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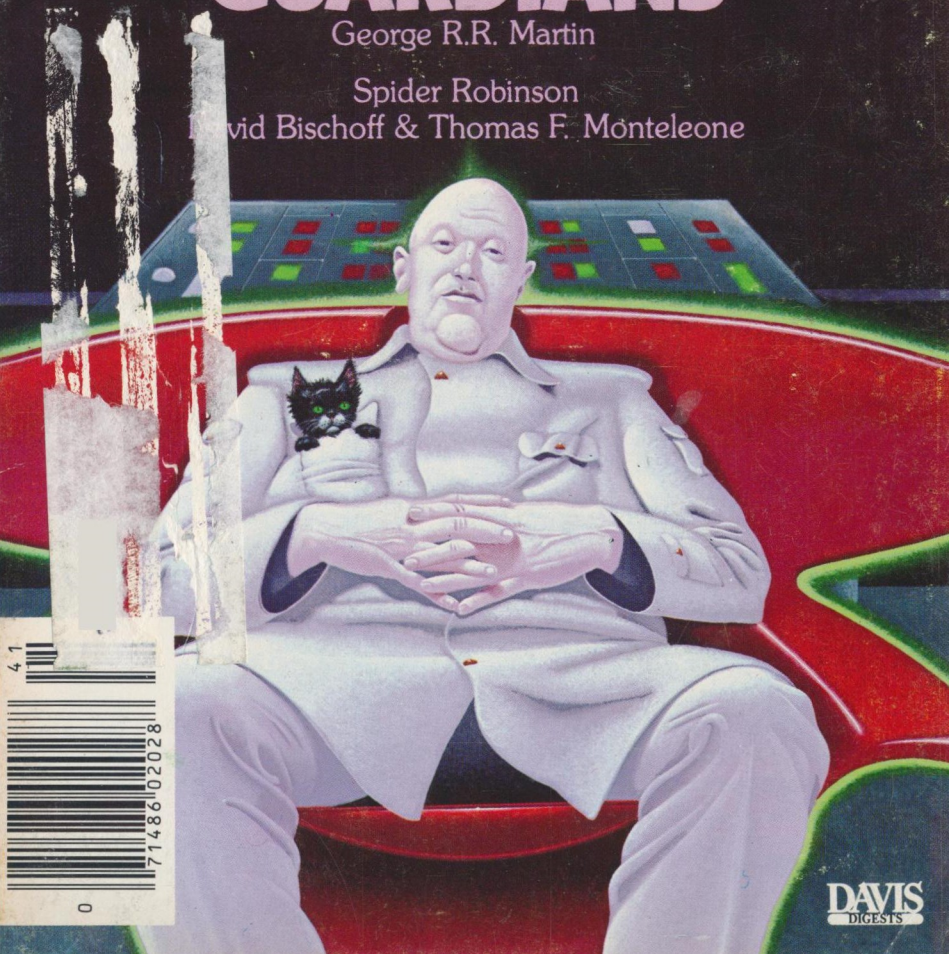

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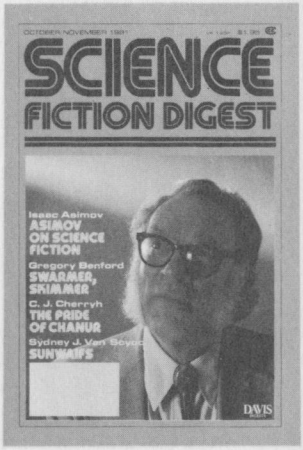

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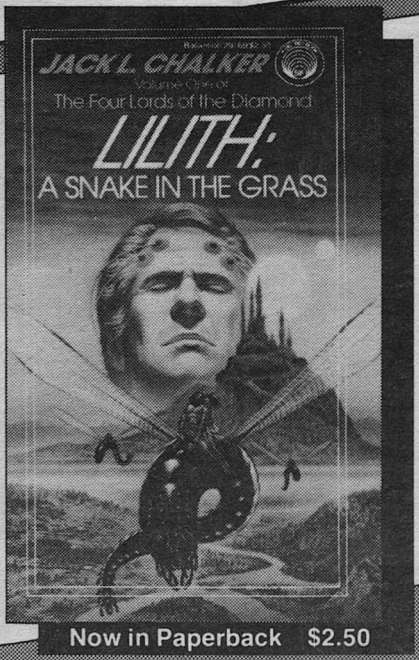

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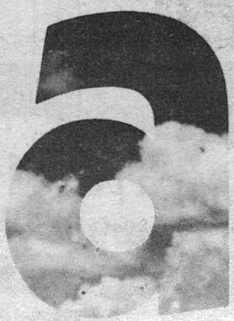

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Editorial
Stanley Schmidt

CRITICAL EVENT

As I write this, we are still basking in the afterglow of space shuttle *Columbia*'s eminently successful maiden voyage. After many months of delays and controversies, the first reusable spaceship not only got off the ground, but repeatedly orbited the Earth, as planned, and finally returned in a spectacularly smooth, "uneventful" landing.

And, quite possibly, saved the American space program (at least for now).

For the first time in years, a space activity provoked a show of intense, active interest throughout the land and in all strata of society. Newspapers and magazines carried extensive specials about the shuttle and what it was doing. When it touched down in the California desert, it did so to the cheers of a waiting multitude. School classes and factory and office work halted so students and workers could watch the landing on television. Newspapers sprouted headlines about "the return to space" and "a rebirth of national pride." *Time* magazine wrote, "So long delayed, so widely criticized, *Columbia*'s flight should finally put to rest any doubts that there will one day be regular commuter runs into the cosmos."

Those of us who most care about those commuter runs would probably find it hard to be quite that smug about them, but we could hardly deny that this flight was more than a much-needed shot in the arm for manned spaceflight. It was a crucial battle won—one which the man-in-space advocates could ill afford to lose.

The widespread exhilaration surrounding *Columbia*'s return is perhaps the most encouraging sign we've seen in a long time—but it won't last forever at its present level. It will certainly help fuel further advances. I can't be sure now what the situation will be when you read this, but if all goes well, the next flight should be drawing near, and it may even already be in progress. If that one goes well, it should lead onward to regular shuttle use and all the possibilities that that implies. But as the initial excitement wears off and the roar dies down, we will again hear the murmur of the kinds of critics who have scornfully dismissed the shuttle as, "Just a truck." (Parenthetical research suggestion: If anyone really believes a truck

is an unimportant thing, let's try a month or so of cutting off all truck deliveries of goods destined for that person, and see if his views show any change.) However, with the beginnings of an impressive track record behind it, the shuttle should be better able to withstand the attacks, and will very likely attract more supporters and—most importantly—users.

But what if this first full-fledged flight had *not* gone so well?

A spectacular success in this highly publicized event gave the shuttle's supporters a badly needed boost. A spectacular or tragic failure could just as well have given its opponents the ammunition they needed to finish it off, by blocking continued development. It's a little frightening to think that so much was riding on a single test flight—an engineer or scientist would probably recognize that a failure just meant more work was needed—but when you're depending on public support, that's a kind of reality that you have to face. Given that fact, the extensive coverage of the April orbital flight was a calculated gamble for high stakes.

Fortunately, *Columbia* won.

A good example of the kind of thinking you're up against when you depend on public support for R&D is summed up in a headline I noticed on one of the many shuttle articles in one of New York's daily papers the day *Columbia* came home. "$9.5 BILLION!" it proclaimed; "WAS IT WORTH IT?"

You know how some people would answer. The *real* answer is: Of course not—*if* that's *all* you got for it. Spending that much to develop a sophisticated spacecraft, flying it once to show it can be done, and then abandoning the program would make just about as much sense as buying a new Mercedes, driving it once around the block to impress the neighbors, and then locking it in the garage for the rest of your life.

Dropping the program because the test flight *failed* would be only trivially better. It would be like buying the Mercedes, trying to drive it around the block, and then junking it because one of the tires was defective and blew out on the way.

