. Jersey was a black man, dark black, and built like an angry defensive linesman. Crowds parted instinctively when he walked down the street. Only Brumbaugh knew Wilks's

dark secret: that he was a bird-watcher and butterfly collector.

He was also the best records man Brumbaugh had.

"So, what'll it be, Lieutenant?" he asked. "Public school records? Bank accounts? Credit cards? Police records?"

"We already know they got no priors," growled Brumbaugh.

"Did you know Benny was rich?"

"I figured it. He's a doctor, isn't he?"

"Sure. He rakes in the credits like leaves on a fall day. But it all goes in and hardly any of it goes out."

"What do you mean?"

Wilks shrugged one shoulder. "He don't spend it. And when he does, he doesn't buy top of the line, even though he can well afford it."

"Why do you suppose that is?"

"How should I know? Maybe he found out hell is expensive and he's planning to take it with him."

"Uh-hunh. What about the others?"

"Barry and Billy are both well off; but Billy's the real spender. Lives on the edge. Barry, he's like any other wheeler-dealer. He could be fabulously wealthy or dirt poor. No one can tell. The other two? Hank's shop keeps him comfortable; but Bobby is pretty much hand-to-mouth. Barry's loaned him money from time to time. Never paid back."

"What else you got?"

"Well, Bobby was in the hospital once, when he was a kid. Traffic accident. They all five came down with neo-mumps. In school— How much of this do you want?"

"Wilks, if I knew what was going to be important in this case, I'da told you to get it."

"Have it your way. They were all B+ students in high school. They all went to the same college—CCNY. They all joined the same frat. They're all registered Independents. Oh. Police record." He grinned at Brumbaugh's surprise. "No, none of 'em were ever arrested. But the father was a complainant on a case back in 2013. Claimed his sons were being harrassed because they were clones. I guess Barry was beat up pretty bad by some neighborhood kids." He shook his head. "I guess they ran out of blacks and Hindus." He scrolled some more pages. "Let's see. I wasn't able to locate their father, Rudolph," he told Brumbaugh. "Local cops cruised by his house, but no one was home."

"He flew into the City. Showed up on my desk late yesterday."

"Yeah, I know. Still want my report?"

"Just give me the high points. I'll read the rest later."

"OK. He works at Matusiak and Kobesky. Genetic counselors. They told me he called in around 0900 Monday morning. Said he wasn't coming to work because Billy had called him from New York. Said 'his boys' were in trouble and he was going there to straighten things out." Wilks scrolled his notescreen. "Matusiak wasn't too thrilled because Kavin had taken an early start on his weekend, but he gave him three days off with pay. He says Kavin's a good worker. High productivity. Not many client complaints."

Brumbaugh grunted. "How do you measure productivity in genetic counseling? Never mind, I don't want to

know. What about Adamides? Did you locate him?''

''Uh-hunh. He said there was nothing out of the ordinary about the Kavin cloning. No special designs or modifications. Strict specs, though. Straight carbon copies, was the way he put it. I could tell he didn't want to open up to me. You know how you can sense when someone is holding back? Well, I got that from this Adamides guy. So I leaned on him a little. He didn't want to admit anything at first, but I finally got out of him that there were originally *eight* Kavin clones.''

Brumbaugh straightened up. ''Eight, did you say? Where are the other three?''

Wilks shrugged expressively. ''Well, he was a little evasive about that. He says that one of the clones didn't 'take' and that the other two failed in morphogenesis.''

''Morphogenesis?''

Wilks grinned. ''Look it up.''

''So what did he do with the three rejects?''

''He says he aborted them.''

''You don't believe him?''

''I don't know. Something I sensed. I think maybe one of them wasn't.''

''Wasn't aborted.''

''At least, not the way Adamides said.''

''Then there may be a *sixth* Kavin running around town. One that Daddy and the Carbon Copies don't even know about.'' A sixth clone. That would explain how the five Kavins could have such good alibis and still leave a tissue sample at the scene. If it were true. He wondered who could have raised number six. Adamides? What must it be like to be part of a brotherhood, but outside it? He tried to imagine the outcast clone, lurking in the background. Resentful. Wistful. Jealous. Watching. Copying. It might work. If it were true.

''That's about the size of it,'' admitted Wilks. ''Of course, maybe this Adamides character is speaking sooth, but I just get a feeling, is all.''

''All right. Someone has to go down to CCNY and check their cloning records. Especially the Tissue Sample Traceability Records and the Lab Reports.''

''From twenty-seven years ago? Sounds like a bitchin' job.''

''It sure does—and it's yours.''

Wilks made a face of great joy. ''Gee whiz, thanks, Lieutenant. You're a pal.''

Hank's alibi checked out, of course.

Brumbaugh took the Lex to Bleeker and walked to Great Jones Street. Hank Kavin's Art Supply Store was open. The stressed glass sign projected in the window gave the Saturday hours as 10 to 2, in glowing letters. Brumbaugh studied the sign, trying to see how it was done. Intelligent windows, they called them. Window glass and computer chips were both silicon.

Inside were two clerks (one male, one female, both young) and a handful of customers (in assorted shapes and sizes). The place smelled of clay and paint. Brumbaugh browsed for a few minutes while the clerks dealt with some purchases. He studied the rack of acrylic paints, wondering how anyone could distinguish among so many subtly different shades. Blue-green and Green-blue. What the hell was the difference?

And all the different browns. Burnt Umber. Sienna. Some of the colors had fantastic names. Martian Rust. L5 Ebon. He wondered what would happen if he switched some of them around. Would any of the artists really notice, or was it some sort of game they played among themselves?

Thinking about artists reminded him of Lewis, the witness who had seen one of the Kavins leaving Higgins's apartment. Did they have enough new data to make autoregression worthwhile? Speakeasy caused total recall. Under the *smertechka* the witness could recall details the conscious mind overlooked. But you had to know what questions to ask.

And Speakeasy was a rough drug, too. It opened *all* the doors in the subject's mind. Shook loose every forgotten sorrow, every buried secret. All the petty and shabby acts of a person's life bubbled to the top of the conscious mind, like the froth on a wastewater settling pond. It was a harrowing experience and, by law, could not be performed without the subject's consent, nor repeated for at least six months.

At last the clerks were free and Brumbaugh presented himself. The announcement that Hank Kavin was a suspect in a murder investigation disturbed them. They didn't think it was possible. Brumbaugh assured them that anything was possible and asked if either of them had worked the previous Saturday.

The young man had. He told Brumbaugh his name was Kyle Karson—with a K—and he had worked all day Saturday until they closed up. They were in the shop until maybe 2:10, locking up. Brumbaugh questioned him closely about Hank's story, and he confirmed all the particulars. He asked him if he knew where Hank had gone for lunch and Karson with a K told him he wasn't sure but he thought that he had bagged it to the Square.

Brumbaugh thanked him and left the shop. He walked down Great Jones until it changed into West 3rd Street. Then he turned north and walked to the park. There was the usual potpourri of hangers out. Painters painting the arch. Dicties scoring dope. Young lovers sitting demurely on blankets, afraid to do what they wanted to do because who knew when a morals proctor might come along?

The dicties and their pushers were playing it so cool they were superconducting. The little packets and the big wads changed hands quickly, surreptitiously. Fooling the proctors was how the game was played. A handshake. A pat on the back. An *abrazzo*. It was easier to disguise that sort of transaction than it was to disguise an illicit kiss, but Brumbaugh's practiced eye was not fooled.

Neither were the pushers. They saw him, made him, and dismissed him. They were almost defiant. They knew with a glance that he was not there for them.

There was no chance that he could confirm Hank Kavin's presence in the Park. Some of these people had undoubtedly been here that day; but the probability that anyone would nark to a policeman was as close to negative as you could get.

He continued through the Park and caught an uptown Eighth Avenue train

at Fourth Street and rode it to Columbus Circle, coming up in the Hearst Building. He walked the two blocks to the hotel.

At first, the desk clerk did not want to cooperate, but a look at Brumbaugh's credentials effected a marvelous transformation in attitude. Actually, the clerk was perfectly correct, Brumbaugh reflected. Information on guests could not be given out to every Jimmy that trucked in from the street. He studied the register screen.

R. Kavin. Room 104. Address 1227 N. 23rd St, Milwaukee. Checked in at 12:08 on the afternoon of the 19th. Brumbaugh copied the credit card number.

R. Kavin bowed him into the room with the same false heartiness that he had shown the day before in the police station.

"Ah, Lieutenant . . . Brumbaugh, right? What can I do for you? Have you released my sons yet?"

Brumbaugh shook his head and looked around the room. "Not yet. We started the paperwork this morning, but it'll take a while to get it processed." Brumbaugh thought that "lost paperwork" was the greatest invention of the criminal justice system. For some reason, the NYPD computers had more timely disk crashes, keystroke errors, and accidental erasures than any computer system in the world.

"Just a few questions we're double-checking. Which of your sons called you Monday morning to tell you of the murder?"

Kavin sat on the edge of the bed. Brumbaugh remained standing, but he leaned his backside against the dresser to take some of the weight off his feet. There were a brush and comb, a razor—the old fashioned kind—and some toiletry articles. Idly, he moved them around with his left hand, playing a kind of chess game with them. Kavin scowled at him, resenting the familiarity, but unwilling to make an issue of it.

"It was Billy who called," Kavin answered.

Brumbaugh looked up, abandoning a checkmate on the deodorant. "Are you sure?"

"He told me it was Billy. My sons don't lie."

"To you, maybe. But one of them's lying to us."

Kavin shook his head. "I don't believe it."

"What time did Billy call you?"

Kavin frowned. "I'm not sure. I don't remember. Early. Maybe eight or so. I packed a bag immediately; called work and told them I wasn't coming in; and grabbed the next flight to New York."

"Yeah? How was it? The flight."

"Bumpy coming over the Appalachians, but the landing in Newark was smooth."

"Yeah, I know what you mean. It's the take-offs and landings that get me. That's when most things can go wrong. Once you're up, you're up." He scrolled across his notescreen, glanced at it. "Have you given any more thought to what I asked you yesterday?"

"About differences among my sons? Yes, I have. I'm sorry I can't help you much. I mean, *I* can tell them apart, but I'll be damned if I know how."

Brumbaugh thought that R. Kavin

knew exactly how he could tell his sons apart, but he wasn't going to cooperate. The family bonds were too strong.

"Bobby has a scar on the back of his scalp from that bike accident," Kavin continued. "I don't know of any other physical differences, though I'm sure they must have picked up random scratches over the years."

Sure, thought Brumbaugh sourly. *But none of them on the face.*

"What about non-physical differences?" he asked.

"Psychological? Not much there, either. They're as alike as peas in a pod."

Brumbaugh was tired of hearing that. "Have you ever seen peas in a pod?" he asked.

"Hmmm? Oh. They aren't very much alike, are they?" He laughed shortly. "Silly metaphor, isn't it."

Brumbaugh crossed his arms. "Suppose you tell me a little about each of your sons. Just give me an impression of each."

Kavin sucked his teeth. "I don't suppose you mean about how gentle they are and how they wouldn't hurt a fly? No, I didn't think so." He tilted his head back and pursed his lips. "Well, let's start with Barry. He's the best of the lot. Serious. No nonsense. Billy's the most like him, I guess, except maybe he lives a little faster. Barry's more a nose to the grindstone type. Billy will wear the Yomatsu watches; Barry prefers a cheap, reliable Brazilian one. Chances are, where you might find Billy in an after hours joint, you'll find Barry working late in his office." He looked at Brumbaugh steadily. "I don't want to exaggerate the difference, understand. This ant and the grasshopper thing. To anyone else, their behavior might seem pretty much the same. I'm their father, so I notice little things."

"Uh hunh. What about the others? How would you characterize them?"

Kavin pursed his lips and looked past Brumbaugh's shoulder. "Well, there's not much to say about Bobby. He doesn't have his brothers' drive and ambition. The others are all professionals or own their own business. Bobby's satisfied with being a bartender in a crummy beer joint. If I had to sum up his personality, I'd say he'd rather watch life than live it."

"And Benny?"

"Benny." Brumbaugh thought he saw a faint twist of disapproval in Kavin's mouth. "Benny's all right, I suppose."

"You don't like him."

Kavin looked surprised. "What? Don't be absurd. He's my son. More than my son. He's my clone. I love him as much as I love all of them."

Brumbaugh wondered how much that was. He didn't think Rudolph Kavin loved any of them half so well as he loved Rudolph Kavin. In a sense, he had had children by making love to himself. There was more than a little narcissism in such an act. "So, tell me about Benny."

"It's not so much Benny," Kavin admitted. "It's that . . . employee of his."

"The nurse? Karen Jo Lincoln?"

"Yes. The woman."

"What about her? Too dark for you?"

"Too . . . female, if you must know."

Brumbaugh thought that, from what

Mac had said, "too female" would be the last description he would apply to Lincoln. Though, come to think of it, the repressed sexuality of both the doctor and his nurse implied a rather considerable psychological tension. Who knew how that might express itself after hours?

"You do know that if Benny is seeing female patients, then he must have a female nurse to chaperone the examinations?"

Kavin sighed. "Yes, I know that. I told Benny he should see only male patients; but he said that would give a wrong impression in some quarters and he would be in violation of some absurd civil rights rule. Besides, women being the weaker sex, they are more prone to ailments and psychosomatic ills, so there was a lot of money involved, too."

"And the money is important." Brumbaugh stated flatly.

"It is to Benny. Now Billy, he's a spender. He likes what he can buy with the money. And for Barry, the money is just the scorecard and the fun comes from playing the financial game. Benny just likes the money. He went into medicine because he thought he could rake it in faster. He didn't love it the way Barry loves finance."

"Scrooge, hunh?" Brumbaugh made a mental note never to see *Doctor* Benny professionally.

Kavin shook his head. "Scrooge? No, not the way most people would understand it." He shifted his place on the bed, looked at Brumbaugh, then looked away again. "Which brings us to Hank."

"Yes, what about Hank?"

"Hank is the loner. He's different from his brothers. Even when he was young I could tell."

"Did that bother you?"

Kavin opened his mouth, closed it, and opened it again. "A little. What parent is there that doesn't fear his child may be defective?"

"Different isn't defective."

"Isn't it? It all depends on your standards, doesn't it? If you have standards. Or are you one of those egalitarians, who think that there is no one best way?"

"My beliefs aren't the issue here. One of your sons is a murderer. My job is to find out which. Or doesn't murder violate your standards?"

Interestingly, that seemed to strike something in Kavin. His face grew sad and a little wistful. "No, Lieutenant, I never raised my sons to be killers."

"But one of them is. That makes him 'defective,' doesn't it? Help me stop him before he does it again."

Kavin gathered himself together. "No, again, Lieutenant. You see, I don't accept your contention. There's been a tragic mistake here, that's all."

Brumbaugh shrugged. "All right, then. Tell me how Hank is different from his brothers."

Kavin paused in thought for a while. "Hank has been a disappointment to me, even more so than Bobby. He hasn't measured up to my expectations."

"Meaning he likes girls."

Kavin looked at him sharply. "He associates with them. More than he should. But I'm positive he hasn't done anything filthy."

"You don't like women yourself, do you?"

"They are no longer necessary. With human cloning legally available once more, men can reproduce themselves without the sloppy and painful need of forming a . . . a 'relationship,' I believe they used to say."

"Relationships can be painful," Brumbaugh admitted. "Only the dead feel nothing."

Kavin laughed. "Very facile, Lieutenant. I'll not convince you that my way is right. And you'll not convince me that the random mixing of genes with chance acquaintances is the best way to produce offspring."

Brumbaugh grunted but said nothing. There was more to the business than producing offspring. Tillie was sterile, had always been sterile; but he couldn't imagine the last thirty years without her.

"And what about Number Six?" he asked gruffly.

Kavin looked blank. "Number Six?"

"There were six clones, weren't there? We've spoken with Dr. Adamides."

Kavin snorted. "Then you know that there were originally eight embryos. Three were defective and were aborted."

"Were they? We have information that suggests that one was not." He didn't really have such information. It was a shot in the dark. He wanted to see how Kavin would react.

The reaction was interesting. Kavin's face grew red, and his eyes took on a wary look. "That's a lie!" he said. "Whoever told you that was lying! There are only five surviving Kavin clones."

Brumbaugh saw that the other was concealing something. Clone number six struck very close to some sort of nerve. "Maybe so. We'll check into it anyway."

Kavin stood up and walked toward the door. "If you are finished now, Lieutenant? I was planning to visit with my sons today." Brumbaugh pushed himself away from the dresser and followed him.

"Thank you for your help, Mr. Kavin," he said at the door. He stuck out his hand and Kavin shook it perfunctorily.

"You should be out on the streets looking for the killer, not persecuting my sons."

"We'll catch the killer," Brumbaugh promised him.

In the hallway, he looked at what he held in his left hand. A hair. He had pulled it from the brush on the dresser. It was long and brown. Kavin's hair was short and grey. *Well, well, Mr. Misogynist. Have we had a visitor? Maybe a woman?* Or maybe a man. No telling Kavin's tastes.

He stopped at the desk on the way out. He asked the clerk if Kavin had taken anyone to his room. Male or female. Did he pick up anyone in the bar or on the street?

The clerk tossed her head back. The hotel did not monitor the behavior of its guests. That was for morals proctors. She looked around quickly as she said that, in case a proctor was nearby. Brumbaugh thanked her and left. What Kavin had told him pretty much bore out his own impressions of the five clones. But he had the nagging feeling

that he was missing something important. Something about the sixth clone.

TUESDAY P.M., 20 OCT 2026

Mac was on the phone when Brumbaugh returned to the station. He waved at Brumbaugh and pointed to the phone. "A tip," he said, covering the mouthpiece. "Wait just a minute while I get this down."

While he waited, Brumbaugh sent the hair to the lab for an analysis. Detective Pizzuli came over and handed him a large manila envelope. Brumbaugh raised his eyebrows questioningly.

Pizzuli was short and chunky, with a swimmer's build. She opened the envelope onto Brumbaugh's desk. Sketches in charcoal and pencil spilled out. Kavins. A coven of Kavins. Kavins scowling. Kavins laughing. Kavins looking thoughtful. "What is this?" he asked.

"We found them in Higgins's apartment. The police artist tells me they're 'studies' or preliminary sketches."

"She was going to make a life-mask, too," Brumbaugh said absently. "Hank told us that." He looked through the sketches. Identical faces. They all seemed to be laughing. He paused over one. There were six faces scattered across the page. Were they six studies of the same man? Or had Higgins learned about the sixth clone?

Pizzuli reported that Barry Kavin's secretary could corroborate Barry's presence in their office until 12:50, when Barry had left to meet his brother for lunch. Brumbaugh asked when the secretary had eaten lunch and Pizzuli told him that she had gone out between 11:45 and 12:15. Also, she said, nobody at the Blarney Stone remembered Bobby stopping there for lunch. Which didn't necessarily prove anything.

Brumbaugh handed her a photograph of Rudolph that he had taken with his tie clasp camera and told her to go to Kavin's hotel and see if she could get him to pick her up. He told her to talk with the bartender and other guests, unofficially, and ask about his activities the previous evening.

"Why the interest in Rudolph?" Mac asked when Pizzuli had gone.

Brumbaugh turned. His partner was off the phone. "Nothing, really. I'm just trying to get a handle on this crazy family. Some feel for what makes 'em tick. The father made them what they are."

"Tell me on the way, Lieutenant. We just got a tip. Manager at some east side fleabag called and said one of the Kavins checked into his hotel late Friday night. He recognized the picture in the paper."

They took a staff car and drove up Third Avenue. Mac listened while Brumbaugh recounted his findings at the Art Shop and at the Holiday Inn. He told Mac about the hair.

"Hunh," the sergeant said. "Know what I think? I think this whole female thing is a facade. I think they like women, but they won't admit it even to themselves. Like they got an image to keep up."

"Is that so?"

"Yeah. Like *Doctor* Benny and his nurse. Methinks they do protest too much. I bet they're getting it on after hours. Don't you? And I bet both of them get a big kick out of examining women patients."

Brumbaugh looked at him. "You got

a dirty mind. You gonna turn them over to the proctors?''

Mac made a face. ''Don't ever mention a proctor to a cop. You know what the word means? Proctor? It's from the Greek. *Proktos,* meaning 'the asshole.' And the suffix is Latin, *-or,* meaning 'one who is or does.' So proctor means 'one who is an asshole.' '' He laughed.

''That's not what the word means,'' Brumbaugh told him.

''Shit, I know that. But that's what it *should* mean. Bluenoses playing at being cops. Who needs 'em?''

The Hotel Calypso was for transients. Brumbaugh wondered if the manager appreciated the irony in the name, then decided that he did. The manager was short and skinny and wore glasses thicker than a boot heel. The table behind the check-in desk was littered with dog-earned paperbacks. Dostoyevsky. Sartre. Joyce. And, of course, Homer. The manager's name was Boris Quint. There was a sign over the desk giving monthly, daily, and hourly room rates.

Brumbaugh showed him a photograph of the Kavins and Quint said, yes, that was the man. At least, one of them was. No, he couldn't say which one. He showed them the terminal and pointed to the entry: Jason Medwick, and said that was the name the man had used. Brumbaugh noted that ''Medwick'' had checked in at nine P.M. on the 16th, paying cash. There was no home address given, which didn't matter since it would have been as phony as the name.

Quint told them that Medwick had met a woman in the bar. Mac looked at Brumbaugh and Brumbaugh looked at Mac. They showed him a holograph of the murdered woman. It was a morgue holo. Head and shoulders. Eyes closed. No complexion, except the purple marking on the throat. Quint stared at it, holding it close to his eyes, and licked his lips.

''Was that the woman?'' Mac asked.

''Maybe. I can't be sure, but I think it was. The bar's dark and I don't see so well.'' He blinked at them and the effect, with the eyes magnified by the lenses, was like twin signal lamps on a battle cruiser.

''What about the bartender?''

''That's my brother-in-law. He never sees anything, if you know what I mean.''

Mac laughed. ''I've got a memory improvement course.'' He took the photo and headed for the bar. Quint watched him go.

''When did he check out?'' Brumbaugh asked.

''What?'' Quint turned.

''This 'Medwick.' When did he check out?''

''He didn't. That's why I called you guys.''

''You mean he's up there now?''

''Oh, no. I haven't seen him since Sunday. But he didn't check out. Didn't pay his tab, either,'' he added, aggrieved.

''Rent the room yet?''

''No. Say, Lieutenant?''

''What?''

''The story in the paper. About what he did to the girl. Do you think . . .''

''Think what?''

''Do you think she knew he was a clone? Was she doing it with all five of them? Maybe all of them together at once?'' Quint's eyes were big; his

mouth was slightly parted. He was hoping for the worst, eager to believe anything if it was bad enough.

"I wouldn't know," said Brumbaugh. He thought: *she had to know. She knew Hank, and she went to Bobby's bar, and Benny was her doctor.* Group sex was illegal, of course; but if the group was a set of clones, you could argue that it was really only one individual. He wondered if Higgins had been playing on a kind of sexual merry-go-round; and, if she had, whether she had found a way to tell the brothers apart.

"It must have been kind of kinky," Quint insisted. "The five of them, like that."

"They don't like girls."

"What?"

"The clones. They don't like girls. Women."

"Y'mean they're queer?"

"No. They don't like sex at all. Too unsanitary." That should give Quint enough material to elaborate on with his pastors. *The investigating lieutenant, he tol' me . . .* Maybe it would make somebody think of something. Bread upon the waters.

"Couldn't prove it by me. Not the way they were muzzling in the bar."

"How's that?"

"They were in each other's faces. You know . . ." He blushed. "Kissing and all. In public."

Brumbaugh thought Quint was overreacting. If he didn't want that sort of thing going on in the bar, why did he keep it dark? So passing proctors couldn't see anything.

Mac returned from the bar with a positive ID. The brother-in-law had fingered the Higgins woman as the one who had been with "Medwick."

The most obvious thing about "Medwick's" room, when Quint had let them in with a pass key, was that there was nothing in it. No clothes. No personal effects. The room was bare.

"Mac, go call forensics. Tell 'em we want a search for tissue samples and fingerprints and all." Mac left and Brumbaugh wandered around the room. He was careful not to touch anything. Quint watched from the doorway, storing up material to tell his buddies. "Has the maid cleaned in here?"

Quint laughed. "Maid?"

Brumbaugh hadn't thought so, but it was nice to check. He took a stylus from his pocket and lifted the sheet where it hung to the floor and peered under the bed. Dust bunnies. No bodies or anything.

He stood up and brushed his knees off. There was a clock on the side table by the bed. It read 13:13. Brumbaugh scowled and checked his watch. His watch read 13:56. "Your clock's slow."

Quint shrugged. "No one stays here wants to know the time anyway. I tell them when their time's up."

"Yeah." For most of the transients who stayed here, time had stopped anyway. He looked around the room again. Nothing to do but wait for forensics. He wondered if Higgins and Kavin had come up here. And, if they were meeting here, why did he go to her apartment the next day? And which one was "Medwick"? Barry, the most woman-hating of the lot? Hank, who actually had dated her? Benny, whose secret

lust, Mac believed, boiled just below the surface? Or maybe . . .

Or maybe Clone number six? A sixth clone would explain an awful lot.

"Ever see either of them in here before?" Brumbaugh asked. "Medwick or the woman?" Quint shook his head.

Mac trudged back up the stairs and stood with Brumbaugh for a moment surveying the room. He pulled a pen from his shirt and began twirling it. "I had a new thought."

"That's good. Don't let me stop you."

"Who says it was the same Kavin that was here on Friday as was at Higgins's place on Saturday?"

Brumbaugh looked at him. "You thinking about what Quint here said?" Then he remembered that Mac had been in the bar when Quint had said it. "That Higgins was playing with all five of them," he added.

"More than one, at least. She knew three of them." He fumbled the pen, caught it in his right hand. "I got a theory."

That was bad. When Mac started getting theories that meant he didn't know the solution. "What is it?" Brumbaugh asked.

"One of the clones was fooling around with Higgins. Let's say it was Hank."

"Why Hank?"

"Why not? It's just a theory. Maybe I should say 'Alpha.' "

"No, Hank is fine."

"OK. Hank and Higgins are getting it on. Or getting it off," he laughed. "Dancing around the maypole. Barry finds out about it and goes into a rage. The worst thing a Kavin can do. He can't kill Hank. That would be like killing himself. So, he finds out where Higgins lives—maybe from Benny's records—and goes there. She thinks it's Hank and lets him in. Gets undressed before he can say boo. He's *never* seen a naked woman before; and Higgins wasn't exactly Tugboat Annie, if you know what I mean. Can you imagine the effect it must have had on him? He does what comes naturally. He can't help it, despite all the conditioning from his father. Afterwards, he's disgusted, but it can't be *his* fault, because he is pure of heart. So he removes the source of temptation."

Brumbaugh nodded. "It's a good theory."

"Yeah. Maybe it wasn't Hank and Barry, but they fit best."

"Uh hunh. There's just two problems with your theory."

"What's that?" Mac sounded hurt.

"Number one. There's no evidence to support it. Number two. Barry was eating lunch in a public restaurant during most of the time that the killer was at Higgins's apartment."

"Not in front of Blabbermouth here." Mac jerked a thumb at Quint, who looked more disappointed than insulted.

Brumbaugh smiled at the manager. "Don't worry. Boris isn't going to say anything. You know why?" Mac asked why. "Because the Kavins have themselves a fancy lawyer whose suits cost more than this whole friggin' hotel; and if Boris here so much as breathes a word of your theory, Kasabian'll be all over him like a garbage slick on the Jersey shore." He swiveled his head and looked at Mac. "Not that I would com-

pare Myron Kasabian to a garbage slick.''

''Naw,'' Mac agreed. ''He ain't that slick.''

TUESDAY EVENING, 20 OCT 2026

When Morris was stuck on a case, Tillie thought, *he was impossible to talk to.* She watched him pace back and forth across their Staten Island living room, scowling like thunderclouds. Morris always kept everything inside him. Police troubles, anyway. He liked to lick his problems on his own. He would share it with her in his own good time.

She knew which case was troubling him. The papers were playing it up, more because of the clone aspect than the sex, which was, after all, routine for New York. The *Times* had editorialized that cases like this were justification for reinstating the anti-cloning ban. The *News-Post* wanted to know why Brumbaugh hadn't solved it yet, and had invented an entire new type size for its headlines. They had interviewed three well-known advice columnists, four psychics, and a Hollywood starlet to get their ideas on the case.

The holovision stage was mute. Morris didn't care for most of the shows on HV; although, with 125 channels to choose from, it was hard to decide which ones he disliked the most. Every week, they studied the published schedules and Tillie programmed the unit to record the ones they were interested in and play them back on their days off. Instead, Morris paced to the background of Alpine music. Franzl Lang yodeled his way through *Freunde der Bergen.* Absurdly cheerful, given Morris's disposition.

Tillie sighed and resumed her study of the chain diagrams. When Morris wanted to share his burden, he would. Meanwhile, there must be a reason why her protein assembler wasn't folding the way it was designed to.

Finally Morris sighed and stalked into the kitchen. She heard the potato chip bag rustle. ''Morris!'' she called. ''You know what the doctor told you about greasy foods.'' He always began stuffing his face when he was unhappy.

''Screw the doctor,'' her husband replied. ''I'm changing doctors. Gonna go to Doctor Benny from now on.'' She recognized the sarcasm, just as she recognized Doctor Benny from the news stories.

She laid the chaingrams down. The clones bothered her, too. But for a reason having nothing to do with Morris's case. She had been born sterile. Yet, she had always wanted to have children with Morris. Not adopted, and certainly not surrogate. Old fashioned, maybe, but it had been a real need within her. Cloning had seemed like the answer. Clones didn't have to be single-parented. They could be grown by combining DNA from both parents. (Or, for that matter, from three or more, but that was still illegal.) They could even be designed with the best gene combinations from both parents. Medically, there was no need for any couple to be infertile.

But Morris had drawn a line there and would not cross it. No cloning. He was seldom stubborn about anything; but on this issue, he would not budge. It made no sense to Tillie; but she couldn't force it on him. Children had to be made

willingly or not at all. Now, she was too old for it to matter.

Morris returned from the kitchen. He stood in the doorway, the potato chip bag in his left hand; his right hand scrounging inside it. "Damn Kavin," he said. "Damn the five Kavin clones. Damn anyone who won't damn Kavin and his clones."

He went to the sofa and planted himself in it. Franzl Lang was singing about mountain climbing.

Um die Wände zu bezwingen, braucht man Kraft und bracht man Mut. Um den Gipfel zu erringen braucht man Schneid und ruhig Blut.

"I really thought we were on to something with the number six clone," he announced.

"Yes, dear."

"But Wilks checked the CCNY records; and it looks like everything matches. He says there was a date altered on one of the Tissue Disposal Forms. Wilks thinks that was why Adamides and Kavin were so nervous. It looks like one clone was aborted *after* quickening."

Tillie blinked at him. "Oh, dear. That is serious."

"Damn right. We could get them both on manslaughter, if the statute of limitations hadn't run out." After quickening, the fetus was legally a person, with Class V rights. Just as Higgins had been an adult with Class I rights. "We're not after a 27-year-old murder; we're after a 27-year-old murderer," Morris finished.

Tillie grimaced. The penalty for murder was alteration by genetic surgery, which she had never liked. It was better, in her mind, to execute the killer outright than to tamper with his personality.

Morris told her about the investigation. Tillie listened attentively, not because she thought she could help him, but because he needed to throw his own thoughts around and hear them out loud.

"We're going to regress our witness in the morning," he told her. "It's a longshot and we really had to argue to get him to agree. You know what Speakeasy is like. And even if he remembers noticing something, like Bobby's limp or scar, or Billy's running his hand through his hair, it won't mean diddly squat because we can't prove opportunity. Every single one of those bastards was somewhere else when the crime was going down."

"All of them?" she asked.

"Wilks and Pizzuli and Mac," he added, "have tracked down every witness we could identify. The businessmen Barry met at the restaurant. The patrons who were in Bobby's bar. The cleaning woman in Billy's office building. And they all corroborate the stories. We can't find a single hole in any of them!"

"That's too bad."

"It's more than too bad. It's impossible. We've got DNA prints. We *know* it was one of them! That's why I was counting on the Sixth Clone Theory. It would have explained all the facts."

"Could the geno-assay have been mistaken?"

He shook a handful of chips at her. "Not a chance. We had the lab run two more replicates. All three agreed."

"Well, you'll think of something." She smiled, patted his arm, and took the chips away from him. "It can't be easy

with them being clones. It's like telling peas in a pod."

Morris laughed and Tillie smiled tentatively, not sure of the reason. He began to tell her how Rudolph had said the same thing and how he used to shell peas as a boy and how peas in a pod weren't really alike, but a funny look came into his eyes. "Shelling peas," he muttered. "Well, I'll be damned. They *are* like peas in a pod!"

WEDNESDAY A.M., 21 OCT 2026

Mac arrived at the station house early, but he found Brumbaugh already there, hard at work, when he walked in. "Hi, Lieutenant," he called. "What's up?" He inspected the clutter on the desk. Street and subway maps of Manhattan. Matrices with times and places filled in. Mac recognized them as Time-and-Position diagrams. He looked them over. "Laying out the afternoon of the crime?"

"It came to me last night," explained Brumbaugh without explaining. "Take a look at this map. I've marked the locations of Billy's ad agency, Hanson's bar, and the other locales. Notice anything?"

Mac studied the layout for a minute. Then he shook his head. "No. Should I?"

"None of them are more than a block away from a subway stop."

Mac shrugged. "No one in Manhattan is more than a block from a subway stop."

"That's an exaggeration. Here, look. Four of them are practically on top of the Lexington Avenue subway. Benny doesn't even have to leave his building to catch it. 51st Street station is right outside Barry's office building. Billy is a block west of 33rd Street station, and Hank is close to the Bleeker Street station."

"Yeah, and Bobby is one block west of the 42nd Street station on the Eighth Avenue line. So what?"

"So none of them are ever more than fifteen minutes away from each other."

Mac frowned and looked at the map. "What about Bobby? He can reach Barry or Hank easy enough on the E train, but what if he wants to see Billy or Benny?"

Brumbaugh pointed. "He walks the two blocks to Times Square. From there, the shuttle goes directly to Doctor Benny's building, and the Broadway trains to 34th Street, which is two blocks from Billy's ad agency. That last one is pushing the fifteen minutes, but it doesn't matter, since Billy spent a good part of the afternoon at a restaurant across the street from Benny's office."

Mac looked up from the map. "OK. They're clone-brothers. They like to stay close to each other. I must be stupid this morning. Why is it so important?"

Brumbaugh handed him the T/P diagram. "Look this over and then you tell me."

Mac sat down in the chair and pulled a pen from his pocket. He whistled while he read. The old Hitchcock theme music. Abruptly, the whistle turned into a single, high pitched note. The pen fell to the floor and rolled under the desk. "I will be dipped in shit! How come we never noticed this before?"

Brumbaugh smiled. "Because the mind is the first thing to go when you get old—"

"The second thing," Mac answered

him. "Son of a bitch. And we thought they all had alibis."

"Tillie and I were talking last night, and she used the old 'peas in a pod' cliché. I started to explain about peas not really being alike and remembered back when I used to shell peas for my mom and that made me think about the old shell game. So, I thought, if four of the brothers kept changing places, they could make it look like there were five of them."

"Yeah," Mac said, running his finger down the chart. "None of the alibis account for all five of them at the same time. There was always one or two of them out to lunch, or on break, or just plain unobserved." He tapped the sheet. "Like when Barry's secretary was at lunch from 11:30 to 12:15."

"Right," Brumbaugh nodded happily. If it made sense to Mac, it probably made sense. "*He* says he stayed in the office. *She* says he was there when she left and there when she got back. *But there was no observer in the meantime.* And an unobserved fact isn't a fact."

"Like Schrödinger's cat?"

"Who's Schrödinger, another detective?"

"In a way," Mac grunted. "So, you're thinking that when she got back from lunch, it wasn't really Barry there at all."

"Hell, maybe it wasn't even Barry to begin with. Ms. Genata, their old neighbor told me how they used to play the switcheroo game when they were kids. They got a kick out of it. It didn't really click with me at the time."

"Since they were all close to the subway, they could trade places whenever they wanted. And, if four of the five brothers can account for all the alibis . . ."

"That leaves one of them free to commit murder."

"Fine, but which one?"

"Easy. The one who suggested playing the game that afternoon."

"And that means they all know who really did it."

"Which makes them all accessories after."

"So now, what do we do?"

"Now we start asking different kinds of questions. 'Barry' was supposed to be shmoozing with some business acquaintances at the restaurant. Did he seem unsure of the details of finance or of past deals? Did anybody order a drink from 'Bobby' that he didn't know how to mix? That sort of thing."

"Uh hunh. You know, if they do this sort of thing often, they'll have briefed each other pretty thoroughly."

"Sure, but they couldn't know *everything* about each other's lives. The meeting in the restaurant, for example, must have been a chance thing. Suppose it was Hank instead of Barry. He might have made some minor slip."

"Unless . . ."

"Unless what?"

"Unless clones really are telepathic."

Brumbaugh stared at him for a moment. "You sure are one cock-eyed optimist, aren't you?"

Mac shrugged. "When a pessimist is wrong, he's happier."

"You know what I think? I think Billy brought up telepathy just to make us wonder."

"Maybe. It'd be hard to test for it, too."

"Yeah. How can you tell the differ-

ence between someone who's not telepathic and someone who's *pretending* to be not telepathic?''

Mac refused to worry about it. ''You can't. What about Lewis? We all set up?''

Brumbaugh checked his watch. ''The tech has everything set up in Interrogation One. Lewis hasn't shown yet.''

''Think he will?''

Brumbaugh considered the question. Then he nodded. ''Yeah, I think so.''

The door opened and they both looked; but it was the lawyer, Kasabian, who entered, followed by a morals proctor. Kasabian nodded curtly then planted himself in a cracked plastic chair against the wall. He picked up a magazine and leafed through it. The proctor continued past him toward the desk.

''Hey, Myron,'' Mac called, jerking a thumb at the proctor, ''They finally catch you?''

Kasabian gave him a sour look, settled his pince nez, and shook the magazine to a new page.

The proctor looked at Mac, then at Brumbaugh. ''Police Lieutenant Brumbaugh?'' she asked. Brumbaugh grunted, ''That's me,'' and the proctor offered her hand.

''Assistant Warden Rebecca Morton. I'm your Official Witness. Is the subject here, yet?''

''Not yet, Warden Morton.'' He shook her hand briefly. ''Have you read the case?''

''No, I haven't.'' Mac snorted and Morton turned and looked at him. ''The case isn't within my jurisdiction,'' she told him. ''I'm not interested in it, per se. My only roles are to certify the transcripts and to assure that you do not abuse the truth drug.''

''We don't mess around with Speakeasy,'' Mac growled.

''I'm sure you don't,'' the Warden replied in a voice that implied she wasn't sure at all. ''Neither do 99 percent of the secular police forces. But you must remember the scandals of 2010 when some departments used it to obtain illegal evidence and—in one instance—to destroy a suspect psychologically.''

''Thompkins was scum,'' Mac told her. ''He was guilty as sin.''

The proctor shrugged. ''Sin is for my department to judge, according to our laws. The police, however, are bound by secular laws. Who shall guard the guardians?''

Mac's reply was forestalled —fortunately, in Brumbaugh's view—by the arrival of Lewis and his lawyer. Lewis's lawyer introduced herself as Jayne van Hook, and Mac introduced the others. The proctor asked everyone to call her Becky. No one did.

''And the scuzz over by the wall,'' added Mac, ''is Myron Kasabian, the Kavins's lawyer.'' Kasabian smiled and waved. Insults were wasted on him.

Brumbaugh passed out sheets of paper. ''These are the questions we plan to ask you, Mr. Lewis. By law, we may ask only these questions, or questions intended to follow up or clarify your answers to these. Hey, Kasabian!'' He waved another copy of the list. ''Don't you want to review the questions?'' Kasabian looked up from his magazine and shook his head.

''Pretty damned confident,'' growled Mac.

"Yeah. He doesn't think we're going to get anything out of this, does he?"

"Screw him," said Mac. Then he looked at the proctor. "I was speaking metaphorically. That wasn't an actual request." Brumbaugh kicked Mac in the ankle.

"Of course," she replied through thin lips.

Lewis handed Brumbaugh the copy of the list. "These look . . . These look fine."

"Nervous?"

"I've heard stories."

"Well, I won't say don't worry. We'll all do our best to make this as easy as possible. You're a witness, not a suspect. You will be given a tranquilizer along with the drug. Your lawyer is here to see we stick to the list. She has the right to terminate the questioning on your behalf if the resurrected memories seem to be causing you great emotional distress. If you do blurt out some embarrassing memory not relevant to the investigation, it will be erased from the record."

"Sure." Lewis licked his lips, glanced at the proctor, then away.

"Do you want to take the Oath, now, Warden Morton? Everyone's here."

Morton agreed and Brumbaugh opened his lower right-hand desk drawer. There were a number of small, bound books. "Which one?" he asked. "Douay? Upanishads? Quran? Torah?"

"King James, of course."

Brumbaugh selected one of the books and pulled a small printed card from it. He handed the miniature to Morton who held it in her left hand, palm up. It looked ludicrously small. Mac set the video camera on his shoulder and nodded.

"Do you swear or affirm," Brumbaugh read from the card, "on your Faith in God and your Hope of Salvation that your Witness to these proceedings will be true and complete; and that, further, you will take no account of, nor otherwise notice, any extraneous information divulged by the subject while under the influence of the drug; nor will you turn any such information over to the Proctor General's office."

"I do so affirm. God be praised!"

They trooped toward the interrogation room. Mac whispered to Brumbaugh, "How much protection is that Oath if she really gets it in for someone."

Van Hook heard him. "It depends on whether you really Believe," she said. "I wouldn't worry about the Sincere so much. It's the opportunists and cynics you need to look out for."

The technician looked up when they entered. "Just finished, Lieutenant."

There was a padded chair, with restraining straps set in the middle of the room. Two drip bottles hung on their racks, one on either side of the chair. The table had been pushed to one side and was now filled with monitoring equipment. The leads hung loose.

The witness looked at the setup and wet his lips again. "Let's get this over with," he said.

He sat in the chair and the technician administered the sedative. Then he began attaching leads. When Lewis was under, the technician inserted the intravenous needles. He turned on the Speakeasy drip. "I'll turn on the tran-

quilizer drip," he told them, "if I need to counteract any agitation."

He watched the α-monitor for a few minutes, while Mac set up the videotape. Finally, the tech nodded. "Go ahead, Lieutenant. He's in the *smertechka*."

"Can you hear me, Mr. Lewis?"

"Yes."

"I want you to go back. To 17 October 2026, four days ago. It is 12:30 in the afternoon. Are you there?"

A hesitation. "Yes. It's Saturday." The voice was heavy, zombie-like. *Smertechka* was Russian for the "little death." It had been used originally to create "zombies" during the purge of the *glasnostniki*.

"What do you see, Mr. Lewis?"

"My room. It's dim. Overcast outside. The light's no good for painting."

"What do you hear?"

"Nothing. Traffic sounds from Third Avenue. The buzzer in the hallway. Someone wants into the building and one of the residents has triggered the door lock. I open the door and peek out."

"Why?" That was Kasabian. Brumbaugh gave him a venomous look.

Lewis continued. "Mugs do that sometimes. They press buttons until someone lets them in."

"What do you see in the hall?"

"A man. Thin. Long, brown hair. Five-nine. He's wearing a light blue windbreaker. He climbs the stairs. I hear knocking from the third floor. Bev Higgins's apartment. Bev is an artist, too. Works in clay, like Cyndy. Cyndy was my wife. She left me. We didn't. . . "

Brumbaugh interrupted the stray thought. "Can you hear anything from the third floor, Mr. Lewis?"

There was a silence while the man in the chair squirmed. He cocked his head in a listening attitude. "No. I hear a car horn from the street." Abruptly, Lewis's face twisted in terror. "No! Hit the brakes! Hit the brakes!"

The technician jumped and turned on the tranquilizer drip. He glanced at Brumbaugh. "Memory association," he apologized. "The automobile horn reminded him of something."

"Don't let him get off the track," warned van Hook. "The accident was very traumatic for him."

Brumbaugh looked at the lawyer as if to say he was more interested in staying on track than she was. But he said nothing and turned his attention back to the witness.

"Mr. Lewis. It is now . . ." He consulted his time sheet. ". . . It is now 1:57 P.M. Tell me what is happening."

"A door slams. Upstairs. Heavy steps on the stairway. Someone in a hurry. I open the door a crack. I peek in. I must be quiet. Mommy and Daddy will be angry. I can see them through the bedroom door. They . . ."

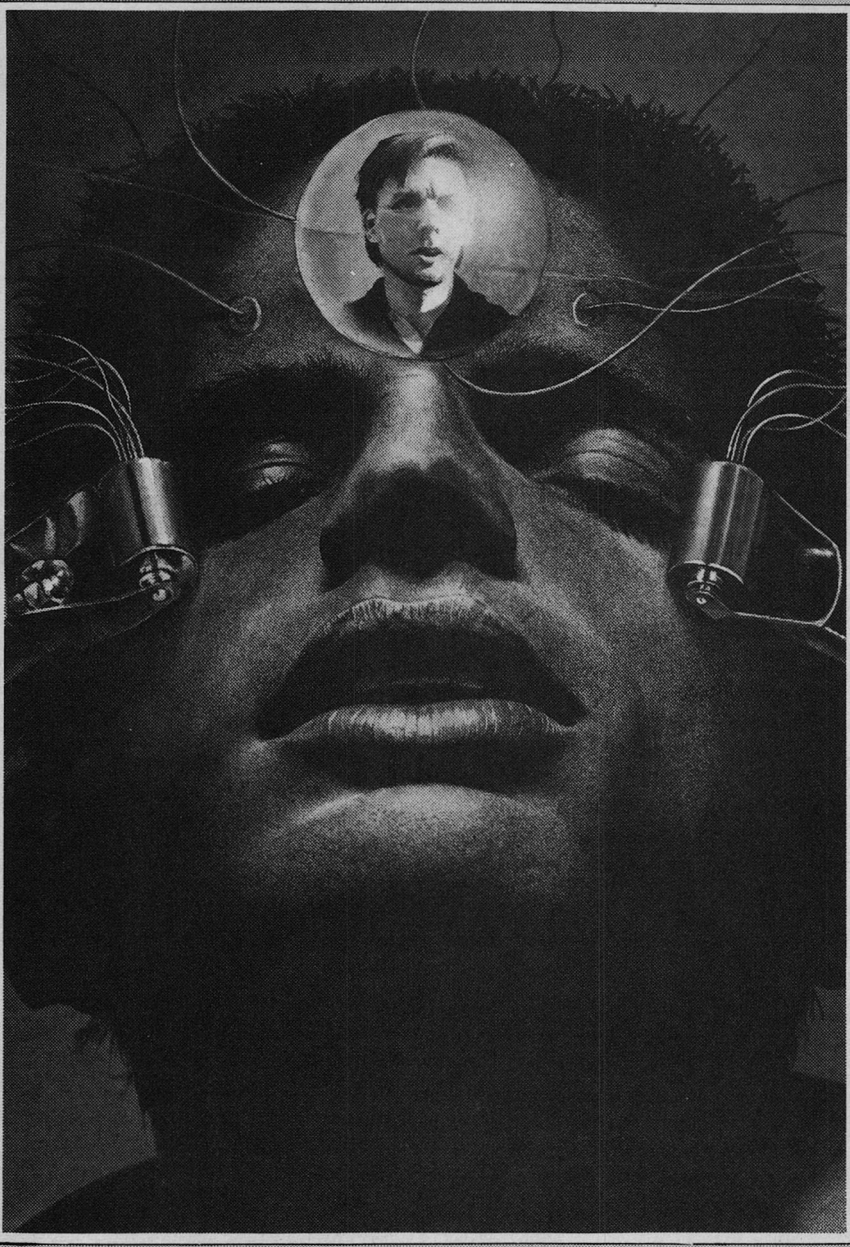
"Stop, Mr. Lewis."

"I'm sorry. I'm so sorry." Tears forced themselves through Lewis's closed eyelids.

"Mr. Lewis. It is the year 2026. You are not a child. You are in your apartment on Third Avenue, not your parents' house. You are looking out through your apartment door at the hallway."

"You should have let me drive, you stupid bitch!"

"Mr. Lewis. It is the year 2026. You



are in your apartment. You are looking out through your door at the hallway."

"There is a man on the stairs," the witness said, suddenly calm. Brumbaugh relaxed.

"Go on. Is it the same man you saw earlier?"

"Yes. He is coming down the stairs. He looks worried. He glances back over his shoulder. He rubs his hands together and shoves them in the pockets of his windbreaker. I know him."

"What is his name?"

"Hank Kavin. He runs the art store where I buy my paints. I've seen him and Bev together sometimes."

"Does he see you?"

"No. Yes, I think he does. He glances at my door and sees it is open a crack. I see his pupils dilate. He takes a step toward my door. He stops and runs for the street door. He's running, the sonuvabitch. That'll teach him we don't want his kind on our turf. Damned wops."

Brumbaugh realized that the image of a running man had triggered another association. "Mr. Lewis, I want you to make time reverse until the man is on the stairs. Then I want time to stop. Do you understand me?"

"The dagos think they can come in here anytime they want. We'll show them, won't we? This is white boys' turf."

Brumbaugh repeated himself patiently. "Mr. Lewis, I want you to back up until the man is on the stairs. Before he puts his hands in his pockets. Then I want time to stop. Do you understand me?"

"He is on the stairs."

"Do you see him in profile or full-face?"

"I see a three-quarter figure, from the front and the left. Lighting is soft white, from the left."

"Good. Time is now frozen. I want you to zoom in on the man. Let your eyes get closer. I want you to focus on his . . ." He consulted the checksheet that he and Mac had put together. It was a list of distinguishing features, based on what Rudolph had told them and on their own and others' observations. ". . . focus on his feet, Mr. Lewis. Can you describe his shoes?"

"They are black shoes. Six-hole laces. Brazilian styling, but not Brazilian made."

"Are there any scuff marks? Or soil?"

"No. They are worn-looking. They are probably comfortable."

Brumbaugh gradually worked his way up the suspect. When Lewis described the prominent bulge in the pants, Morton blushed. When they reached the hands, Brumbaugh asked him if the suspect was wearing any jewelry.

"He has a ring on his fourth finger."

"Describe the ring."

"It is the worm Ourobouros. The snake that swallows its own tail. A powerful symbol. Primordial. Jungian. The *ur*-snake. The snake is striking her. She is gasping. She is laughing. She is laughing at me. She is laughing at the snake. I am so ashamed." Lewis turned in the chair and tried to curl up, but the straps held him in place. The technician adjusted the tranquilizer flow.

"Mr. Lewis. What else do you see on the man's hand? Is he wearing a watch?"

Lewis quieted. "Yes. He is wearing a watch. It is expensive. Japanese. I can read the logo. Yomatsu. It reads 13:18."

"Now look at the man's scalp. There may be a scar there, above his ear on the left side. Look carefully. Let your eyes go into the hair."

"His hair is not combed."

"Can you see a scar beneath the hair?"

"So fine," Lewis murmured. "Her hair is so fine. I run my hands through her hair. She turns her face toward me. We—"

"Please, Mr. Lewis. Do not digress. Stay in the hallway of your apartment building."

"I'll never see her again." A sob escaped from his throat. Van Hook sat up and laid a hand on Brumbaugh's arm.

"Just a little while longer," Brumbaugh pleaded. Van Hook frowned, looked at Lewis, and nodded slightly.

"Mr. Lewis, are you back in your apartment? You were inspecting Kavin's scalp for a scar. Can you see a scar?"

"Yes. A small scar, just behind the ear. I see it when he runs his hand through his hair."

"Is it Kavin you are seeing? Are you back in the hallway?"

"Yes. I wonder why he looks so worried. Worry. Worry. Do you think the show will go off all right? What if the critics don't like my work?"

"The critics will love your paintings," Brumbaugh told him. "Now let Kavin walk toward the door. Let time resume. There may be a slight limp. Tell me if he limps."

"He is coming down the stairs. He looks worried. He glances back over his shoulder. He rubs his hands together and shoves them in the pockets of his windbreaker. He stumbles on the third step."

"Which foot?" asked Brumbaugh sharply. Lewis told him it was the right and Brumbaugh made a note. "Go on."

"He looks at my door and sees it is open a crack. I see his pupils dilate. He drops his eyes. He takes a step toward my door. His hair is not straight. He stops and runs his hand through his hair. His lips move . . ."

"Stop! Can you hear his words?"

"He is whispering to himself. He says, 'Sonuvabitch. I didn't want to. I'm a sonuvabitch.' Then he turns and bolts for the street door. I see no limp."

"Thank you, Mr. Lewis. We will go through it once more."

Van Hook stopped him. "Is that really necessary? Look at him." Brumbaugh watched the witness twist and squirm in the chair. Lewis moaned and tears stained his cheeks. A thin drool of saliva stained his collar. "The longer he stays under," van Hook reminded him, "the more buried memories will bob to the surface of his mind. Every mean and petty act. Every embarrassment and disappointment. Every mistake and slip of the lip."

"Yes, and every joy and fondness."

"On the balance, Lieutenant, of which is any life more full?"

Brumbaugh bit his lip, then he shook his head. "You can stop me at any time, counselor. But I need a second run-through, so I can sort out the stray remarks. Remember, he volunteered. Beverly Higgins was a neighbor and a friend. He *wants* to help us."

Van Hook gave in and they went through the questioning again. Five

times, Lewis lost his train of thought, as his subconscious segued through associated images into other memories. Four times, the recollections were painful. Once he screamed, "The baby! The baby!" And Brumbaugh wondered what private torment he was reliving.

Brumbaugh felt that hell must be very much like this. Total and complete recollection, without any illusions or excuses.

Afterward, they left Lewis alone so he could compose himself. Mac and Brumbaugh went to their desks. Kasabian laughed and waved to them as he left.

"Sonuvabitch," muttered Mac. "He doesn't think we learned anything useful."

"Did we?"

"Hell, no, but I can't stand it that he knows it."

"Lewis didn't see a limp."

"So what? Negative evidence doesn't prove anything. You know that."

"What about the lowering of the eyes?"

"You mean, was it Benny? Anybody can lower their eyes. Or run their hand through their hair. Or wear a fancy watch."

"Like Billy."

"Yeah, like Billy. I still like Barry for the Jimmy, you know what I mean? But we didn't get any proof from Lewis. Hell, it's like the Jimmy was deliberately mimicking his brothers' habits. We've got to dig deeper."

Warden Morton took her leave. "I've sealed the video with my official seal," she told them. "Sorry you didn't learn anything, but don't worry. Our Father, Who sees all in secrecy, will act justly. The killer, whichever he is, will be punished."

Mac watched her go. "What an attitude for a cop! Don't worry if you don't catch the Jimmy, because God'll get him. That must be comforting if you're a crook."

Brumbaugh rubbed his nose. "Actually, I think she was trying to comfort us."

"Us?" Mac seemed surprised that anyone would think he needed comfort. "Hell." He lapsed into silence. "You know what bothers me most of all?"

"What's that?"

"That we put Lewis through hell, and it didn't help our case any. I mean, it'd be one thing if his subconscious remembered something important. Then, at least, we could all tell each other that it was worth it."

"Yeah." Brumbaugh felt depressed. It seemed as if they had made no progress at all on the killing, despite everything that they had learned. None of it seemed to hang together. None of it pointed at any particular individual. Even if the clones *had* played musical chairs that afternoon, it didn't tell them which one was odd-man-out.

Mac told him he was going to the corner deli for lunch and did Brumbaugh want to come with him. Brumbaugh told him no thanks. They were releasing the Kavins that afternoon and he wanted to make sure the paperwork was straightened out. Mac said that was a hell of a note and Brumbaugh agreed. It was a hell of a note.

He fiddled with the papers on his desk. Printouts. Interviews with Nurse

Lincoln; with the bartender at Hanson's. The lab report on the hair. Time and position notes. Maps of subway stops. Quint's fleabag hotel. Forensic reports on the DNA found on the scene. The transcript of Lewis's testimony. His own scribbled thoughts on scratch paper. He picked up the map showing the hypothetical movements of the clone-brothers during the afternoon of the crime. He studied it silently for a while. Then he threw it down in disgust. The "musical chairs" gambit just wouldn't work.

Benny. Brumbaugh watched his carefully erected theory collapse like a house of straw. Benny was the key and he just wouldn't fit in the lock.

Doctor Benny loved money. He would never risk a malpractice suit by letting one of his brothers take his place in the office. It didn't matter that all the appointments that afternoon were "routine." When even the slightest chance of a slip-up could have multi-million dollar repercussions, Benny just wouldn't take the risk. The "old switcheroo" was a fine theory, in the abstract. But it couldn't stand up in the face of practical human realities.

And if Benny was out of it, the other three couldn't pull it off. There was no way they could have traded places without Benny's cooperation. The timing wasn't right. Only the clone manning Benny's office could make it to Hanson's Bar by noon.

So, where did that leave him?

Nowhere, dammit. He propped his elbows on the desk and cupped his chin in his hands. He found himself staring at the litter on his desk.

And that was when it all fell into place.

There was a tiny *click* in the back of his head and the pieces all came together and fit. There was no rhyme or reason for it. He had stared at the same reports countless times already. He picked one up and studied it. It just might be possible. He sniffed at the idea from different angles. By God, it smelled right!

He picked up the phone and dialed a number and talked to someone on the other end for fifteen minutes. Then he transmitted a photograph using the DataNet. He made more phone calls and confirmed some times that he had noted.

Lewis and van Horn were just leaving. He called them over and showed them a statement in the transcript. He asked Lewis whether he could now recall that moment consciously. Lewis looked at him with haunted eyes and agreed that he could recall a great many things that he had long forgotten. Brumbaugh made a suggestion. Could that be what Lewis had noticed?

Lewis started and looked thoughtful. Yes, he agreed. Now that he thought of it. That might have been what struck him. An artist notices such things. Brumbaugh thanked him and returned his attention to the Net terminal.

After a half hour his terminal screen blinked and began scrolling. Brumbaugh read the material as it downloaded. He smiled in satisfaction. Yes, indeed. A *very* pretty picture.

Mac came back from lunch in the middle of it. Brumbaugh told him what he was thinking and Mac thought about it, too, and agreed that maybe—just maybe—it was possible. Brumbaugh told him he was a cock-eyed optimist.

When he had everything he needed, he gathered the evidence into a file and printed out a hardcopy file as well. Then he checked his watch and sat back to wait.

Rudolph Kavin and Myron Kasabian arrived right on time. The baliff had just brought the five Kavin clones from the holding cells and returned their possessions to them. The elder Kavin looked at Brumbaugh.

"I see you've given up."

"I never give up," Brumbaugh told him.

"I meant you've given up trying to blame my sons for it."

Brumbaugh shrugged. "Time will tell."

Rudolph looked to the lawyer. "Can we leave now, or is there more bureaucratic red tape to go through?"

"Oh, why not wait a moment," Brumbaugh said. "I'd like to bounce some ideas off of you. All of you."

The Kavins looked at him suspiciously. It was an identical look, timed identically. With all of them standing together like that, the resemblance was more than startling. It was eerie.

Mac pulled up a couple of chairs and they spent a few moments sorting themselves out. When they were finally seated, one of them—Brumbaugh thought it was Barry—said, 'All right, Lieutenant, what's up?"

"I am trying to solve a murder."

They looked at each other. They knew that. Brumbaugh couldn't tell if one pair of eyes was warier than any of the others. Kasabian slouched in his seat and inspected his fingernails.

The first thing to note," Brumbaugh began, "is that we have a positive make, through genotyping, that the Jimmy was one of you."

They scowled at him. And three of them simultaneously crossed their arms.

"What made it difficult," Brumbaugh continued, "was that you all had airtight alibis." (And *that* got him seven satisfied smiles.) "So we figured there must be something we were overlooking. There were three possibilities. Number one was maybe the alibis were not as airtight as they looked. That happens. Sometimes people lie or they don't remember right. That's why we always look for corroboration. For example, we couldn't find anyone to corroborate Bobby's lunch at the Blarney Stone, or Hank's in Washington Square."

Two clones started and sat up straight. "Hey," said one. But Kasabian put a hand on his shoulder. "It doesn't matter," he told him.

"That's right," Brumbaugh agreed. "Given a long enough time and even Myron will be right. You see, even if we couldn't account for a half hour here or there, we could still place each of you for some portion of the time that the killer was at Higgins' apartment."

They all relaxed at that and Rudolph gave him an I-told-you-so glare.

"So, no matter how deep we dug, everything seemed to check. Then we tried Possibility Number Two." He waited, wanting one of them to ask.

One of them did. "What was number two?" Brumbaugh thought it was Hank.

"Or maybe I should say number six, instead."

Rudolph Kavin's head jerked and his eyes flicked from side to side. He

opened his mouth, as if he wanted to say something. Then he closed it tight.

"You see, originally, there were eight of you."

That did surprise them. Their arms unfolded. They looked at each other, at Brumbaugh, at their father.

"Two of the other clones failed to develop. They died as embryos. But there was something funny about the paperwork on the other. Let's call him Number Six. It looked to us like the termination dates had been altered. So we began to wonder if maybe there weren't another one of you running around the City." Brumbaugh noted the odd look in the clone-brothers' eyes. As if the idea of a sixth brother were both unnerving and exciting. "You see, a sixth clone would explain everything. The tissue samples. The airtight alibis. Imagine how your brother would feel, knowing he was part of you, but excluded from your group. We pictured his resentment building into hate, and eventually into a kind of vengence by implicating all of you in a murder."

"Very nice, Lieutenant," said Rudolph. "Except that Number Six is dead."

The brothers all turned and looked at him.

"Yes. Your father's right," Brumbaugh said. "Number Six was aborted two months after quickening. That's why the dates were altered. Not to feign a termination, but to conceal the late termination."

"But . . ." Brumbaugh didn't know which of the clones it was who interrupted. "But, that was a crime back then."

"It still is. Manslaughter. But let me tell everyone—especially you Kasabian, because I see you're itching to say it. Fetuses, from quickening up to one year post-partum, are class five persons. They are neither infants, children, adolescents, nor adults. The statute of limitations on this particular crime has run out."

"Then what's the point of bringing it up?" demanded Rudolph.

"Oh, nothing, really," Brumbaugh answered casually. "Just the *reason* for the illegal termination. Your geneticist didn't want to talk, but we finally got it out of him. It seems Number Six was flushed because he was not developing *exactly* like the rest of you. A few minor deviations. Nothing major. Not even anything overt. Poor Number Six was just not a precise copy."

Identical frowns creased five brows. They looked at each other and saw the frowns were identical and the implications of that began to sink into them, and the frowns deepened. Identically. One of them turned to the father and said, "You killed our brother just for that? That he wasn't exactly like the rest of us? Damn you!" Brumbaugh was almost certain it was Hank that spoke, so he was surprised when Ruldolph said, "Be quiet, Barry."

"What about me?" asked another. "How close did I come to your friggin' spec limits?" The clone on the far right had risen from his chair and was glaring at his parent. The others looked troubled and one nibbled his lip.

"Boys," said Rudolph Kavin. "Boys."

Brumbaugh smiled to himself. He had driven a wedge into the Kavin solidarity. Now to exploit the crack. He

played with his folder for a moment. He was being childish, he knew, drawing it out like this. But they had been playing games with him up till now, so turnabout was fair play.

"Then we went on to Possibility Number Three. Musical chairs." He saw their looks of puzzlement and explained how it was possible for them to switch places often enough that they could mask the fact that one of them had actually been somewhere else. "After all," he said, "Your alibi witnesses could swear only that they were with one of you. But not *which* one!"

The Kavins looked at each other. Bobby bit his lip. Barry laughed and glanced at his father. Benny looked frightened. That's when Brumbaugh realized that they really had done it! *I'll be damned,* he thought. He wondered how they had talked Benny into risking a malpractice suit. Then he remembered that some of the patients that day had cancelled. So it didn't matter if the right Kavin was in the doctor's office or not. Brumbaugh kicked himself mentally. Could he be wrong? No, he was sure of it. The fancy footwork was only a red herring.

"You can't prove that they did it," said Kasabian. "You can't prove a negative from the lack of evidence." He smiled smugly.

Brumbaugh agreed. "Not only that," he said, "but even if it were true, it put us no closer to the killer; since there was no way of telling *which* of the five of you was odd man out. Still," he added wistfully, "whoever the killer was, he seemed to go out of his way to throw suspicion on all the brothers."

That remark got him a stone-faced look from all of them except Kasabian, who looked bored.

The elder Kavin smiled grimly. "So. That takes care of Possibilities One, Two, and Three," he said. "What's left? Nothin'. You got no case against any of my sons."

Brumbaugh smiled at him. He was going to enjoy this. "What's left is I went back to Possibility Number Two."

"Number T—" The father shook his head. "I don't get it. What are you trying to pull? You already eliminated that one. There is no sixth clone."

"Yes, there is. Tell me, Hank, what makes the five of you clones?"

The Kavin on the far right looked at him and shrugged. "We're all exact genetic duplicates."

"Duplicates," Brumbaugh repeated. "Duplicates of whom?"

Hank paused and his mouth parted. Bobby's head jerked up and he turned and looked at Rudolph. *"You?"*

"That's right," Brumbaugh said. "The Sixth Clone Theory was too good to abandon. Then I realized that there was a sixth clone all along."

The elder Kavin grew red-faced. "That's impossible! I wasn't even in the City the day of the murder!"

"Yes, you were. You were checked into a flea-bag hotel up on Third Avenue. You flew in Friday night and met Higgins in the bar there. It was a casual pick-up. You had your fun and she left. How often do you do that sort of thing, once a month? Never mind. We'll find out. What you didn't know at the time was that she recognized you. That she knew three of your sons. She asked you to come to her place the next day so she

could do a life-mask. You didn't know why until you went to her apartment."

"Impossible!"

"Well, it doesn't matter. You were already disgusted with her because of what she 'made you do.' Now there was the certainty that she would tell your sons about your weakness. You couldn't accept that. So, you choked her. What you didn't count on was Lewis seeing you as you left. If he hadn't identified you as a Kavin, we might never have matched the genotypes."

"Lewis saw a man with long brown hair." Rudolph rubbed his greying brush cut for emphasis. "I read Kasabian's copy of the transcript."

Brumbaugh shrugged. "Anyone can wear a wig."

"I don't have a wig," Kavin protested.

Brumbaugh shook his head. "Sorry. I found a hair in your hairbrush. Long and brown; not like your own hair at all. The lab report came back and said it was artificial fiber, not natural hair. And one of the things that Lewis noticed about the man he saw coming down the stairs was that 'his hair was not straight.' He thinks now that his eye might have caught a wig slightly askew. Not only that, but he noticed the scar from your facelift. We've asked him to come back and compare your scar and Bobby's to see which one he remembers."

There was silence in the office. None of the Kavins said anything. They didn't even look at each other. Kasabian, the lawyer, looked unconcerned. The father, after all, wasn't *his* client.

Finally, Kavin heaved a breath. "I was in Milwaukee until Monday morning," he said steadily. "When Billy called me and told me what happened, I called Matusiak and asked for some time off to come here. You can call them and check."

"We did. You told me you called your office around 0815."

"That's right."

"But *they* said you called in a little after 0900. Ten o'clock, our time."

"I . . ." Kavin looked confused. "Maybe it was nine. I don't remember."

Brumbaugh shook his head. "You know why? Because when you came from Milwaukee, you changed time zones. You had to reset your watch. You probably didn't bother to do it until after you had checked into the hotel, *ipso facto*. The clock in your room was slow by about three quarters of an hour. You didn't think to check it. Even by Monday morning you were still off."

"Bullshit! Just because I misremembered the time—"

"Billy," said Brumbaugh. "What time did you call your father?"

The second clone from the left answered. "Sometime around eight, eight fifteen. It was just after you brought us in."

"And what did you say to your father?"

Billy sucked on his teeth. He looked at Barry, then at Bobby. "I didn't talk to him," he admitted. "I got his answering machine. Left a message. He called back later through Kasabian and said he was flying out right away."

"How much later was that?"

Billy answered slowly. "About an hour."

"Uh hunh. Sometime around nine." Brumbaugh looked at Kavin Sr. "We

checked with the long distance companies. Matusiak and Kobesky received a call from a New York public phone booth at 0851 central time on Monday morning. Now, if Billy called you around 0800 eastern time, you would have known about the arrests at 0700 central time, *if* you were in Milwaukee. So why wait almost two hours to call your boss?''

''I didn't call right away. I waited an hour. Matusiak isn't in until—''

''Patience,'' said Brumbaugh. ''To make it look right, you wanted to wait until 0800 central time to call in. There you are in the hotel room. You've just checked your answering machine, long distance, so you know Billy's tried to notify you. So you call Kasabian, here, pretending you are calling from Milwaukee. You tell him you're flying out. Now to call Matusiak. Your clock says it's 0815. That's 0715 in Milwaukee, you think. Matusiak ain't there. So you wait an hour. That's reasonable. It might take you an hour to pack a bag, right? At 0951, your clock says 0908 or thereabouts. So you think it's a little after 0800 at your office. Actually, it's 0851, their time, about when Matusiak remembers you called; and 0951 our time, when the phone company says a long distance call was placed.''

''I told you, maybe it was nine o'clock! I don't remember clearly. I was upset. That long distance call was just a coincidence.''

''Yeah? Matusiak doesn't remember talking to anybody from New York that morning. No matter how you cut it, it was two hours between Billy's call to you and your call to your office. So, I checked the airline schedule, too. You told me you landed in Newark. The first flight leaving Milwaukee, after your phone call to the office, doesn't arrive in Newark until 11:28. Now how could you do that and check into a Midtown hotel at 12:08?''

Kavin laughed. ''That's easy. Since they extended the PATH lines to the airport in the 1990s, the trip has been a piece of cake.''

''Except, the PATH tubes were down the day you said you came in.''

Kavin's mouth set. ''I think I better see a lawyer. You're desperate to solve this case and you obviously feel a need to pin it on one of us.''

Brumbaugh shrugged. ''You couldn't possibly have flown in on Monday. The way we reconstruct it is this way: you knock off work early on Friday and fly into New York. A gate agent in Milwaukee thinks she recognizes your holo from Friday afternoon. You arrive late, check into the Hotel, call into your answering machine to see if there are any messages you need to return. Then, on Monday, you check into the Holiday Inn, pretending you just arrived.'' Brumbaugh settled back in his chair and let a satisfied look creep across his face. ''We have people out now with your holograph, checking places where you might have gone. And we're still checking with the airline people in Milwaukee and Newark to see if any of them can give us a positive make. Someone will. Maybe your buddy, Boris.''

''Boris do—'' Kavin gave him a thin smile. ''Boris who?''

''Boris Quint. He runs the hotel you stayed in up on Third Avenue. By the way, he wants to know when you're checking out.''

"I've never been to the Hotel Calypso!"

"Did I say the name was Calypso?" Brumbaugh made a surprised face. He looked at Mac. "Did I say Calypso, Mac?"

Mac shook his head. "I never heard it."

Kavin's face grew red again. "Yes, you did! A few minutes ago. I heard you. You said the Hotel Calypso." He turned to his sons. "You heard him, didn't you?"

Hank shook his head. "He said, '. . . the hotel, *ipso facto*.' Later, he said, '. . . the Hotel, call into . . .' "

Brumbaugh raised his eyebrows. "Did I say that? Gee, you must have *thought* I said 'Hotel Calypso' instead." He smiled and showed his teeth. "It's a natural mistake. Especially when you're under a lot of stress."

"I want a lawyer." He twisted in his chair. "Kasabian! You want the job?"

Kasabian looked up from his fingernails. "I thought you'd never ask. If you got the money, honey, I've got the time."

"Good, I—"

"And my first piece of legal advice is to shut your goddamn mouth! You already got more feet in it than the Rockettes." Kasabian smiled and looked at Brumbaugh. "Sorry to spoil your fun, Lieutenant. I was enjoying it myself."

"I bet you were," Brumbaugh said.

"That's why you called me Friday night," said Barry, staring at his father. "I wondered why you wanted us to play the switch game."

"It was *his* idea?" asked Bobby. "I thought it was yours!"

"Yeah. Which means you been thinking I set it all up, so I must be guilty, right?"

"Well . . ."

"Yeah, I'd'a thought the same thing if it was you. But *I* knew it was Dad's idea, and by Monday morning I had a good notion why."

"Barry!" Rudolph Kavin reached out toward his son. "Don't."

Barry brushed the hand away. "So, I went along with it. Given the choice between my clone-father and some woman I didn't even know . . . Well, it's like Billy sometimes says: me against my brother, but my brother and me against the world. We don't break ranks." He turned and looked at Hank and Bobby and Benny. "I didn't know then that you guys knew her."

"Then why are you breaking ranks now?" asked Mac.