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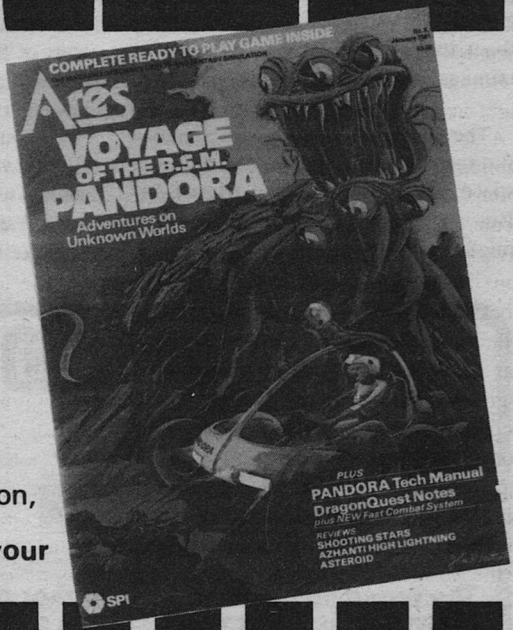

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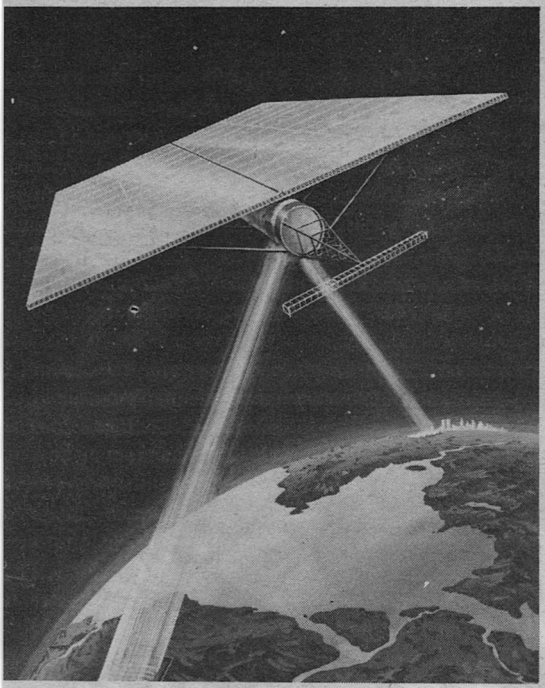
Most of us would agree, when the case is put that way, that the sensible course is to buy a good new tire and get the Mercedes running again. A Mercedes—or a space shuttle—which is *used* can repay its initial cost many times over. But you can't expect the population at large to be quite that analytical about something that most of them have only seen for a couple of minutes, and that via television.

The *Columbia*'s exhilarating maiden voyage did not guarantee our future in space; there will be other trials later. But an *unsuccessful* maiden voyage might have jeopardized it irreparably. Had the *Columbia* suffered the equivalent of a flat tire, public opinion might well have been swayed to junk the whole thing.

Okay, so it's not *reasonable* to place that much emphasis on a single test. But it's *done* quite regularly, and saying it shouldn't be isn't going to change it. So those of us who think this should be the start of Something Big should be very relieved and very thankful that the shuttle did so well the first time out.

And since the stakes on the next few flights will be only slightly lower, we should wish it many equally happy returns—and do everything in our power to make sure they happen. ■



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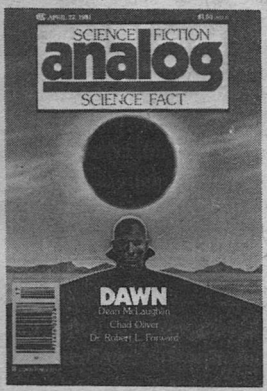

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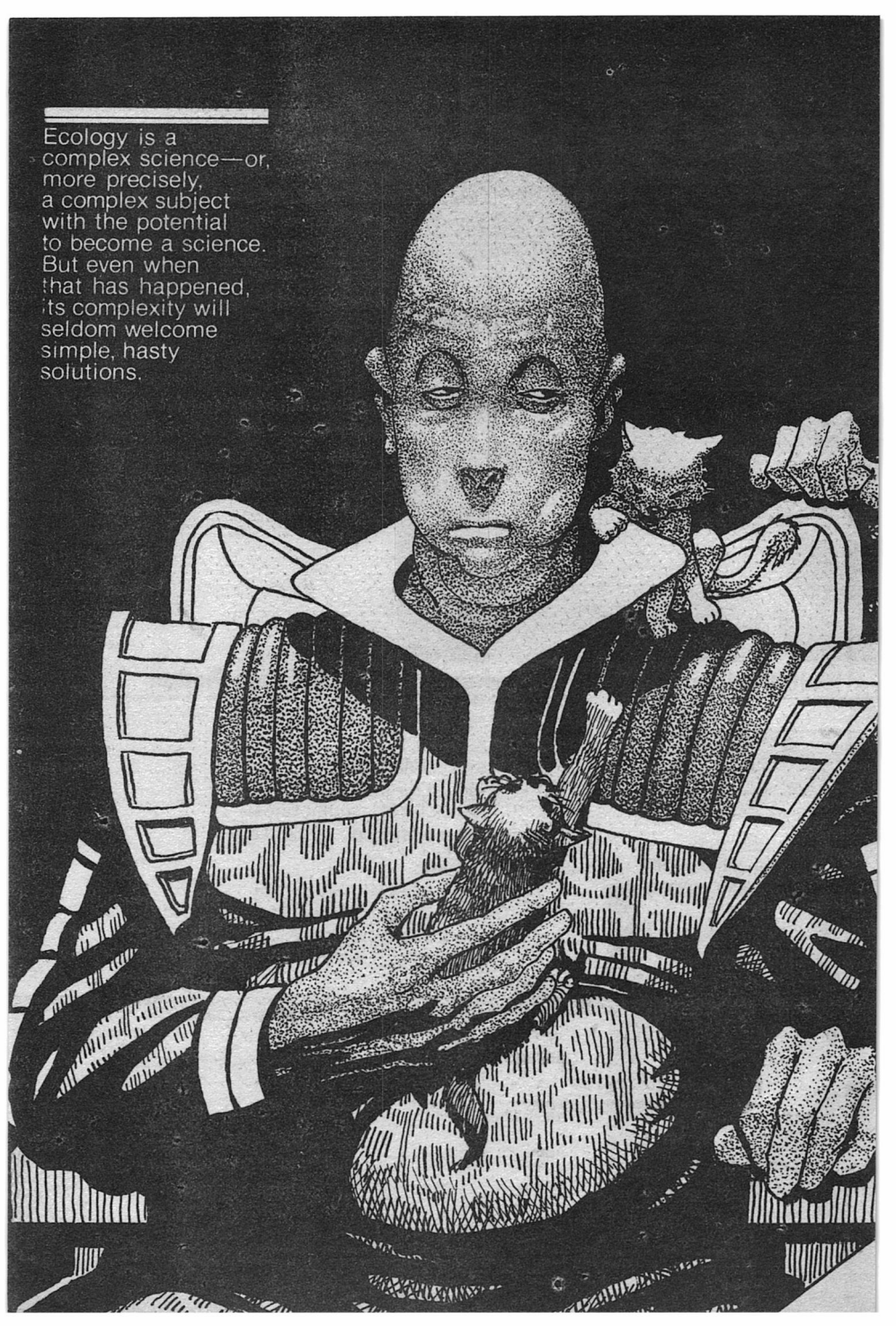
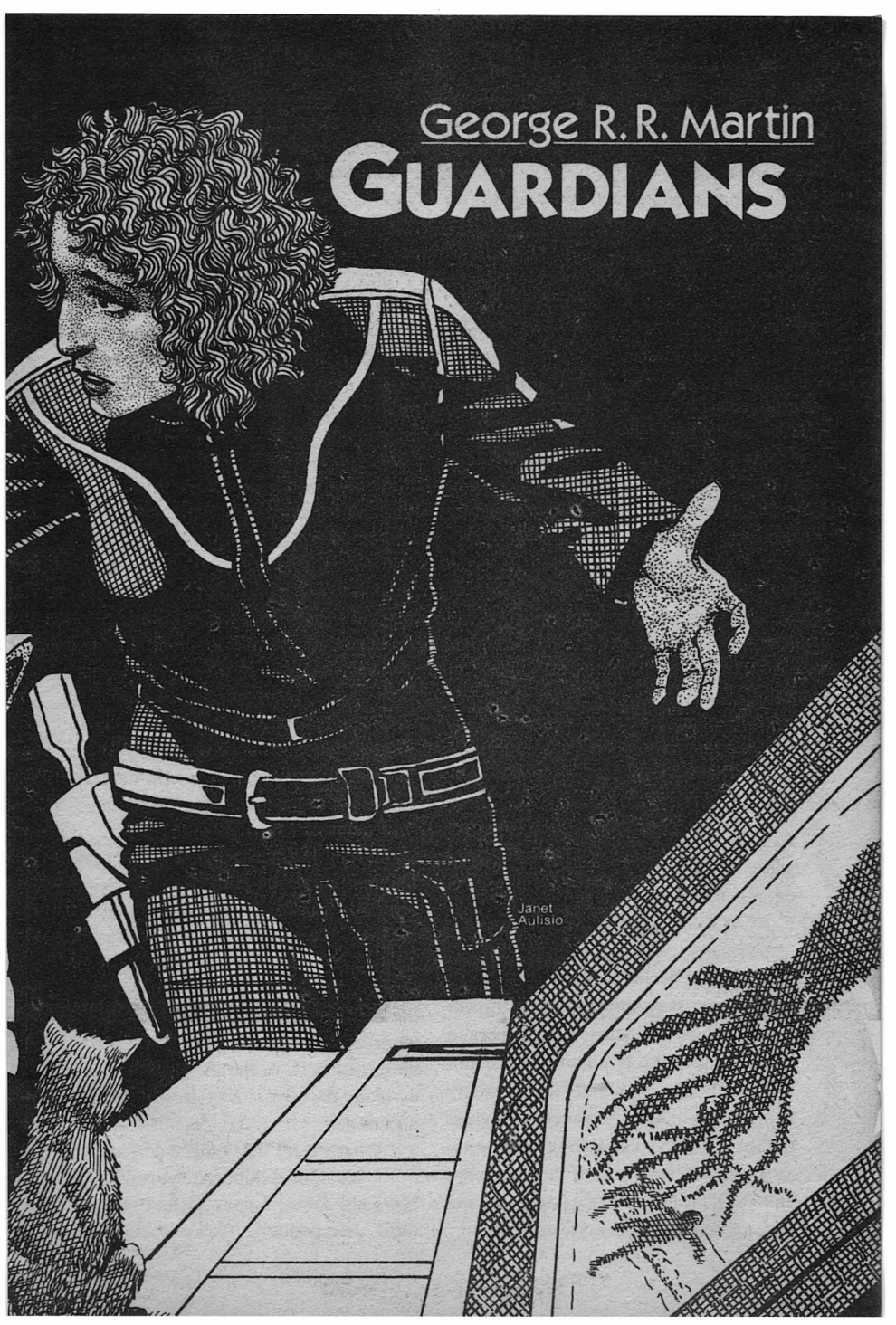

Ecology is a complex science—or, more precisely, a complex subject with the potential to become a science. But even when that has happened, its complexity will seldom welcome simple, hasty solutions.


George R. R. Martin
GUARDIANS
Janet Aulisio

Haviland Tuf thought the Six Worlds Bio-Agricultural Exhibition a great disappointment.

He had spent a long wearying day on Brazelourn, trooping through the cavernous exhibition halls, pausing now and then to give a cursory inspection to a new grain hybrid or a genetically improved insect. His interest was professional in nature. Although his *Ark*'s cell library held cloning material for literally millions of plant and animal species from an uncounted number of worlds, Haviland Tuf was nonetheless always alert for any opportunity to expand his stock-in-trade.

But few of the displays on Brazelourn seemed especially promising, and as the hours passed Tuf grew bored and uncomfortable in the jostling, indifferent crowds. People swarmed everywhere: Vagabonder tunnel-farmers in deep maroon furs, plumed and perfumed Areeni landlords, somber nightsiders and brightly-garbed evernoons from New Janus, and a plethora of the native Brazeleen. All of them made excessive noise and favored Tuf with curious stares as he passed among him. Some even brushed up against him, bringing a frown to his long face.

Ultimately, seeking escape from the throngs, Tuf decided he was hungry. He pressed his way through the fairgoers with dignified distaste and emerged from the vaulting five-story Ptolan Exhibit Hall. Outside hundreds of vendors had set up booths between the great buildings. The man selling pop-onion pies seemed least busy of those nearby, and Tuf determined that a pop-onion pie was the very thing he craved.

"Sir," he said to the vendor, "I would have a pie."

The pieman was round and pink and wore a greasy apron. He opened his hotbox, reached in with a gloved hand, and extracted a hot pie. When he pushed it across the counter at Tuf, he stared. "Oh," he said, "you're a big one."

"Indeed, sir," said Haviland Tuf. Two-and-a-half meters tall, he stood nearly a full head higher than any of those around him. With the great paunch he carried, he was probably twice as heavy as well. He picked up the pie and bit into it impassively.

"You're an offworlder," the pieman observed. "Not from no place nearby, neither."

Tuf finished his pie in three neat bites, and cleaned his greasy fingers on a napkin. "You belabor the obvious, sir," he said. Not only was Tuf notably larger than any of the locals, he looked and dressed conspicuously different as well. Haviland Tuf was pure milk white, without a hair on his body. He held up a long, calloused finger. "Another," he said.

Rebuffed, the vendor fetched out another pie without further observations, letting Tuf eat in relative peace. As he savored the flaky crust and tartness within, Tuf studied the milling fairgoers, the rows of vendors' booths, and the five great halls that loomed over the landscape. When he had done eating, he turned back to the pieman, his face as blank as ever. "Sir. If you will, a question."

"What's that?" the other said gruffly.

"I see five exhibition halls," said Haviland Tuf. "I have visited each in turn." He pointed. "Brazelourn, Vale

Areen, New Janus, Vagabond, and here Ptola." Tuf folded his hands together neatly atop his bulging stomach. "Five, sir. Five halls, five worlds. No doubt, being a stranger as I am, I am unfamiliar with some subtle point of local usage, yet I am perplexed. In those regions where I have heretofore travelled, a gathering calling itself the Six Worlds Bio-Agricultural Exhibition might be expected to include exhibits from six worlds. Plainly that is not the case here. Perhaps you might enlighten me as to why?"

"No one came from Namor."

"Indeed," said Haviland Tuf.

"On account of the troubles," the vendor added.

"All is made clear," said Tuf. "Or, if not all, at least a portion. Perhaps you would care to serve me another pie, and explain to me the nature of these troubles. I am nothing if not curious, sir. It is my great vice, I fear."

The pieman slipped on his glove again and opened the hotbox. "You know what they say. Curiosity makes you hungry."

"Indeed," said Tuf. "I must admit I have never heard them say that before."

The man frowned. "No, I got it wrong. Hunger makes you curious, that's what it is. Don't matter. My pies will fill you up."

"Ah," said Tuf. He took up the pie. "Please proceed."

So the pie-seller told him, at great rambling length, about the troubles on the world Namor. "So you can see," he finally concluded, "why they didn't come, with all this going on. Not much to exhibit."

"Of course," said Haviland Tuf, dabbing his lips. "Sea monsters can be most vexing."

Namor was a dark green world, moonless and solitary, banded by wispy golden clouds. The *Ark* shuddered out of drive and settled ponderously into orbit around it. In the long, narrow communications room, Haviland Tuf moved from seat to seat, studying the planet on a dozen of the room's hundred viewscreens. Three small grey kittens kept him company, bounding across the consoles and pausing only to slap at each other. Tuf paid them no mind.

A water world, Namor had only one landmass decently large enough to be seen from orbit, and that none too large. But magnification revealed thousands of islands scattered in long, crescent-shaped archipelagoes across the deep green seas, earthen jewels strewn throughout the oceans. Other screens showed the lights of dozens of cities and towns on the nightside and pulsing dots of energy outlay where settlements sat in sunlight.

Tuf looked at it all and then seated himself, flicked on another console, and began to play a war game with the computer. A kitten bounded up into his lap and went to sleep. He was careful not to disturb it. Some time later, a second kitten vaulted up and pounced on it, and they began to tussle. Tuf brushed them to the floor.

It took longer than even Tuf had anticipated, but finally the challenge came, as he had known it would. *"Ship in orbit,"* came the demand, "ship in orbit, this is Namor Control. State your name and business. State your name and

business, please. Interceptors have been dispatched. State your name and business.''

The transmission was coming from the chief landmass. The *Ark* tapped into it. At the same time, it found the ship that was moving towards them—there was only one—and flashed it on another screen.

''I am the *Ark*,'' Haviland Tuf told Namor Control.

Namor Control was a round-faced woman with close-cropped brown hair, sitting at a console and wearing a deep green uniform with golden piping. She frowned, her eyes flicking to the side, no doubt to a superior or another console. ''*Ark*,'' she said, ''state your homeworld. State your homeworld and your business, please.''