Barry twisted in his seat and looked at him. "Look. The woman was dead. Nothing I could do to change that. All right? It bothered me a little when I realized that he had put suspicion on all of us, deliberately. But, that's why we all worked up our alibis. I knew that in the end you could never pin it on any of us. And by playing our games we could make it *seem* like it coulda been one of us. Distract you from Dad."

"But . . ." Brumbaugh threw the word out and let it hang in the air.

"But, he killed our brother. For nothing. I know we're all identical twins. We like it. You can't imagine what it's like to have someone who understands you, totally and completely. Part of that's genetic and part of it's the way we were raised. But I know we're also a little different, *and that's all right, too*. It'd be too boring if we were all

exactly the same. I didn't know your obsession ran that deep, Dad. I didn't know how ruthless you were about it.'' He turned from his father and looked at Brumbaugh. ''That's why you told us that, wasn't it? About the sixth brother, I mean. So we would know that Dad had broken faith with us a long time ago.'' Brumbaugh wasn't sure, but he thought he saw tears in the clone's eyes.

Hank Kavin was glaring at his father. His hands were tight balls pressed against his knees. ''Why, Dad? Bev was good people! She was a good customer and a good friend. Why'd you do it?'' He took a ragged breath between stiff lips. ''You know what you are? You're a son of a bitch! You're a goddamned son of a bitch!''

Brumbaugh laughed and they all looked at him. ''That's what made me think of Rudolph in the first place. Lewis remembered that when the killer came down the stairs he muttered, 'I'm a son of a bitch.' And really . . .'' He showed his teeth again. ''When you come to think of it, there's only one of you that fits that description.'' ■

ON GAMING

(continued from page 51)

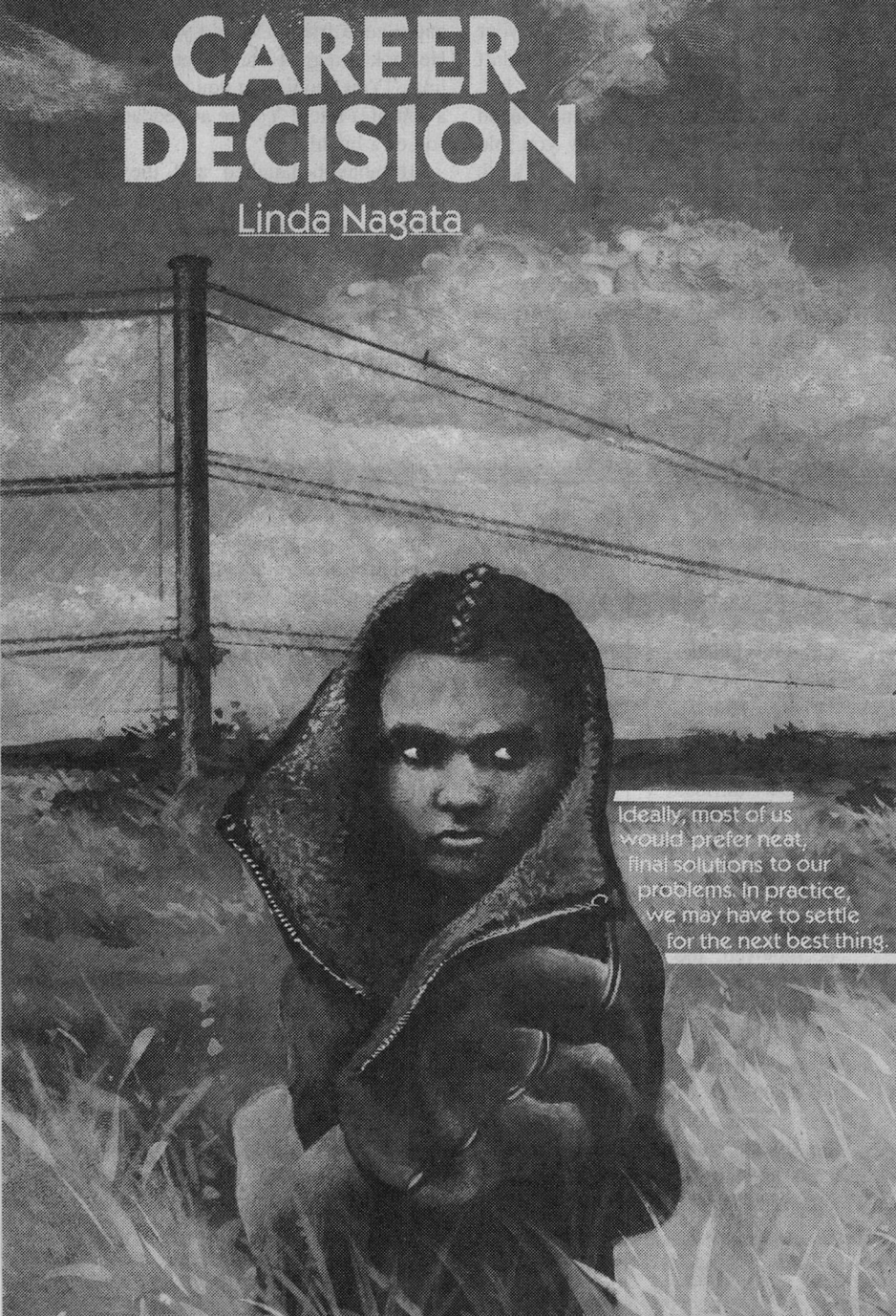
their detailed simulations, like *Orbiter* and *Falcon,* but recently they've ventured into other areas. *Solitaire Royale* (Spectrum Holobyte, 2061 Challenger Drive, Alameda, CA 94501) features eight different solitaire games, many of them unfamiliar to me and some of them deucedly difficult.

In *Pyramid,* the object is to remove a pyramid of cards, a pair at a time, using only the bottom layer of cards and the top card on the deck (called the stack.) Only pairs totalling thirteen can be removed, the king (equalling thirteen) is the only card that can be removed by itself.

Another tough, more familiar game is *Klondike,* where twenty-eight cards are dealt into seven columns, with the first column containing one card, and the seventh with seven. The remaining cards are turned over three at a time, and cards are played on the columns in descending order. *Solitaire Royale* also comes with a special children's menu, offering classic solitaire games like concentration. Games can be saved, points totalled for tournament play, and the game will even teach you the finer points of solitaire play.

All of these games would make fine companions, but if you get homesick for the tacky sea-side resorts of the world, and their inevitable arcade parlors, Accolade also offers *Pinball Wizard.* The amazing thing about Pinball Wizard is that it plays like a pinball game. Your IBM's shift keys become flippers, the games ''bings'' and squeaks like the real McCoy, and the action is about a lifelike as you could demand. You can also bang the side of the game (by hitting a button) putting a bit of English onto the ball, but risking a tilt.

There's even a Pinball Construction set, so you can design your own flashing, flipping wonder, complete with paint menu to create your own colorful display. ■


CAREER DECISION
Linda Nagata
Ideally, most of us would prefer neat, final solutions to our problems. In practice, we may have to settle for the next best thing.


Nicholas Parschley

Tomahoff couldn't shake the conviction that he'd been the last person in a position to stop the war—and that he'd failed.

Observe; don't interfere. Those had been his orders. And he'd followed them to the letter. Every time he screwed up, it was because he insisted on following orders. This time, too many people had paid for his mistake.

He climbed the long, concrete ramp of a subterranean parking garage up from under the superheated ruins of the Schönhausen police station. An empty munitions vault in a basement three stories underground had saved him from the fire. He still carried with him a half-empty oxygen tank. Around his neck his radio phones hung, their tiny speakers jabbering high-pitched German: *Shop at Harrah's in Schönhausen for the best in foreign fashions. Visit Restaurant Yoshitsune, featuring live lobsters, oysters, crabs and clams. Protect yourself and your unborn baby.* . . . Advertisements, broadcast by an automated radio station: the only intact facility in the area. Programming should have arrived over the satellite. Not today.

Reaching the middle of the deserted street, Tomahoff paused to survey the results of the Russians' surgical strike against the West German border town. Beds of embers marked the remains of the police station and a nearby supermarket. Gingerbread-laden buildings huddled between, their paint scorched and their windows shattered by the repeated blasts. The town itself had been abandoned. Only one vehicle was left on the street: an old IVECO truck, its hood up and its front windshield a frosty span of broken glass. Turning a slow circle, Tomahoff counted nine other columns of smoke climbing on the still evening air. Those would be communication facilities and food warehouses. Beyond the jagged line of Bavarian rooftops, a huge red sun sank in melodramatic splendor.

What a fuck-up, he thought. He hefted the oxygen bottle, testing its weight. Then with a roar, he heaved it through a storefront.

A few more fragments of glass tinkled bitterly to the ground.

If only he'd known. . . .

The pulse-beat lament that had pounded in his head all day, as he crouched in the oven-dry heat of the munitions vault, came back to him now.

If only he'd known that peace depended on the timeliness of Shamsher Rajid's forced "defection" to the Soviet Union, he could have intervened, pointed the KGB agents towards their quarry. He hadn't known. He hadn't thought the situation through. He'd only followed orders: *observe; don't interfere.*

Shamsher Rajid had come to Schönhausen as a participant in the European Enhanced Intelligence Conference. He'd delivered a scheduled speech to the assembly, then promptly dropped out of sight along with his five-year-old son, Pieter.

Not out of Tomahoff's sight, to be sure. Tomahoff had been more careful than the Russians. A twelve hour bug nestled like an epithelial cell against the American scientist's right forearm, sang out his whereabouts at three second intervals. But Tomahoff hadn't shared that data with the Soviets.

His lips curled back in voiceless rage. *I should have exposed him to the KGB!*

Now it was too late.

The gray men had finally caught up with Rajid in the morning, when he surfaced at a local train station with Pieter. But the Kremlin generals, suspecting betrayal, had already opted for war. Even as Rajid was being forced into the back of a black sedan, the first bombs fell on Schönhausen.

Tomahoff looked down at his heat-blistered hands. How had Rajid known he was to be sacrificed? And how had he known when to set Pieter loose so the boy could escape into the early morning crowds of office workers? During the long hours underground, he'd explored those questions again and again, coming up always with the same answer: the seer had warned him.

He ran his injured fingers through his long, dark hair, taking penance from the pain of his burns. Then he took out his pocket phone and punched in a number. Silence rang in his ear for over a minute. *How many satellites have been knocked out? Has the war gone nuclear yet?* Closing his eyes, he muttered into the open line, "Secret agent James Tomahoff reporting for duty. Sir."

Behind him, a child giggled.

"Pieter?" Slowly, he turned around.

Orders hadn't covered the moment when the boy fled. So Tomahoff made up his own mind and pursued him in a crosstown chase that culminated in the Schönhausen police station, where they both sought refuge from the attack. It was Pieter who found the fire door leading down to the basement. Tomahoff followed him underground, but lost sight of the elusive child just moments before an incendiary bomb ignited the upper floors.

Now, Pieter had chosen to reappear. Half-hidden in the evening light, he crouched near the mouth of an alley, just behind a long wooden flower bed whose seared blooms had collapsed into a tangled brown mat. His wide eyes studied Tomahoff, while his child-fingers picked nervously at a peel of scorched white paint. "Don't run away again, Pieter. Please."

Pieter Rajid's black skin reflected his Bengali heritage, but his hair had been styled in line with the latest American fashion: short everywhere except for the skinny french braid that ran from the crest of his skull to the nape of his neck. The already muted colors of his shirt and pants had been eclipsed by smoke stains; he'd lost his jacket with the red reflector stripes.

Slowly, Tomahoff dropped into a crouch, bringing himself down to the boy's level. Pieter struck him as a strange kid. Remote. Disconnected somehow from the real world. The depth of his eyes hinted at an age older than five years. "Hey, Pieter. Do you think we can help each other get out of this mess?"

The boy cocked his head as if listening to some faint sound. Oddly, he seemed more curious than scared. . . . as if he had the situation in hand.

"When you disappeared in that basement, Pieter," Tomahoff went on, speaking swiftly as the boy began to edge away, "I thought you'd gotten lost. Wandered back to the upper levels maybe and that would have been it. I'm glad you made it through."

A pebble skittered across hot asphalt as Pieter scampered into the dusky shad-

ows of the alley. Tomahoff swore silently. "Pieter—" he began.

The boy's small voice interrupted him: "You have a new assignment, Jim. She's coming to tell you about it. She wants you to meet her. On the east edge of town. By the highway, that's right."

A rivulet of superstitious fear trickled through Tomahoff's gut. "Who wants to meet me, Pieter?" Distant movement caught his eye. He glanced up. Three blocks away, a dog had emerged into the ruddy light. It paused when it saw him and wagged its tail hopefully. Turning back to Pieter, he asked: "who is she?"

No answer.

When he checked the alley, the boy was gone. With a sigh, Tomahoff began walking towards the east, wondering how Pieter had learned his name.

Dinner was gleaned from an employee lunch room: sandwiches, cookies and a six pack of Coke. The dog was waiting for him when he returned to the street. It had followed him across town, though he hadn't said a word to encourage it. He set off again in an easterly direction. The dog fell into step ten meters behind him.

Tomahoff's thoughts wandered back (only a week!) to the first time he'd seen Rajid. It had been at the American embassy in Bonn. The psychologist had stopped there on his way to the Enhanced Intelligence Conference. Talk among the resident reporters suggested that he was directing a revolutionary artificial intelligence program, possibly under the auspices of the National Security Agency. Predictive analysis. That was the term that had been tossed about, apparently referring to a new generation seer computer, designed to foretell the course of near-future events.

Tomahoff paused to sniff suspiciously at an egg sandwich. From the rumors, he'd assumed the computer was still in the planning stage. Only when he received his orders did he realize it must have already been built, and—he took a bite out of the sandwich, forcing himself to swallow against the sudden tension in his throat—it must have worked. Why else would Rajid have been sacrificed to the Soviet Union? A functioning seer would destabilize the delicate balance between east and west. Russia would assume the device was to be used to plan a first strike against her. With the nascent revolution in Czechoslovakia already feeding Soviet anxiety, NATO command must have seen war as inevitable. . . . unless they made a peace offering. What better gift than the designer of the seer? (*Learn all about our system! Build one of your very own!*)

Darkness slowly filled the street as he finished the egg sandwich. A chill breeze sprang up out of the east. The dog's nostrils flared in the wind; then it growled.

Tomahoff stared at the animal. It was looking past him, at something farther down the street. No movement there that he could see. Suddenly, a short, high-pitched human cry cut the evening air. Moments later, there came another call, much closer. Instinctively, Tomahoff dropped back into the shadows of the building.

Shadows won't hide you from night vision!

He looked for better shelter, saw a

sporting goods store only a few meters away. Glass from its broken window had spilled across the sidewalk. He edged towards it. He'd almost reached it when, less than a block away, a man-sized stick figure materialized in the middle of the street, its body drawn in luminescent green strips. "*Sind Sie Soldat?*" Are you a soldier? The soft voice carried easily in the twilight.

"I'm *lost,*" Tomahoff said. He recognized the apparition from news clips he'd seen. A Party of Angels commando, for sure. Hi-tech terrorists schooled in psychological warfare. *Mindfucking:* his lips shaped the word. Angels were supposed to be non-violent. "I'm no soldier. Just lost." He wondered if the man in the electric suit had infrared goggles.

"We're all lost," the soft voice answered. "The powers that be have led us to the edge of the abyss. Turn back now. There's still time to turn back."

Tomahoff leaned against the brick building, drew a deep breath, then reached into the store's display shelf, searching blindly for a shard of glass. His eyes never strayed from the figure in the street.

"Don't take up weapons, soldier. Peace is the answer. We'll all die unless we disarm." When he didn't answer, the stick figure sighed and switched itself off. Tomahoff was blind in the sudden darkness. "You should have gone out with the evacuation," the disembodied voice warned. "This is the central front. The war will sweep through here again. Stay, and you'll be dead by morning."

He waited, barely breathing, keeping one eye on the dog. It stared intently into the shadows for nearly a minute, its ears twitching as it tracked something he couldn't see. Only when it finally relaxed, did he drop the shard of glass. "Asshole," he said. He called the dog to him, scratched it behind the ear and fed it half a sandwich. Then he backtracked a block before starting east again, down another street.

The last of the sun's light had faded by the time he found the highway leading out of town. Pieter wasn't there, so he sat on a stone wall next to the road to wait. In the north, artillery thumped like an off-balance engine. The clouds burned red.

An hour passed. He looked at the dog. "What the hell am I doing here?" The animal rolled its eyes. *I'm following orders again, aren't I?* Pieter's orders. Why had the boy been so sure of himself?

At 2007 he thought he heard the fluttering of wind against canvas. The dog pricked up its ears. "Somebody new coming on stage, girl?" He scanned the cloudy skies, but didn't see the chute.

At 2015 someone started playing with holograms in the stubble field on the other side of the highway. The display was typical Angel art: a quartet of radiation-rotted corpses dressed in Soviet army uniforms. The faceless light-artist sent his phantoms hobbling slowly towards the highway.

The dog whined, and a moment later Tomahoff heard the sound, too, the deep throated purr of tanks coming up the road from Czechoslovakia. He dropped behind the wall into a low stand of brush, ceding the highway to the Angels's grisly reception committee.

"*Jim!*"

The whispered voice was a goad that sent the dog charging, teeth bared. Tomahoff caught it by the ruff of its neck. "Come on in, Pieter," he hissed over the rumbling tanks. "If that's you."

A child-sized shadow detached itself from the brush and moved forward into the faint red light cast by the nothern battle. "I hope you're tired of running, Pieter, because I'm damn tired of chasing you across half—" He stopped in mid-sentence and blinked hard. Beyond the boy's right shoulder, suspended more than five feet above the ground, a girl's face in red-glowing wraparound glasses stared at him.

"She's here, Jim," Pieter said quietly, as he bent down to pet the dog.

For a moment, Tomahoff could see no body at all. Then she moved, and the silver glow of a pending moonrise slurred across her figure. He swallowed against a dry throat. "Camouflage chill suit, isn't it?" he asked.

"That's right." Her voice was low and liquid, tinged with the petulance of adolescence.

"I've never seen one before . . . though I've heard rumors." He reached out to touch her. The holographic skin felt cold and glassy across her thigh. As she moved, embedded microprocessors analyzed and mimicked the shifting colors and temperatures of surrounding objects, camouflaging her even in infrared light. She'd pulled the hood back; that's why he'd seen her face first.

"Here, I've brought one for you." She twisted, and Tomahoff's vision seemed to blur. He heard the purr of a zipper. Was there a pouch built into the back of the suit? Apparently so. A package appeared out of nowhere and thumped to the ground. "Please put it on."

Tomahoff glanced at it. "Your goggles are reflecting the light," he said. "You'd better get down."

The face bobbed halfway to the ground; the glowing lens turned dark. "Better?"

"Switch the display off, would you? Just for a minute."

"Sure." Opaque shadow replaced the shimmering imagery: he saw that she was kneeling. Under the taut skin of her suit she wore a cylindrical backpack, hard, tubular pockets rode on each thigh. She reached into one of these and withdrew a narrow bag. "Water?"

"Sure." She broke the seal and passed it to him. He accepted gratefully, studying her as he drank. She was young—sixteen or seventeen, he guessed—but with a rangy build that promised to be over six feet when she finished growing. Capping the bottle, he passed it back to her. "Who the hell are you, anyway?"

"Elise."

"That's all?"

"It's enough. You're James Tomahoff, a spy working for the American government—"

"I'm not a spy," he interrupted. "I'm an observer. Everything I do is legal."

She shrugged. "As you like." She sat cross-legged on the ground and began to recite his identification number, code name, birth and EOD dates.

"You're trying to tell me we're on the same side?" he interrupted impatiently.

An amused look flickered across her face. "Yes."

The last of the tanks had passed. Across the road, the Angels were whistling to each other to regroup. "So, let's hear it," he said. "What's my assignment? How can I stop the war and save the world?"

"You can't. That's for others to do . . . this time."

He cocked an eyebrow. Whoever Elise was, she came cloaked in supreme self-confidence. He liked that. It was something he'd always missed in himself. Shrugging, he sat down beside her.

She said: "you were in Schönhausen to observe the kidnapping of Dr. Shamsher Rajid."

"Defection," he corrected.

"Defection. Of course. But now the war has brought a change in command. A previous mistake must be corrected. Your new assignment is to get Dr. Rajid back."

He grinned. "No way."

Pieter stirred. "Why not, Jim?" he asked.

"Because he's in Moscow by now, Pieter. Out of our reach."

"No he's not. He's just across the border."

The boy was so certain! A cold finger of suspicion began to scratch at the back of Tomahoff's mind. "How do you know that?"

"I've been watching him."

"How?"

Elise waved a gloved hand in dismissal. "No more questions. You have no need to know the specifics."

"Oh no?" He scowled. "I think maybe I do. I've suspended judgment this far, but maybe I don't know either one of you at all. Maybe I think you're just two kids on a wild joyride, or Angels trying to put a kink in the war. Sorry, Pieter, but the powers had good reason to send Rajid over. They *needed* the Soviets to have access to that new—" he hesitated, looked questioningly at Elise "—slick brain?"

She glanced at Pieter, nodded, then raised her eyes until they met his again. "A seer computer, yes. That's what Rajid was working on."

His scowl deepened; he chewed a thumbnail. "It's real then?"

"Oh yes."

"*Damn!*" If only he'd gotten Rajid across to the other side in time!

In time to do what? he wondered. Stop the war? Had that really been within his power? Another thought occurred to him: if the seer worked, then Rajid must have known this war was coming. Why had he done nothing to prevent it?

Elise answered his unspoken question. "Don't think ill of Doctor Rajid. This engagement was necessary, and it should be limited in its scope—that's an 85 percent probability. Believe me, the alternative was much worse."

He massaged his forehead with the heels of his hands. Engagement? Probability? These words didn't belong in a child's mouth. "I'll ask you again, Elise: who are you?"

"I told you."

"You told me a name. *What* are you? Some kind of whiz kid? A computer freak? A math freak? A mind freak? NSA isn't in the habit of hiring teens. Why are you here?"

She paused, as if listening. After a few seconds, Pieter whispered some-

thing, but so quietly, Tomahoff was certain she couldn't have heard. At last she looked at him, a smile on her lips. "It's agreed we should tell you. I *am* the computer. Or at least a minor module of it."

She explained it to him as the moon rose over a distant stand of trees. "I have a slick in my head; a network of biochips that augments my neuronal connections. The human brain is the most compact computer ever invented . . . it's just not very efficient. When I was six my brain was re-wired to overcome that deficiency. It's changed me, Jim; I'm not like you. Not only do I have immediate access to data bases around the world, but I can think and reason and extrapolate faster than any human mind that existed before me. With the help of slicks—and the other, human modules that compose the seer—I can analyze and organize more data in a few seconds than most minds encounter in a lifetime. It's a causal world, Jim. The present determines the future. I understand the present; therefore, I can predict the future.

"But I'm slow, almost retarded by the standards of the new generation." Her gaze drifted to Pieter, who sat against the wall, half-listening, playing absently with the dog's ears. She nodded towards him. "Nearly a hundred individuals are part of the seer, but Pieter's the first of us to wear a chip since infancy; he's the best to come out of the system so far."

"And we tried to give him away," Tomahoff said.

She shrugged. "He was to be a sample module, the basis of the Soviet system. It was no security risk—" she smiled at that peculiar statement "—with his access codes deactivated he'd be cut out of our system. It's true the seer would be damaged by his absence, but not irreparably. There are other young minds in training. No, Jim, giving Pieter and Dr. Rajid away was not a bad decision; it simply wasn't the best."

"And you've come to set things straight?"

She nodded. "The Soviets can't be allowed to construct another seer."

"Hell, why not? If it'll bring peace. . . . "

"It won't, Jim. Not in the long run."

"It'll mess everything up," Pieter said.

"A Soviet seer would be an opposing force. It would neutralize us—increase the resistance in the field lines of the future so we couldn't manipulate them."

"Manipulate?" The implications of that word angered him. "You *determine* the future?"

"We all determine the future, every time we make a decision. . . . or refuse to decide."

"Except that *you* see the consequences before you act." Somehow that made all the difference. He gazed up at the silver-edged clouds. "What *do* you see, Elise? One future? Or many?"

"Many," she said. "Millions. Old possibilities are eliminated and new ones created each time a decision is made. It's impossible to track all the variations, of course. But possibilities are regulated by statistics, and we understand how to manipulate those. We can fix a general goal and track a course towards it through the eddies of probability and chance, refining our options as time advances. Not every imaginable

future is open to us, but every possible one is.''

''And what are the possibilities of my living to see another sunset?''

She smiled. ''Good, I'd say. Excellent. But that's just a hunch. The perturbations of individual lives are fine grained; I can't follow them.''

He raised an eyebrow. ''Maybe Pieter can do better?''

''No.''

A jet screamed somewhere far overhead. Pieter got up, opened the package Elise had dropped on the ground, and pulled out a large, glassy-gray coverall. ''You should put it on, Jim.''

Tomahoff looked at it uneasily, then turned back to Elise. ''Tell me about the war—this 'engagement' of yours. What's happening out there?''

''It hasn't gone nuclear yet. There's a 45 percent chance it'll still be limited to Germany by the time a peace treaty is signed. Sixty-five percent that it won't go beyond Europe.''

He blanched. ''Those odds stink.''

''They're acceptable.''

''To whom?''

Her eyes flashed angrily. ''The seer is doing the best it can with lousy material, Tomahoff. *We* didn't bring the world to the brink. And please believe me, we're working all the time to pull it back. Now will you put your chill suit on—*please?* Armed commandos who wouldn't be averse to taking a shot at an unidentified figure have just entered this area.''

''The war's already passed over this sector,'' he scoffed. ''The only commandos I've seen around here are Angels, and they won't—''

''Get down!''

He saw the next few moments clearly only when he played them back in his head: the smooth arc of her hand as she hit a switch on her suit and disappeared. The smeared suggestion of motion as she dove across the space between them. The concussion that knocked his breath away. He was pinned beneath an invisible weight, pressed up against the wall while her calm voice whispered in his ear: ''*Be still.*''

He pitched her off and scrambled away.

''Jim!''

''Elise, don't—!'' He raised a palm to stop her, but she hit him again, tumbling him against a half-buried field stone. ''You can't hide me,'' he groaned. ''You're making yourself a target. My image will be projected right through the suit!''

''No! I've got a ground image frozen in the display.''

''What?'' Pieter was humming a pop tune from inside the voluminous shelter of the other chill suit.

''An image of bare ground,'' Elise hissed.

''But it won't match the terrain . . . discontinuities—''

''Not significant. Don't worry. I've got full control through the chip. Now hush. Pieter, you too.''

He lay still and waited. A breeze soughed softly through distant trees, but there was no other sound. ''What's out there?'' he whispered.

''Hush! He can hear you talking.''

''Who? How far can you see?''

''Jim, *please*.''

He saw it then. A single delta wing glider, cutting like a dark arrow across the smoky sky. The lens of an infrared

camera gleamed dully in the red light. A plastic composite rifle would be slaved to the pilot's video screen. *Soviet sky sniper.*

The wing came around again, its cables buzzing angrily in the wind. A flare burst. Eyes clenched shut, he held Elise against him, thankful that she was so close to his own height.

They lay like that for a long time, listening, until at last Elise spoke. "He's moved on. We're all right for now." As she rolled away, a spatter of high-powered rifle shots erupted to the north. "That'll be the Angels," she said. "Some of them must have been caught in the open."

"They're unarmed."

"Yes."

Pieter crawled out from under his magic blanket, looked around, and grinned. "Close call, huh, Jim?"

From somewhere nearby, Elise growled, "Shut up, Pieter." He felt her hand cool against his shoulder. "And turn off that suit before you lose it."

Tomahoff got shakily to his feet. "How did you know that sniper was coming?"

She switched off her suit and pointed at the sky. "A stealth drone at 12,000 feet. I can access the camera data. And I've scattered a few ground-based eyes along the road as well. Do you believe me now?"

"Maybe." He looked away. "Thanks for covering me, Elise. I would have been dead without you."

She sighed. "You may still be, Jim. You see, we're crossing the border in the company of Russian soldiers."

The suit felt like a cool gel spread across his skin. When he stretched, the material flexed with him. "Perfect fit," he noted.

"I checked your size before I came. Use this toggle to activate it."

He pressed the switch and watched the holographic skin flicker to life. . . watched himself fade away. And he sensed it: that feeling of inevitability that had dogged him all his adult life, waiting for him like some anonymous salesman at every turning point in his existence. Once again, a situation was evolving around him that he wanted no part of, yet already he couldn't bring himself to turn away from Elise. She'd touched him; a rare event in his memory. He liked her. He wanted to believe her, and not because she'd saved his life. There was something special about Elise.

He watched her as she picked up his discarded jacket. "May I use this?" she asked.

"Sure."

Pieter stood up; Elise helped him slip the jacket on. She rolled up the sleeves for him, then zipped up the front.

Strange, how they seldom talk to each other. Then he remembered: the implant. No need for archaic conversation when you could communicate at the speed of light.

"How well do you know the past?" he asked suddenly.

Elise seemed mildly surprised. "Better than you think."

He hesitated. She'd claimed to be only a minor and outdated module of the seer, yet he sensed her influence transcended the obsolete technology in her head. As young as she was, she possessed the aura of a progenitor, an

elder. . . . a *leader*. Was there a social structure within the seer? Who controlled the beast? He pulled an energy bar out of the pile Pieter had dumped on the ground and ripped the wrapper open. "Know why I'm here?"

She smiled. "Tell me your version."

"It was a perverse desire to be different. In school, it seemed like just about everybody was into computers, business, engineering, medicine. Not me. I wanted to be original, esoteric. I wanted to piss my old man off. So I got my degree in Russian studies." He stripped off the wrapper and flung it away.

"Obstinate, huh?" Elise said. "That fits your dossier."

He grinned. "I never guessed there'd be a demand for my services. Shit, I was practically drafted by the state department."

"They offered you a lot of money?"

"More than I ever expected to make without having to stab someone in the back." He sighed. "I still haven't had to do that, thank God. But then I've never done anything worthwhile, either."

"We need people like you."

"Sure, we gather the data your system needs to run on. But what are we getting in return?" His gaze wandered to the fiery northern skies. "Not security, that's for sure."

She settled on the ground next to Pieter, her arm resting protectively around his shoulders. "Things are in bad shape now," she agreed.

"You know the funniest part of it all? I spent my youth protesting the government, the CIA, the whole concept of covert and overt intelligence. And now I'm it. What does my dossier say about that?"

"Just what you might think. It says you see yourself as a rebel; a man who follows his own mind. You habitually berate the government that pays you; you mock state policy; you indulge in verbal cynicism at every opportunity. Yet you always toe the line." She leaned forward, her eyes flashing a challenge. "Why is that? *Are* you a rebel, Jim? Or are you just talk?"

That threw him. He tried to pass it off with a laugh but failed, because the salesman on the corner was eyeing him again, barking the same old blunt and irresistible pitch: *Sell out, Tomahoff. Play it straight, march to the company tune and I'll give you the best deal you can get.* "Whew, you like to hit a guy hard, don't you Elise?"

She raised her eyebrows mockingly. "So? Which is it?"

He winced, embarrassed and intrigued that anyone should know so much about him. She was playing him, of course. He knew that. But he could play games too. "A *faux* rebel," he announced, in a pinch-nosed accent that made her laugh. "Dime a dozen next to the real kind. All talk, and no substance."

"Still true to form, huh, Jim?"

He grinned sheepishly and took a bite out of the energy bar. It occurred to him: people like himself must make predictive analysis easy—smart enough to discern the logical choice; bland enough to choose it. He chewed thoughtfully on the coarse oat grains. "So what's the plan?"

"Rest, for now. We'll be getting started in about three hours."

* * *

She woke him near midnight. When he rolled over to stretch the aches out of his body, he noticed the chill suit was active; he hadn't left it that way. "Why the camo?"

"Troops passed us twice," Elise said. "They picked up Pieter and the dog on IR. I thought it better if they didn't see us."

Pieter huddled in the shadow of the wall, his arms around the dog's neck, face buried in its thick fur. Tomahoff realized with a start that the boy was crying—whimpering softly like a . . . lost and frightened child. Tomahoff stared at him; it was the last thing he'd expected Pieter to do.

"Don't worry about him," Elise said. "He's just tired." Her chill suit was active. Tomahoff followed her voice as she walked to Pieter's side. He thought she crouched, a barely perceptible blur beside the wall. "Come on, love. Time to go."

"No!" he sobbed. "I can't see! And it's empty. There's nobody left."

"Hush, sweetheart," she murmured. "They're still out there; I can see them. Everything's going to be all right." She stole a glance at Tomahoff. "But be quiet for now. And open your eyes! That's right. Come on, I'll hold your hand."

Pieter was nervous, constantly questioning Elise as they moved east along the road. Tomahoff followed a few paces behind them. It was a strange sight: the boy, with the dog trotting at his side, demanding answers of an indefinite companion.

"Are they coming, Elise? Can you still see them?"

"Yes."

"Where are they?"

"In the forest."

"How many? Two? Or three?"

"Pieter! Quiet, my love. You know the meeting's all arranged."

Something about this continuing exchange bothered Tomahoff, after a few minutes he realized what it was: *Pieter should already know the answers to these questions!* He had access to the same information as Elise. Didn't he? Or had something changed?

Ahead, a steel and concrete bridge spanned a small, boulder-choked stream. The cultivated fields ended abruptly at the crossing. Forest began on the eastern shore—young, healthy trees crowding each other for space beneath the scraggly remnants of a previous generation withered by acid rain. On the bridge a band of Angels waited, three figures dressed in brown camouflage fatigues.

Tomahoff halted abruptly. "Do you know those clowns?"

"Sure," Elise said. "Pieter's going to stay with them until we get back."

"But you can't trust those bastards. They'll mess with his head!"

"Elise?" Pieter asked uncertainly, reaching out for the ghost of her hand.

"It's all right, love. You know how they operate. You've seen all their tricks before." She rumpled his hair. "Now go on." She beckoned to Tomahoff to wait with her while Pieter went ahead.

They watched in silence as he approached the bridge, the dog still at his side. "Peace," one of the Angels said in greeting. Pieter echoed the wish. A few more soft words were exchanged

before they all disappeared into the forest.

Elise put her hand on Tomahoff's shoulder. "A nuclear weapon has just been used near Bonn."

He flinched. A hot flush of fear surged through his brain. "Which side burned it?"

"NATO. They're losing the war, just as we'd planned."

He was stunned speechless, staring blindly at the road ahead. *Just as we'd planned. . . .* "What do they pay you for?" he whispered. "If you can't even plan a successful defense?"

"That's a good question. One the Soviets are certain to ask themselves."

He struggled to grasp her implications. "You're trying to convince them the seer's a fake?"

"Or at least that it doesn't work. Our kidnapping of Rajid will look like an attempt to salvage something from our failure."

"And this whole war," he whispered, his voice hoarse with emotion, "is a ruse."

"Oh no!" She sounded shocked. Then she seemed to reconsider. "Would we have engineered it? I don't know. Probably we could have found a more subtle way of proving our 'fallibility.' We didn't have to. This conflict was ordained a long time ago. The best we can hope to do is temper its intensity."

"If you die, will the seer still work?"

"Of course. That's why I'm here."

" . . . and me?"

"I need your help, your strength. Sorry, Jim. I know you never wanted to see action like this, but you were in the right place at the wrong time. I had to draft you."

And how did I come to be in Schönhausen? he wondered. *Was that your doing too? Did you have me sent here because you knew I'd listen to your tales?*

The transit to the border was an exercise in evasion: dodging sky snipers and tank columns; lying in a ditch waiting for a convoy to pass; dropping scent capsules to confuse any patrolling dogs.

Finally, they jumped the third truck in a Soviet convoy carrying wounded soldiers, and rode it the last kilometer into Czechoslovakia, clinging to the steel framework that supported the canvas canopy. At the checkpoint, the truck jerked to a stop. While he kept his face towards the canvas to hide his goggles, Tomahoff looked out from the corner of his eye. A shifting melange of noise surrounded them: rumbling engines, muttered Russian oaths, soldier-bitching. A border guard came by. He glanced at them, stared for a few seconds as if he saw something not quite right. . . . Then he shook his head and went on.

Tomahoff sighed, light-headed with relief. Beside him, Elise shifted nervously. She was a shimmer, a phantasm cast in moonlight, an occasional shadow on the ground. No more substance than this, yet he followed her.

The truck lurched into gear. Two minutes past the border, they rounded a bend into a dense stand of forest. "Time!" Elise called.

Tomahoff counted to three, took a deep breath, then kicked away from the truck. He hit the ground rolling. Behind him, the convoy's headlights receded into the night.