The other ship had opened communications with the planet, the computer indicated. Two more viewscreens lit up. One showed a slender young woman with a large, crooked nose on a ship's bridge, the other an elderly man before a console. They both wore green uniforms, and they were conversing animatedly in code. It took the computer less than a minute to break it so Tuf could listen in ''. . . damned if I know what it is,'' the woman on the ship was saying. ''There's never been a ship that big, my God, just look at it, are you getting all this? Has it answered?''

''*Ark*,'' the round-faced woman was still saying, ''state your homeworld and your business, please. This is Namor Control.''

Haviland Tuf cut into the other conversation, to talk to all three of them simultaneously. ''This is the *Ark*,'' he said. ''I have no homeworld, sirs. My intentions are purely peaceful. Trade and consultation. I learned of your tragic difficulties, and moved by your plight I have come to offer you my services.''

The woman on the ship looked startled. ''What are *you*. . . .'' she started. The man was equally nonplussed, but he said nothing, only gaped open-mouthed at Tuf's blank white visage.

''This is Namor Control, *Ark*,'' said the round-faced woman. ''We are closed to trade. Repeat, we are closed to trade. We are under martial law here.''

By then the slender woman on the ship had composed herself. ''*Ark*, this is Guardian Kefira Qay, commanding NGS *Sunrazor*. We are armed, *Ark*. Explain yourself. You are a thousand times larger than any trader I have ever seen, *Ark*. Explain yourself or be fired upon.''

''Indeed,'' said Haviland Tuf. ''Threats will avail you little, Guardian. I am most sorely vexed. I have come all this long way from Brazelourn to offer you my aid and solace, and you meet me with threats and hostility.'' A kitten leaped up into his lap. Tuf scooped it up with a huge white hand, and deposited it on the console in front of him where the viewer would pick it up. He gazed down at it sorrowfully. ''There is no trust left in humanity,'' he said to the kitten.

''Hold your fire, *Sunrazor*,'' said the elderly man. ''*Ark*, if your intentions are truly peaceful, explain yourself. What are you? We are hard-pressed here, *Ark*, and Namor is a small, undeveloped world. We have never seen your like before. Explain yourself.''

Haviland Tuf stroked the kitten. ''Always I must truckle to suspicion,''

he told it. "They are fortunate that I am so kind-hearted, or else I would simply depart and leave them to their fate." He looked up, straight into the viewer. "Sir," he said. "I am the *Ark*. I am Haviland Tuf, captain and master here, crew entire. You are troubled by great monsters from the depths of your seas, I have been told. Very well. I shall rid you of them."

"*Ark*, this is *Sunrazor*. How do you propose doing that?"

"The *Ark* is a seedship of the Ecological Engineering Corps," said Haviland Tuf with stiff formality. "I am an ecological engineer and a specialist in biological warfare."

"Impossible," said the old man. "The EEC was wiped out a thousand years ago, along with the Federal Empire. None of their seedships remain."

"How distressing," said Haviland Tuf. "Here I sit in an illusion. No doubt, now that you have told me my ship does not exist, I shall sink right through it and plunge into your atmosphere, where I shall burn up as I fall."

"Guardian," said Kefira Qay from the *Sunrazor*, "these seedships may indeed no longer exist, but I am fast closing on something that my scopes tell me is almost thirty kilometers long. It does not appear to be an illusion."

"I am not yet falling," admitted Haviland Tuf.

"Can you truly help us?" asked the round-faced woman at Namor Control.

"Why must I always be doubted?" Tuf asked the small gray kitten.

"Lord Guardian, we must give him the chance to prove what he says," insisted Namor Control.

Tuf looked up. "Threatened, insulted, and doubted as I have been, nonetheless my empathy for your situation bids me to persist. Perhaps I might suggest that *Sunrazor* dock with me, so to speak. Guardian Qay may come aboard and join me for an evening meal, while we converse. Surely your suspicions cannot extend to mere conversation, that most civilized of human pastimes."

The three Guardians conferred hurriedly with each other and with person or persons offscreen, while Haviland Tuf sat back and toyed with the kitten. "I shall name you Suspicion," he said to it, "to commemorate my reception here. Your siblings shall be Doubt, Hostility, Ingratitude, and Foolishness."

"We accept your proposal, Haviland Tuf," said Guardian Kefira Qay from the bridge of the *Sunrazor*. "Prepare to be boarded."

"Indeed," said Tuf. "Do you like mushrooms?"

The shuttle deck of the *Ark* was as large as the landing field of a major starport, and seemed almost a junkyard for derelict spacecraft. The *Ark*'s own shuttles stood trim in their launch berths, five identical black ships with rakish lines and stubby triangular wings angling back, designed for atmospheric flight and still in good repair. Other craft were less impressive. A teardrop-shaped trading vessel from Avalon squatted wearily on three extended landing legs next to a driveshift courier scored by battle and a Karaleo lionboat whose ornate trim was largely gone. Elsewhere stood vessels of stranger, more alien design.

Above, the great dome cracked into

a hundred pie-wedge segments and drew back to reveal a small yellow sun surrounded by stars, and a dull green manta-shaped ship of about the same size as one of Tuf's shuttles. The *Sunrazor*. It settled, and the dome closed behind it. When the stars had been blotted out again, atmosphere came swirling back into the deck, and Haviland Tuf came soon after.

Kefira Qay emerged from her ship with her lips set sternly beneath her big, crooked nose, but no amount of control could quite conceal the awe in her eyes. Two armed men in golden coveralls trimmed with green followed her.

Haviland Tuf drove up to them in an open three-wheeled cart. "I am afraid that my dinner invitation was only for one, Guardian Qay," he said when he saw her escort. "I regret any misunderstanding, yet I must insist."

"Very well," she said. She turned to her guard. "Wait with the others. You have your orders." When she got in next to Tuf she told him, "The *Sunrazor* will tear your ship apart if I am not returned safely within two standard hours."

Haviland Tuf blinked at her. "Dreadful," he said. "Everywhere my warmth and hospitality is met with mistrust and violence." He set the vehicle into motion.

They drove in silence through a maze of interconnected rooms and corridors, and finally entered a huge shadowy shaft that seemed to extend the full length of the ship in both directions. Transparent vats of a hundred different sizes covered walls and ceiling as far as the eye could see, most empty and dusty, a few filled by colored liquids in which half-seen shapes stirred feebly. There was no sound but a wet, viscous dripping somewhere off behind them. Kefira Qay studied everything and said nothing. They went at least three kilometers down the great shaft, until Tuf veered off into a blank wall that dilated before them. Shortly thereafter they parked and dismounted.

A sumptuous meal had been laid out in the small, spartan dining chamber to which Tuf escorted the Guardian Kefira Qay. They began with an iced soup, sweet and piquant and black as coal, followed by neograss salads with a gingery topping. The main course was a breaded mushroom top fully as large as the plate on which it was served, surrounded by a dozen different sorts of vegetables in individual sauces. The Guardian ate with great relish.

"It would appear you find my humble fare to your taste," observed Haviland Tuf.

"I haven't had a good meal in longer than I care to admit," replied Kefira Qay. "On Namor, we have always depended on the sea for our sustenance. Normally it is bountiful, but since our troubles began. . . ." She lifted a forkful of dark, misshapen vegetables in a yellow-brown sauce. "What am I eating? It's delightful."

"Rhiannese sinners' root, in a mustard sauce," Haviland Tuf said.

Qay swallowed and set down her fork. "But Rhiannon is so far. How do you. . . ?" She stopped.

"Of course," Tuf said, steepling his fingers beneath his chin as he watched her face. "All this provender derives from the *Ark*, though originally it might be traced back to a dozen different

worlds. Would you like more spiced milk?''

''No,'' she muttered. She gazed at the empty plates. ''You weren't lying, then. You are what you claim, and this is a seedship of the . . . what did you call them?''

''The Ecological Engineering Corps, of the long-defunct Federal Empire. Their ships were few in number, and all but one destroyed by the vicissitudes of war. The *Ark* alone survived, derelict for a millennium. The details need not concern you. Suffice it to say that I found it and made it functional.''

''You *found* it?''

''I believe I just said as much, in those very same words. Kindly pay attention. I am not partial to repeating myself. Before finding the *Ark*, I made a humble living from trade. My former ship is still on the landing deck. Perhaps you chanced to see it.''

''Then you're really just a trader.''

''Please!'' said Tuf with indignation. ''I am an ecological engineer. The *Ark* can remake whole planets, Guardian. True, I am but one man, alone, when once this ship was crewed by two hundred; and I do lack the extensive formal training such as was given centuries ago to those who wore the golden theta, which was the sigil of the Ecological Engineers. Yet, in my own small way, I contrive to muddle through. If Namor would care to avail itself of my services, I have no doubt that I can help you.''

''Why?'' the slender Guardian asked warily. ''Why are you so anxious to help us?''

Haviland Tuf spread his big white hands helplessly. ''I know, I might appear a fool. I cannot help myself. I am a humanitarian by nature, much moved by hardship and suffering. I could no more abandon your people, beset as they are, than I could harm one of my cats. The Ecological Engineers were made of sterner stuff, I fear, but I am helpless to change my sentimental nature. So here I sit before you, prepared to do my best.''

''You want nothing!''

''I shall labor without recompense,'' said Tuf. ''Of course, I will have operating expenses. I must charge a small fee to offset them. Say, three million standards. Do you think that fair?''

''Fair,'' she said sarcastically. ''Fairly high, I'd say. There have been others like you, Tuf. Arms merchants and soldiers of fortune who have come to grow rich off our misery.''

''Guardian,'' said Tuf, reproachfully, ''you do me grievous wrong. I take little for myself. The *Ark* is so large, so costly. Perhaps two million standards would suffice? I cannot believe you would grudge me this pittance. Is your world worth less?''

Kefira Qay sighed, a tired look etched on her narrow face. ''No,'' she admitted. ''Not if you can do all you promise. Of course, we are not a rich world. I will have to consult my superiors. This is not my decision alone.'' She stood up abruptly. ''Your communications facilities?''

''Through the door and left down the blue corridor. The fifth door on the right.'' Tuf rose with ponderous dignity and began cleaning up as she left.

When the Guardian returned he had opened a decanter of liquor, vividly scarlet, and was stroking a huge black-

and-white cat that had made himself at home on the table. "You're hired, Tuf," said Kefira Qay, seating herself. "Two million standards. *After* you win this war."

"Agreed," said Tuf. "Let us discuss your situation over glasses of this delightful beverage."

"Alcoholic?"

"Mildly narcotic."

"A Guardian uses no stimulants or depressants. We are a fighting guild. Substances like that pollute the body and slow the reflexes. A Guardian must be vigilant. We guard and protect."

"Laudable," said Haviland Tuf. He filled his own glass.

"*Sunrazor* is wasted here. It has been recalled by Namor Control. We need its combat capabilities below."

"I shall expedite its departure, then. And yourself?"

"I have been detached," she said, wrinkling up her face. "We are standing by with data on the situation below. I am to help brief you, and act as your liaison officer."

The water was calm, a tranquil green mirror from horizon to horizon. It was a hot day. Bright yellow sunlight poured down through a thin bank of gilded clouds. The ship rested still on the water, its metallic sides flashing silver-blue, its open deck a small island of activity in an ocean of peace. Men and women small as insects worked the dredges and nets, bare-chested in the heat. A great claw full of mud and weeds emerged from the water, dripping, and was sluiced down an open hatchway. Elsewhere bins of huge milky jellyfish baked in the sun.

Suddenly there was agitation. For no apparent reason, people began to run. Others stopped what they were doing and looked around, confused. Still others worked on, oblivious. The great metal claw, open and empty now, swung back out over the water and submerged again, even as another one rose on the far side of the ship. More people were running. Two men collided and went down.

Then the first tentacle came curling up from beneath the ship.

It rose and rose. It was longer than the dredging claws. Where it emerged from the dark green sea, it looked as thick as a big man's torso. It tapered to the size of an arm. The tentacle was white, a soft slimy sort of white. All along its underside were vivid pink circles big as dinner plates, circles that writhed and pulsed as the tentacle curled over and about the huge farming ship. The end of the tentacle split into a rat's nest of smaller tentacles, dark and restless as snakes.

Up and up it went, and then over and down, pinioning the ship. Something moved on the other side, something pale stirring beneath all that green, and the second tentacle emerged. Then a third, and a fourth. One wrestled with a dredging claw. Another had the remains of a net draped all about it, like a veil. It didn't seem to hinder it. Now all the people were running, all but those the tentacles had found. One of them had curled itself around a woman with an axe. She hacked at it wildly, thrashing in the pale embrace, until her back arched and suddenly she fell still. The tentacle dropped her, white fluid pulsing

feebly from the gashes she had left, and seized someone else.

Twenty tentacles had attached themselves when the ship abruptly listed to starboard. Survivors slid across the deck and into the sea. The ship tilted more and more. Something was pushing it over, pulling it down. Water sloshed across the side, and into the open hatchways. Then the ship began to break up.

Haviland Tuf stopped the projection, and held the image on the large viewscreen: the green sea and golden sun, the shattered vessel, the pale embracing tentacles. "This was the first attack?" he asked.

"Yes and no," replied Kefira Qay. "Prior to this, one other harvester and two passenger hydrofoils had vanished mysteriously. We were investigating, but we did not know the cause. In this case, a news crew happened to be on the site, making a recording for an educational broadcast. They got more than they bargained for."

"Indeed," said Tuf.

"They were airborne, in a skimmer. The broadcast that night almost caused a panic. But it was not until the next ship went down that things began to get truly serious. That was when the Guardians began to realize the full extent of the problem."

Haviland Tuf stared up at the viewscreen, his heavy face impassive, expressionless, his hands resting on the console. A black-and-white kitten began to bat at his fingers. "Away, Foolishness," he said, depositing the kitten gently on the floor.

"Enlarge a section of one of the tentacles," suggested the Guardian beside him.

Silently, Tuf did as she bid him. A second screen lit up, showing a grainy close-up of a great pale rope of tissue arching over the deck.

"Take a good look at one of the suckers," said Qay. "The pink areas, there, you see?"

"The third one from the end is dark within. And it appears to have teeth."

"Yes," said Kefira Qay. "All of them do. The outer lips of those suckers are a kind of hard, fleshy flange. Slapped down, they spread and create a vacuum seal of sorts, virtually impossible to tear loose. But each of them is a mouth too. Within the flange is a soft pink flap that falls back, and then the teeth come sliding out. A triple row of them. Serrated, and sharper than you'd think. Now move down to the tendrils at the end, if you would."

Tuf touched the console, and put another magnification up on a third screen, bringing the twisting snakes into easy view.

"Eyes," said Kefira Qay. "At the end of every one of those tendrils. Twenty eyes. The tentacles don't need to grope around blindly. They can *see* what they are doing."

"Fascinating," said Haviland Tuf. "What lies beneath the water? The source of these terrible arms?"

"There are cross-sections and photographs of dead specimens later on, as well as some computer simulations. Most of the specimens we took were quite badly mangled. The main body of the thing is sort of an inverted cup, like a half-inflated bladder, surrounded by a great ring of bone and muscle that anchors these tentacles. The bladder fills and empties with water to enable

the creature to rise to the surface, or descend far below. The submarine principle. That's how it is able to drag ships under. By itself it doesn't weigh much, although it is amazingly strong. What it does, it empties its bladder to rise to the surface, grabs hold, and then begins to fill again. The capacity of the bladder is astounding, and as you can see, the creature is *huge*. Completely full, it can pull under any ship we have afloat. If need be, it can even force water *up* those tentacles and out of its mouths, in order to flood the vessel and speed things along. So those tentacles are arms, mouths, eyes, and living hoses all at once."

"And you say that your people had no knowledge of such creatures until this attack?"

"Right. A cousin of this thing, the Namorian man-of-war, was well known in the early days of colonization. It was sort of a cross between a jellyfish and an octopus. With twenty arms. Many native species are built along the same lines—a central bladder, or body, or shell, or what have you, with twenty legs or tendrils or tentacles in a ring around it. The men-of-war were carnivores, much like this monster, although they had a ring of eyes on the central body instead of at the end of the tentacles. The arms couldn't function as hoses, either. And they were much smaller, about the size of a human. They bobbed about on the surface above the continental shelves, particularly above mud-pot beds, where fish were thick. Fish were their usual prey, although a few unwary swimmers met a bloody awful death in their embrace."

"Might I ask what became of them?" said Tuf.