* * *

Elise called a halt on a cratered slope above the road, where an allied bomber had dropped its load prematurely in an attempted strike against the highway. Tumbled into a gully at the foot of the hill were the still-warm carcasses of three burned-out Soviet tanks.

"Have you spotted the security facility where they're holding Rajid?" Elise asked, as she sat down beside Tomahoff. They'd switched their chill suits off to save power. "It's there, right across the road, dug into the hillside."

Tomahoff adjusted his goggles. The photo-multipliers gathered in just enough light from moon and stars to show him a pair of reinforced steel doors set back against the far slope. "Yep, I've got it." He looked up. "So now what do we do?"

"Eat breakfast. After that, we get to work. We'll set up a string of cameras between here and the ambush point. They'll watch the road; let us know when Rajid is being moved."

"And me?" he asked, as he helped her unload the back pouch of her suit. "Are you ready to tell me what I'm here for?"

"Have you changed your mind?"

He arched his eyebrows. "Am I supposed to?"

"How could I know that?"

He shrugged.

"Jim," she sighed, "I wish you'd believe me. I *don't* know everything. I don't know what goes on in the heart of the Kremlin. . . . or in the heart of a man."

Helicopters buzzed in the starry distance, a line of six Soviet gunships returning to the east. "And my assignment?" he asked. He didn't mean to be brusque, but he was uneasy. He sensed that something had changed in the hour since they'd dropped off the truck. The war had gone quiet; there was too little activity along the border. It was as if the armies were waiting . . . for what? The dawn? Or the holocaust?

Elise picked up a miniature camera lens from the collection of equipment that had come out of her pouch. "When we pop the gas canisters, Rajid will be out of it for a max of twenty minutes. You've got to move him during that time."

He groaned. "Oh man, grunt labor."

"Sorry, kid," she drawled in ancient Bogart-ese. "It's a lousy job, but someone's got to do it."

"Right." He watched her sort through her equipment: field rations, gas canisters, light explosives, a third chill suit for Rajid, and an impressive collection of miniature photographic gear.

She set aside the explosives and the chill suit. "You carry these."

He looked at the little cylinders distastefully, then shrugged. "We're at war, aren't we?"

She didn't answer.

Dawn had begun to infiltrate the forest by the time they finished stringing the cameras. They'd come to a place two kilometers beyond the security facility, where the road jogged sharply south.

Elise dumped the last three cameras in a pile on the ground. "I have to make a trip into the woods," she said.

He nodded, and sat down to wait. When she'd been gone for a minute, he

remembered the radio. Pushing back his hood, he felt around his neck for it and slipped it on. It was still tuned in to the local station. He turned it on, and a cultured German voice filled his ears.

" . . . *hostilities to cease at once, by order of NATO command. Troops are currently being withdrawn behind their respective international borders. Repeat: a ceasefire was declared at 0540. Civilians are to—*"

He jumped as leaves rustled behind him. With one hand he swept the radio from his head and switched off the transceiver. Then he turned to see Elise's calm face hovering eerily above the brush.

Ceasefire! Did she know?

Of course she knew.

She'd been following the diplomatic exchange. She probably knew before the negotiators themselves reached a decision.

She switched off her suit and crouched beside him. "They'll call it the twenty-two-hour-war," she whispered. "It'll scare hell out of both sides. The truce will last a century."

"And Rajid?"

"Nothing's changed there. We still need to get him back."

But everything had changed! *Ceasefire*. "The border! The check point is going to close. We won't be able to get back across."

"There's still time. We can get him out and get back to the west before the border's reorganized."

Ceasefire.

"Can you call in air support? If we can get picked up right after we snatch him—" He stopped. She was shaking her head.

"No support. We have to get back on our own."

"But a chopper could—"

"No."

Tomahoff stared hard at Elise, accumulated doubts finally crystallizing in his mind. "Who issued my orders anyway?"

She looked away, her fingers tapping out indecision against her thigh.

"It was you, wasn't it?"

"Yes, Jim. It was."

"Then you're not sanctioned to be here."

He was thinking hard. He'd almost unraveled it: why Elise couldn't call for support; why Pieter had suddenly seemed so vulnerable. "The access codes!" he realized. "You said Pieter used access codes that could be deactivated. And that's just what happened last night, isn't it? He was badgering you with questions because he couldn't get any information on his own; he'd been cut off from the seer. And you couldn't call somebody up to say 'please turn the codes back on' because Pieter was supposed to be with the Soviets. . . . Rajid, too! This rescue is a personal crusade. . . . and if you let on what you're doing, your own codes will be neutralized. Maybe the whole seer!"

"No," she said quietly. "It would end with me. The west's defense structure would collapse without the seer."

He nodded, as understanding flooded his mind. "You said a Soviet seer would neutralize you. And that's exactly what NATO wants, isn't it? Because you're no longer under their control. Who does control you, Elise? Or are you the senior statesman of the next superpower?"

"It's not like that, Jim. Don't quit on me."

"But this is illegal! I have no orders to be here."

"Does it always take orders to make you get off your ass? What we're doing is *right*. The superpowers have made a mess of the world. It's time someone else tried to do a little better."

"And you've taken that burden upon yourself?"

"We had to, because we can see what will happen if we don't."

A motorcycle sped down the road. "I don't want to be your puppet," Tomahoff said.

"Who's puppet are you now?" She shook her head. "I don't want to control you, Jim. I *can't* control you. Any influence I have is on averages, not on individuals. Your free will remains intact. I'm only asking that you help me. I can't get Rajid out by myself."

I have no orders to be here!

"I could be imprisoned if I help you." She said nothing. "Elise, let it go! You predicted peace. Let it go at that."

Her lips came together in a hard line. "This isn't peace. It's a truce, that's all. Even a century is only temporary."

He searched her eyes, startled by the gravity of her voice. "And then? The final war?"

"That's right. It'll be the same old story. Fear. Mistrust. Accident. The End."

Tomahoff grunted. Pulling the radio phones from around his neck, he folded them neatly into a loop, then climbed to his feet. "The war's over," he said. "We should go back right now. Rajid's not worth risking life and career on." Her gaze held steady on his face. He looked away, twirling the radio on his finger, watching the smooth gray plastic blur with the speed of its rotation.

Rajid wasn't worth it, but Elise and her clan might be. Whoever they were, at least they were different; a third weight in the old balance of power, they held out the promise of something new. He flicked his fingers, letting the radio phones fly away. "Yeah, it'd be smart to go back. . . . but I guess we'll go on instead."

A smile broke across her face. "Thanks, Jim."

He grinned. Looking at her, he wondered what she saw on the edge of her long horizon.

She pulled her hood across her face until only her eyes were visible. "They're bringing Rajid out now." Leaves rustled. She touched his palm. "Shall we go?"

Holding her hand, he followed after her. He knew no orders would ever be written that would cover him on this one. He went anyway. ■

● Science is always simple and always profound. It is only the half-truths that are dangerous.

George Bernard Shaw

Creative Science

LIKELIER THAN 100,000,000 SUPERNOVAE

Cyn Mason

Astrophysicists were recently galvanized (that means shocked, but it's a more impressive word) by the discovery of two gigantic blue arcs in space, by far the biggest objects in the universe. Well, the biggest found so far.

"It would take 100 million supernovae going off simultaneously to create and energize these arcs," said Vahe Petrosian, professor of applied physics at Stanford University. Since this is obviously a trifle far-fetched (Carl Sagan undoubtedly would have said "Billions and billions of supernovae. . . ."), I'd like to propose a few alternative theories. After all, just about *anything* is more likely than 100 million supernovae going off at once!

Beer Can Rings of the Gods

Throughout human history, legends have constantly reiterated (it means repeated, but it's harder to spell) that men are but the playthings of the Gods. As

with any spectator sport or board game, even the Gods have to have someplace to set Their drinks. Which logically could only be beer, the original nectar. Mystic sources advise us that the Gods drink Coors, as they prefer non-union products. As to the presence of the rings, look, are *you* going to tell a God to use a coaster?

Galactic Art forms

Take a look at any modern art gallery. You'll find single lines made with a carbon pencil, beautifully framed, and selling for $500. Or conceptual art, whereupon the artist, if literate, types out a little card telling you to imagine a scene, like maybe a giant water tap in the side of Hoover Dam, and wishes to sell the little index card to you for $500. I recall a time when an artist received a grant to put little fabric fences across a large portion of California, and then took an aerial photo of them before they all blew down.

It is not logical to assume that insanity is peculiar to the human race, so is it not possible that somewhere, in the vast reaches of the universe, an alien artist-type organism has utilized enormous amounts of technology and currency to produce the arcs? Perhaps as we examine them more closely, we will discover black holes in the center of each, emulating gigantic cartoon eyeballs. Crossed eyeballs, even.

A secondary possibility along the same lines is that the aforementioned Gods, in addition to their fondness for beer, are partial to darts, and we've finally found the bull's-eyes.

End of a Very Long Rope

Another theory was proposed by the eminent Dr. Petrosian, "It looks like God created something like a long rope, cut it into simple pieces . . . and plopped (author's note: this means threw, but is a more scientific word) it up into the sky."

Perhaps this explains the legendary Indian Rope Trick. Or alternatively, the Gods might be in need of a physical fitness program to offset the inevitable weight gain that comes of an overindulgence in beer. Jumping rope is popular, and another bonus of this explanation is that it easily accounts for the arc shapes. Could it be that cosmic waves are the otherworldly echoes of Godly feet thumping rhythmically?

Alien Advertising

In particular, the fact that there are *two* of the arcs causes a horrible suspicion to slowly form—what pair of arches is known and recognized all over, even on our own planet? At last, the truth will come out! McDonalds is backed by aliens, who opened an Earth franchise a generation ago. For marketing reasons (the color blue is the least stimulating to the human appetite, a fact that once caused the author to paint the

entire interior of her home in that color), they changed the blue arcs that mark their major corporate office to yellow ones for this world. Despite the fact that this is, galactically speaking, a tiny backwater planet, it is obviously profitable to them or there wouldn't be so many of the damn things. The author's personal theory is that the alien corporation handles universal waste disposal as well, combining the two businesses into one hugely lucrative operation.

Think about it the next time you order that Big Mac. After all, it's still more likely than 100 million supernovae all going off at once.

A late-breaking note: in the time since the original discovery of the arcs and now, Dr. Petrosian has continued to investigate these fascinating phenomena. He now believes that the original theory, that of 100 million supernovae going off at once is "possible, but not likely." This may possibly qualify as the understatement of the year.

The arcs themselves are perfect circular arcs, and appear to be shaped by the gravitational lens effect of the mass of the galaxies they're seen through. (Recent measurements show that the light of the objects, one of which may be a quasar, and the other possibly a galaxy being born, is originating twice as far away as the galaxies themselves.)

The very term "gravitational lens" lends itself to further speculation. Watch this space for my next essay, "Contact Lenses of The Gods"! ■

● We keep, in science, getting a more and more sophisticated view of our essential ignorance.

Warren Weaver

●How many learned men are working at the forge of science—laborious, ardent, tireless Cyclopes, but one-eyed!

Joseph Joubert

The Alternate View

OPEN-LOOP BUREAUCRACY

G. Harry Stine

Any electronics engineer can explain what happens when a system is pushed to its limits. Because all systems inherently possess distortion—an inevitable consequence of the Second Law of Thermodynamics—such a system becomes unstable.

More than half a century ago, electronic engineers learned how to handle this sort of thing when they had to deal with the many forms of distortion in vacuum-tube amplifiers. The way to stabilize an "open-loop" system is to install some negative feedback—take a portion of the output, shift it 180° out of phase, and add it to the input signal. Negative feedback stabilizes an unstable open-loop system; it also greatly decreases the power output of the system. (You can't get something for nothing.)

Engineers know this and know what to do about it.

Politicians and bureaucrats don't understand systems and won't bring them under control with negative feedback principles. Bureaucrats detest negative feedback because it decreases the power of the system which gives them power over people.

As a result, we've got an unstable, open-loop bureaucracy running wild. The bigger the governmental system, the more unstable it becomes and the more resistant its personnel are to instituting power-limiting negative feedback to get it under control. A small-town government can work because the people affected by it can directly apply the negative feedback to their public officials. (It can also become *too stable* and thus static.) When the governed population grows, the system begins to become slightly unstable in the open-loop mode. The governments of big metropolitan areas have a lot more power and a lot less feedback control. By the time you get to the level of the federal government, the whole thing has become a bizarre bureaucracy that's running wild.

I've recently encountered two examples of this, both of which I believe are of interest. I give two examples (a) to show it's not a phenomenon affecting one agency, and (b) to spread the blame.

On January 5, 1988, President Ronald Reagan approved a revised national space policy.

At last! A national space policy! Hurrah!

It was supposed to be made public in the State of the Union message. Instead, it was announced at 9:00 A.M. on January 25, 1988.

The White House released a "Fact Sheet" on the new national space policy. I got a copy. Any citizen can obtain a copy. Write your congresscritter. I also got a massive amount of documentation from the Department of Commerce with two different fact sheets, a transcript of the press conference at which the new policy was announced, and a copy of an article from *U.S.A.*

Today repeating what was said in the fact sheets.

But I could not obtain a copy of the original national space policy document itself!

I wanted it because I know from long experience that one *always* refers back to the original data, paper, publication, law, statute, standard, document, etc., to obtain the exact wording, and not someone's interpretation or paraphrase of the original.

I was told that I could not see or obtain a copy of the public space policy of the United States of America that will guide our activities in space well into the next century.

Why?

Because the National Security Council has *classified* it in the interests of national security!

Say what?

A public policy document that covers the goals and principles of our space effort including civil space policy, commercial space policy, inter-sector policies, implementing procedures, and guidelines for all of these carries a government security classification, and *you and I cannot see it without a security clearance and a need to know!*

The new space policy reportedly has some needed provisions having to do with government encouragement of private-sector commercial space ventures.

Recall my article in the February 1988 issue with Wilfred Smith, "Laughing All The Way To Orbit." How can we go to investment bankers, entrepreneurs, and venture capitalists with a commercial space business plan and answer one of the first questions they'll toss at us: "what's the government's policy?"

The only thing we'll be able to do is to show them a "Fact Sheet."

"Oh, really? This is a fact sheet. What does the actual policy say?"

"Sorry, Mister Bux, but the government has classified it."

Mister Bux is going to invest multimillions of dollars in a commercial space venture when he can't learn what the government's *real* policy says?

I could probably charge into the fray and try to get the national space policy document released under the Freedom of Information Act. But once a piece of paper has been classified, it's damnably difficult to get it unclassified.

Here's one example of open-loop bureaucracy. Sure, a feedback loop is there. But it's difficult and expensive for the ordinary citizen to use.

The second example of open-loop bureaucracy is the Federal Aviation Administration (FAA) and its cavalier and arrogant bureaucratic promulgation of its own regulations.

The FAA is entrusted with promoting aviation safety, certificating aircraft and airmen, operating the air traffic control system, and *keeping its own safety records* with which it justifies anything it wants to do.

Over the past fifty-five years, the FAA and its predecessor, the Civil Aeronautics Authority (CAA), built an air traffic control system by exercising an increasing level of control over who gets to do what in a given volume of airspace. It started out designed to handle the 180-mph Douglas DC-3. As accidents happened, new kinds of controlled airspace and procedures were created by

the FAA/CAA. A few of these took into account the increasing differences in aircraft performance. Sometimes new technology was plugged into the system without careful examination. At other times, the FAA/CAA operated with the NIH (Not Invented Here) Factor.

When I first started flying in 1943, the CAA regulations were in a sixty-four page book (I still have it). My 1988 Federal Aviation Regulations relating only to certification, medical requirements, and air traffic and general operating rules, plus the "Airman's Information Manual" explaining what the rules mean, is one inch thick.

We now have a mish-mash of old airspace elements piled atop newer airspace elements: airport traffic areas, airport control zones, transition zones, positive controlled airspace, special-use airspace, the continental control area, prohibited areas, restricted areas, alert areas, military operation areas, federal airways, jet airways, terminal control areas, airport radar service areas, terminal radar service areas, and—oh, yes—uncontrolled airspace. Very little of the last, by the way.

What we have in the United States is the world's finest air transportation system run by the world's most arrogant bureaucracy, staffed with people who have never once been at the controls of an airplane.

We have an air traffic control system run by an open-loop bureaucracy that will not listen to the majority of its users and flaunts the rules by which it must make regulations.

The current flap was initiated by former Transportation Secretary Elizabeth Dole, in a flagrant bid for political attention. Nothing happened when an Aeromexico DC-9 ran into a Piper Archer over Cerritos, California in August 1986. Lots of newspaper coverage, of course. Airplane crashes have garnered column-inches ever since Orville Wright crashed at Fort Myer, Virginia, and killed Lieutenant Thomas Selfridge on September 17, 1908. What came out of the investigation of the Cerritos accident by the National Transportation Safety Board hardly saw the light of day. The cause of the accident was laid squarely on the air traffic control system. The United States government has thirty-nine lawsuits pending against it, including one from Aeromexico. Chances are these lawsuits will be quietly settled out of court with our tax money. The San Diego mid-air between the Cessna and the PSA 727 was silently settled that way for about $150 million.

Then came a "near-mid-air" between an American Airlines flight and a "Cessna" over Malibu in August 1987. But NO records, radar video tapes, voice tapes, etc., exist indicating that it really happened. However, Secretary Dole vowed in a Saturday news conference that she would make the skies of America safe.

Let's get one thing straight: whether I'm flying my Cherokee or in an airliner, I want the skies to be safe, too!

But the reaction of the FAA has been to clamp positive control on more airspace. They want more Terminal Control Areas of the sort where the Cerritos mid-air took place. And mandatory altitude-reporting radar beacons on *everything* that flies above 1,200 feet anywhere in the U.S.A. (Goodbye balloons, sailplanes, aerobatic aircraft, and ultra-

lights.) However, the FAA can't even handle the traffic load now because the system is a patchwork of airspace elements piled on airspace elements dating back to the 1930s. And they want to add to the load! Internal FAA reports (I have copies) say they can't do the job safely because they don't have the hardware, software, or jellyware. But they're going hell-bent for total control anyway.

They're doing this by ignoring the way government regulations are created and put into place. I wrote about this in a previous *Alternate View* column ("Overreaction," July 1987).

The FAA is putting Notices of Proposed Rule Making (NPRM) into the Federal Register in a way that buries them. If you don't know about an NPRM, you won't write an opposing response to it. Even if you write an opposing response (the FAA got 60,000 opposing responses to a recent NPRM), the FAA doesn't have to consider it; they can put the rule into effect anyway. In 1968, they got 10 favorable and 16,000 opposing comments to the original proposal to establish Terminal Control Areas; TCAs were established anyway. The FAA is putting things into "Advisory Circulars" that have the effect of federal law. The FAA are putting procedures into their controllers' manuals that are contrary to the Federal Aviation Regulations. The FAA is using their own accident and near-mid-air data to justify their own proposals for more and "safer" airspace.

With the FAA, the feedback factors are there, but they're switched off.

So we have a situation where public policy documents are classified and a government agency tasked with safety is operating for its own benefit.

This is government run amuck.

We need to start thinking like engineers about how and where to introduce the little negative feedback elements into the system to bring it back under control again.

I can tell you about the problems. I don't have the answers. But we must get the answers. Start thinking. ■

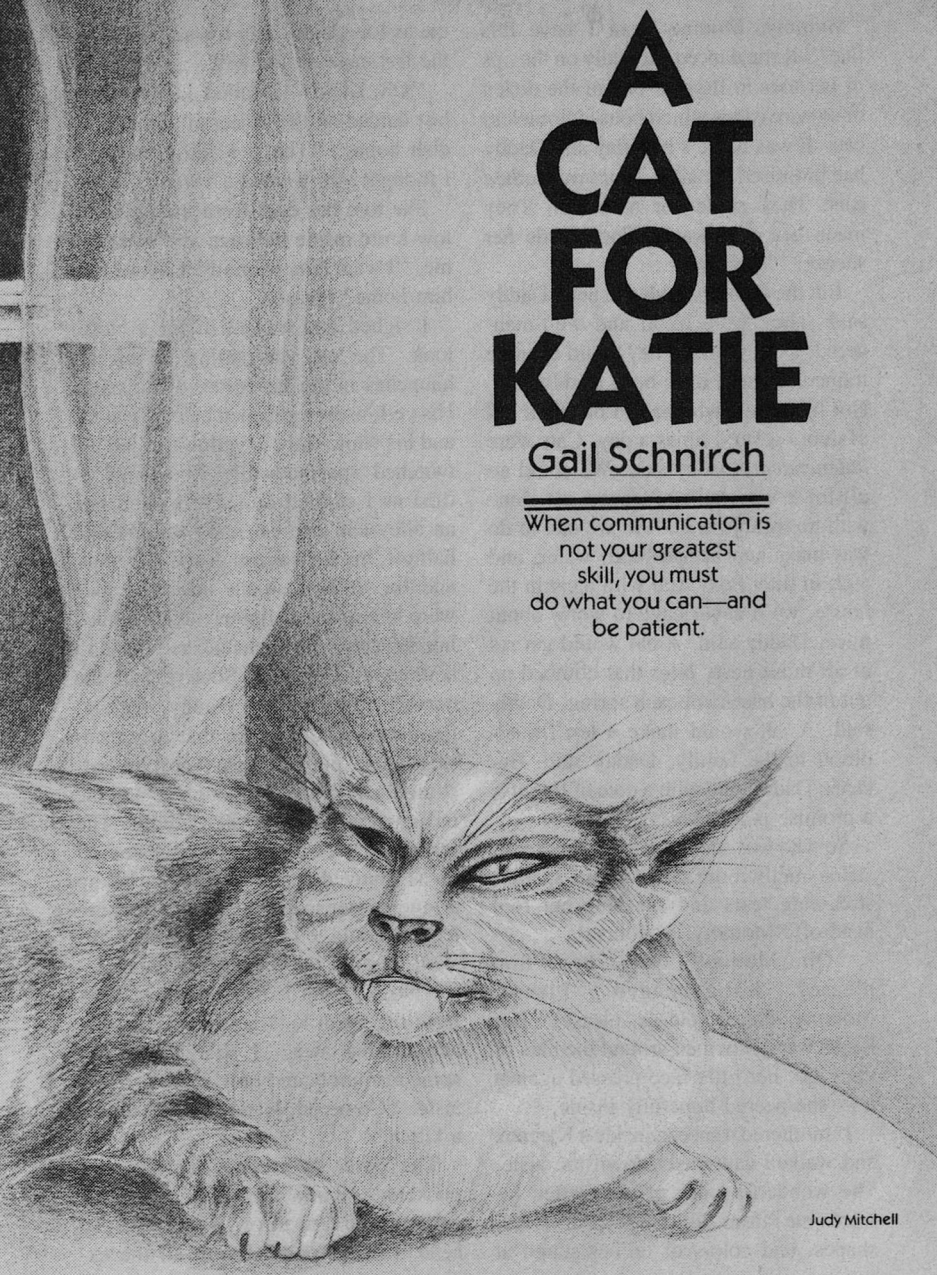
● To accomplish great things, we must not only act but also dream, not only plan but also believe.

Anatole France

A CAT FOR KATIE

Gail Schnirch

When communication is not your greatest skill, you must do what you can—and be patient.



Judy Mitchell

"Mommy, Mommy, can I have this one?" Katie danced excitedly on the tips of her toes in front of one of the dozen or so wire cages which housed homeless cats. It was Katie's birthday and Daddy had promised her a cat. Mommy *loathed* cats. They made her nose run. They made her eyes water. They made her sneeze.

But they made wonderful pets, Daddy said. They were clean and well-mannered, Daddy said. They could even be trained to use a litter box, Daddy said. Not like *dogs,* who had to be taken out of doors several times a day. Cats were *independent,* Daddy said. We could go off for a weekend and leave a cat alone with no trouble at all. All we had to do was make sure it had food, water, and a clean litter box. And with a cat in the house, we'd never have to worry about mice, Daddy said. A cat would get rid of all those nasty *bugs* that climbed up out of the basement each spring, Daddy said. A cat would make a terrific addition to the family, Daddy said. Besides, Daddy said with a note of finality, a promise is a promise.

So who was standing inside the small, stale, smelly room at the animal shelter, streaming tears and sneezing her fool head off? Mommy, of course!

"Oh, Mommy, can I have him please?" Katie begged. "Please, Mommy. Please, please, please!" Her hands were entwined around the bars of the cage, her little face pressed against it as she peered hopefully inside.

I smothered a sneeze inside a Kleenex and walked cautiously down the aisle. The wonderful odor of *cat* wafted toward me from all sides. All sizes, shapes, and colors of felines stared at me as I made my way toward Katie and the last cage on the left.

"Oh, Katie," I wailed as my eyes at last landed on the object of all her childish hopes. "That's a full-grown cat. I thought you wanted a *kitten.*"

She tore her eyes from the ugly yellow brute inside the cage and looked at me. "I want *him,* Mommy. Can we take him home? Please?"

I sighed and moved in for a closer look. The cat was sitting up on his haunches in the far corner of his cage. His yellow eyes gleamed balefully at me and his white-tipped, yellow-striped tail twitched spasmodically from time to time as I studied him. He looked like an alley cat; one ear had been chewed half off, his fur was rough and unkempt, and the whiskers on one side of his face were missing. A fighter, I concluded immediately. A troublemaker. I couldn't believe the Humane Society had the nerve to offer such a mangy, rag-tag, flea-bitten creature like that to an unsuspecting public. But there he sat, straight and proud, as though he was the indisputable King of all Catdom. The fur on the back of his neck rose straight up as I moved nearer. His lip curled up at one corner to reveal wicked-looking teeth. I could tell he hated me on sight. Well, buddy, the feeling was mutual.

"No," I said firmly, stepping back from the mean look he was giving me, and turning away. I straightened my spine resolutely and moved back up the aisle. "Come on, Katie. Let's look for a kitten."

The lower lip dropped and the face puckered. I knew that look. Katie was getting ready to throw a tantrum. To head it off, I pointed with all the ex-

citement I could muster to a cage midway down the aisle. "Look, honey! Isn't this one adorable? Soft and cuddly and sooo cute!" I forced a smile to my face. "Let's take this one home with us, okay?"

Katie's eyes filled with tears. "Noooo!" she sobbed. "I want this one, Mommy." She stamped her little foot for emphasis. "*This* one!" She gripped the bars of the cage until her knuckles whitened. "And I'm not going home till I get him," she added stubbornly.

I sighed again and started back down the aisle to drag her from Half-Ear's cage. I had hardly taken more than two steps before a fit of sneezing halted me in my tracks. Six Kleenexes and one very red nose later, Katie was still clinging furiously to the cage bars and I was fast losing what little patience I had left.

"Katie, this cat is *old,* honey," I wheedled shamelessly. Well, he *looked* old, I told myself, trying to justify what could very easily be an out-and-out lie. For all I knew about cats, Half-Ear might well be scarcely out of puberty. "He probably won't live very long, and then you wouldn't have a cat. If we choose a nice, small kitten to take home with us, it'll live for a long, long time."

Katie looked at me with her big blue eyes. "Mommy," she said, very seriously. "We *need* this cat. We *gotta* take him home with us. We just *gotta*."

"*Why* this one?" I asked, trying to curb my exasperation.

"Cause he's been here waiting *forever,*" Katie said. So much for four-year-old logic.

I straightened up and glared at the creature. He sat calmly watching me, as though he'd known all along what the outcome of the argument would be. Hands on hips, I stared at him through narrowed eyes. He stared back, slit-eyed. The hairs on the back of my neck rose as his yellow eyes met mine unblinkingly. "You're not going to win, Half-Ear," I informed him under my breath. "We're *not* taking you home with us!"

I grabbed Katie's hand and propelled her out of the room. She screamed every step of the way, but I didn't slow down until we were in the car heading for home. Katie cried the whole way. She cried through supper and through her bath and for nearly an hour after she went to bed. She started in again the next morning when she woke up. Mommy had another headache by now and was feeling slightly ridiculous about the whole thing. After all, it *was* Katie's birthday present, I reminded myself. And a promise *was* a promise.

After breakfast, we drove back to the Humane Society. As I was filling out the adoption papers and paying the adoption fee, Katie went back to spring her pal from jail. He was still there, of course. No one in their right mind would have taken *that* animal home with them.

After the paperwork had been completed, I went back to collect Katie's cat. The animal shelter employee, a friendly little guy by the name of Ben, opened the cage and I reached inside —and then jerked my hand back to safety.

"That animal tried to bite me," I said indignantly.

Ben shrugged. "Cats are kinda skittish sometimes," he drawled laconi-

cally. "Maybe you oughta let the little lady hold him."

"Are you kidding?" I asked. "He'd chew her up and spit her out in little pieces all over the floor."

The man laughed. "Now, he won't neither," he assured me, still grinning. "Cats have this *sense*, y'know. They can tell when someone don't like 'em. This cat'll do just dandy with that little girl of yours 'cause Katie *likes* him."

I held my breath as the man reached inside the cage and withdrew Mr. Ugly. He handed the big yellow hunk of skin and bones over to my daughter and I hefted my purse nervously, ready to beat the beast over his ugly head if he so much as grinned at Katie and showed his teeth. To my consternation, the cat snuggled down in her arms and started making a strange noise in the back of his throat.

"He's growling at her!" I whispered, horrified.

The man laughed again. "Lady, that cat's *purring*," he said. "Him and your little girl'll do just fine. Stop worrying. Can't you see he's just a kitten at heart?"

Half-Ear arched his back under Katie's gleeful petting and blinked his big yellow eyes at me. I wasn't fooled by the innocent routine. After all, I read Garfield just like everybody else.

We settled down into an uneasy truce after that. The cat stayed out of my way—and I stayed out of his. I fed and watered him and cleaned his litter box, sneezing and blowing my nose every step of the way, and Half-Ear kept out of my sight. It worked pretty well for awhile. Katie, at least, was happy. So was her Daddy.

"What have you got against him anyway?" Dave inquired one evening after supper.

I got up from the table and started picking up the dishes. "Look at him, Dave. He reminds me of one of my Grandpa's barn cats out on the farm. Cats like that aren't meant to be *pets*. Old Half-Ear will escape through the door one of these days and we'll never see him again. Katie will be heartbroken—and we'll be out twenty-five bucks, plus room and board!"

Dave grinned but before he could reply, Katie interrupted. "Octopus!" she said, out of the blue.

I looked at Dave questioningly. Dave looked at Katie. "What did you say, Katie?"

"Octopus," she repeated carefully. "Not Ole Half-Ear—Octopus!"

I put the dishes back down on the table. "Sweetie," I said, bending down to eye level with her. "That's an awfully strange name for a cat. Don't you think something like Tom or Tiger or Whiskers would sound a little better?" Actually I preferred Half-Ear; I thought it fit him perfectly.

But Katie shook her head stubbornly. "Octopus," she insisted.

I gave in gracefully, having learned from experience the futility of arguing with a four year old. From that point on, Old Half-Ear became Octopus. After awhile, I even adjusted to the name. He *did* seem to have more than the normal four feet, at times.

I was down in the basement doing laundry, and Katie and the cat were outside playing. They had become inseparable partners, and Katie talked to the

cat constantly. At first I hadn't paid much attention to their conversation. As with most preschoolers, Katie talked to *everything*—her toy spaceships, her Mr. Spock doll, her Wookie, her Ewoks, the woolly worm on the sidewalk, the butterflies in the yard, *everything*.

Today, however, as I was hanging up clothes on the clothesline I noticed something odd. Katie wasn't just babbling to the cat, she was asking him questions! And then, after asking them, she would sit patiently and pretend to be listening to his answer. I smiled to myself as I eavesdropped on this new game. The cat gazed at her silently through slitted yellow eyes, then he meowed softly a couple of times, almost as though in answer to her question. Katie listened intently, then shook her head sadly. "I don't know where that is, Octopus," she told the cat. "Is it farther than Grandma and Grandpa's house?"

I chuckled. In Katie's limited experience, there was nothing any farther than Grandma and Grandpa's house. And after riding for six hours in the car with her, listening to the same old question asked at least every ten minutes—How much longer *now*, Mommy?—sometimes I thought it was the end of the world myself. I pegged up the last of the laundry and went back inside to start supper. Katie and Octopus moved from the back deck to the front yard.

"Stay on the sidewalk, Katie," I called out the window as Katie powered up her tricycle and deposited Octopus in the basket in front. "And don't go any further than Mrs. Jones's driveway!"

"We'll be back for lunch, Mommy. We're going to Mars!" Katie waved to me and then was off, her sturdy little legs pumping the pedals vigorously. Octopus curled up inside the white wicker basket attached to the handlebars and yawned. I went back to the kitchen to finish chopping the salad.

Katie was truly a child of the space age, I reflected as I selected one of the last garden tomatoes of the season to add to the salad. She lived in a world of the future. As far as she was concerned, going to Mars was just as real and just as feasible as going to Grandma and Grandpa's. I shook my head, slicing into the tomato. When I'd been her age, going to the moon was still considered science fiction.

The knife slipped through my hand as a horn suddenly blared from out in front and the sickening sound of screeching brakes and crunching metal tore into me, bringing me back to Earth with a vengeance.

Heart pounding furiously in my throat, I ran to the front door and threw it open. "Oh, no," I gasped, my legs suddenly turning to jelly beneath me. Katie's tricycle was turned over on its side in the street, one wheel still spinning crazily in midair. A station wagon had slammed to a stop not three inches from it. Katie, little Katie, was laying on her back beside the tricycle, ominously still.

I could feel the scream building in my chest and rushing to the back of my throat as I ran blindly toward the motionless form of my daughter. Hot tears scalded my eyes so that I could barely see where I was going. The driver of the station wagon was getting out of his car, white-faced and shaking.

A scream tore through the air, high-pitched and wavering and growing in intensity as I neared my daughter. For a long moment, I thought it was me. Suddenly Kate sat up on the pavement, screeching like a banshee.

"Katie, Katie," I sobbed, gathering her up in my arms and searching desperately for her injuries. "All you all right, honey? Where does it hurt?" I could hardly believe the evidence of my eyes. Katie didn't have so much as a scratch on her!

The driver approached nervously, stammering out his story to anyone who would listen. By now a small crowd had begun to gather around us. I sat on the pavement, clutching my daughter to me and trying to make sense of what the driver was saying.

"I swear I didn't see her," he said, his eyes huge in an ashen face. He couldn't have been more than sixteen or seventeen at the most. The kid was as terrified as I was. "She was coming down out of that sloping driveway, too fast to stop. She musta not seen me until it was too late. I never would've missed her if that big yellow cat hadn't run right out in front of me. I swerved to miss it, and it was then I saw the little girl."

Katie began wailing all over again as the boy spoke. "Where's Octopus?" she whimpered, tears running in streams down her grubby little face. "He jumped out of my basket and ran across the street, Mommy. I don't see him *anywhere!*"

"Shhh," I whispered, stroking her dark curls with a shaking hand. "He's all right, Katie. He's probably just scared and found somewhere to hide. He'll be back when he's had a chance to calm down."

Katie looked up at me trustingly. "You promise, Mommy?" she asked, hiccupping a little with the aftereffects of her sobbing.

"I promise," I said, wondering if I ought to cross my fingers behind my back—just in case.

Two days passed with no sign of Katie's cat. Katie was heartbroken. She moped around the house, refusing to play with her new stuffed E.T. or the Jedi light-saber she'd gotten for her birthday until Octopus came back. Against my better judgment, I placed an ad in the local paper and posted notices around the neighborhood. I called the animal shelter and had the local radio station run our ad on their Missing Pets line. I even offered a small reward, but no one had seen a large yellow cat with a striped tail and a malformed ear.

I was up late the second night of Octopus's disappearance, trying to think of a way to tell Katie that her cat wasn't coming home. Mommy had lied. Some promises just couldn't be kept, no matter how good the intentions behind them. I sat in the rocker, listening to music and rocking and thinking. We could always go back to the animal shelter, of course. But somehow I knew that this solution wouldn't appeal to poor little Katie. She said she'd never find another cat like Octopus. I had a gut feeling she was right. There *couldn't* be two such ugly critters in the world.

Dave was working late that night and when I heard a noise at the back of the house, I put it down to jangled nerves and exhaustion. But when I heard it the

second time, I quit rationalizing. *Someone* was out there. My heart started pounding and I had an awful feeling in the pit of my stomach. What if someone was trying to break in? Should I call the police? Should I get Katie out of bed and run? Should I get the gun and confront the burglar?