"They were a nuisance. Their hunting grounds were the same areas we needed: shallows rich with fish and seagrass and waterfruit, over mud-pot beds and scrabbler runs full of chameleon-clams and bobbing freddies. Before we could harvest or farm safely, we had to pretty much clean out the men-of-war. We did. Oh, there are still a few around, but they are rare now."

"I see," said Haviland Tuf. "And this most formidable creature, this living submarine and ship-eater that plagues you so dreadfully, does it have a name?"

"The Namorian dreadnaught," said Kefira Qay. "When it first appeared, we theorized it was an inhabitant of the great deeps that had somehow wandered to the surface. Namor has been inhabited for barely a hundred standard years, after all. We have scarcely begun to explore the deeper regions of the seas, and we have little knowledge of the things that might live down there. But as more and more ships were attacked and sunk, it became obvious that we had an army of dreadnaughts to contend with."

"A navy," corrected Haviland Tuf.

Kefira Qay scowled. "Whatever. A *lot* of them, not just one lost specimen. At that point the theory was that some unimaginable catastrophe had taken place deep under the ocean, driving forth this entire species."

"You give no credit to this theory," Tuf said.

"No one does. It's been disproved. The dreadnaughts wouldn't be able to withstand the pressures at those depths.

So now we don't know where they came from." She made a face. "Only that they are here."

"Indeed," said Haviland Tuf. "No doubt you fought back."

"Certainly. A game but losing fight. Namor is a young planet, with neither the population nor the resources for the sort of struggle we have been plunged into. Three million Namorians are scattered across our seas, on more than seventeen thousand small islands. Another million huddle on New Atlantis, our single small continent. Most of our people are fisherfolk and sea-farmers. When this all began, the Guardians numbered barely fifty thousand. Our guild is descended from the crews of the ships who brought the colonists from Old Poseidon and Aquarius here to Namor. We have always protected them, but before the coming of the dreadnaughts our task was simple. Our world was peaceful, with little real conflict. Some ethnic rivalry between Poseidonites and Aquarians, but it was good-natured. The Guardians provided planetary defense with *Sunrazor* and two similar craft, but most of our work was in fire and flood control, disaster relief, police work, that sort of thing. We had about a hundred armed hydrofoil patrolboats, and we used them for escort duty for a while and inflicted some casualties, but they were really no match for the dreadnaughts. It soon became clear that there were more dreadnaughts than patrolboats, anyway."

"Nor do patrolboats reproduce, as I must assume these dreadnaughts do," Tuf said. Foolishness and Doubt were tussling in his lap.

"Exactly. Still, we tried. We dropped depth charges on them when we detected them below the sea, we torpedoed them when they came to the surface. We killed hundreds. But there were hundreds more, and every boat we lost was irreplaceable. Namor has no technological base to speak of. In better days, we imported what we needed from Brazelourn and Vale Areen. Our people believed in a simple life. The planet couldn't support industry anyway. It is poor in heavy metals and has almost no fossil fuel."

"How many Guardian patrolboats remain to you?" asked Haviland Tuf.

"Perhaps thirty. We dare not use them anymore. Within a year of the first attack, the dreadnaughts were in complete command of our sea lanes. All of the great harvesters were lost, hundreds of sea-farms had been abandoned or destroyed, half of the small fisherfolk were dead and the other half huddled fearfully in port. Nothing human dared move on the seas of Namor."

"Your islands were isolated from one another?"

"Not quite," Kefira Qay replied. "The Guardians had twenty armed skimmers, and there were another hundred-odd skimmers and aircars in private hands. We commandeered them, armed them. We also had our airships. Skimmers and aircars are difficult and expensive to maintain here. Parts are hard to come by, and we have few trained techs. So most of the air traffic before the troubles was carried by airships. Solar-powered, helium-filled, large. There was quite a sizeable fleet, as many as a thousand. The airships took over the provisioning of some of the small islands, where starvation was a very real threat. Other airships, as well

as the Guardian skimmers, carried on the fight. We dumped chemicals, poisons, explosives and such from the safety of the air. Destroyed thousands of dreadnaughts, although the cost was frightful. They clustered thickest about our best fishing grounds and mud-pot beds, so we were forced to blow up and poison the very areas we needed most. Still, we had no choice. For a time, we thought we were winning the fight. A few fishing boats even put out and returned safely, with a Guardian skimmer flying escort.''

''Obviously this was not the ultimate result of the conflict,'' said Haviland Tuf, ''or we would not be sitting here talking.'' Doubt batted Foolishness soundly across the head, and the smaller kitten fell off Tuf's knee to the floor. Tuf bent and scooped him up. ''Here,'' he said, handing him to Kefira Qay, ''hold him, if you please. Their small war is distracting me from your larger one.''

''I—why, of course.'' The Guardian took the small black-and-white kitten in hand gingerly. He fit snugly into her palm. ''What is it?'' she asked.

''A cat,'' said Tuf. ''He will jump out of your hand if you continue to hold him as if he were a diseased fruit. Kindly put him in your lap. I assure you he is harmless.''

Kefira Qay, appearing very uncertain, shook the kitten out of her hand onto her knees. Foolishness yowled, almost tumbling to the floor again before sinking his small claws into the fabric of her uniform. ''*Ow*,'' said Kefira Qay. ''It has talons.''

''Claws,'' corrected Tuf. ''Tiny and harmless.''

''They aren't poisoned, are they?''

''I think not,'' said Tuf. ''Stroke him front to back. It will make him less agitated.''

Kefira Qay touched the kitten's head uncertainly.

''Please,'' said Tuf. ''I said *stroke*, not pat.''

The Guardian began to pet the kitten. Instantly Foolishness began to purr. She stopped and looked up in horror. ''It's trembling,'' she said, ''and making a noise.''

''Such a response is considered favorable,'' Tuf assured her. ''I beg you to continue your ministrations, and your briefing. If you will.''

''Of course,'' said Qay. She resumed petting Foolishness, who settled down comfortably on her knee. ''If you would go on to the next tape,'' she prompted.

Tuf wiped the stricken ship and the dreadnaught off the main screen. Another scene took their place. A winter's day, windy and chill by the look of it. The water below was dark and choppy, flecked with white foam as the wind pushed against it. A dreadnaught was afloat on the unruly sea, its huge white tentacles extended all around it, giving it the look of some vast swollen flower bobbing on the waves. It reached up as they passed overhead, two arms with their writhing snakes lifting feebly from the water, but they were too far above to be in danger. They appeared to be in the gondola of some long silver airship, looking down through a glass-bottomed viewport, and as Tuf watched the vantage point shifted and he saw that they were part of a convoy of three immense airships, cruising with stately indifference above the war-torn waters.

"The *Spirit of Aquarius*, the *Lyle D.*, and the *Skyshadow*," said Kefira Qay, "on a relief mission to a small island grouping in the north where famine had been raging. They were going to evacuate the survivors and take them back to New Atlantis." Her voice was grim. "This record was made by a news crew on the *Skyshadow*, the only airship to survive. Watch."

On and on the airships sailed, invincible and serene. Then, just ahead of the silver-blue *Spirit of Aquarius*, there was motion in the water. Something stirring beneath that dark green veil. Something big. But not a dreadnaught. It was dark, not pale. The water grew black and blacker in a great swelling patch, bulged upward. A great ebony dome heaved into view, grew and grew. Like an island emerging from the depths—black and leathery and immense—and surrounded by twenty long black tentacles. Larger and higher it swelled, second by second, until it burst from the sea entirely. Its tentacles hung below it, dripping water, as it rose. Then they began to lift and spread. The thing was fully as large as the airship moving toward it. When they met, it was as if two vast leviathans of the sky had come together to mate. The black immensity settled atop the long silver-blue dirigible, its arms curling about in a deadly embrace. They watched the airship's outer skin tear asunder, and the helium cells rip and crumple. The *Spirit of Aquarius* twisted and buckled like a living thing, and shriveled in the black embrace of its lover. When it was over, the dark creature dropped the remains into the sea.

Tuf froze the image, staring with solemn regard at the small figures leaping from the doomed gondola.

"Another one got the *Lyle D.* on the way home," said Kefira Qay. "The *Skyshadow* survived to tell the story, but it never returned from its next mission. More than a hundred airships and twelve skimmers were lost in the first week the fire-balloons emerged."

"Fire-balloons?" queried Haviland Tuf. He stroked Doubt, who was sitting on his console. "I saw no fire."

"The name was coined the first time we destroyed one of the accursed things. A Guardian skimmer put a round of explosive shot into it, and it went up like a bomb. Sank burning into the sea. They are extremely inflammable. One laser burst, and they go up spectacularly."

"Hydrogen," said Haviland Tuf.

"Exactly," the Guardian confirmed. "We've never taken one whole, but we've puzzled them out from bits and pieces. The creatures can generate an electric current internally. They take on water and perform a sort of biological electrolysis. The oxygen is vented into the water or the air, and helps push the things around. Air jets, so to speak. The hydrogen fills the balloon sacs and gives them lift. When they want to retreat to the water, they open a flap on top—see, up there—and all the gas escapes, so the fire-balloon drops back into the sea. The outer skin is leathery, very tough. They're slow, but clever. At times they hide in cloud banks and snatch unwary skimmers flying below. And we soon discovered, to our dismay, that they breed just as fast as the dreadnaughts."

"Most intriguing," said Haviland Tuf. "So, I might venture to suggest, that with the emergence of these fire-

balloons you lost the sky as well as the sea.''

''More or less,'' admitted Kefira Qay. ''Our airships were simply too slow to risk. We tried to keep things going by sending them out in convoys, escorted by Guardian skimmers and aircars, but even that failed. The morning of the Fire Dawn . . . I was there, commanding a nine-gun skimmer . . . it was terrible. . . .''

''Continue,'' said Tuf.

''The Fire Dawn,'' she muttered bleakly. ''We were . . . we had thirty airships, *thirty,* a great convoy. Protected by a dozen armed skimmers. A long trip, from New Atlantis to the Broken Hand, a major island grouping. Near dawn on the second day, just as the east was turning red, the sea beneath us began to . . . seethe. Like a pot of soup that has begun to boil. It was *them,* venting oxygen and water, rising. Thousands of them, Tuf, thousands. The waters churned madly, and they rose, all at once, all those vast black shadows coming up at us, as far as the eye could see in all directions. We attacked: with lasers, with explosive shells, with everything we had. It was like the sky itself was ablaze. All those things bulging with hydrogen, and the air was rich and giddy with the oxygen they had vented. The Fire Dawn, we call it. It was terrible. Screaming everywhere, balloons burning, our airships crushed and falling around us, bodies afire. There were dreadnaughts waiting below, too. I saw them snatching swimmers who had fallen from the airships, those pale tentacles coiling around them and yanking them under. Four skimmers escaped from that battle. Four. Every airship was lost, with all hands.''

''A grim tale,'' said Tuf.

Kefira Qay had a haunted look in her eyes. She was petting Foolishness with a blind rhythm, her lips pressed tightly together, her eyes fixed on the screen, where the first fire-balloon floated above the tumbling corpse of the *Spirit of Aquarius*. ''Since then,'' she said at last, ''life has been a continuing nightmare. We have lost our seas. On three-fourths of Namor, hunger and even starvation hold sway. Only New Atlantis still has surplus food, since only there is land-farming practiced extensively. The Guardians have continued to fight. The *Sunrazor* and our two other spacecraft have been pressed into service—bombing runs, dumping poison, evacuating some of the smaller islands. With aircars and fast skimmers, we have maintained a loose web of contact with the outer islands. We have radio, of course. But we are barely hanging on. Within the last year more than twenty islands have fallen silent. We sent patrols out to investigate in a half-dozen of those cases. Those that returned all reported the same things. Bodies everywhere, rotting in the sun. Buildings crushed and ruined. Scrabblers and crawling maggies feasting on the corpses. And on one island they found something else, something even more frightful. The island was Seastar. Almost forty thousand people lived there, and it was a major spaceport as well, before trade was cut off. It was a terrible shock when Seastar suddenly stopped broadcasting. Go to the next exhibit, Tuf. Go on.''

Tuf pressed a series of lights on the console.

A dead thing was lying on a beach, rotting on indigo sands.

It was a still picture, this one, not a tape. Haviland Tuf and Guardian Kefira Qay had a long time to study the dead thing where it sprawled, rich and rotten. Around and about it was a litter of human corpses, lending it scale by their proximity. The dead thing was shaped like an inverted bowl, and it was as big as a house. Its leathery flesh, cracked and oozing pustulence now, was a mottled gray-green. Spread on the sand around it, like spokes from a central wheel, were the thing's appendages. Ten twisted green tentacles, puckered with pinkish-white mouths. And, alternately, ten limbs that looked stiff and hard and black, and were obviously jointed.

"Legs," said Kefira Qay bitterly. "It was a walker, Tuf. Before they killed it. We have only found that one specimen, but it was enough. We know why our islands fall silent now. They come from out of the sea, Tuf. Things like that. Larger, smaller, walking on ten legs like spiders and grabbing and eating with the other ten, the tentacles. The carapace is thick and tough. A single explosive shell or laser burst won't kill one of these the way it would a fireballoon. So now you understand. First the sea, then the air, and now it has begun on the land as well. The *land*. They burst from the water in thousands, striding up onto the sand like some terrible tide. Two islands were overrun last week alone. They mean to wipe us from this planet. No doubt a few of us will survive on New Atlantis, in the high inland mountains, but it will be a cruel life and a short one. Until Namor throws something new at us, some new thing out of nightmare." Her voice had a wild edge of hysteria.

Haviland Tuf turned off his console, and the viewscreens all went black. "Calm yourself, Guardian," he said, turning to face her. "Your fears are understandable but unnecessary. I appreciate your plight more fully now. A tragic one indeed. Yet not hopeless."

"You still think you can help?" she said. "Alone? You and this ship? Oh, I'm not discouraging you, by any means. We'll grasp at any straw. But. . . ."

"But you do not believe," Tuf said. A small sigh escaped his lips. "Doubt," he said to the gray kitten, hoisting him up in a huge white hand, "you are indeed well named." He shifted his gaze back to Kefira Qay. "I am a forgiving man, and you have been through many cruel hardships, so I shall take no notice of the casual way you belittle me and my abilities. Now, if you might excuse me, I have work to do. Your people have sent up a great many more detailed reports on these creatures, and on Namorian ecology in general. It is vital that I peruse these, in order to understand and analyze the situation. Thank you for your briefing."

Kefira Qay frowned, lifted Foolishness from her knee and set him on the ground, and stood up. "Very well," she said. "How soon will you be ready?"

"I cannot ascertain that with any degree of accuracy," Tuf replied, "until I have had a chance to run some simulations. Perhaps a day and we shall begin. Perhaps a month. Perhaps longer."

"If you take too long, you'll find it difficult to collect your two million," she snapped. "We'll all be dead."

"Indeed," said Tuf. "I shall strive to avoid that scenario. Now, if you would let me work. We shall converse again at dinner. I shall serve vegetable stew in the fashion of Arion, with plates of Thorite fire mushrooms to whet our appetites."

Qay sighed loudly. "Mushrooms again?" she complained. "We had stir-fried mushrooms and peppers for lunch, and crisped mushrooms in bitter cream for breakfast."

"I am fond of mushrooms," said Haviland Tuf.

"I am weary of mushrooms," said Kefira Qay. Foolishness rubbed up against her leg, and she frowned down at him. "Might I suggest some meat? Or seafood?" She looked wistful. "It has been years since I've had a mud-pot. I dream of it sometimes. Crack it open and pour butter inside, and spoon out the soft meat . . . you can't imagine how fine it was. Or sabrefin. Ah, I'd kill for a sabrefin on a bed of seagrass!"

Haviland Tuf looked stern. "We do not eat animals here," he said. He set to work, ignoring her, and Kefira Qay took her leave. Foolishness went bounding after her. "Appropriate," muttered Tuf, "indeed."

Four days and many mushrooms later, Kefira Qay began to pressure Haviland Tuf for results. "What are you *doing?*" she demanded over dinner. "When are you going to act? Every day you seclude yourself and every day conditions on Namor worsen. I spoke to Lord Guardian Harvan an hour ago, while you were off with your computers. Little Aquarius and the Dancing Sisters have been lost while you and I are up here dithering, Tuf."

"Dithering?" said Haviland Tuf. "Guardian, I do not dither. I have never dithered, nor do I intend to begin dithering now. I work. There is a great mass of information to digest."