The gun was out, I decided. For safety's sake, Dave had hidden the small handgun in the top of his closet. Then he had hidden the bullets in the top of *my* closet. By the time I got a chair and climbed into two closets, put the gun and the bullets together, and got back downstairs, the burglar would have cleaned us out. Besides, I couldn't hit the broad side of a barn.

I stood up, my knees rubbery. I could no longer hear the strange scratching noise over the pounding of my heart in my ears. I forced my feet to move, one step at a time. Not wishing to alert the intruder to my presence, I didn't turn the kitchen light on and as a result stumbled and nearly broke my ankle on Katie's Buck Rogers doll. Clutching the injured foot with one hand, I hobbled over to the toy and kicked it out of my way. After several muffled curses, I finally managed to limp cautiously toward the sliding glass door.

The curtains were drawn, but I must have forgotten to turn off the back deck light. I stopped breathing altogether when I saw the huge, misshapen shadow outlined faintly against the curtains. Oh, God, why hadn't I taken the time to get the gun after all? What on Earth could make such an awful silhouette?

My nerve faltered and for one long second I was tempted to cut and run. Then I closed my eyes, counted to ten, and opened them again. Before I could change my mind, I dashed across the room and whipped the curtain away from the patio door, screaming at the top of my lungs as though sheer lung capacity alone would scare the intruder away.

I halted in mid-scream and what was left of my voice came out in a little squeak as my eyes settled on the intruder, lounging casually against the doorframe. Octopus stared up at me, his head tilted a little to one side as he contemplated my ridiculous behavior. I stared at him, closing my mouth at last with great difficulty. His yellow eyes glowed with unblinking intensity as he waited for me to speak. We regarded each other for a long moment, then I finally unlocked the door and slid it open.

"You stupid cat," I muttered with as much animosity as I could summon after being scared witless. I hated to admit it, even to myself, but I was *glad* to see the dumb beast. He sauntered casually through the door, head high, tail twitching. I would have bet my bottom dollar that he knew just exactly what I was thinking.

I followed him through the house, swearing to myself that I'd quit postponing my eye examination and have my vision checked first thing the next morning. I'd always suspected that I might have night blindness. Now I was almost sure.

I noticed then that he was limping slightly and I wondered if he'd been hit by the station wagon, after all, during that mad dash he'd made into the street ahead of Katie. Then I hardened my heart and sniffed disdainfully. More

likely the ugly beast had been out tomcatting around while poor Katie cried her heart out, I thought. That's gratitude for you.

He padded his way silently through the house toward Katie's room. I stood in the doorway, watching, as he jumped up on her bed and curled himself into a ball beside her. Katie stirred in her sleep and then turned over. Her face was wreathed in smiles despite the fact that she was sound asleep. She muttered something but I couldn't make out the words. I watched a moment longer. Octopus finally lifted his head and looked at me. His yellow eyes glowed almost red in the darkness. I shivered suddenly. Didn't cats have *green* eyes that turned *yellow* at night? And what about that silhouette against the patio curtain?

The cat meowed softly and I started guiltily, scolding myself for letting my imagination run away with me. Suddenly I felt very, very tired. Slowly I pulled Katie's door shut and shuffled down the hallway to my own bed. It had been a long night; I was exhausted. No wonder I was letting my imagination run away with me.

Katie and her cat were never apart after that. She even insisted that Octopus ride along with us in the car whenever we went shopping or out running errands. At first it seemed strange that the cat never balked at getting in the car. It also seemed weird that he was apparently so content to spend all of his time exclusively in the company of a four year old. Dave had said that cats were independent; this one never seemed happy if Katie was out of his sight for more than a few minutes at a time. Eventually I got used to never seeing one without the other and finally I quit worrying about it. I did, however, begin to wonder how Octopus would react when Katie started kindergarten the following year. As it turned out, I needn't have concerned myself with it.

Very late one night I awoke to discover Katie standing quietly in the doorway of our bedroom. Dave snored gently beside me, oblivious to our daughter's presence. But my maternal instincts sensed her there, even before I was consciously aware of it. Or maybe it was something else my instincts picked up besides my daughter's presence. In her arms she carried her cat.

"It's time to go now, Mommy," she said softly through the darkness. I could just make out her shadowy outline in the pale moonlight streaming through our bedroom window. Octopus's glowing red eyes were much easier to see.

"Go?" I mumbled sleepily. "Go where, honey?" I sat up in bed and stared at her in confusion. She must be sleepwalking, I thought. But her eyes were open and she seemed wide awake. She was stroking the cat's yellow fur gently.

"We hafta go *now,*" she repeated, taking a step into the room. "Octopus says so."

I swung my legs over the edge of the bed and pulled on my robe. "Katie, you must have had a dream. Cats can't talk." I stood up and started to walk over to her. The cat in her arms suddenly arched its back and spat. I froze.

"Katie," I said, trying to keep my voice steady. "Put Octopus down on the floor, please."

Katie shook her head. "We hafta go, Mommy," she said. "Right now."

"Dave," I said, the quiver in my voice betraying my panic. "Dave!"

Dave rolled over and sat up, groaning. "What time is it?" he demanded, rubbing his eyes and peering nearsightedly at the alarm clock.

"Never mind the time," I told him. "I think something's wrong with the cat."

He looked at me like I'd lost my mind. "What are you talking about?" he asked, finally noticing that we were not alone in the room. "Katie, hon, what are you doing up?"

"Daddy, we have to *go,*" she said calmly. There was no trace of panic in her voice, but the cat in her arms was tensed for action.

Dave looked at me and I shrugged helplessly. "Just get dressed, Dave, and don't ask any questions," I said in a low voice. He pulled on his pants, muttering under his breath about cats, and kids, and wacko wives. We approached Katie cautiously, one from either side. I expected the cat in her arms to spring for our throats but Octopus just watched us quietly.

We left the room, David, Katie, and I. Katie still carried her cat in her arms but he seemed satisfied now that we were leaving. "Katie," I said carefully as we neared the patio door in the kitchen. "Where are we supposed to go?"

She looked down at the creature in her arms. The cat stared at her through its strange reddish eyes, and for just an instant they seemed to flicker back into their normal yellow hue. Then Katie looked back at me. "Not too far, Mommy. Just out in the woods behind our house. Octopus says to cross over to the other side of the creek. It'll be safe there."

Again, Dave's eyes met mine. His eyes filled with disbelief, skepticism, and argument. I don't know what he saw in my eyes, but whatever it was, he decided not to argue. We walked out the back door, Dave in pants with no shirt, me in a purple robe, and Katie in her Starman pajamas.

Just before Katie stepped out on the deck, she bent over and lowered the cat to the floor. He arched his back and she ran her hands lovingly across the scruffy fur. Then she stood up and sighed. "Let's go," she said quietly. At that moment she sounded far wiser than a four year old had any right to be.

We stepped off the deck and crossed the back yard, walking quickly into the woods behind our house. Katie led the way. The full moon lit the woods nearby, casting an eerie glow over the land. Katie only looked back once, from a slight ridge not far away. We could still see the house, and the patio door with the big yellow cat sitting, straight and proud, in front of it.

For a fraction of a second, my vision wavered and the cat's outline began to shimmer and sparkle into another form—a form I had seen once before, in the shape of a unearthly shadow. And then the image was gone and I was rubbing my eyes and muttering something about night blindness. Katie had turned away from the house and was picking her way through the woods with renewed determination. She never looked back again.

* * *

That was the last we saw of Katie's cat. That was the last we saw of a lot of things. You probably read about it in the newspaper. It made front page news across most of the country. A freak accident, they called it. The DC-9 fell from the sky without warning, crashing into our quiet neighborhood amid a sea of flames, spreading death and destruction for miles. Hundreds died that night as a result of the accident. When the last of the debris had finally been cleared away, there were less than thirty survivors aboard a flight that had carried nearly two hundred. There were no survivors at all on Maple Court —except for Katie, Dave, and me.

Where once our home had stood, now only charred timbers and blackened bricks remained. We came away with nothing but our lives, and I considered us among the most fortunate of God's creatures to have escaped with that much. If not for an ugly, half-eared brute with yellow eyes, we would have died along with our neighbors. Of Octopus there was no sign. Somehow I think we all knew that we'd never see Katie's cat again.

We stayed with my parents while the details of the disaster were being settled by our insurance company. One night about a week later, Katie was playing with the Space-Age Lego's her grandpa had bought her. All her attention was fixed on the spaceship she was constructing. I sat beside her, watching and thinking. She hadn't talked about her cat since the night of the accident. She never asked about him, she didn't cry or mope as she had done before. It was as if he'd never existed.

"Katie," I said quietly.

"Hmmm?" she murmured distractedly, not looking up.

"About Octopus," I began hesitantly.

She frowned at the name but said nothing, continuing to build her ship to the moon, or Mars, or wherever she decided she would go this week.

"Aren't you sad that he's gone?" I asked gently.

She shook her head. "Nope," she said curtly.

"But . . . why not?" I probed, puzzled by her blasé attitude.

"Cause he told me he could only stay for awhile, till after the 'plosion, but then he'd hafta go home," she said, holding the spaceship up to the light and studying it with a critical eye. Evidently some modifications were in order for she promptly dismantled the wing section and began anew.

"Go home?" I repeated. "And . . . where is his home, Katie?"

"Octopus," she muttered, bending over to search through the remaining Lego's for a different piece.

I drew a breath and prayed for patience. "That's his name, honey," I reminded her. "Where's his home?"

She finally looked up, grinning. "Oh, Mommy," she giggled. "You're so silly. That wasn't his *real* name. I never could say it right. That was where he was *from*—a far, far away place. Even farther than Grandma and Grandpa's."

I stared at her in bewilderment. "Octopus?" I asked doubtfully. "But Katie, where *is* Octopus?"

She sighed in exasperation, her four-year-old patience nearly ended. "Come here, Mommy," she ordered. I obediently followed her to the window. She

drew back the curtain and gazed out into the darkness. Then she looked up, searching the sky for something. Suddenly a wide grin broke out on her face. "There it is," she said happily, pointing to one of the tiny, glittering specks of light in the heavens. "Octopus," she announced with satisfaction.

She went back to her Lego's leaving me to stand at the window, gazing at the sky in disbelief. Katie had pointed to a bright star in the Northern Hemisphere, in a constellation near Virgo. I tried to recall the amateur astronomy class I'd taken while in college. Octopus? I mused. Suddenly it came to me. Not Octopus—Arcturus! Why hadn't I ever made the connection?

"Why did you choose him of all the cats at the animal shelter?" I asked softly, still staring out at the twinkling star.

She picked out another Lego and attached it to the wing section. "I didn't pick him, Mommy," she said absently. "*He* picked me."

"But . . . *why*?" I asked, trying to figure out something that had been bothering me for days. "Why did he pick you?"

She was having trouble getting the new piece to snap into place. Her tongue came out between her teeth as she struggled with it. "Because," she said at last. "He picked me because I could understand what he *said*." At last the piece snapped into place and Katie looked up, a brilliant smile on her face. She lifted the awkward little spacecraft into the air and showed it to me. "One of these days, Mommy, I'm going to visit Octopus. He said so. He said he'd be waiting for me. He *promised*."

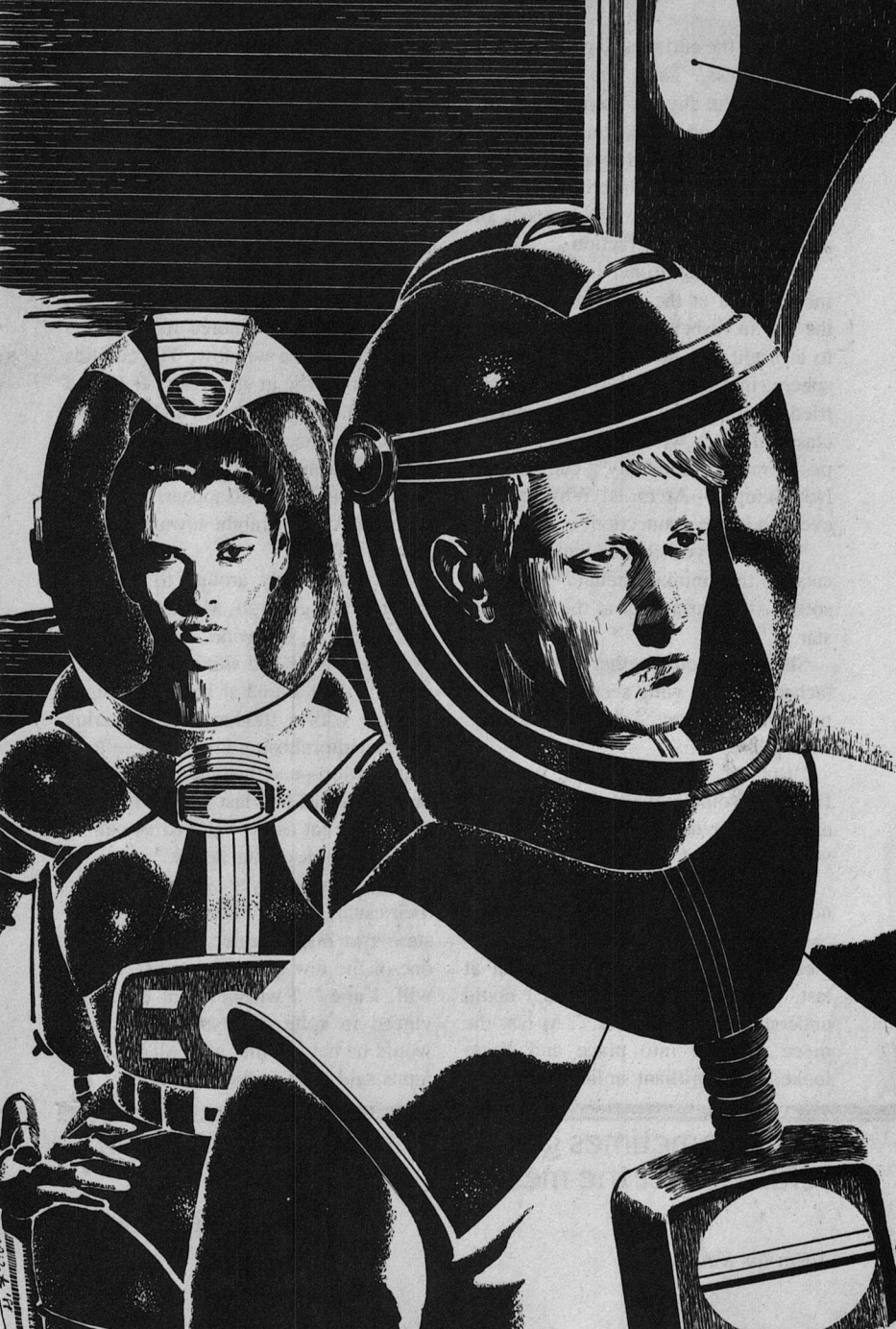
The tiny, handmade ship lifted from her hands and hovered in the air, right in front of my disbelieving eyes. Then it tilted gently on its axis and floated toward me. I ducked, panic-stricken, but the little ship ignored me and disappeared out the window. The curtains billowed softly in its wake. It turned slowly in a three-hundred and sixty degree circle once outside, as though getting its bearings, and then it lifted into the darkened sky, disappearing finally on a trajectory straight toward Katie's strange "friend."

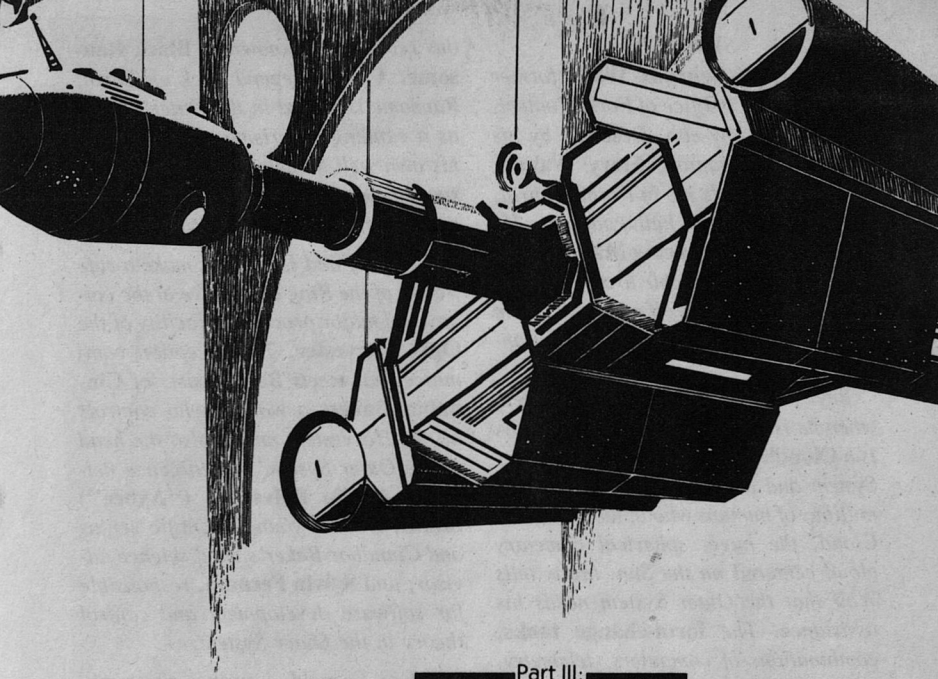
I turned slowly around to face my daughter. "I gotta go, Mommy," Katie said softly, "I just *gotta*." Her big blue eyes were wide and shining with anticipation. As I stared at her, they began to glow with a strange fire, flickering and metamorphosing first into a yellow-amber color—and then into an eerie reddish hue that I had last seen in the eyes of Katie's cat as he watched us calmly from the deck of our house.

And then her eyes were once again their usual, vibrant blue. I found myself staring at my daughter, speechless for one of the few times in my life. "You will, Katie," I whispered at last, convinced in spite of myself. Why else would he have come, after all? "If Octopus said so, sweetie—you will!" ■

● We sometimes get all the information, but we refuse to get the message.

Cullen Hightower





Part III:

We commonly think of the Solar System as the Sun, nine planets, and their satellites. But there's alot more to it than that. . . .

PROTEUS UNBOUND

Charles Sheffield

SYNOPSIS

The life of **Behrooz Wolf**, *former head of Earth's Office of Form Control, has reached low ebb. Deserted by his long-time companion,* **Mary Walton**, *and fired from his job in Form Control, Wolf is plagued by hallucinations. He keeps seeing the* **Dancing Man,** *a jerky, capering figure invisible to anyone else, who dances before Wolf and talks to him in a strange, near-comprehensible language.*

Bey Wolf is sinking into madness when he is visited by **Leo Manx.** *Manx is a* **Cloudlander,** *a citizen of the Outer System and one of the thinly-scattered millions of humans who inhabit the Oort Cloud, the huge, spherical cometary cloud centered on the Sun. Manx tells Wolf that the Outer System needs his assistance. The* **form-change tanks,** *combinations of computers, telemetry, and biofeedback equipment that permit humans to perform purposive form modification to other shapes, have been malfunctioning in unheard-of ways. Together, Bey Wolf and Leo Manx set off for the Outer System.*

On their way, they must pass close to the **Kernel Ring.** *This is an annular region where the* **power kernels** *are found. The Kerr-Newman black holes are used as the major energy sources for both the Inner and Outer Systems. The Kernel Ring is the home of rebels who prey on ships passing between the Inner and Outer Systems. Manx tells Wolf that he has evidence that Mary Walton ran off not with someone from the Oort Cloud, but with a man from the Kernel Ring.*

As their own ship transits the Ring, Manx warns of a powerful and dangerous rebel leader known as **Black Ransome.** *A vague legend back on Earth, Ransome is feared in the Outer System as a cunning, charismatic figure, with his own well-hidden and well-defended stronghold,* **Ransome's Hole,** *located somewhere in the Kernel Ring.*

Bey Wolf and Leo Manx make a safe transit of the Ring and arrive at the colony and major processing facility of the **Opik Harvester.** *The reception committee that meets Bey consists of* **Cinnabar Baker,** *a woman who controls all the Harvesters and is also the head of the Outer System's intelligence network;* **Apollo Belvedere ("Aybee") Smith,** *a brash young scientific genius and Cinnabar Baker's chief science advisor; and* **Sylvia Fernald,** *responsible for software development and control theory in the Outer System.*

Sylvia Fernald describes the problems they have been having with their form-change equipment. As she does so it becomes clear to Bey that it is not merely form-change equipment that is failing. There is widespread failure of communications equipment in the Outer System, failures for which the Inner System is being increasingly blamed.

This is confirmed when Bey takes a closer look at the inside of the Opik Harvester, and is unexpectedly attacked by three Cloudlanders. Aybee Smith explains to Bey Wolf that one of the Harvesters on the far side of the Cloud has been destroyed, and the Cloudlanders are blaming Earth and the Inner System. Bey is in danger of mob violence. However, before he encounters more trouble he and Sylvia Fernald are sent to the **Sagdeyev Space Farm,** *where there*

have been new reports of form-change problems.

Before they leave, Cinnabar Baker has a private session with Sylvia Fernald. Baker has with her only her constant companion, an old, bedraggled crow called **Turpin.** *She tells Sylvia in strictest secrecy that she does not trust Bey Wolf, and wants Fernald to try to achieve a close personal relationship with him. Sylvia Fernald finds Bey physically repulsive. She leaves, now dreading the trip to the Sagdeyev Space Farm alone with him.*

That trip turns out to be far easier on Sylvia than she expected. Before they leave, Aybee gives Bey a device he has built to allow Wolf to study his hallucinations objectively. It provides an iterated feedback, matching memories against stored scenes. Bey puts the machine headset in position, and becomes locked in an endless cycling of memories. It is only through Sylvia Fernald's intervention that the cycle is broken.

When Bey returns to normal consciousness he is exhausted, but Aybee's device has done its job. Bey's hallucinatory memories have been captured exactly and can now be studied objectively. While he sleeps, Sylvia studies the sequence of images, and by changing time-sequence and speed she is able to make sense of them. She plays the reprocessed signal to Bey when he wakes again. The little dancing figure can be understood now. It describes itself as the **Negentropic Man.** *Sylvia recognizes the dancing figure as Black Ransome, the legendary rebel from the Kernel Ring. But she cannot explain Ransome's interest in Bey, nor his attempt to drive Bey mad.*

Bey and Sylvia arrive at the Sagdeyev Space Farm, a vast collector of rare elements isolated far from all other Cloudland settlements. The Farmers are reclusive types who shun all meetings. Left to themselves, Bey and Sylvia talk about Black Ransome and his recruiting of Sylvia Fernald's long-time lover, **Paul Chu.** *Before he left to join Ransome's rebel operation, Chu told Sylvia that Ransome has a secret weapon, one that he will use for System conquest. Now, Sylvia has lost track of him. She realizes that Bey Wolf would like to talk to him about Ransome, and Ransome's apparent desire to drive Wolf insane.*

When Bey finally has a chance to examine the form-change anomalies on the Space Farm, he finds that the dead occupants of the form-change tanks have not been killed by hardware failure or by random errors. They were killed by systematic spurious signals introduced into the form-change process, apparently by a data source interacting with the Space Farm's central computer. The people have been murdered.

Meanwhile, Aybee Smith and Leo Manx have arrived, and are studying the recording of Bey's hallucinatory messages from the Negentropic Man. Aybee points out the difficulty of interpreting them, and of the idea of negative entropy. He points out the word "entropy" admits at least four different interpretations: entropy in thermodynamics, entropy in statistical mechanics, entropy in information theory, and entropy in kernel theory. Without more information, he does not know which one of them is likely to be relevant here, but the Negentropic Man ought to be someone who somehow decreases the entropy of a system.

Before they can discuss it further, the Space Farm is destroyed by collision with a cometary fragment. The four survive, but Wolf, Fernald, and Manx are injured. Aybee Smith puts them on a ship that will return them to a Harvester, while he stays to explore the reason for the "accident"—which could happen only if the whole control system of the Space Farm had not been working correctly. More and more, it is clear that all the communication and controls of the Outer System are sabotaged by an external source of spurious information being fed to the Cloudland computers. Aybee finds evidence that this false information is related to the power kernels, but he does not know how.

Trying to solve that mystery, Aybee gets into trouble. While he is floating safely outside in his suit, a strange cargo vessel arrives at the ruined Space Farm. Aybee sees the power kernel of the Space Farm's main habitat replaced by another one from the new ship. When the strangers have gone, Aybee goes back into the Space Farm to investigate the kernel. He finds that it is perfectly normal—but he also finds that not all the strangers have departed. He is captured, and taken away to the cargo vessel.

Meanwhile Wolf, Fernald, and Manx have returned to the Harvester where Cinnabar Baker is located. They find a rapid worsening of form-change equipment performance there, to the point where most people are afraid to use it. They also find increased talk of war between the Inner and Outer Systems. Cinnabar Baker confirms that there is a high-level leak within her own organization, sending out secret information, but her efforts to track down the spy have not been successful. On the positive side, the high failure rate in the form-change equipment convinces Bey that he can now track down the source of the trouble.

Before he can begin, he must enter a form-change tank for treatment of the injuries he received when the Sagdeyev Space Farm was destroyed. Without his approval, Sylvia at the same time puts him through a form-change to make him look like a Cloudlander. He is angry, but she points out to him that feelings between the Inner and Outer System are running so high that anyone who looks like an Earthman will get no cooperation on the Harvester, and will even be in danger. It is vital that Bey be able to pass as a Cloudlander.

To test the acceptability of Bey's new form, they wander through the interior of the Harvester. They find people terrified by the breakdown in the form-change equipment, and trying desperate alternatives for medical treatments. They also encounter **Andromeda Diconis,** *an old acquaintance of Sylvia's, who makes it clear that Bey is not only able to pass as a Cloudlander in his new form, but is highly attractive to her. Sylvia drags Bey away, but not before Andromeda mentions that she has seen Sylvia's old boyfriend, Paul Chu, on the Harvester just a few weeks ago. Sylvia knows that Chu is working for Black Ransome, and she wonders if this is connected to the information leak that Cinnabar Baker has reported. She decides to try to track Chu down. She leaves Bey, exhausted by the after-effects of the form-change experience, in his quarters, and goes back to find Andromeda.*

Bey sleeps for a few hours, then suddenly wakens to find his old lover, Mary Walton, in his room. She warns him not to get involved in trying to solve the Outer System's problems with information breakdown, and tells him to go back to Earth. Mary's image fades. Bey realizes that she was never in his room and he was seeing only a field projection of her.

He falls asleep again puzzling over a major mystery. Only a couple of people knew he was back from the Space Farm; he did not know himself where he would be staying until he was brought to these quarters. So how did Mary know how to find him so quickly?

The high-level information leaks in Cinnabar Baker's operation must be more serious than anyone dreamed.

CHAPTER SEVENTEEN

Aybee had a problem. He wanted his captors to think he was from the Space Farm, not a representative of the Cloud's central government. On the other hand, he could not afford to meet any other Farmers. They would know at once that he was not one of them, and they would have no reason to hide the fact from the Podders.

For the moment at least he seemed safe. There were plenty of Podders visible near the lock of the cargo vessel, easily recognized from their suits, but he could see no sign of Farmers. Steered along by the woman behind him, Aybee went drifting on into the interior. From the outside, the ship had been an inert, lifeless hulk, a derelict abandoned in the early days of Cloud colonization. Within, the airless enclosure was filled with activity.

Aybee looked around him with a professional eye. They had entered through one of the ship's forward ports. The outer hull arched away from them, a great curved span of carbon fiber sheet with strengthening beams of hardened polymers. From the inside it seemed much more than six hundred meters wide. There was enough interior space here for whole cities, complete with everything from food and power production to swimming pools and game fields. But there were signs that the ship was more than a simple colony.

The first giveaway was the bracing struts and cables. They ran through the whole interior, and there was no reason to have them unless the ship had to withstand acceleration. Aybee did a quick mental calculation, and decided that the electromagnetic stiffening was consistent with about a two-gee thrust.

That at once told him something else. At two gees, the ship was over a year's run away from the Podders's natural home in the Halo. There had to be some way of moving people and materials faster than that. Aybee looked again around the cluttered and dimly-lit cargo shell, and saw the expected equipment far away near the outer wall. A high-acceleration ship hung there, McAndrew drive off. From the design, it would allow up to three hundred gees before the gravitational and inertial accelerations were in balance. Aybee studied that ship very closely. With it, the Marsden Harvester was only twenty-four hours away.

The second oddity was the presence of transparent internal partitions and numerous internal airlocks. Cargo hulls were rarely pressurized, and the Podders

had no interest in living within an atmosphere. Their suits were all the air supply they cared to have. So who wanted parts of the ship to be air-filled, and where were they?

Finally, there were the kernels. Aybee could see a dozen places where the local spherical structure implied housings for shielded kernels. That suggested a monstrous power demand. One kernel would be sufficient for normal operations of a volume this size, even if it were a full-scale colony ship. The alternative explanation, that the kernels were being used for some other purpose, made no sense without more data.

Aybee turned back to the woman behind him. Inside the ship, she had put her gun away. "What are you going to do to me?"

"Just keep going. You'll find out in a few minutes." She relented. "Don't worry. We don't kill people without a good reason."

But we do kill people with a good reason? Aybee wondered what a good reason was. Trying to escape? Lying about your identity? Being a spy for the Outer System government?

They were entering a new section of the ship, passing through an interior lock into an enclosure with opaque walls. Aybee heard the hiss of air, and looked questioningly at the woman.

She nodded. "Transition point. Here's where I leave you. Get out of your suit and go through the inner lock." She switched to some other transmission frequency, had a conversation that Aybee could not follow as he was removing his suit, and gestured him forward. "Move it, unless you like to breathe vacuum. I'll be exhausting this lock again in thirty seconds."

Aybee had been worried when he took off his suit, because underneath it he wasn't dressed like any of the Farmers that he had seen. But apparently the Podders were no experts on Space Farm attire, and certainly the woman did not give his clothes a second glance. He went on through.

A man and a woman were waiting for him on the other side of the lock, facing him across a curved table.

More mystery. Neither one of them had the stunted form and compact build preferred by Podders, or the elongated shape of a Cloudlander. Aybee was in about a twentieth of a gee field, which suggested that the room must be close to a kernel. Both the people in front of him appeared comfortable with that, which meant they were not likely to be from the Inner System.

The woman gestured him to a seat opposite her. She had black hair, black skin, and a wary look in her eye. "Leila tells us that you talk," she said. "Good. That's a nice change from your buddies."

Aybee sat down, hunching low in the chair. "All right, so I know how to talk. What happens to me now?"

"That depends on you. I don't suppose you know any physics?"

"I know a bit." It was no time to act insulted.

The other two people looked at each other. By this time Aybee had decided what they were. They had the build of Inner System inhabitants, but not the Sunhugger look. Both of them hailed from farther out, and yet both of them were used to gravity. That meant the

Kernel Ring, living in close proximity to shielded kernels.

"We'll test that in a little while," said the man. Aybee noticed that he was wearing a kernel ruby in his shoulder epaulet. "D'you know math too?"

"Some." There was a fine line to be walked here. Too much knowledge might be as dangerous as too little.

"Then if you know an adequate amount, you'll have a choice. Either you can go to a Halo development project, a long way from here, and work with no one but a few of the other Farmers and a lot of machines. That's what all your friends will be doing, helping to build a new Farm—the Halo is short of metals, too. Or if you're really willing to work with people, we have a more interesting prospect to offer you."

"I don't like the sound of no Farm. I've had it with Farms. Tell me about the other thing."

"Not yet." The woman was looking at him suspiciously. "First, we want to hear *you* talk, and make sure you can say more than a few phrases. You can start by telling us why you're different from the rest of the Farmers. They haven't said ten words between them."

Nasty question. If he seemed too different from the other Farmers, these people would wonder why. If he were too similar, he'd be sent out to the edge of nowhere and spend the rest of his life building a collector to sieve stray atoms from nothing.

If you have to lie, make the lies little ones. "I was the interface," he said at last. "With people from the harvesters. When engineers came to the Farm, *somebody* had to work with them. We all had a psych profile run. I looked like the best choice. So I got special training. I sorta liked it, wanted to do it more. Mebbe even get a job away from the Farm."

The man nodded, but the woman leaned forward and stared Aybee in the eye. Her own eyes, glowing brown with a yellow center to the iris, gave her a definitely feral appearance. She had the dedicated face of a fanatic. "Did you interface with the group that came to the Space Farm from the Opik Harvester," she said, "just a couple of days ago?"

"Yeah." Aybee did not even blink. "They insisted on a face-to-face with us. I met 'em, four of 'em. My special training came in real useful."

"How long were you with them?"

"Not long. Ten minutes, mebbe. I been wondering what happened to 'em since the impact. Were they all killed?"

"Why do you care?"

"Dunno. Guess I wondered if they were here, too. They're like me, don't mind working with other people. *Are* they here?"

"No. They went back where they came from. We saw their ship leaving."

Aybee hid his relief. But the woman was suspicious again. "Why do you care about them? Never mind, I'll accept that you talk. It seems to me maybe you talk a little too well. I don't know how you could stand it on the Space Farm."

"Let's give him the test," said the man. "If he's lying about what he knows, we don't have to waste more time talking."

The woman shrugged, and slid two sheets of paper across the table to Aybee. "Write your answers right there if

you want to," she said. "Or say them out loud to us. We don't care."

"I'd rather write. If you have something I can write with." Aybee had seen the first page of questions, and he had a new worry. If the tests were all like this, he needed time to think. He was being asked things so elementary that he wasn't sure how much ignorance he should feign. For what these people had in mind, ought he to know Newton's laws of motion and Maxwell's equations and the classical definitions of entropy? Almost certainly. But how about Price's theorem and spinors and Killing vectors? They were on the list, too, along with Newman-Penrose constants and Petrov classification. He had written papers on each of these, but he didn't want anyone here to suspect that. The questions themselves were also a tantalizing hint as to the work he might be expected to do. He would certainly be working with kernels.

He took the pen they gave him, and carefully wrote out his answers. Two wrong out of each ten. That ought to be about right.

Aybee could see the irony of it. For half his life he had been trying to do well on stupid tests; now he had to do just well enough to be accepted but badly enough to be plausible.

He handed back the sheets, and for the first time in his life sweated while he waited for test results. The man was reading his answers, and his expression was guarded.

At last he looked up. "Did you work with the kernel on the Space Farm?"

"Some. Part of my job, to check power use and rotational state. Learned how to measure the optical scalars. That was all."

"You're not afraid to go near a kernel?"

"Not if the shields are in good working order."

"I'll second that." The man flipped the pages casually onto the table. He turned to the woman. "What do you think, Gudrun? It's your decision."

She nodded. "Do you work hard?"

At last, a question that Aybee could answer comfortably. "You bet. Harder than anyone I know. Try me."

"I guess we will. You have to know one more thing, before you say yes or no. If you join us, you'll have a chance to become a full part of our group. We have big plans, but we're few in numbers. That means wonderful opportunities. But many people do not understand the importance of our goals. Once you join us, you'll be considered a rebel by the Outer System. Now let me ask you directly. Do you want the assignment?"

"I think so." Aybee nodded his head slowly. He had to appear interested, but cautious. "The Outer System never did nothing for me. I never asked to be out on the Farm. Guess I'd like to know more about your deal, though, before I'm sure."

"Fair enough." For the first time the woman smiled, and held out her hand. "You're on for a trial run. I'm Gudrun. This is Jason. What's your name?"

Spacehooks! What's my name? Better pick somebody real. Aybee groped for the name of his first instructor in calculus. "Karl Lyman."

"Welcome to the program, Karl. Are you tired?"

"Nothing special."

"Then let's go and eat." She saw his expression and laughed. "I don't mean *with* me. Don't worry, we know what people are like in the Outer System. You can have your own cubicle, you won't have to look at anybody taking meals. But I want to find out a bit more about you, and tell you what you'll be doing." She gave him another look, but this one was of a shared secret. "I liked your answers to that test, and I think maybe you were wasting your time on the Farm. You may be able to go a lot further with us than you realize."

As they stood up she moved to his side and looked up at him. "One thing, though. You're too tall for this place. We don't even have a bed to fit you. When you've started work, Karl, we'll give you a spell in a form-change tank and cut you down to size."

Aybee put on a worried frown. "D'yer think it's safe? I mean, we've had bad trouble with form-change equipment on the Farm. Bad stuff coming out of it. Suppose yours don't work right either?"

Gudrun and Jason exchanged a quick look. "Don't worry your head about that," said the man. "That's something we can guarantee—absolutely. You'll have no trouble with our form-change equipment."

They led the way on into the interior of the ship. Aybee, following close behind, pondered that final remark. Gudrun and Jason, whoever they were working for, had plenty of confidence and conviction. They acted as though they had a direct pipeline to the secrets of the Universe. Could they deliver safe form-change operation, though, where the whole Outer System was failing?

Aybee wondered if he had become an instant convert to their fanaticism. Somehow, he was sure they could deliver what they promised.

CHAPTER EIGHTEEN

"So when this world's compounded union breaks, Time ends, and to old Chaos all things turn."

Bey Wolf had inherited a good stubborn streak from his German father, and a subtle and suspicious mind from his Persian mother. Both parts of the combination were needed now. He was stuck in the middle of a rank impossibility.

He had analyzed one hundred and fifty-seven defective form-change runs. They ranged from minor flaws too suble to be detected in outward appearance, to grotesque end-forms that could never have survived in any environment known to Bey. Everyone was different; but in one way, all were alike. The ferret routines that he had introduced into the purposive form-change programs confirmed that there had been systematic modifications to whole sections of code; they pointed always to the same impossible blind alley. The changes were no accident. They were so complicated, they must be generated by a computer—but in a place where no computer capability existed on the harvester.

He swore, and grumbled, and grunted to himself. His work had gone on obsessively for several days, broken only by hurried meals and occasional naps. He had not washed or changed his clothes. He was surrounded by empty disposable plates and cups, listings, diagnostic trace routines, system flow diagrams, and his own scribbled notes and

questions. Paper was everywhere, sprawling across the floor and over every available surface.

Bey was totally frustrated and oddly content. No one on the harvester could help him, and he did not want help. He wanted to solve this *himself.* He did not admit it, but intense concentration was also a form of therapy. He wanted to keep the disturbing thought of Mary Walton's visitation out of his head.

Sylvia Fernald had stopped by a couple of times in the first day of work. She had watched his efforts sympathetically, spoken to him, and left when it was clear that his mind was elsewhere. On the third day Leo Manx had also appeared. He came to the door of the room several times, stared in disgust at the mess, and hobbled away. The wounds he had received on the Space Farm were not yet fully healed, but he was in no apparent discomfort.

When Leo came by for the fourth time, he stayed, standing silent in the doorway and puzzling over a blue folder that he had brought with him. Bey Wolf ignored him, until a final and irrefutable statistical analysis came back on the display screen. At that point he swore at length, switched off the unit, and turned to the other man.

"That does it. I know exactly *what* happened—and I've no idea how."

Manx looked up from his own musings. "If you've discovered anything useful, you're making more progress than I am. What have you found? Cinnabar Baker will want to know."

Wolf waved his arm at the sea of listings covering the floor around them. "I have output trace listings of everything. Do you know how the harvester computer system works?"

Manx frowned at the question. "Well, I feel sure it's a straightforward distributed system. There's computing capacity and major storage in a couple of hundred nodes located at different points in the harvester, and local storage with limited computer power at a few hundred more. Everything is tied together through a fiber communications system. It's exactly like the integrated computer system on the other harvesters—or in your own Office of Form Control, back on Earth."

"My ex-office. So there's nothing unusual about the arrangement?"

"Of course not." Manx had stepped gingerly into the middle of the paper jungle, and was now carefully collecting the listings into neat piles. "Bey, you must have known all this days ago—you couldn't generate these message traces without knowing."

"I thought I did." Wolf grabbed an elaborate schematic. "The general structure is shown here. I took this, and I began to search for places in the system where spurious coding sequences could be introduced to modify the form-change programs. Watch now."

He switched on the wall-sized display screen. "I've color-coded this. You need to know what they mean. The blue network is the overall connection plan for the distributed computer system. The red nodes show where we have data storage, green ones show computer elements. Purple dots are sensors—data collection points for the computer system. Orange dots are form-change tanks. They have some of their own storage and computer power, but they rely on

the master system for some data and computation. Understood?"

"Perfectly. I hope there's a point to all this."

"There is. Just watch. I spent days working it out. You're going to see my ferret routines, chasing down all the places where false code might have come into the system. We'll do just one case now, for a form-change anomaly they had in the resource control office of this harvester. Watch the moving yellow tracer." Bey entered the command, and leaned back in his chair.

For a moment or two, the display was static. Then a fine yellow line appeared at one of the orange dots, and crawled across the screen. It reached a green node, divided there, and two yellow daughter traces continued on their way to a red element of the schematic. ("Picking up data from two different banks," said Bey. "That happens a lot.") The yellow lines crept onwards, reaching new computer nodes, sometimes branching, sometimes terminating there. After thirty seconds a complete tree structure had been established, starting at a single form-change tank and spreading across half the screen.

"That's one complete form-change operation," said Bey.

"It's too complicated. I can't follow all that structure."

"Nor could I, without help. The central controller used whatever computer power happened to be available—that's why you see so many green nodes in use. It's a horrible mess. Now, I'm going to add the other hundred and fifty-six cases, all at once. You'd expect the picture to become even worse, impossibly complicated."

"It's impossibly complicated already."

"I agree. But it simplifies. Watch." Bey entered a new command. The whole screen lit up with a tracery of moving yellow lines. They each began at a form-change tank, and branched and zig-zagged across the display. Thirty seconds later the screen steadied. Leo Manx shook his head. Lines were everywhere, a tangled mass of knotted interconnections, convoluted and horribly interwoven.

"I hope you don't expect me to read anything useful out of that."

"With a little help you will." Bey was busy again at the terminal. "I agree, it still looks like a gigantic mess. So I wrote another program to help sort it out. I asked for a statistical analysis of the places that each branching set *ended*. That would tell me how often the form changes were using a particular data storage bank, or a particular computer. If one storage area or computer were receiving unusually heavy use, that would be a good place to do some trouble-shooting. Take a look at what I found. The program flags every terminating node that occurs more than two sigma away from the mean for all nodes."

A couple of dozen points on the screen began to blink. Leo Manx stared at them blankly. "Very interesting," he said after a few seconds.

"You're wrong. It *is* interesting—once you look at those nodes more closely." Bey stood up and went to the wall display. "Some end at computer elements, some end at data banks. Very reasonable. But what about this one?"

He was pointing at a flashing purple point on the screen.

"What about it?"

"Leo, remember the color code. Purple. That means it's a *sensor*—a place that collects data for the computer system."

"That's not surprising. There are sensors on each form-change tank."

"True. Not surprising—*if* this were a sensor associated with a form-change tank. It would be collecting physical readings from the tank, and using those in the programs. But this sensor should have nothing to do with a form-change process. And *every* form-change anomaly has a branch that ends there. That sensor was involved *every single time* we had a form-change problem."

Manx had stood up, and was craning to see the blinking point next to Bey's finger. "I don't know which sensor that is. Are you sure it's not a form-change monitor?"

"I checked it a dozen times. It's not. So I decided that it had to be a signal coming from *outside* the harvester, maybe something we were picking up on beamed data from an external antenna. It's not that, either."

"Don't keep telling me what it *isn't*." Leo Manx was losing his usual courtly politeness. "We have to check this directly. Which sensor is it?"

"I'll tell you, but you're not going to like the answer." Bey tapped the display. "That sensor is inside the harvester, but it's in the hardest place of all to check. It monitors the radiation level from the harvester's kernel, and that means it's sitting where we can't get at it. *Inside* the kernel shields."

Leo was shaking his head. "You're suggesting that somebody put a computer and a data storage unit in there? It couldn't happen. Nothing but hardened sensors can operate inside the shields—even the remote-handling machines that manipulate the kernels don't have programs."

"I know. But I'm convinced there's *something* there, inside the shield. Some information source, some chaos-generator for the form-change process. It's the 'negentropic' influence again—spurious information that's the source of disruption for the whole System."

"But the other problems we've had were nothing to do with form-change!"

"We've gone past form-change now, Leo. Form-change just happens to be highly sensitive to signal control sequences. Problems show up there first. But what I've found takes us into kernel control theory, and that's a different game. I don't know enough about Kerr-Newman black holes to decide what's going on. That's why I've been waiting for Aybee to get back from the Sagdeyev space farm."

"That you might have to wait a long time. He's not there."

"But he's on the way back, isn't he?"

"I'm afraid not." Leo Manx retreated to a cleared area of the floor and sat down cross-legged. "Before I came here I was with Cinnabar Baker. She'd just had a report from a repair and maintenance crew who had reached the Farm. Apparently it's totally deserted. No Farmers, no Aybee."

"More mechanical trouble?"

"No signs of that. The bubble was halfway repaired, reasonably habitable. But deserted. It was just as though

everyone had decided to down tools at the same time, and leave. We have no idea why they went, or where they went. Or even *how* they went. Baker says that no transit vessel was missing. All they took with them were their suits. There was no sign of new violence."

"So it could be worse. Aybee's probably safe. And he's a survival type." Bey left the screen and flopped down untidily on a pile of output listings. He was almost at home in his new body, but the odd center of mass offered occasional surprises. "But it's very bad for me. I don't know who else to ask."

"We have other experts on the kernels."

"Not like Aybee. I need somebody who thinks round corners." Suddenly, Wolf's labors were catching up with him. He was exhausted.

"And so do I." For the first time, Leo Manx held up his own blue folder. "That's why I came to you. You've got your problems, I've got mine. Aybee got me started on this before we left the Farm. I need him as much as you do. But he told me to talk to you if he wasn't there—I don't know if you cherish the notion, but Aybee suggests that you and he think about things the same way."

"He's wrong." Bey made no attempt to take the proffered folder. He was still staring moodily at the display screen. "Aybee's smarter than I am, but he makes me feel a thousand years old. I don't have his childlike faith. If I can't solve my own problems, I'm sure I can't solve anybody else's."

It was a dismissive comment; at that point Leo Manx was supposed to stand up and leave. Instead he inched forward along the floor and placed the folder open on Bey's knees.

"The Negentropic Man," he said. Bey looked down at him, then shook his head.

"Where he came from," went on Manx. "What he means. Aybee listed four ways of thinking about entropy: thermodynamic entropy, statistical mechanics entropy, information theory entropy, and kernel entropy. But he couldn't suggest which meaning was appropriate."

"Nor can I."

"That's all right. I don't want to ask you about that." Manx lifted one sheet from the folder. "Aybee suggested that if we want to make progress we ought to examine the exact time when your hallucinations occurred. I've made a list of everything that you told me when we were in transit from the Inner System. Now I'd like to make sure it's complete."

Bey stared gloomily at the list. He knew what Leo was doing: exactly what he would have done himself with a reluctant partner. Bait him with something he was interested in, reel him in slowly, and hope that after a few minutes you could drag him far enough to be useful.

Well, what the hell. It was a game two could play, and Bey had gone as far as he could in the form-change tracking without allowing time for his ideas to sort themselves out.

"You only want to hear about my seeing the Negentropic Man? You know that Sylvia is sure he's Black Ransome?"

"I know. We have only her word for it. Isn't the Negentropic Man the only person you saw in your hallucinations?"

"He was, until a few days ago." Wolf did not look up. Now that he was into it, he wasn't sure he wanted to tell anyone at all about Mary's strange visit. It felt remote and improbable. Even the day after it happened, he had become half convinced that he had dreamed the whole episode. "I saw Mary Walton," he said at last. "After I came out of the change tank."

"You mean—saw her in person?"

"No. A recorded message, left in my sleeping quarters."

"And you didn't tell Sylvia, or Cinnabar Baker?"

"No." Bey hesitated for a moment, evaluating the risk. He decided that he had to trust *somebody*—they couldn't all be spies. "Leo, I had a reason why I didn't talk about this. We have an information leak here. We arrived from the Space Farm just a few days ago. No one knew we were coming, no one even knew we had survived the 'accident' there. No messages were sent out from here *after* we arrived, saying we were here. I know, because I checked the message center myself. And yet, as soon as I went to my sleeping quarters, a planted recorded message from Mary Walton was waiting for me. Leo, until I was taken to those quarters, I didn't know *myself* where I would be sleeping."

"So that's why you didn't talk about it to me, or Sylvia Fernald, or Cinnabar Baker?" Manx was full of an unfocused energy that made his arms and legs jerk like a puppet's. "Bey, I know you're not used to Outer System ways, and I know where you're heading. But it's crazy. Those are terribly serious charges that you're making, and it's just as well you told this only to me. I can absolutely assure you that Sylvia and Cinnabar are not providing information leaks."

"Not *intentional* ones, maybe. But think back, Leo. Somebody seemed to know we were going to the Farm almost before we set out. Somebody knew we were here the moment we arrived."

"Then it must be somebody on the harvester staff."

"On two different harvesters? We left the Opik Harvester, we came back here to the Marsden Harvester. Are you suggesting that there are *two* leaks, both close to Cinnabar Baker, one on each harvester?"

"Then who? I hope you don't think that *I*—"

"There's an old Earth saying: 'Everyone's suspect but me and thee; and I'm none too sure of thee.' I thought about you. But I don't see how it could be. When we arrived here you were in pretty bad shape, and you went straight to the tank for remedial form-change work. You weren't conscious until after this happened."

"Your faith in me is touching. I wonder why you're telling me now."

The bait was taken. Now to reel in the line. Slowly. "Because I need your help, Leo. And I want your word that you won't pass this on to anyone, unless we've discussed it first. And I mean *anyone*."

"Not Sylvia. Not even Baker?"

"*Especially* not Baker. Can't you see that if we're logical, her office is the only place where the leaks can start? Don't tell her anything, unless it's at a meeting that I've arranged, in a place I arrange. I think we should talk to Sylvia and see how she responds to the idea

of a spy in our group. Will you come with me, right now, and do it?''

''Under one condition.'' Manx took back his blue folder and looked at it in a puzzled way. Somehow the whole conversation had headed off in an unintended direction.

''Anything reasonable.''

''That you take a shower first. I don't want Sylvia or anyone else we meet to think that smell is coming from me.''

''Is this the Leo Manx who dragged me out of Old City? All right. If you insist. Let's go.''

Later, Bey would describe the shower as a wasted effort. As soon as he was scrubbed clean and dressed in clean clothing to Leo Manx's satisfaction, they headed for Sylvia's quarters.

But she was not there. No one knew where she was, or when she would be back. Twelve hours earlier, Sylvia Fernald had requisitioned a high-gee transit ship. She had headed inward, toward the edge of the Halo, traveling fast and traveling alone. She had told no one her mission, and no one on the the Harvester seemed to know her destination.

CHAPTER NINETEEN

''Stone walls do not a prison make,
Nor iron bars a cage.''
—Richard Lovelace (1618-1658)
''—but empty space does a pretty
good job of it.''
—Apollo Belvedere ''Aybee'' Smith (2217-)

The training schedule was rigorous but reasonable. Four hours of theory in the morning; a food break at which all the trainees were expected to eat together, and to discuss what they had learned; four hours of practical work in the afternoon; and then the evening free, but with enough reading, interactive education sessions, and quizzes to fill at least another six hours before sleeping.

It was scheduled to continue for seven weeks. Aybee kept his head down for the first couple of days, watched what the others were doing, and tried to fall nicely in the middle of the group when it came to tests and answering questions. That wasn't so easy. The rest of the trainees were a miserable, mismatched set who had apparently been dragged in from random sources. In Aybee's not-so-humble opinion, none of them had the least idea of any kind of science, and a couple of them acted positively half-witted. They offered bizarre answers to the simplest mathematical questions—Aybee couldn't figure out how they came up with such odd replies.

On the third day he made his first request. He was not used to eating food with other people; it would be a lot less strain if he were allowed to take the midday break alone. Could he get permission?

Gudrun looked doubtful, but she agreed. There were twenty-four trainees, and Aybee's absence would not make much difference to the discussions. ''Remember, Karl,'' she added, ''If you hurt your progress because you can't talk to others while what you've learned is fresh in your mind, you'll have no one but yourself to blame. If the reason you're doing this is that you find the work difficult and you're embarrassed to talk with the others, come and see me. I'll arrange personal coaching for you.''

Aybee/Karl nodded politely. He had gained an hour. The morning classes so far were routine general relativity material, three centuries old, and he didn't need to discuss that with anyone. More than that, he didn't want to. The big danger was that he would reveal how much he knew about the subject.

The evening work was a joke. He didn't need to do the reading, and he could handle all the rest of the assignments in the middle of the day. His next request to Gudrun was a little more risky. He handed in a perfect test, which he was usually careful to avoid doing, and went to see Gudrun that afternoon.

She beamed as he came in the door. "Well! Smart Karl. You don't seem to be harmed by missing the midday sessions."

"Hope not." Aybee had the horrible feeling that he was her favorite trainee. She always looked at him in a special way. "But I'm not used to high gravity. Not like the Farm. I sleep bad here. Wake up a lot in the middle of the night. If I'm all done with my work an' that happens, could I look round the ship?"

Danger signs. Her smile vanished, and she was staring at him suspiciously. "Look at *what* in the ship, Karl?"

"Dunno. Whatever." He waved his arm vaguely around them. "Power supplies, maintenance shops. Anything."

"Oh, that shouldn't be a problem. But only if you still do well enough in your training. Let's see how you perform in the next few days."

She wasn't worried about security —she was worried that he would take too much time wandering around and flunk! Aybee made fewer deliberate mistakes on the tests, and three days later he had his permission. He was fascinated to see what was off-limits: armories, main drives, and the areas where the suits and transit ships were kept. It made good sense for them to keep him out of those until they were absolutely sure about his loyalties. It was also no big loss. So long as they were steaming along to nowhere, Aybee didn't like the idea of leaving the ship until he knew exactly where he was.

There was one big unexpected freedom. He would be allowed to go to the kernels, and do what he liked there. Gudrun must have decided that he wasn't interested in suicide by fiddling with a power kernel and blowing up the whole ship. It also tended to confirm what she had said at their first meeting. When the training course was over he would be working with the kernels.

The first night he had his permission to wander, he couldn't use it. A formal evening meeting was scheduled for all the trainees. After a special dinner which Aybee did not eat, they were subjected to a four-hour session of live and recorded speeches, slogans, and arm-waving.

Gudrun stood up and offered her version of System history. Between the millstones of the Inner and Outer Systems, the inhabitants of the Halo had been crushed for over a century. The Kernel Ring was a borderland, a dangerous region of scattered high-density bodies. As a result, all the travelers from Sunhugger territory bypassed it on their journeys outward. They were quite willing to exploit its energy supplies, but none of the wealth generated from the Kernel Ring's resources was ever returned to it. That was unjust and intol-

erable. Finally, it was going to change. The balance of power had shifted. The Halo had a born leader, and the Revolution had begun.

Jason came next, and he was worse. The Outer System is composed of oppressive tyrants! The Inner System is decadent! It supports an idle and growing population by the efforts of our people! Both Federations deserve to fall! You are all part of a great reform that will achieve those ends—and soon!

Aybee hid his yawns, but he noticed that the other trainees were lapping it up. Gudrun, Jason, and the handful of other permanent crew of the ship knew how to whip up enthusiasm. They had enough for everybody. Gudrun stood up again for another statement. A special announcement would be made on the ship in a few days, reporting an event that was truly extraordinary. All training would be interrupted when it happened, and everyone would have two days free. The group cheered.

Aybee cheered as loudly as anyone, and wondered if propaganda had a cumulative effect. If so, he'd have to find a way to escape before his own brain was softened.

Escape seemed harder and harder. All the access points to suits, transit ships, and weapons were guarded not by humans, which would have been bad, but by machines: Roguards that didn't sleep, couldn't be distracted, and couldn't be persuaded.

Aybee decided that he needed some radically new approach. The next night, he set out to prowl the ship.

He had no illusions about the size of the task that faced him. The ship was small compared with the central sphere of a harvester, but it was still huge. With a length of two kilometers, and a diameter of six hundred meters, the ship he was on now had enough internal volume to house a couple of million people on Earth—or one or two Space Farmers. Podders and the rebels of the Kernel Ring sat somewhere between those two extremes, but Aybee could not guess at the ship's internal structure from the limited regions he had seen in training.

Fortunately, he did not need to. Overall ship schematics were held in a central data bank, and he had been studying them in the evenings for over a week. There were half a dozen blank spots in the plans, which he assumed corresponded to regions of special privacy, but all the rest of the ship was there.

As an experiment, he headed outward toward the surface. The ship had been built to carry cargo, and so all the internal bulkheads and corridors were a later addition. The whole habitat interior had an unfinished and neglected look to it. Mildewed partitions were warped and grimy, and at central communications nodes, masses of cables and fiber lines festooned the walls and ceilings.

Aybee wandered on, committing everything he saw to memory. If the need ever arose he wanted to be able to run through the ship blindfolded.

No one questioned him, no one stopped him. In a few minutes he was at an observation port, peering through the outer shell of the hull to the stars beyond. He could tell from the positions of the constellations that the ship was heading sunward, but that was all he was able to deduce. He watched quietly for ten minutes. There were no signs of

other man-made vessels out there, or of natural bodies of the Outer System.

When he finally moved on, easing his way along the hull towards the nearest airlock, a Roguard appeared at his side before he had gone fifty meters. It seemed to ignore him, but it moved as he did and ignored his questions and commands. Twenty meters before he reached the lock, it passed silently in front of him and extended a broad polymer net to block his path.

Aybee didn't try to talk to it. The machine was too stupid for logic. Instead, he turned to head away from the surface. When he was forty meters from the ship's hull the machine dropped behind. He turned to look, and it was disappearing through a service aperture. Aybee did not go back. If he did, he was sure that it or its sister Roguard would be there again to balk his progress towards the airlocks. Instead, he headed on down the gravity gradient for the nearest kernel, two hundred meters away.

In the corridors he encountered a couple of dozen maintenance machines and three humans. The machines offered him friendly greetings. The humans, each two feet shorter than Aybee, said not a word. They hardly looked at him, and seemed preoccupied with their own worries.

Was it his trainee's uniform, which made him so much lower in status than anyone else on the ship that they would not even talk to him? If so, that was fine with Aybee. He traveled on, along a dirty passageway coated with the grime of a decade's neglect. Somehow the controller of the cleaning machines seemed to have lost this narrow alley from its memory.

He passed down a narrow final stair, just wide enough for his skinny body, and he was there. The shielded kernel was not the one that had been removed from the Space Farm. This one was a monster. Even at the outer shield's thirty meter radius, Aybee judged that he was standing in a field of over a twentieth of a gee. That put the kernel mass at nearly eight billion tons. It must have been found near the middle of the *Zirkelloch*, the circular singularity that formed the center of the Kernel Ring.

That did not mean it was particularly useful as a controllable power source. If it were a slowly rotating kernel, approximately a Schwarzschild black hole, it was useless for anything except raw heat.

Was this one rotating?

Aybee fixed his eyes on one point on the ceiling and crouched low. No doubt about it, this kernel was both massive and rotating extremely rapidly. He could feel the inertial dragging as the kernel's spin rotated the reference frame along with it, tilting the local vertical.

He turned his attention to the controls. Most of them were already familiar to him. There were a dozen superconducting electromagnets, holding the charged kernel firmly at the center of its spherical shields. They appeared standard, no different from systems that Aybee had seen in dozens of other energy generation facilities.

There was the energy-extraction mechanism itself, clearly identifiable by its plasma injection units. This system was unusually finely calibrated, allowing far smaller changes to the kernel's

rotational energy than any that Aybee had seen before; but that was an easy technological refinement, within the power of any kernel user. It was not clear why anyone would *want* to do it.

The first sign of real oddity came in the sensor leads. They were ten times as big as Aybee expected, suggesting a high signal-carrying capacity, and they ran to a substantial computer sitting right on the outer shield.

A computer to do what?

Inside the shield, the spinning black hole of the kernel was sending out a seething stream of radiation and particles. That random energy emission was a nuisance, and the shields were necessary for it to reflect back on itself. At the same time, the sensors monitoring the outward flood within the shields allowed the mass, charge, and angular momentum of the kernel to be measured to one part in a trillion.

Aybee crouched on the dull black surface of the outer shield, staring at the computer and its connecting cables for a long time. He would have loved to follow those optic bundles a meter or so farther, beyond the shields. It was impossible. There were hatches for robot access, but he would not survive a moment inside the shields.

He stood up, puzzled, and stared throughtfully at the sensor leads for a few minutes. When he finally wandered through the corridors back to his own quarters, his head was whirling with ideas and conjectures. He had theories, but no way to test them. What he needed was a long spell of quiet thought.

What he found, when he arrived at his room, was Gudrun. She was sitting on his bed. She had abandoned her silver-blue uniform and badged cap for a brief black exercise suit and purple skin makeup. Gudrun nodded at him and patted the bed next to her.

Aybee eyed her uneasily, and remained standing. "I was just taking a look round."

"I know. Sit down, Karl."

He placed himself at the far end of the bed. "I'm doing all right, aren't I?" He cleared his throat. "I mean, no problem with my work."

"Just the opposite." She inched along closer to him. "Karl, you've been doing well, but I'm convinced you could do a lot better. Some of your answers on the tests are so concise and clear, they're better than anything in the training manuals. I'm using them as reference material. Where do you get them from?"

Aybee swore internally and shrugged. "Dunno. I just write what I think of."

"If you can think that way consistently, there's more in your future than a job as a maintenance engineer. I want to do something special with you."

"What do you mean?" Aybee didn't like the look in her eye.

"I want to take you to meet the big boss—the head of the whole Revolution and Movement. We have his orders to sift for unusual potential, and report it to Headquarters." She misread his concern. "Don't worry, I wouldn't send you there alone. We'd go together, just you and me, on one of the special high-acceleration transit ships. I'd be your sponsor."

"When?" The training course had five more weeks to run.

"In a couple of days. Jason and the other assistants can handle the training course easily enough. It's five days'

travel from here to Headquarters in the new ship, but he wouldn't waste the time. You have a lot to learn. I'd give you personal coaching and special training.'' Gudrun had moved Aybee all the way to the end of the bed, and he couldn't retreat further. Her golden-brown eyes were gleaming. She took his hands in hers, and stared at him possessively. ''And we still haven't done that form-change, have we?—the one that we talked about when you signed on. You're still too tall for comfort. We'll work on that. There might be some spare time for a form-change on the journey, too. I want to make you look more like one of us—less like a Cloudlander.'' She squeezed his hands. ''What do you say, Karl? It's a one-time opportunity.''

Five days confined to a high-gee transit cabin with Gudrun. Five days of ''personal coaching'' and ''special training.'' What did that include? He had horrible suspicions. Aybee avoided her gaze, but she was very close. Everywhere he looked he saw nothing but bare flesh, plump thighs, arms and shoulders and breasts.

''Well, Karl, what do you say?'' She was whispering, close to his cheek.

Aybee closed his eyes in horror. *Do I have a choice?*

He took a deep breath. Look at it this way, Apollo Belvedere Smith: you go to Headquarters, and the chances of finding out if your ideas are right are a hell of a lot better there than they are here. Whatever happens on the journey, you can handle it. So say yes quick, before you decide you can't stand the idea.

He nodded, eyes still closed. ''It sounds . . . wonderful.''

He felt Gudrun's hand on his thigh. ''I'll make sure that it is,'' she said. ''We'll leave tomorrow. I'll put a form-change tank and size reduction programs on the ship, too. You can use them as much as you want to. But you'd better get some rest now, Karl. You need your rest.''

''Yeah.'' Aybee swallowed. ''I think I do.''

She was moving slowly away from him. He could breathe again. He looked at her red lips and half-open mouth. She seemed ready to eat him.

Just make sure the form-change tank and size-reduction program is there, Gudrun. I'll use 'em, all right. In fact, if this trip is anything like I imagine, I'll use 'em over and over. I'm going to arrive at Headquarters as a two-foot midget.

CHAPTER TWENTY

''I disapprove of every conspiracy of which I am not a part.''
—Cinnabar Baker.

Sylvia Fernald had agonized over the decision for a long time. Who should be told what she was planning to do, and how much should they be told?

On the one hand, her attempt to contact Paul Chu was in no sense an official mission. She had not been ordered to do it, or even asked to think about it. On the other hand, Bey Wolf and Aybee Smith believed that the rebels were behind the technical malfunctions in the Inner and Outer System, and they agreed with Cinnabar Baker that the rebels' end objective might be to instigate an all-out

war between the other two parties. If that was the case, and if Paul was part of the rebel group, a dialog with him was supremely important. Sylvia knew of no one else who might be able to open that dialogue. Paul had always been secretive and mistrustful, but he would talk to Sylvia.

Wouldn't he? They had been very close, but in the final months she had never known what Paul was thinking, or even what he was doing. But surely he would at least *talk* to her—they had been partners for more than three years. On the other hand, if he were now a rebel himself, she ought not to be talking to him, and if she did meet with him she should not tell anyone she was doing it.

Sylvia wondered and worried, and at last settled for a compromise. Since she would be using a Cloudland ship in her travels, someone in government had to know and approve it. But the fewer people who knew, the less the danger that her mission would be leaked to others.

Sylvia looked at her options: Leo Manx was a good man, but pedantic in approach and (much more dangerous) apt to gossip. Bey Wolf would not talk, but he would probably try to stop her. Aybee, her first choice, was off who-knew-where, and all her other close friends in the harvesters would be overwhelmed by the implied responsibility. They would feel a compulsion to tell their superiors—who might then tell anyone.

In the end, Sylvia called Cinnabar Baker directly and asked for a private meeting. If the information were likely to end with Baker, it might as well begin there.

The other woman asked her — typically—to come to her quarters that same day, but at one o'clock in the morning. Sylvia spent the next twelve hours making final preparations for her departure, and rehearsing what she was going to say to Baker. When she finally entered the bare-walled apartment, she forgot about her prepared speech.

Cinnabar Baker looked terrible. She had lost fifty or sixty pounds, and her grey-toned skin was lined and pouchy. From time to time she rubbed at her eyes, wheezed deep in her chest, and produced a rumbling cough. Turpin sat blinking on her shoulder. Each time she coughed, the bedraggled crow provided an impressive imitation of the sound. He must have had plenty of time to practice.

"I know." Baker saw Sylvia's dismay. "Don't tell me I look like hell, and don't worry. It's not permanent. I've been over-working, and everyone here is scared to let me near the form-change machines for a remedial session. The machines are so messed up, people are afraid I'll turn into a pumpkin. What can I do for you? We have ten minutes."

Sylvia jumped into her description of how she had found a trail that should lead to Paul Chu. Half her explanation proved unnecessary—Cinnabar Baker knew more about the relationship with Chu than Sylvia dreamed. Baker waved her on past that, then listened in a silence broken only by her coughs and hoarse breathing.

At the end of it she sniffed and pinched the end of her nose between her fingers. "I've heard your reports, and the ones from Leo Manx. Do you agree with him, that the rebels are behind Bey

Wolf's problems with the 'Negentropic Man'?"

"I think so."

"You've saved Wolf's life at least once, probably twice. Do you know what the ancient Chinese, back on Earth, used to say if you saved a man from drowning?"

Sylvia shook her head in confusion. Cinnabar Baker had lost her.

"They would say you are then responsible for the welfare of that man, for the whole rest of his life. Let me ask you, how much of what you're proposing to do is for the sake of the Outer System? And how much are you doing to help with Wolf's personal problems?"

The suggestion floored Sylvia.

She had acted to save Bey on the transit ship and on the Space Farm without thinking for a moment about her own motives. She would have done as much for anyone. And as for sitting beside the form-change tank while Bey Wolf was in it . . .

"Don't bother to answer that." Cinnabar Baker was moving on. Sylvia had been there more than ten minutes. "Tell me this instead. You're proposing to leave at once. What's the hurry? Why not wait a few more days?"

"More days?" repeated Turpin.

Sylvia shook her head. "I daren't. Paul Chu is at that location to perform a facility conversion, adding a low-gee drive—probably to a cometary fragment. That means he'll be working alone except for machines. We'll be able to talk freely. But that will last only another couple of weeks, then he'll be leaving. I don't know where he'll be going next."

"Does he know anything about this?"

"Not a thing. I didn't suggest to *anyone* that I might try to visit him. You're the only person who knows I'm even thinking of it." She saw the slow nod of Cinnabar Baker's head. "You will approve it, then?"

Baker grunted. "Fernald, I never did like Paul Chu. I remember him, and I don't believe he'll do one thing to help you." She held up her hand. "But before you begin to argue, let me tell you I'm going to approve your request. You ought to have this job for a day. You'd approve *anything* that might give you a toehold on our problems. The Cloud's technology is all going to hell, people daren't go near the form-change machines, we've been receiving communications from some of the other harvesters that suggest the populations there have all gone crazy, and I just had a report from the other side of the Cloud about a bad accident on another of the space farms. To top that off, one of our inbound cargo ships was destroyed yesterday, and the Sunhuggers are blaming *us* for it—saying we blew up one of our own vessels!"

She sighed. "All right. You've heard enough of that. Of course I'll approve it. Go do it, and use my authority if you need it to get your ship. But one other thing"—Sylvia was standing up—"this has to be a two-way street. You won't tell anyone where you're going. And I won't tell anyone, not even the Inner Council, what you are trying to do. If you get into hot water, I'll have to disown you. I'll even deny that you had my permission for a transit ship. We have a firm policy, you see; we don't

deal with the rebels in any circumstances. Understood?"

Sylvia bit her lip, then nodded. "All right."

Cinnabar Baker reached out and took her hand in an unexpected gesture. "We never had a meeting tonight, Fernald, and you leave by the other exit. I have another group of people waiting outside. Good luck, and good hunting. You'll be a long way from home."

"From home," echoed Turpin hoarsely. The crow wagged his head. "Way from home."

That had been eight days ago. Eight days of silence and solitude. Sylvia had maintained a strict communications blackout all through the journey, even when the ship's drive was inactive and it was easy to send or receive signals.

But now, as she slowed to approach her final destination and the rendezvous was only a few minutes away, her nervousness increased. The urge to send some kind of message back to Cinnabar Baker grew stronger. Sylvia had been provided with an ephemeris for a body in an orbit skirting the outer part of the Kernel Ring, and told that Paul Chu should be there. But the positional data had come with an admonition to strict secrecy, and nothing else. She had not been told the nature of the object to which she was traveling, or whether it was large or small, man-made or natural, a colony or a military base. She had *assumed* a cometary fragment—why else would he be installing an add-on drive unit—but suppose that was wrong?

Well, she would know soon enough. At last, the body was visible. From a distance of five kilometers, it was like an irregular, granular egg, shining by internal lights. Sylvia turned the high-magnification sensors onto it. She was confused and her nervousness had increased. The object was about three hundred meters long, too small to be a harvester, a colony, or a cargo ship, and the wrong shape for a transit vessel. That fitted with the idea of a small comet nucleus, still rich in volatiles. Yet the pattern of ports and lights implied an inhabited body, and two docking ports and airlocks were clearly visible on the surface.

If it were a natural body, then it was one that had already seen some internal tunneling and modifications. The newly installed drive unit was easily recognized, gleaming at the thicker end of the lumpy body.

Delay would not help, and she had not come all this way for nothing. Sylvia was already in her suit. She allowed the transit ship to dock itself gently against the bigger port, opened the cabin, and went straight to the lock.

It was open, contrary to standard safety regulations. And the *inner* lock was open, too, which meant that the interior of the body was airless. If Paul Chu was inside, he was either wearing a suit, or he was a corpse. Sylvia noticed how loud her own breath sounded in the helmet. She set her suit receiver to perform a frequency sweep and passed on through the inner airlock.

The first chamber had been carved from the water-ice and CO_2-ice of the cometary interior, and it was clearly intended as a workshop and equipment maintenance facility. There were plenty of signs that it had been recently inhabited, with cutting torches still attached

to their fuel bottles in a tool shop chamber, and an electrical generator in standby mode. Three or four construction machines were waiting patiently against one of the walls. Sylvia regarded them with irritation. They were obsolete models by Cloud standards. If they had been made just a little bit smarter, she could have asked them what was going on. As it was, they had been designed with a specialized vocabulary and understood nothing but mechanical construction tasks. If no one came along to give instructions, they would wait contentedly for a million years.

She passed on through a sliding partition, deeper into the interior. The scan for received signals had produced nothing, so she switched to an all-frequency broadcast. "Paul Chu. This is Sylvia." Her suit repeated the message automatically, over and over, and listened for any reply.

She had reached the temporary living quarters built by the machines near the center of the body. He was not here, but there were many signs of his recent occupancy. That was definitely his computer link, the one he had used for ten years. No Cloudlander, no matter how long he was away from the Outer System, would ever leave metal objects strewn so casually around, unless he knew he would be coming back soon, or he had been forced to leave in a great hurry.

Or dead, said her mind insistently.

She pushed away the thought. Perhaps Paul was somewhere on the other side of the body, or perhaps he had been temporarily called away.

But called away to what? And to where? She had seen no sign of other bodies in her approach, and her suit radio had an effective range of many thousands of kilometers.

Then suppose that he didn't *want* to meet her, and was hiding away to avoid an encounter? That thought rejected itself. How could he be hiding, when he had no idea that she was even on the way here? He thought she was back in the Outer System.

Almost against her will, Sylvia set out to explore the desolate interior. Sometime, far in the past, this had been a human home for a long period. There were kitchens, bedrooms, even chambers set up for entertainment and for exercise. Those rooms held harnesses, and stretch bars, and workout machines, each with dials to measure effort-level and progress. But over all the equipment and instruments lay a thin layer of sublimed ice. No one had touched anything here for years, maybe for decades.

In less than half an hour, she was convinced that there was no one anywhere on the hollowed-out comet. She was alone. And only a few moments later she felt a a strange vibration beneath her feet, and sensed a slight pressure on the front of her suit. She knew at once what was happening. The airlocks had been closed on the body's surface, and the interior was filling with air.

She set off, hurriedly retracing her steps toward the lock through which she had first entered. When she was halfway there a flicker of movement appeared at the end of a corridor.

"Paul?" She paused, her hand on the wall of the corridor. "Paul Chu? Is that you, Paul? Who is there?"

The corridor now supported a full

atmosphere, and her voice went echoing along the narrow passageway. There was no reply, but suddenly a little machine came scuttling into view and moved towards her. Ten feet away it paused. Sylvia was thrilled to see it. Unlike the others that she had seen, this one she recognized as a very advanced model, one that was scarcely out of the development labs. It was a GA machine, a General Assistance model that would perform hundreds of tasks with vocal direction and little human supervision. If it had to, it could fly her home in her own transit ship.

"What's been happening here?" She advanced on it confidently. No machine would harm her—no machine *could* harm her, except by accident. "Where are the people? Is Paul Chu here?"

It said nothing. The arrays of detectors on the front of the machine had tilted her way, and there was no doubt that it was aware of her presence. But when she was within a couple of paces, it began to back away. A second machine of the same design had appeared at the end of the corridor, and advanced to stand next to the first.

"Come on." Sylvia was becoming impatient. "I want answers. Don't pretend you can't understand me, I know you're too smart for that. What's been going on in this place?"

From a circular aperture at its base, the second machine suddenly extruded a pair of long, rubbery arms. Before Sylvia could retreat, they had moved forward to circle her ankles.

"Hey! Let go of me!"

It took no notice, and now arms from the first machine came forward to wrap around her forearms and her waist. She was gently lifted off her feet and held in midair. Both machines moved in unison along the corridor, holding Sylvia as delicately but as firmly as an armed bomb.

"There is no problem." The first machine finally spoke, in a voice that Sylvia recognized at once. It sounded just like Paul Chu. "We will be going on a journey. You will be quite safe. One moment."

While Sylvia struggled as hard as she could, yet another pair of arms appeared to check the closure of her suit helmet.

"What do you mean, a journey? Damn you, let go of me. Take me to see Paul Chu. *I order you to release me.*"

That *had* to work. No machine could hold a human against her will, unless it was to save a life.

"We cannot do that." The voice was suitably regretful and apologetic. "We cannot set you free; not yet. But we can take you to Paul Chu's present location. Maybe you will see him there."

"When?" They were already in the lock, and there was a hiss of escaping air.

"When we reach our destination. Ten days' journey from here."

They were outside, drifting along in a glimmer of starlight. The second machine had stayed behind at the lock, so now she was held only by her arms and waist. Sylvia saw a new shape in front of her, a small ellipsoidal object only twenty meters long. It was like no ship she had ever seen. "We can't fly in that." She spoke into her suit radio, offering what should have been for a machine the ultimate threat. "If you make me fly in that, it will *kill* me."

"Not so." The machine sounded shocked, but it did not even pause. "Otherwise, of course, we would never permit it. Ten days will quickly pass. Perhaps when we are on the way you would like to play chess with me? We will be alone."

"I hate chess!"

As Sylvia was carried into the ship she had a final unhappy thought. She had given Cinnabar Baker the coordinates of this destination, and felt pleased with her foresight. But how much use would that information be, wherever she was ten days from now?

CHAPTER TWENTY-ONE

"Any sufficiently advanced technology is indistinguishable from magic."
—Arthur C. Clarke (1917-)

Aybee had seen many transit ships during his wanderings through the Outer System. The design was standard. It differed only in detail whether the fabrication was done at the Vulcan Nexus, whispering its way across the surface of the Sun, or out in the Dry Tortugas, wandering the remote and ill-defined perimeter of the Oort Cloud.

Every transit ship had a thick disk of dense matter on the front end. Every one also had a passenger cabin that could slide back or forward along the two-hundred meter central spike jutting out behind the mass plate. The McAndrew vacuum energy drive sat at the plate's outer edge. The whole assembly looked like an axle with only one wheel attached.

It was a shock to be taken by Gudrun to the front of the ship, and be shown a smooth, spikeless ellipsoid just twenty meters long.

Aybee stared at it like the audience at a magic show, waiting for the missing bluebird to appear. "Where's the rest of it?"

"There is no more." Gudrun laughed. She was bubbling with excitement. "I told you, Karl, the surprises are just beginning. This is the ship for our journey. It arrived from Headquarters two days ago."

Aybee made a complete circuit of the outside. The ovoid had a smooth glassy hull, polished and unmarked. He could see his own distorted reflection in the convex surface. That alone was sufficient to make it out of place in the dingy and grimy environment of the old cargo ship. It was as new as its surroundings were old. Odder yet, it showed no sign of a drive mechanism. There was nowhere to attach the massive disk that balanced gravity and acceleration, and the clear ports suggested that at least half of the internal space was passenger quarters.

As a supposed trainee, Aybee couldn't tell Gudrun what he was thinking, which was, either this supposed ship was a total hoax, and would go nowhere—or there were whole realms of physics unknown to the best minds in the Inner and Outer Systems.

Instead he said, "Who built it?"

"Headquarters. It's very new and very fast. The old ships took weeks to get to Headquarters—it's over six hundred billion kilometers. We'll be there in five days!"

"What's the acceleration?"

"That's not relevant. This works on a new principle. They are making more

of them, but today there are only a handful of others like this ship."

But there ought to be none *like it.* Aybee did the instant mental conversion, five days for six hundred billion kilometers meant about five hundred gees. Then he at once ignored his own answer. The range calculation made sense only if the ship performed like a transit ship, with an acceleration phase, a crossover, and a deceleration. There was no reason for that assumption. If the ship were as new as it seemed, Headquarters could be on the other side of the Galaxy. Aybee had no idea how it could function. At the moment he didn't even know what questions to ask.

"How is it powered?" he said at last. "With a kernel?"

That was fishing. The transit ships used the McAndrew vacuum drive, not kernels.

"No. But apparently it has a low-mass kernel at the center."

Curiouser and curiouser. Even a small kernel was a few hundred million tons. Why accelerate that mass, if you didn't need it?

They went aboard, and Aybee's confusion performed a quantum jump to a higher level state. The internal living space on the ship was ten times what he had expected. There was too little space for any reasonable power supply, engines, or drive mechanism.

In the back of his mind Aybee had already decided that a new and first-rate intellect must have arisen in the rebel communities of the Kernel Ring. That was the only way to explain something as radically different as the new ship. But once inside and looking around him he was forced to drop even that idea. Too many things were new and unfamiliar. Out of a dozen different internal systems, he could identify and explain maybe half of them. And those few hinted at something that Aybee had been groping his way towards for the past four years, a new landscape just beyond the horizon.

Aybee had a clear image of current science, of its peaks and valleys and grey clouded areas where theory failed. Technology advanced constantly, but it depended on models of the physical world that were often centuries old. It advanced by ignoring the foggy regions, those places where deep understanding had not been achieved and where the subtle paradoxes lurked. Aybee had charted those anomalies. It was shocking to find the misty curtain suddenly blown aside, and a new world shining forth in full-blown glory.

Gudrun had no such worries. She sat down confidently at the control board and began to follow the simple sequence of instructions provided by the panel's prompting. The new ship did not seem to amaze her, but Aybee recalled the description of the Outer System Navy: a system designed by a genius to be run by idiots. And when he thought of the level of genius needed to come up with a whole system so different from anything he had ever seen, his skin crawled with excitement.

Five days. That's how long he would have, to explore everything and find out how it all worked. Aybee had been dreading so long a trip with Gudrun, but now he wished the travel duration was double. His useable time would almost certainly be much less than five days. Gudrun would insist on talking—or

worse—for part of it, and she also wanted him in a form-change tank, to waste more precious hours.

Even while she was finishing the command sequence to move them out of the cargo hulk and on their way, Aybee was thinking hard. What he needed was a complete reversal of roles: Gudrun absent, and Aybee free to explore the ship. How could he manage it?

Cinnabar Baker would have solved that problem in a moment. With stakes so high, Gudrun had to be out of action for the duration of the journey. One blow would do it; then the disposal of a corpse, or the confinement of an injured body to the medical unit.

Aybee had plenty of brain-power. The idea that Gudrun could be killed or injured occurred to him at once. She had finished the control sequence, and now she was with the communications unit. As she crouched before the panel with the headset shielding any of his actions, he picked up a heavy data storage case and moved to stand directly behind her. It would take only a moment, a single strike to the unprotected skull.

Now!

Aybee stared the possibility full in the face—and blinked. For the first time in his life, he was forced to face one of his own limitations: he was not particularly fond of Gudrun, but regardless of logic and motivation he could not harm her physically.

He put down the case and stared at her in total frustration. At the same moment, she swiveled round in her chair to look up into his face. Her expression was curious, somewhere between cold and startled. Aybee could visualize a five-dimensional knotted manifold and manipulate its topology in his head, but he could not read that human countenance. If he had, he would have recognized a look of fear.

"I've been in touch with Headquarters," Gudrun said after a few moments. "I said we'll be on our way any moment now."

Aybee nodded. It hardly seemed like a Universe-shattering revelation.

"And I'm afraid we can't do the things we'd planned," she hurried on. "There have been changes. I have urgent work to do on the journey, so you'll have to occupy yourself as best you can. Don't come in here."

Without another word she went through to the aft part of the cabin and slid the door closed. Any child could see that something had happened to upset her very much.

But if Aybee were a child, he was the little boy who had suddenly been given the run of the candy store. He stared after Gudrun for all of ten seconds, until he heard a high-pitched whirring from somewhere beneath his feet. A new mechanism had come into operation.

Aybee felt no acceleration, but he suspected he might be hearing the drive. It was easy enough to test the idea. The McAndrew propulsion system produced a faint sparkle of eldritch light as high-speed particles collided with the occasional hydrogen atoms of free space. He went across to the port and peered out.

And gasped. There was no pinpoint twinkle of drive interactions. Instead, the whole star field had been replaced by a tangled rainbow of color, rippling across his field of view.

From that moment, Aybee forgot all about Gudrun for many hours.

CHAPTER TWENTY-TWO

"I often wonder what the vintners buy
One half so precious as the goods they sell."

Behrooz Wolf claimed to have no conscience. He denied having brains. What he had in place of both, he said, was a little voice that whispered in his ear, urging him to take actions that his natural indolence discouraged.

It was doing it now, interfering with his work. What he *wanted* to do was solve the mystery of the demon of form-change, that impossible chimaera that could live in the radioactive inferno inside a kernel shield and send a stream of misdirection through the computer system to the rest of the harvester. (And if it could do it to form-change, it could do it to everything else. It was the key to wholesale delusions, impossible sensor messages. Even the Negentropic Man himself, and Mary's visitation, and failed mass detection systems —*something* had allowed that cometary fragment to crash undetected into the Sagdeyev Space Farm.)

That's what he *wanted* to do, work on technical problems. So why was he wandering the interior of the Marsden Harvester, seeking a woman whose last name he had not at first remembered? It was Andromeda, but Andromeda who? Leo Manx had never heard of her. Bey went to the central data bank and asked for a complete listing of the Andromeda's—Diconis, that was the name he had been groping for; but the computer offered only a general location within the harvester. She was a woman with no permanent partner and no particular job. Bey started with the dining area where they had met, and widened his sphere of search from there.

His new form had a stamina level inferior to his Earth body. After seven hours of roaming the harvester's corridors, asking for a woman that everyone seemed to know and no one seemed able to locate, he was wilting. He needed food. He gave up his search, headed for the nearest dining area—and found Andromeda Diconis.

He dropped the idea of food and filled a jug with purple-red wine when he saw her. This was a meeting he did not expect to enjoy (*so why was he doing it?*). She was alone, dressed in a cleverly cut garment that suggested body curves where there were none. He had to hurry, since she was carrying a tray of food and about to enter a dining cubicle. He grabbed his jug and a cup, hurried that way, and crowded in after her.

She gave him a first amazed stare, then a gasp of pleased recognition. "Why—Behrooz. What a nice surprise."

"I have to talk to you."

"But I'm about to eat." She gestured to the tray in front of her. "You'll have to wait until I've finished. Unless"—her face turned pink, but her eyes were gleaming before they looked away from his—"unless you were thinking of staying here while I do it."

"Sure. Here, we'll share this." Bey placed the wine on the table between them and heard her gasp. He might be getting into more than he realized.

Andromeda was looking around her,

checking that no one else had seen Bey enter the cubicle. "Wait a minute." Her voice was breathless, and she quickly set the table controls to make all the walls opaque. "There—if you are sure you really want to?"

"I do. I'm sure." Bey picked up the flagon and poured wine. He did not think Andromeda was a woman who did favors for nothing. Who was it said that Paris was worth a Mass? One of the Henrys. Well, Sylvia was worth more than that. According to his estimates, she had saved his life at least twice. And she had sat for days by the tank when he went into form-change, to make sure nothing bad happened there. Sylvia was worth it, whatever it took. Bey followed his instincts, picked up his cup of wine, and drained it.

Andromeda had taken a spoonful of clear soup, but she was hesitating with it poised in front of her mouth, watching him drink. Bey stared right at her, not letting her off the hook. After a moment she gave a little shiver, pursed her lips, and sipped in a determined way. She swallowed, blushed, and said, "I hope you don't think I'm like this all the time. I mean, I'm really a very respectable woman."

"I know. Sylvia says you're the tops." Bey gulped more wine, and watched Andromeda lean forward and lick her lips. Her nipples were pushing against the indigo fabric of her dress. He was even getting excited himself. Maybe the Cloudlanders knew something that Earth people had never learned about the serious business of eating. Bey struggled to keep his mind on the job at hand. "She says the two of you go way back together. You were big buddies until she set up with Paul Chu."

"We were." Andromeda swallowed another lascivious spoonful of soup. "I was very disappointed when that happened. I mean, he was *nothing*. Little, and fat, and full of strange ideas."

Lady, that was me two weeks ago. Bey leaned across, poured a full glass for Andromeda, drank deep from his own glass, and nodded agreeably. He had not eaten for a long time, and the alcohol was pumping straight through to his blood stream. Andromeda was beginning to look much more attractive. "I don't know why she started to hang out with him." He leaned forward. "Wasn't he part of some sort of religious group?"

"Not *religion*. Revolution." She gave Bey another knowing look, waited to be sure he was watching, and took a deliberate swallow of wine. Her face was flushed and her lower lip swollen. "He was into revolution, and Borderland politics, and all that rubbish. I don't know how much she told you about the two of them, but they were an item for a long time. I think she still has the hots for him. I don't know what she told you, but in my opinion she hasn't got him out of her system."

"Was she asking about him?" The question was overly direct, but Andromeda was too preoccupied to notice. She was sitting with a forkful of food poised in front of her. Not until Bey fixed his eyes on her again did she slowly place it in her mouth, pull the food free with her white teeth, and chew steadily while he watched. The pulse in the hollow of her throat was throbbing.

"She was asking." Andromeda fi-

nally swallowed and put down her fork. "She was asking about him, and I told her how I thought she could get in touch with him."

"You *know* that?"

"I'm fairly sure I do. He was here secretly, but he wanted certain people to be able to reach him. I know who they are."

"And you could tell me?"

"Well, not immediately." Andromeda licked her lips again. "It would take time to find them. But we could look together."

Bey knew what was coming. " 'There's a divinity that shapes our ends, Andromeda, rough-hew them how we will.' "

"I'm sorry?"

"Shapes our ends." Lord. He'd had far too much to drink (but too much for *what?*)

Andromeda laughed. "You're such a *strange* person—not at all the way you look. If you want to search, I can tell you where we should start." She moved closer to Bey. Andromeda had lost all interest in eating. "I have their names and locations—but not with me. Back in my private quarters. We'd have to go there. If you want to."

She paused, and was looking at him inquiringly.

With a wild surmise. Silent, upon a peak in Darien. Lord, he *was* drunk.

"Well, Bey." She had stopped smiling. "Do you want to?"

" 'Being your slave, what should I do but tend upon the hours and times of your desire?' "

"What?"

"I mean, let's go. Now. To your place. I want to."

"Mm. Are you *sure?*" Now she was playing hard to get. "I mean, what about Sylvia?"

" 'I have been faithful to thee Cynara, in my fashion.' " *I mean Sylvia. I mean* Mary, *for god's sake.*

"What?"

"I mean, I'm quite sure. Can't wait. Let's go." Bey lurched to his feet, clutching the half-full flagon of wine. She was out there somewhere, in the featureless gulf of the Outer System. He was going to find her. If he had to lay his body down to do it, that was part of the game. *Whatever* it took, he was going to find her. But not quite yet.

Leo Manx stared at him in disbelief. "Let me get this straight. You're leaving tomorrow for these coordinates." He tapped the sheet he was holding. "In the wilderness. And you don't want me to come with you. I'll second that. You don't want to tell the harvester controllers where you're going. All right, if you say so. But what are you hoping to accomplish?"

Leo Manx was a good listener. He proved it now, while Bey outlined his ideas. At the wilder moments, Leo muttered to himself but did not interrupt. "How are you proposing to prove all this?" he said at last.

"I'm going to bring one back. A live one." Bey was white-faced, exhausted, and somewhere between stoned and hungover. Four days of wine, drugs, and Andromeda Diconis was not an experience for the faint-hearted. They had wandered the harvester together from one end of the other. Andromeda believed in stimulation rather than sleep. If he survived, Bey wanted to see her

again. He had to know where she got her energy. "But if I don't make it back," he went on, "there has to be at least one person who knows exactly where I'm heading and what I think is going on. That's you."

"But how am I ever going to persuade Cinnabar Baker that what you're doing makes sense?"

"You don't start with Cinnabar. You *end* with her, and only if I don't come back and there's absolutely no other alternative. I told you the danger. Did you do what I asked you to?"

"As much as I could. Have you ever tried to brief your boss, without telling her what's going on?"

"A hundred times. It's the first rule of self-preservation. Do you have them in a safe place?"

"The coordinates? Sure I do. But you realize those coordinates are almost certainly *not* the location of Ransome's Hole? They're too far out of the Kernel Ring."

"I know. But they're the only starting point I have, and I feel sure Sylvia went there. I'm leaving now. If everything goes to hell, you know what to do. Give me thirty days, then if you don't hear from me assume I'm dead and gone."

He was ready to go, but Leo Manx stopped him. "Bey, you tell me you need thirty days before I panic, and you're not frantic now about Aybee. So why don't you give as much breathing room to Sylvia? Maybe she's working her own agenda. You could ruin it for her."

Leo deserved an answer, but Bey didn't have one. All he had was that small voice again, whispering in his ear. It said that Aybee might be fine, and Bey might be fine, but Sylvia was in trouble. Or was it telling him that he owed more to her than he did to Aybee, and so he had to worry more about her?

Bey couldn't turn off that voice, but he could sometimes see through its strategies. He was in a hurry to leave, but not perhaps for the obvious reason. If he found Sylvia, she might lead him to Paul Chu. And Paul Chu might lead to Black Ransome. And Black Ransome was the Negentropic Man, that grinning, dancing figure who had driven Bey near insanity and forced him to leave Earth. *That* was who Bey was after. Wasn't it?

Maybe. The inner voice insisted on the last word. You want to get even with Black Ransome, I can believe that. And you want to solve the mystery of the kernels, which begins and ends with Black Ransome. But aren't we conveniently forgetting one other little thing? If you find Black Ransome at the end of the trail, who else may you find with him? And what will gallant Bey Wolf do then?

CHAPTER TWENTY-THREE

"Time to worry, time to fear,
The Negentropic Man is here."

Aybee Smith was a helpless prisoner, boxed up in a ship with a woman who would not talk to him, racing towards an unknown destination, heading for a meeting with people who were sworn enemies of everything that Aybee's own civilization stood for.

Any logical person would have been worried sick about his own future. And logic ruled Aybee's whole life. He loved logic, he lived by logic. And yet he did

not give any of those worries a single thought. He was busy with something far more important.

The ship was a treasure-box of mysteries. Beginning with the puzzle of the drive mechanism (no high-density balancing plate, and no acceleration forces) he had listed twenty-seven devices that required some new technology—or, beyond mere technology, some new physical principle!

With a mental clock always ticking in his mind (*five days!—too little time*) Aybee had foregone the luxury of sleep or rest. No matter what they did to him at his destination, he could sleep when he arrived there; today the exploration of the ship was his only goal.

Gudrun appeared from her locked quarters only for a few minutes twice a day, when she found it necessary to use the ship's single galley. Aybee was eating randomly, snatching food when he could bear the interruption to his work. He and Gudrun met in the galley only once. She avoided his eyes and did not speak. He didn't even notice. A new insight had occurred to him, a possible basis for the ship's garbage disposal unit, which somehow removed the mass from the ship but did not eject it to open space.

While she prepared her meal, and fled, he sat motionless and gawked at the blank wall. Aybee worked in his head. He only transcribed results when everything was complete. So far, he had written nothing.

He had performed a taxonomy of those twenty-seven anomalies, placing them neatly into four major categories. Thus:

(1) inertial versus gravitational mass; half a dozen devices on the ship, including all its positional and navigation systems, could be explained very well in one simple theory—*if* Aybee was willing to abandon the Principle of Equivalence. He wasn't. He would give up his virginity first.

(2) heat into motion; another set of devices on the ship made sense only if heat could be converted *perfectly* to other forms of mechanical energy; in other words, if Aybee were willing to give up the Second Law of Thermodynamics.

The Negentropic Man again! In a closed system (and what was more closed than the ship?) Aybee was asked to admit an entity that would decrease entropy. He remembered Maxwell's Demon, that tiny imp who was supposed to sit in a container sorting molecules. The fast-moving ones would be allowed to pass in one direction, only slow-moving molecules in the opposite one. Maxwell's Demon had been introduced in 1874, but Szilard had banished it completely in 1928. Hadn't he?

Aybee wasn't sure anymore. But he certainly didn't want to give up the Second Law of Thermodynamics. Eddington's words were graven in his memory: "The law that entropy always increases—the second law of thermodynamics—holds, I think, the supreme position among the laws of nature. If someone points out to you that your pet theory of the universe is in disagreement with Maxwell's equations, then so much the worse for Maxwell's equations. If it is found to be contradicted by observation, well, these experimentalists do bungle things sometimes. But if your theory is found to be against the second

law of thermodyamics I can give you no hope; there is nothing for it but to collapse in deepest humiliation.''

Aybee agreed with that. Wholeheartedly.

(3) force-field aberrations. By the end of the third day, Aybee had devised an alternative theory which explained how the drive might work; but it involved the introduction of a new type of force, similar to the ancient and long-discredited concept of ''hypercharge.'' Aybee shrank from such *ad hoc* leaps into darkness. ''*Hypotheses non fingo*''—''I don't make new assumptions.'' If that had been good enough for Isaac Newton, it was good enough for Aybee.

(4) information from nothing. All the rest of the ship would work fine—if only it were possible to create information from random noise! Chaos to signal, that was all Aybee needed. The ship's communication system seemed to *depend* on that impossible capability. Could he accept it? Aybee knew exactly where it would lead him, and he didn't like it. He would again need a way in which entropy could be decreased. It was the Negentropic Man, popping up again in a different but equally unappetizing form. Aybee hated the whole idea.

Five days flew by. The approach to their destination was an irritating distraction, but finally a necessary one. Aybee would not stop thinking about the physical problems—he *could* not stop thinking—but at least he would have an obligatory break from it.

One hour before arrival, Gudrun appeared grim-faced from her cabin and moved at once to the communications terminal. She was wearing a space-suit, and it was clear that she was very nervous. But her feelings were not obvious enough to break through Aybee's shield of obsessions. He went on working, until the very moment when the ship docked and the lock began to open. Then it was not Gudrun's voice that brought him out of his reverie, it was the clatter of metal from within the lock itself.

''There he is!'' Gudrun had run to the opening and squeezed through it. She turned to point back inside. ''That's Karl Lyman. Be careful—he's dangerous!''

The airlock on the ship, like its passenger quarters, was far bigger than on an ordinary transit vessel. Aybee stared into it, and saw to his amazement that it was crammed with armed men, all in full space attire and squeezed tightly together. There were eight or nine of them; to a Cloudlander, that many people in one place was a major gathering. Gudrun had pushed into their midst. As he watched, all the weapons lifted to point straight at him.

''Into your suit,'' said an uncompromising voice. ''If you have an explanation, you can give it later.''

It was not a time to argue. One shot from any of those weapons would pierce the average hull. Aybee had a suit on and was ready to go in less than thirty seconds. He nodded as he closed the final seal. The outer lock opened, and air hissed out into vacuum. One of the guns lifted and gestured. ''Outside.''

One step behind Gudrun, Aybee moved on through the lock. It had been three days since he last looked out of an observation port, and now he stared around with keen interest. The strange

rainbow aurora had vanished, presumably disappearing when the drive went off, and the familiar starfield was all around. The Sun was visible off to his right, noticeably more brilliant than it had been when the journey began. Aybee made a quick assessment of its apparent magnitude, and decided that they were somewhere on the outer edge of the Kernel Ring.

The ship had docked on the perimeter of a structure that was no more than a minor way station, a long skeletal framework of struts with clamps to hold ships in position and massive tanks for fusion fuels. The group moved to a little pinnace propelled by a high-thrust ion engine. Their real destination was a few kilometers sunward, a dull darkness whose size and shape could only be assessed from stray glints of sunlight splintering off external ports and antennas.

The body was roughly spherical, perhaps five kilometers across. Aybee stared at it with the greatest interest. If he were unworried, it was not that he was confident of his own fate. He was simply unable to drag his mind away from the new physical universe suggested by the ship he had arrived in. And if he had any emotion, it was anticipation; whatever he had seen in transit, there would be greater marvels here, where the transit ship had been built.

Aybee did a quick analysis. The sphere ahead might be a source of ships, but it was not itself a ship. It was also the size and shape of a cargo hulk, but it was not being used for cargo. There were no signs of a drive mechanism, and there could be none, since the delicate spikes and silvery filaments of exterior antennas were incompatible with accelerated motion. They were no stronger than tinsel, and would be crushed and deformed by the slightest of body forces.

It could be a colony, like the Outer System's free drifters; or it might be a converted factory, originally dedicated to the production of a particular line of goods.

Aybee abandoned speculation. They were moving to a huge airlock built into the hull's convex surface, and already several of the party had their hands ready to break suit seals. Aybee waited. If anyone attempted to breathe vacuum, he would not be the first. He was amused to note that Gudrun had positioned herself as far away from him as possible, at the opposite side of the lock. The escort had apparently formed their own conclusions about Aybee's threat to them. No one held a gun at the ready, and half of them didn't even bother to look at him.

The inner lock opened. The group moved quietly forward into a large, bare chamber, with a flat floor and a local gravity field that varied irregularly from one point to the next. To Aybee, that suggested the resultant vector from many kernels, scattered through the interior of the body and each adding its own field component.

The man in front halted and turned around. At his gesture, Aybee removed his own suit with the rest. For the first time he could assess their physical appearance. Most of them had the short, stocky build that he associated with the Inner System and the Kernel Ring, but two were long and lean, as much Cloud-

landers as anyone that Aybee had ever seen. They were probably not recent arrivals, either, since they were not dressed in Outer System style; their arms and legs stuck wildly out of clothes far too small for them.

Gudrun was staring at him in fear and horror. Aybee felt tempted to go across, wiggle his fingers in his ears, and see if she screamed. What was she expecting? Someone to appear in a puff of smoke and carry her off to hell?

Instead, he nodded amiably to the others in the group. "Well." They all stared at him. "You got me. What happens now?"

"That depends on you." The speaker was a black-haired man with dark skin and a thickset build. Aybee recognized the voice as the one that had been ordering him around. "I was told to get you here, that's all. If Gudrun is right"—the man spoke as someone who already knew her well—"then you're in trouble. We don't like spies here. If you're innocent, you'll have to prove it."

"Guilty until proved innocent. Nice. Where's here?"

Several of the man stirred uneasily at Aybee's question. "Got a bit of a nerve, haven't you?" said the stocky man. "What did you tell him, Gudrun?"

"Nothing." She was defensive. "At least, not very much. I thought until we were on the ship that he was just a new trainee that we captured on the Sagdeyev Space Farm. How was I supposed to know he's a Cloudland spy?"

That produced another reaction from the rest of them, and a couple of guns were again pointed at Aybee.

"I don't think you want to believe this," he said. "But I'm not a spy, and I've never been one."

"He's lying!" Gudrun's face was flushed with anger. "He even gave me a false name. He says he's Karl Lyman, but his real name is Smith—Apollo Belvedere Smith."

That shocked Aybee more than he wanted to admit. He could see how he might have revealed by his actions that he was not from the Space Farm, or that some other Farmer might have said he was not part of that group. But how could anyone know his real name? Unless he had taken to talking in his sleep, he had never mentioned his name since the accident back on the Farm.

"*Is* that your name?" asked one of the tall, thin escorts. "Because if it is, then man, you're in deep trouble." He turned to the rest of them without waiting to hear Aybee's answer. "There's an Apollo Belvedere Smith who works for Outer System headquarters. High up, staff position. So if this is him, he's definitely a spy, and we have to—"

"I tell you, I'm not a spy." Aybee cut him off before the other could finish. "I'm a *scientist*—"

"He's lying!" shouted Gudrun. "He's no scientist. He lied to me."

"He did," said a quiet new voice from behind the group. "And yet, oddly enough, he is not lying now. He is telling the exact truth."

Everyone spun around. A small, lightly-built man had stepped into the chamber through its open inner door. He was dressed in a tight-fitting suit of rusty black, and on his head he wore a peaked cap of the same sable tone. His face was fine-boned and pale, with an

odd little smile on the thin lips, but that expression was belied and dominated by the eyes. There was no smile there, only a dark and piercing look that demanded and held attention.

Aybee found his attention drawn to those eyes. It took an amazing effort to look away. He heard Gudrun gasp. She, at least, had not been expecting the new arrival. But she must have been less surprised than Aybee himself. For although the dress was quite different, and the teeth no longer incongruously blackened, Aybee recognized the man standing in front of them. It was the Negentropic Man, just as he had danced and capered through Bey Wolf's tormented memories.

The newcomer stepped forward, and the others moved aside to make a corridor. Right in front of Aybee, the man stopped and looked up. Aybee was a head and a half taller. The thin grin widened.

"As you said, Apollo Belvedere Smith, there was no lie. You are a scientist, and Cinnabar Baker thinks you are the best in the System." He held out his hand. "Let me welcome you here, and let me introduce myself."

"That's not necessary." Aybee took the outstretched hand, and decided it was time to do more than just deny everything. He had to establish independence. "I know where I am. This is Ransome's Hole. And you are Black Ransome."

If Aybee had expected a shocked response, he was to be disappointed. The other man frowned, just a little, and gave Aybee's hand a dry, firm shake. "I'm Ransome, true enough. Some call me Black Ransome, although that is not my name. And some call this Ransome's Hole, too, though I would never do so." The smile returned, warm and embracing. "I'm going to welcome you here, whether you want it or not. You've come a long way, and we must talk. You may be very valuable to us. Come on."

Aybee had apparently been switched in status from prisoner and spy to welcome guest. Gudrun gasped, but there was no murmur of dissent from anyone. The force of Ransome's personality was too strong to brook argument. Instead, the group of people moved to leave a clear path to the door. He turned and left, confident that Aybee would follow.

That annoyed Aybee. So Ransome was to lead, and he was supposed to trot along behind like some pet animal? No way.

He left the chamber just behind Ransome, and tagged along until they were out of sight of the other group. But then he paused and looked all around him. Ransome went on and was almost out of sight in the curving corridor, heading deeper into the sphere along a spiral path whose field, in less than fifty meters, fluctuated from almost zero gee to a thirtieth of Earth gravity. The floor turned in the same space through a hundred and eighty degrees. In any other structure, Aybee would have known just how to interpret that. The path must wind its way past two shielded kernels, one below the "floor," the other, forty meters farther on, above the "ceiling"—which had become the floor.

That was the only logical explanation, but Aybee's new experiences on the transit ship had taught him to mistrust preconceived ideas. He slowed his

pace and hunted backwards and forwards, seeking a point of maximum field in the corridor floor. If he were now close to a kernel, he would feel an inertial dragging.

He went down on his hands and knees and put his head close to the floor, moving it slowly about. While he was in that position he saw a pair of black-clad legs standing a few feet in front of him.

"If you're going to travel all the way like that," said Ransome's calm voice, "it will take you a long time and I won't wait. I'll send one of the machines back here to show you the way. It *is* a kernel down there, you know. What else did you think it might be?"

Aybee stood up. He was still young enough to hate looking like a fool more than anything in the world. For the rest of the journey through the interior of Ransome's Hole, he trudged grumpily along right behind Ransome.

In a few minutes they came to the end of the corridor and passed through into a great hemispherical chamber, furnished to a level of luxury that Aybee had never seen. Glittering silver sculptures of human and animal figures were everywhere. The domed ceiling housed a huge sprinkler system, able to deliver anything from a fine mist of rain to a total deluge. Fruit trees and flowering vines, trained in elaborate espaliers along walls and trellises, grew beneath in disciplined variety. At the center of the chamber stood its most spectacular feature. A forty-meter globe of greenish water was held in position by the gravitational field of the kernel at its center, and brilliantly colored fish were swimming within it. Fronds of weed and branched coral grew down on the kernel's outer shield, and an external lighting system created ever-varying patterns of light and dark within the clouded interior.

Aybee goggled. No one had anything like that in the Outer System, not even the three General Coordinators.

Ransome had caught his expression. The shorter man shrugged. "Not for me, Mr. Smith. That isn't my taste at all." He sounded amused and tolerant, far from the fanatic rebel promised by his reputation. The ogre of the Kernel Ring was easy company, lulling you to relax and listen to him.

"But sometimes you have to do these things, don't you?" Ransome went on. "For the sake of the less scientific. Stick around here for a while, and you'll see worse. Maybe you should think of this as my version of the Hanging Gardens of Babylon."

The what of what? Aybee decided to look it up when he had a chance. Meanwhile, he could not help changing his mind about Black Ransome. The man was treating him like an equal rather than a prisoner, and given the other's reputation and authority, that had to be flattering.

"Now this *is* my own taste," said Ransome. "A person can really work here." He led the way through a gleaming door of white metal, on into a sparsely furnished room about eight meters by six. A long desk, half-covered with random piles of data cubes, stood against one wall. Half a dozen displays were mounted above it, on plain beige walls that carried unobtrusive light fixtures, the biggest holograph projectors Aybee had ever seen, and no decorations of any kind. Elaborate computer

consoles were built into the surface of the desk itself.

Ransome sat down on one of three easy chairs and gestured to another one. Now that they had arrived, he seemed in no mood to speak. There was a long, uncomfortable pause, with Aybee standing waiting and Ransome staring blank-eyed at the wall.

At last Aybee tucked himself into a chair. They had been made for Ransome's convenience, not for a tall Cloudlander, and his knees came up near his chin. "So I blew it," he said. The personal failure had been troubling him since they first reached Ransome's Hole. "Mind telling me how?"

Ransome raised dark eyebrows questioningly, but still he did not speak.

"I mean, my *name,*" added Aybee. "Gudrun knew it, and you knew it. But I told her I was Karl Lyman when she found me on the Space Farm, and nobody did a chromosomal ID check on me. You shouldn't have had any idea I was lying. So I must have done something dumb. I'd just like to know what it was."

Ransome shook his head. "You demean yourself, Aybee Smith. It was not your failure. Watch." He nodded to one of the displays and played briefly with the miniature console set into the arm of his chair.

The screen glowed. Aybee had half-expected to see the result of some unsuspected test, conducted on the Space Farm, or perhaps on the dark cargo hulk. Instead, a color image appeared. It was Sylvia Fernald, seen full face. After the flicker of a fast audio search, her image steadied and began to speak.

"We thought Aybee would have been here long ago," she was saying. "Now it looks as though he was captured along with the others. Do you have any idea where they were taken?"

"Not yet." The voice was Cinnabar Baker's, and as the field of view on the display scrolled across and down, Aybee realized that he must be viewing the scene through her eyes.

"I hope he has the sense to lie low until we can trace him," said Sylvia, from outside the field of view.

"If we ever can," said Baker. "We have no clues so far. If he's still alive—we're not sure of that—he could have been taken anywhere in the System." Now the screen showed the main display in Baker's own office. It held a listing of the names and physical description of all personnel of the Space Farm, plus Aybee's own personal data.

"You know Aybee," said Sylvia. She appeared again in the picture. "If he is alive, he'll be looking for a chance to get away—"

"—as I'm sure you were," said Ransome. He cut off the display and Sylvia vanished. "But once we knew you had not left the Sagdeyev farm with the others, we could identify you from your description and take special precautions."

Aybee was still staring at the blank screen. "That was in Baker's private apartment. It was seen through her own eyes!"

"Indeed." Ransome leaned back comfortably in his chair. "Aybee Smith, you are surprised. You should not be. My resources for the collection of information through the whole System—even within the Coordinator's private apartment—are unmatched. Cinnabar

Baker keeps no secrets from me. I know every word that is said, in every one of her meetings. If you want more proof of that, I can easily provide it. I have been aware of your own existence and of your potential for more than three years. Had I realized that you were with Behrooz Wolf on the Space Farm, I would have prevented the accident there."

"Could you have stopped it?"

"With ease. I controlled the whole destiny of the Sagdeyev farm, from form-change units to matter detection systems. But before we come to something so specific, let us be general. You are a young man, and you are fascinated by science. Let me ask you, do you have an equal interest in politics?"

The tone in Ransome's voice was still casual and detached, but Aybee detected a heightened level of interest. He shook his head. "Politics isn't for me. I leave that sort of stuff to people like Baker."

"Ah. To be young. You will change as you grow older. If you do not know politics, do you know the theory of dissipative systems far from equilibrium?"

"I know all the classical work, Onsager and Prigogine and Helmut. And I've followed what Borsten has been doing on iterated function spaces in the past few years." The abrupt turn in the conversation was baffling, but Aybee was on familiar ground. Maybe they were going to talk about science at last.

"In that case you will readily follow what I am about to tell you, even if at first you have trouble accepting it." Ransome's eyes were like magnets, drawing Aybee's attention against his will. "I can demonstrate to you that the whole civilization of the Solar System is on the brink of massive change—total and irreversible change. I know this, and soon everyone will know it. In the language of dissipative systems, we now stand at a bifurcation point, at a singular moment on the time line. As you know, this bifurcation implies an instability. In such situations, the future of a large system can be controlled by small forces. I have such a force at my disposal!—the same force that guarantees we occupy a singular point in time. But before the new system can emerge, the old order must crumble and fade. The process has begun; you have seen the signs, in the general breakdown of the Outer System. From its ruins, we will create the new order. Today's divisions into Inner System, Halo, and Outer System, will disappear. There will be a central government, a single point of power and control. It will be here, under my control. My office will become the center of the Solar System." He leaned forward toward Aybee, eyes dark and hypnotic. "The program to accomplish this is well advanced. But in certain scientific areas I need help. You are well equipped to provide it, and I can guarantee that you will find the work totally fascinating. And think of the prospect. You will help to define the future! You will help to *create* the future. What could compare with that?"

He paused and looked at Aybee expectantly. His voice had never risen a decibel, always completely thoughtful and reasonable. But in terms of its persuasive power, it was like a triumphant shout.

Aybee struggled to resist the feeling of enthusiasm and well-being that was flooding through him. He had always

been a loner, never one to join any movement, and now some small corner of his brain was fighting back. But it *was* a small corner—most of him was in there cheering for Ransome.

He forced himself to think again about his journey to Ransome's Hole. He wanted to hear about the new scientific advances that made the little ovoid ship possible. If Ransome were the genius behind those developments, Aybee had to hear the theory—all the theory. Instead he was listening to a man talk about politics. Was it conceivable that the scientific genius and the would-be emperor were the same person? Aybee knew very well the sacrifices and the demands on time and energy called for by great scientific advances. He was prepared to meet those demands, but could anyone combine such a life with an attempt to take over the Solar System? Surely not.

Aybee felt the flood of enthusiasm giving way to rational thought. He knew it was no time to argue with Ransome. Instead he nodded slowly and said, "What you are telling me is fascinating. I'd like to hear more."

He was not surprised when Ransome accepted his apparent conversion. The other man projected so powerfully, he was probably amazed by anyone who did not become his follower on first exposure.

Ransome stood up, so warm and friendly and convincing that Aybee began to have second thoughts about his motives. "You have much to learn, Aybee Smith. To the few thousand people already devoted to my cause—yes, we are still spread that thin—I am their only scientific expert. They see me as their prophet, and as the source of all the new technology. But there is a limit to what one man can do, and I have no more than scratched the surface of the possible. That has been enough to allow us to begin the reorganization of the System. You will help me to take our work much farther. When you are ready, we will go to the laboratories. You can begin work there as soon as you like. The facilities are the finest that we can provide."

He paused and frowned. "Of course," he added mildly, "there are certain precautions taken for such sensitive work. As you will appreciate, it would be intolerable if word of our plans and discoveries were to leak prematurely to the Inner or the Outer System." He smiled. "The monitor systems are automatic, and beyond my control. Attempted escape would unfortunately and inevitably lead to your capture, perhaps to your death. Now. Shall we proceed?" ■

CONCLUDED IN NEXT ISSUE

●Modern science has imposed on humanity the necessity for wandering.

Alfred North Whitehead

the reference library

By Tom Easton

Barking Dogs, Terence M. Green, St. Martin's, $15.95, 224 pp.
At Winter's End, Robert Silverberg, Warner, $17.85, 416 pp.
Antibodies, David J. Skal, Congdon & Weed, $15.95, ? pp.
Sin of Origin John Barnes, Congdon & Weed, $15.95, ? pp.
Portal: A Dataspace Retrieval, Rob Swigart, St. Martin's, $18.95, 352 pp.
Vengeance of Orion, Ben Bova, TOR, $17.95, 342 pp.
The Armageddon Blues: A Tale of the Great Wheel of Existence, Daniel Keys Moran, Bantam, $3.50, 224 pp.

Terence M. Green's first novel, **Barking Dogs,** left me immensely frustrated.

It was *not* Mr. Green's fault. His publisher, St. Martin's Press, like most other publishers, sends to reviewers advance, prepublication versions of books called "bound galleys." Their pages are photocopied from the freshly typeset "galley proofs" used to check (or "proof"-read) the typesetting, and bound like paperbacks in cardboard covers. The covers bear no artwork, and the galleys are rife with typos, but neither of those deficits bothers the experienced reviewer. He or she assumes the typos will be corrected before the books are actually published (don't you wish they always were?) and ignores the missing art, unless the publisher has included proofs of that as well, often as separate sheets.

Bound galleys are much to be preferred over loose galleys, bundles of (often) legal-sized or bigger sheets held together only by rubber bands. At least, they look and feel like books. Their pages don't dribble off your lap and over the arms of your easy chair and onto the floor.

So what was so frustrating about *Barking Dogs?* The galleys were bound. No problem there. The typos were to be expected. No problem there. The

lack of cover art I barely noticed. I'm that used to these "prebooks."

But the thing ended on page 213, in mid-sentence.

I *HATE* that! I hate it worse when it happens in an official, published book. Or when pages, paragraphs, or lines are switched, missing, duplicated, or . . . If you have read many books, you have seen all the many ways mechanical printing and collating and binding can get screwed up. And you hate them, too.

Fortunately, the truncation that so pissed me off with *Barking Dogs* is unlikely to be repeated in the real book. Even more fortunately, the book is good enough that I can say, even without having read the last few lines or pages, that you will enjoy it. The only requirement is that you remember fondly Mickey Spillane's style of vigilantism.

The setting is Toronto, 1999. The hero is a city cop, Mitch Helwig, whose partner was recently gunned down. He is angry, but he is also powerless. The city's underworld is armed with lasers, while he is stuck with an obsolete, if classic, .38. The police department is understaffed, underequipped, and ruled by politicians, many of them on the take.

The science-fictional element does not inhere only in the lasers. More crucial to the story is the "Barking Dog," a device that informs its user when someone is lying. It analyzes voice, odor, posture, and other cues. When it detects a falsehood, it delivers, via a wire to the abdomen, a jolt Green describes as an "icy stab" (which fits, considering that toward the end Green admits that one does not always want to know the truth). Helwig blows his and his wife's (without her knowledge or consent) life savings on one of these things, along with a laser shield, and begins to seek revenge. He wants his partner's killers, but he will settle for any scum. He will ask them, "Have you killed anyone?" And when they say "Yes," or when their "No" bring the cold stab of truth, he zaps them.

Helwig's chief soon twigs to what is going on. After all, the streets on which the bodies are piling up are all on Helwig's beat. But he says nothing, and in fact he helps actively toward the end, when Helwig takes on the city's criminal kingpin.

The violence and the one-man, above-the-law justice are strong elements. But Green does not display Spillane's constant belligerence. The focus is on Helwig's interior life: his pain, his attempts to master a fate he does not understand. A secondary focus is on the wife who must watch her husband grow distant, rifle their savings, and spend late nights away from her bed, and thus strain their marriage. The overall theme seems to be that we must embrace our lives, problems and all, and we should not regret that when we resolve one large problem, "we're just starting." We cannot flee to Greenland, or to other rural isolation, for though that may be safe it is also boring.

There is also the thought that the reason for a complex criminal justice system, and for civilization's disapproval of vigilantism and the death penalty, is the fear of convicting, and executing, the innocent. Green's *Barking Dogs* obviates this problem, and Helwig, unlike Spillane's heroes or real life, can dispense true justice without fear of error. We are left with the question of whether, given a Barking Dog, vigilantism can possibly be a moral solution to the crime problem.

Does that "we're just starting" line I quoted above mean the *Barking Dogs* is but the first in a long series of Ca-

nadian vigilante novels? I hope not. This one stands alone too well to dilute it with sequels and imitations. On the other hand, precisely those seem very likely to come if this one finds commercial success.

Robert Silverberg's **At Winter's End,** is an intriguing exercise in world-building. No one should be disappointed that the stage is Earth itself, for though that gives Silverberg a smaller physical scale than he had on Majipoor, he has seized a temporal scale to beggar most imaginations.

A current topic of scientific debate is whether the apparent rain of comets that extinguished the dinosaurs (via a "nuclear winter" dust-mediated chilling) is a periodic event. There is some, albeit arguable, evidence of periodicity, for extinctions seem to come in greater or lesser waves roughly every 25-30 million years (at least in the "recent" past). When the wave is a greater one, the world's biological diversity may be greatly reduced. And when the comets stop falling, the survivors must emerge from their burrows and begin to evolve again, eventually refilling all the vacant ecological niches.

Assuming periodicity, the next comet wave is due in about 13 million years. Silverberg assumes that it will be a bad one. It will bombard the Earth intermittently for 700 millennia and scrub the planet clean of humans—or what humans have become by then—and all its other sentient species. The vegetals, sentient plants, will wither in the frost. The sapphire-eyed ones, kin to dinosaurs, will resign and die. The mechanicals will say the heck with it. The humans will disappear. Two species will survive—the hjjk, evolved from insects, and that of the protagonists, who think they are human, though they are furred and equipped with tail-like telesensory organs.

Silverberg follows these creatures as, deep within their "cocoon," the caverns in which they have weathered the long winter, they realize that spring is coming. They emerge, migrate to the surprisingly intact ruins of an ancient city, and begin to explore it. The story's central character, Hresh, a youth with a sharp and driving mind, finds clues that begin to reveal the truth of the past, of who the humans were, of who—or what—Hresh and his people were, and of what his people's role must be in the new world.

Silverberg here seems to be suggesting that certain behaviors are not uniquely human. Hresh's species is not human (though it is clearly kin), but it remains vulnerable to power-trips, rivalries, politics, courtship misunderstandings, and other social monkey-wrenches. What is different is—perhaps Silverberg is not entirely clear on this point—a lesser tendency to violent solutions, more reliance on cleverness, more social cohesiveness, all as we might expect given the origin he posits for his characters.

It's intriguing, as I said. Sadly, it is not as absorbing as we expect from Silverberg. The story moves slowly as it follows Hresh from the childhood moment when he tries to escape the cocoon through his succession, at age nine, to the post of "old man" of the tribe, through his explorations of the city and his learning from another tribe, through his mating with the tribe's next leader, to his routing of the hjjk and his acceptance of destiny. The characters and events too often slip into cliché (I think, for one, of the wise old man of another tribe who, like the proverbial Zen master, clouts his student causelessly), which because it lets us know what is about to happen robs the tale of some of the

suspense it might have had.

I thus expect that though you may well enjoy this one, you will not be entirely satisfied. On the other hand, Silverberg may be preparing the ground for a multi-volume pseudohistorical epic in the vein of Harrison's *Eden* or Aldiss' *Helliconia* stories. In that case, final judgment must be reserved for a later date.

Do you remember David J. Skal's *Scavengers* (reviewed here in September 1980)? It involved, among other things, taking people's minds apart in order to let others share their memories. When I reviewed his next novel, *When We Were Good,* in October 1981 I used phrases such as "trenchantly morbid vision" and "may well spoil your sleep for a night or two."

Have I got news for you: he's still at it. His latest is **Antibodies,** and it is so disgusting, perverse, weird, disquieting, and revolting that it will surely scorch your eyelids off (again, no sleep) and put your stomach on ball bearings (just try to hold your lunch down). It will also send you racing to the bookstore screaming for your money back—if you can put the book down long enough. Skal has transcended his previous efforts.

The story is set in California in the not-too-distant future. A cult has appeared, its members, variant cyberpunks, owing their allegiance to the Cybernetic Temple and dedicated to denying the flesh. They minimize all fleshly functions, and they dream of having their bodies replaced, bit by bit, by machinery (not necessarily prosthetics). In due time, Skal introduces us to Venus Tramhell, an artist who lost her arms and seems intimately involved with recruiting cult members with subliminally loaded videotapes. Her attitude is that of a goddess trammeling her worshippers as she aims them toward a South American clinic where they will be freed, once and for all, of their bodies. And it's true. Oh, yes, it is.

If you have a cult, you must also have a deprogrammer. Skal's is Julian Nagy, a Connecticut psychiatrist gone totally west coast. He attacks the body-denying cultists by being equally body-insistent: he rapes them, beats them, keeps them in cages, dumps excrement over them. And during a televised interview he masturbates to orgasm, out of camera view but right in front of the female interviewer. Nice guy.

Julian's wife is Gillian. She wrote, under a pseudonym, the SF novel that became the cult's bible. Julian doesn't know that, though he does know about her paraplegic lover and, when things begin to fall apart, suggests to his "outpatients" that they do certain nasty things.

Diandra designs department store window displays whose technophilic glamor enchants the cultists. Venus recruits her. She flips out. Julian gets her. Eventually, she triggers the collapse of everything, and we learn just what that Boca Verde clinic is really doing, and why.

Skal's is the ultimate denunciation of materialism. His cultists are something of a *reductio ad absurdum* of our fascination with machines. But more than that, he damns technology itself as the work of the devil. He never utters an explicit curse, but near the end a businessman reaches into the shattered cadaver of a pivotal character (I won't identify her) to extract a tiny homunculus wrapped in membrane. This follows a scene of abortuses, in costume, wired as puppets, reeking of formaldehyde, dancing in a small, disco-lit room. I read that homuculus as the char-

acter's soul, being claimed at last by the devil with whom s/he made the deal that may soon destroy the world.

Go ahead. Read it. But don't send *me* your psychiatric bills.

John Barnes does another sort of *reductio ad absurdum* with his novel, **Sin of Origin.** The time is centuries hence. Earth has been destroyed. The stars are divided among three confederations, the Christians, the Moslems, and the Communists. And the frontier is constantly expanding.

In this context, we have the world of Randall. It is being studied by a coalition of monastics who have managed to offend the local sentients. Their camp is besieged until Brother Hauskyld takes off on an anthropological excursion. His sole companion is the lovely Clio, a Communist anthropologist who has come to Randall surreptitiously—she stowed away—to check out certain offbeat ideas under the wing of a famed scholar such as Hauskyld. They quickly learn that the natives are actually three species—the six-limbed sort the humans had taken for the only sentients, their griffin-like steeds, and the venomous handsnakes in the griffins' pouches. They negotiate peace, and then they set out to bring Christianity and civilization to Randall, much in the mode of a thousand other novels.

Yet there is novelty. Clio's bonnet-bee is that intelligence arises when bits of genetic material from other worlds drift down from space and are incorporated into local genomes. The greatest and most varied intelligence, as on Randall, arises where lots of the stuff arrives. It doesn't wash (DNA is too complex a molecule to long survive the radiation storms of space), but it's a nice idea. It gets especially nice when Barnes produces his explanation of how the DNA gets into space—thanks to what we fear may be the ultimate fate of technological civilization—and moves from that to a Christian-Communist, and maybe later Moslem, peace treaty and a nifty new funeral custom.

What gets reduced to absurdity here are the dominance of the Catholic Church and the polarizations of Earthy ideologies, which we can be sure are historically temporary. Surely, the Church will continue to exist, though I expect it to continue its long decline. Conflict too will always be with us, even though we can be confident that future human civilization will not be triply polarized, at least not along Christian, Moslem, Communist lines. And it is in the resolution of such conflict, and in the promise of a new kind of afterlife, that Barnes makes his contribution.

Rob Swigart seems to be involved in the computer game business, although I cannot say to what extent. The cover blurb for **Portal: A Dataspace Retrieval** says, "In software form, *Portal* has already gained critical acclaim for its fresh voice and imaginative scope. Added material makes the novel a must for admirers of the software. . . . The 'hard copy' of Activision's computer software hit . . . " It doesn't say whether Swigart wrote the software or merely novelized someone else's game.

Does it matter? Not really, but it's nice to know. Then we can have some idea of whose nifty ideas are all these—from the human narrator, who had been riding a ramscoop to the stars until his ship inexplicably reversed course and returned him to Earth, to neurophage weapons and Mind Wars, to the reasons for Earth's emptiness.

The narrator finds, soon after he thaws from his cryogenic sleep, that he is truly the only human in the solar sys-

tem. All the rest have vanished. All that remains is crumbling buildings, inactive machinery, and unresponsive computer terminals. But then he finds an active terminal in a Chicago hospital. His presence stimulates Homer, a dormant artificial intelligence, to arouse, to begin arousing other nodes in the system-wide computer network, and to begin tracking down and assembling, for itself and for its lonely audience, the story of where the rest of the human species has gone, and how and why.

The why is perhaps the simplest of the three questions: Utopia had arrived, the people were bored out of their skulls, and the departure became possible. The Realm is the where, the other dimensions of the multiverse, wrapped so tightly that one must have vast supplies of energy to break through the portal. The how is the story: it begins when teenager Peter Devore strays into a database for ESP and sundry nonsense, starts to play with the "psion equations," and develops a sense of what it all means. Powerful forces, marshalled by the man who may be his father, try to stop him. Others, centered in the independent nation of Antarctica, come to his aid. And he moves inexorably—designedly? he wonders —toward . . .

Portal has no action or plot in the usual sense. The narrator almost entirely disappears as Homer awakens, gets into his role, and develops a truer consciousness. But even then, Homer's discourses bear the stamp of the computer, of files—marked "CENTRAL PROCESSING MESSAGE," "HOMER COMMENTARY," "HOMER SCENE," "PSILINK DATABASE," and so on—called onto a screen. The book—presumably like the software—is a carefully orchestrated uncovering of linked data. In the end, the data add up to the answers we seek, and the book seems much more a worked-out puzzle than a novel.

To the extent that the book captures the spirit of the computer game—which I haven't seen—it makes that game look like a lot of fun. As a novel, it has the appeal of a puzzle. Unfortunately, that means it is too slow and passive to be a "good read."

With *Orion,* Ben Bova created a fascinating vision: a creator, human but from the far future, identified with Ahura-Mazda; a created hero, Orion, who cannot die; and a mission, to defeat Ahriman, god of darkness, and make eternity safe for humanity. But Orion's efforts caused the continuum to split, leaving Ahriman and his fellow Neanderthals with a cosmos of their own.

Now Ben gives us **Vengeance of Orion.** Orion's love among the superhumans is dead at the hand of his master, and his only hope of reviving her is to aid that man in his dreams of reshaping Earth's human continuum. This means taking on life in the time of Troy, where his master wears the guise of Apollo, and striving for a Trojan victory. But Orion is less than obedient. He finds instead a way to use Hittite engineers to ensure a Trojan failure, and then he leaves with his Hittites, a newly blinded Homer (whom Ben calls Poletes), and Helen for Egypt, where he hopes to confront and defeat his master. Along the way, he must help Joshua bring down the walls of Jericho and —sheer coincidence with the next book in this column—pass near Megiddo, local synonym of Armageddon.

It may bother some readers that Ben's main characters echo more of myth than of humanity—only his spear carriers fail to rant and posture—but perhaps that should not be surprising. Ben has a tend-

ency to draw his characters boldly, not subtly, and here he has more excuse than usual. He is rewriting myth, in part in the style of myth, and drawing on all the wealth of myth for the incidents of his plot (there is indeed a tale that Helen went to Egypt). And he clearly had fun in doing so. He also enjoyed finding rational alternatives for the Trojan horse, the falling walls of Jericho, and more, and we have fun in following along with him. If the charm fails at all, it is because Trojan times may be getting a mite over-exploited, what with Gene Wolfe's and S. P. Somtow's recent efforts.

Note: in an afterword, Ben promises us that there will be more.

When I once asked my grandfather why his hair was white and his belly bulged, he said, "Armageddon old, and armageddon fat." He had dem armageddon blues, he did. But seriously, let's be geddon on with . . . Ouch! No! Don't hit me again! I can't help it! Please!

Ahem. I'm supposed to be talking about Daniel Keys Moran's novel, **The Armageddon Blues.** And no, it's not funny. Its story begins some centuries after it ends, long after nuclear war has destroyed civilization and all its creators except for the irradiated, impoverished, mutated remnants of humanity. Among the remnants is a tribe that gives birth to a child with white skin and silvery eyes, and she becomes the founder of the Silver-Eyes clan, ken Selvren, dominated by women who blame men for the Big Crunch (academics, take note: Pamela Sargent uses a similar device in her most recent novels). Generations later is born Jalian, a girl of defiant spirit who, at age six, runs away to seek the marvels at the end of the ancient freeway that enchants her. She does not get far, however, for she finds an alien starship astride the road and returns to report. The aliens prove friendly, and she eventually learns telepathy and much of the science behind the aliens' technology of travel through the alternate realities of the Great Wheel of Existence. When the aliens announce their impending departure, she gets mad and leaves for the past. There, she hopes, she will prevent Armageddon and destroy her world. If she succeeds, she may be able to create a force that will in time be able to resist the conquering aliens *her* aliens say are on the way.

She has superlative advantages in her telepathy, intelligence, and warrior skills, but Moran stacks the deck even more in her favor. He promptly introduces her to Georges Mordreaux, a curious fellow, over two centuries in age, around whom entropy reverses its flow. Then Moran moves Jalian through the years from 1962 to doomsday, creating differences minor and major between the past of her personal history and the present in which she lives. Many are intriguing, and not least among them are the artificially intelligent computers that come on line, with a little boost from her and Georges, and give the book more than a little resemblance to Swigart's *Portal*.

Does she succeed? I won't say, except to note that Moran does offer us a form of disarmament that may indeed be the only one with any hope of success, and that he does so very readably and satisfyingly. His greatest success may be Georges, for he has beautifully realized the pain of an immortal who literally cannot die, even by accident, and then he has used that pain to drive his plot to excellent effect. Jalian herself is somewhat less successful, for Moran fails to present her as consistently as he might. ■

brass tacks

Dear Stan:

Re: "Laughing All The Way To Orbit"; with *many* apologies to the shade of the poet . . .

There are many, many ways
Of constructing Tribal Lays
And although not all of them are right
It doesn't add much promise
To hear a doubting Thomas
Shout NOT INVENTED HERE with all his might.

There are going to be many, many ways of getting useful stuff into useful orbit, in a relatively few years. There *ought* to be many, not just a few.

It would be satisfying if the doers of some of them speak English, along with all those who will speak Russian and Japanese and Cantonese. G. Harry Stine is high on several of the possibilities. Another is the Spaceplane concept.

I couldn't agree with Stine more when he speaks of the need for venture capital. I still think—as I said once before—that the most likely developers of the spaceplane will be those who want to use it to service another installation in space; a manufacturing facility of one kind or another.

We made a jocular reference to one D.D. Harriman, just to introduce the theme of venture capital. I believe Mr. Stine misunderstood why we mentioned Harriman.

Dan DeLong covered most of the points we might make about Stine's article, in his recent letter to you, far better than I could. In particular, we were *trying* to make the costs high, to show that the preliminary costs per pound in orbit *still* looked good. It wasn't that we were trying to look responsible (or "conservative"; damn, why didn't we ask Jack Kemp to co-author?).

TOM PACE

Dear Dr. Schmidt:

I just finished reading "Laughing All The Way To Orbit," and I was impressed. (My wife wasn't when, in my enthusiasm, I read practically the whole article to her.)

Last year I attended a SF convention and listened to Dick Edwards of NASA and Jerry Pournelle (definitely not of NASA!) argue (debate?) the same points. I also am convinced that it is the private sector that is better suited to get us into space the right way. Permanently, not in a one shot deal like the Apollo program.

This does put me in a dilemma. Do I support the president's plan for a permanent space station? After some thought I've concluded: yes. The station will create more off-the-shelf technology that the private sector will be able to exploit. As will the technology for the SDI (eventually).

When people finally realize that there is money to be made out there, then it will happen fast. I might yet be able to buy a ticket to the moon in my lifetime. I just hope I don't have to make my connections for the flight in Tokyo.

One final point: the Commercial Space Incentive Act would guarantee an entrepreneur five hundred dollars per pound of payload placed into low earth orbit (10,000 pounds minimum per launch). Five million dollars would go a long way towards defraying the expense of building launch vehicles. I think it's a good idea. RICHARD BUSH
Overton, NV

Dear Dr. Schmidt:

The article "Laughing All the Way to Orbit" (February, 1988), was an interesting effort. I think you would have been better served by calling it a guest editorial, but "science fact" is a pretty general term and easily defensible. Harry Stine's Alternate View column in the same issue made much the same point, better and more succinctly.

Whoever "Wilfred C. Smith" is, gigabucks billionaire or two-bit broker, his use of a pseudonym renders him valueless as an authority figure/expert. If he is to be credible, he needs to come out of the closet. It seems possible that, rather than some Wall Street rules and regulations, his real fear is the laughter of his business colleagues were he to be unmasked. That, at least, would confirm his claim of being Streetwise.

The main point that the article seemed to have was to add to the unfortunate polarization that continues to invade and distort the whole disorganized pro-space movement. It further advances the notion that we have fallen on hard times because big, bad government has prevented the noble entrepreneurs from having their way. There's certainly an element of truth in that.

But . . .

We should at least *consider* the possibility that America in general, and the space program in particular, are in poor shape because this country remains a battleground between conservatives who feel that big government is necessarily bad government, and liberals who seem convinced that big business is the *real* "Evil Empire." Since neither side has been able to win a decisive victory in this ill-considered dispute, both big business and big government are crippled.

To my way of thinking, the real irony is that both sides could not be more wrong. If we have bad government in this country, it is not because it is big, but rather because we, in our collective wisdom, have chosen incompetent men to lead us; men who then go on to provide incompetent government. Harry is right in pointing out the virtues of

NACA and pre-Shuttle NASA: one proper function of big government is to support the development of enabling technologies and to capitalize great ventures beyond the means of any private group.

As for big business—its abuses, recognizably similar to those of big government, are a matter of record. Many of the rules and regulations which protect individual (and corporate) rights are necessary in the domestic arena. If I fail to pay my bills, I'm damned glad there has to be "due process" before the Repo Man can come take my furniture.

If our businesses cannot successfully compete with the likes of the Japanese, it is not because American workers are overpaid and lazy or that American managers are overpaid and stupid. Japanese businesses operate in a domestic environment that is even more constrained than our own. In the international arena, Japanese foreign policy and business work hand-in-glove. The idea is for Japan to come out on top, and the policymakers regard the best way of achieving that aim is for Mitsubishi (etc.) to come out on top. It seems to work.

What do you suppose would happen if our political leaders, who are neither big businessmen nor big government bureaucrats, suddenly "wised up" and dropped their petty ideological differences? What would happen if the big car-makers, aerospace firms, and major banks were encouraged to form a carefully monitored industrial conglomerate for the express purpose of wiping out the foreign competition? World War III? Overwhelming success? Your guess is as good as mine.

As long as we continue to fight over who should do the job, and how, the job is never going to get done. There will be no space development and the American economy will continue its downward slide so long as big business and big government are prevented from doing the things that they do best.

Finally, regarding the mysterious assertion that Harry and "Wilfred" may be working on Something Big . . . We've heard that song and dance before, from many quarters. When they are laughing at us from orbit, we will all gladly make obeisance.

WILLIAM BARTON

Chapel Hill, NC

Dear Stan,

I read every editorial (usually first), and tend to agree with most. Those with which I do *not* agree, I use as a mind-exercise, to try to see them from another perspective. However, as a sometime juror I felt I should comment on " . . . And Justice For All," in the February issue.

I agree that justice is not always "fair" (to whom?), and is usually not speedy. I also agree that computers can help to speed the process. However, I urge caution for several reasons.

One is related to the assumption that a computer *can* replace a jury of one's peers. Having served on juries before, I can attest that we fallible humans somehow do a remarkable job. It is our function to consider the evidence as presented, then act as representatives of society to consider if the evidence is convincing. No "artificial intelligence" can be expected to fill that role.

Another is the assumption that a computer can replace a judge. Judgment is a human function requiring more than a search of a database for applicable law and precedent, no matter how extensive the database or how sophisticated the search algorithm. There is no question that a judge may be *aided* by a database search, but the decision must be that of

a human being. A judge must (hopefully) have *wisdom*, which is not to be confused with having intelligence or knowledge.

It may be true that we cling to the old ways because we fear the new. Still, our antique system of justice has not yet dissolved into anarchy. It may be true that great progress has been made toward artificial intelligence. Still, when it is finally achieved it will remain *artificial*, especially because it is merely *intelligence*. It may be true that human judges are slow and fallible. Still, they are *human*, and they are capable of making judgments.

An old saying counsels against throwing out the baby with the bathwater. However desirable you may personally believe those changes to be, let us take this one step at a time. Much time may be saved by completely computerizing our law libraries, allowing electronic searching and retrieval. Once that becomes a reality (which may take longer than you think), let us see if additional time saving may be worth the potential loss of the human touch.

In closing, I would like to point out the irony (and the apparent contradiction) of the quote from Bertrand Russell that appears at the end of your editorial. Science (or technology) by itself cannot solve the problems of our present system of justice, but it may be able to help.

PHILIP E. BOND

Spring Valley, NY

I haven't assumed that a computer can *replace a judge (anyway a good one), but you have assumed without proof that it can't. You assert that humans have things called "judgment" and "wisdom" that computers can't have, but you don't attempt to say what judgment and wisdom* are *or* why *computers can't have them. I merely suggest that it might be worthwhile to take a much closer look at what those words mean—and if we can understand that, maybe we* will *be able to put them into other than human containers.*

Dear Dr. Schmidt:

In the recent review of my novel, *The Architects of Hyperspace*, the esteemed reference library accused me of not knowing the difference between a virus and a bacterium. If this were true I—though a mere astrophysicist—would not be able to hold my head up high in the hallowed halls of Caltech, where I teach.

However, since I was writing fiction, I was entitled to speculate that life might arise based on viruses the way ours is on bacteria. Indeed, it has been theorized that life on Earth might have arisen through viruses. There seems no inherent limit to the complexity of viruses, and furthermore, on the cryogenic world I put them in, bacteria, with their considerable moisture content, might be at a great disadvantage compared with viruses. Furthermore, because of their small size, viruses are much more able to experience the cryogenic quantum-tunneling chemistry recently discovered in the real world, a cornerstone of my speculation.

Evidently not everyone agrees with the review, because the first printing sold out in two months—near-record time for a first novel, the publisher tells me.

DR. THOMAS R. McDONOUGH

Pasadena, CA ■

a calendar of analog upcoming events

30 September-2 October
CONTRADICTION 8 (Niagara Frontier area SF conference) at the Ramada Inn, Niagara Falls, N.Y. Guest of Honor—Frederik Pohl. Registration—$16 until 12 September, $20 thereafter and at the door. Info: Contradiction, Box 2043, Newmarket Station, Niagara Falls NY 14301.

1-2 October
JUST-A-CON (gaming convention) at charlotte, N.C. Info: Just-a-Con I, 9232-35 University City Blvd., Charlotte NC 28213. Include S.A.S.E.

7-9 October
ROVACON 13 (Roanoke Valley area SF conference) at Salem Civic Center, Salem, Va. Guest of Honor—Julian May, Art Guests of Honor—Frank Kelly Freas and Bob Eggleton, Media Guest—Mark Lenard, Special Guests—Ben Bova, Hal Clement, Christopher Stasheff, Richard Pini, Allen Wold, Lisa Cantrell, Rebecca Ore, David Poyer. Info: Box 117, Salem VA 24135. (703) 389-9400.

7-9 October
ARMADILLOCON 10 (Austin area SF conference) at Wyndham South Hotel, Austin, Texas. Guest of Honor—K. W. Jeter, Fan Guests of Honor—Scott & Jane Dennis, TM—Lewis Shiner, Special Guest—Ginjer Buchanan, Official Artist—Brad Foster. Registration—$15 until 31 March, more thereafter. Info: Armadillocon 10, Box 9612, Austin TX 78766. (512) 443-3491.

7-9 October
SILICON 3.5: Tales of the Arabian Nights (Role-playing convention) at Boston, Mass. Real-time, real-space roleplaying convention. Info: Society for Interactive Literature, 130 Morrison Avenue, Somerville MA 02144. (617) 623-0133.

14-16 October
PINEKONE 1 (Ottawa area SF conference) at Holiday Inn, Market Square, Ottawa, Ont. SF Guest of Honour—Barry Longyear, Fantasy Guests of Honour—Will Shetterly & Emma Bull, Art Guest of Honour—Bob Eggleton, Fan Guests of Honour—Lloyd & Yvone Penney. Registration—C$20/US$16 until 15 September, C$25/US$20 thereafter. Attendance limited to 500. Info: Pinekone 1, Box 5368, Station F, Ottawa ON K2C 3J1 CANADA.

21-23 October
NOTJUSTANOTHER CON 4 (Central Massachusetts SF conference) at University of Massachuesetts, Amherst, Mass. Guest of Honor—Samuel R. Delany, Artist Guest of Honor—Tom Kidd. Registration—$13 until 1 October, $15 until 20 October, $17 at the door. Info: RSO 104, University of Massachusetts, Amherst MA 01003. Include S.A.S.E.

21-23 October
NECRONOMICON '88 (Tampa area SF conference) at the Holiday Inn-Ashley Plaza, Tampa, Fla. Guests of Honor—Alan Dean Foster and Timothy Zahn. Registration—$10 until 15 September, $15 at the door. One-day memberships $6. Info: Necronomicon, Box 2076, Riverview FL 33569.

31 August-4 September 1989
NOREASCON III (47th World Science Fiction Convention) at Sheraton-Boston Hotel & Hynes Convention Center, Boston, Mass. Guests of Honor—Andre Norton, Ian & Betty Ballantine; Fan Guest of Honor—The Stranger Club (Boston's first Sf club). Registration—$60 to 15 July 1988, child $40 (probably more thereafter); Supporting—$20 at all times. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate and vote for the Hugo awards and the John W. Campbell Award for Best New Writer. Info: Noreascon III, Box 46, MIT Branch, Cambridge MA 02139.

—Anthony Lewis

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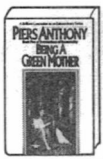

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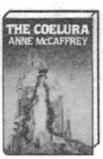

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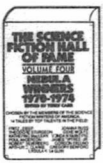

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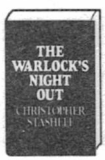

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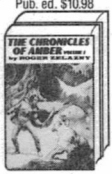

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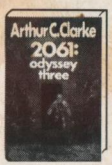

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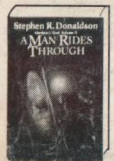

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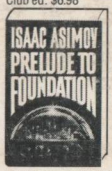

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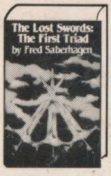

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