Kefira Qay snorted. "A great mass of mushrooms to digest, you mean," she said. She stood up, tipping Foolishness from her lap. The kitten and she had become boon companions of late. "Twelve thousand people lived on Little Aquarius," she said, "and almost as many on the Dancing Sisters. Think of that while you're digesting, Tuf." She spun and stalked out of the room.

"Indeed," said Haviland Tuf. He returned his attention to his sweet-flower pie.

A week passed before they clashed again. "Well?" the Guardian demanded one day in the corridor, stepping in front of Tuf as he lumbered with great dignity down to his work room.

"Well," he repeated. "Good day, Guardian Qay."

"It is not a good day," she said querulously. "Namor Control tells me the Sunrise Islands are gone. Overrun. And a dozen skimmers lost defending them, along with all the ships drawn up in those harbors. What do you say to that?"

"Most tragic," replied Tuf. "Regrettable."

"When are you going to be ready?"

He gave a great shrug. "I cannot say. This is no simple task you have set me. A most complex problem. Complex. Yes indeed, that is the very word. Per-

haps I might even say mystifying. I assure you that Namor's sad plight has fully engaged my sympathies, however, and this problem has similarly engaged my intellect.''

''That's all it is to you, Tuf, isn't it? A problem?''

Haviland Tuf frowned slightly, and folded his hands before him, resting them atop his bulging stomach. ''A problem indeed,'' he said.

''No. It is not just a problem. This is no game we are playing. Real people are dying down there. Dying because the Guardians are not equal to their trust, and because you do nothing. *Nothing*.''

''Calm yourself. You have my assurances that I am laboring ceaselessly on your behalf. You must consider that my task is not so simple as yours. It is all very well and good to drop bombs on a dreadnaught, or fire shells into a fire-balloon and watch it burn. Yet these simple, quaint methods have availed you little, Guardian. Ecological engineering is a far more demanding business. I study the reports of your leaders, your marine biologists, your historians. I reflect and analyze. I devise various approaches, and run simulations on the *Ark*'s great computers. Sooner or later I shall find your answer.''

''Sooner,'' said Kefira Qay, in a hard voice. ''Namor wants results, and I agree. The Council of Guardians is impatient. Sooner, Tuf. Not later. I warn you.'' She stepped aside and let him pass.

Kefira Qay spent the next week and a half avoiding Tuf as much as possible. She skipped dinner and scowled when she saw him in the corridors. Each day she repaired to the communications room, where she had long discussions with her superiors below and kept up on all the latest news. It was bad. All the news was bad.

Finally, things came to a head. Pale-faced and furious, she stalked into the darkened chamber Tuf called his ''war room,'' where she found him sitting before a bank of computer screens, watching red and blue lines chase each other across a grid. ''*Tuf,*'' she roared. He turned off the screen and swung to face her, batting away Ingratitude. Shrouded by shadows, he regarded her impassively. ''The Council of Guardians has given me an order,'' she said.

''How fortunate for you,'' Tuf replied. ''I know you have been growing restless of late from inactivity.''

''The Council wants immediate action, Tuf. *Immediate*. Today. Do you understand?''

Tuf steepled his hands beneath his chin, almost in an attitude of prayer. ''Must I tolerate not only hostility and impatience, but slurs on my intelligence as well? I understand all that needs understanding about your Guardians, I assure you. It is only the peculiar and perverse ecology of Namor that I do not understand. Until I have acquired that understanding, I cannot act.''

''You *will* act,'' said Kefira Qay. Suddenly a laser pistol was in her hand, aimed at Tuf's broad paunch. ''You will act now.''

Haviland Tuf reacted not at all. ''Violence,'' he said, in a voice of mild reproach. ''Perhaps, before you burn a hole in me and thereby doom yourself and your world, you might give me the opportunity to explain?''

"Go on," she said. "I'll listen. For a little while."

"Excellent," said Haviland Tuf. "Guardian, something very odd is happening on Namor."

"You've noticed," she said drily. The laser did not move.

"Indeed. You are being destroyed by an infestation of creatures that we must, for want of a better term, collectively dub *sea monsters*. Three species have appeared in less than half-a-dozen standard years. Each of these species is apparently new, or at least unknown. This strikes me as unlikely in the extreme. Your people have been on Namor for one hundred years, yet not until recently have you had any knowledge of these things you call dreadnaughts, fireballoons, and walkers. It is almost as if some dark analogue of my *Ark* were waging biowar upon you, yet obviously that is not the case. New or old, these sea monsters are native to Namor, a product of local evolution. Their close relatives fill your seas—the mud-pots, the bobbing freddies, the jellydancers and men-of-war. So. Where does that leave us?"

"I don't know," said Kefira Qay.

"Nor do I," Tuf said. "Consider further. These sea monsters breed in vast numbers. The sea teems with them; they fill the air; they overrun populous islands. They kill. Yet they do not kill each other, nor do they seem to have any other natural enemies. The cruel checks of a normal ecosystem do not apply. I have studied the reports of your scientists with great interest. Much about these sea monsters is fascinating, but perhaps most intriguing is the fact that you know nothing about them except in their full adult form. Vast dreadnaughts prowl the seas and sink ships; monstrous fire-balloons swirl across your skies. Where, might I ask, are the little dreadnaughts, the baby balloons? Where indeed."

"Deep under the sea."

"Perhaps, Guardian, perhaps. You cannot say for certain, nor can I. These monsters are most formidable creatures, yet I have seen equally formidable predators on other worlds. They do not number in hundreds of thousands. Why? Ah, because the young, or the eggs, or the hatchlings, they are less formidable than the parents, and most die long before reaching their terrible maturity. This does not appear to happen on Namor. It does not appear to happen at all. What can it all mean? What indeed." Tuf shrugged. "I cannot say, but I work on, I think, I endeavor to solve the riddle of your overabundant sea."

Kefira Qay grimaced. "And meanwhile, we die. We die, and you don't care."

"I protest!" Tuf began.

"Silence!" she said, waving the laser. "I'll talk now; you've given your speech. Today we lost contact with the Broken Hand. The Broken Hand. Forty-three islands, Tuf. I'm afraid to even think how many people. All gone now, in a single day. A few garbled radio transmissions, hysteria, and silence. And you sit and talk about riddles. No more. You *will* take action now. I insist. Or threaten, if you prefer. Later, we will solve the whys and hows of these things. For the moment, we will kill them, without pausing for questions."

"Once," said Haviland Tuf, "there was a world idyllic but for a single

flaw—an insect the size of a dust mote. It was a harmless creature, but it was everywhere. It fed on the microscopic spores of a floating fungus. The folk of this world hated the tiny insect, which sometimes flew about in clouds so thick they obscured the sun. When citizens went outdoors, the insects would land on them by the thousands, covering their bodies with a living shroud. So a would-be ecological engineer proposed to solve their problem. From a distant world, he introduced another insect, larger, to prey on the living dust motes. The scheme worked admirably. The new insects multiplied and multiplied, having no natural enemies in this ecosystem, until they had entirely wiped out the native species. It was a great triumph. Unfortunately, there were unforeseen side effects. The invader, having destroyed one form of life, moved on to other, more beneficial sorts. Many native insects became extinct. The local analogue of bird life, deprived of its customary prey and unable to digest the alien bug, also suffered grievously. Plants were not pollinated as before. Whole forests and jungles changed and withered. And the spores of the fungus that had been the food of the original nuisance were left unchecked. The fungus grew everywhere: on buildings, on food crops, even on living animals. In short, the ecosystem was wrenched entirely askew. Today, should you visit, you would find a planet dead but for a terrible fungus. Such are the fruits of hasty action with insufficient study. There are grave risks should one move without understanding.''

''And certain destruction if one fails to move at all,'' Kefira Qay said stubbornly. ''No, Tuf. You tell frightening tales, but we are a desperate people. The Guardians accept whatever risks there may be. I have my orders. Unless you do as I bid, I will use this.'' She nodded at her laser.

Haviland Tuf folded his arms. ''If you use that,'' he said, ''you will be very foolish. No doubt you could learn to operate the *Ark*. In time. The task would take years, which by your own admission you do not have. I shall work on in your behalf and forgive you your crude bluster and your threats, but I shall move only when I deem myself ready. I am an ecological engineer. I have my personal and professional integrity. And I must point out that, without my services, you are utterly without hope. Utterly. So, since you know this and I know this, let us dispense with further drama. You will not use that laser.''

For a moment, Kefira Qay's face looked stricken. ''You. . . .'' she said in confusion; the laser wavered just a bit. Then her look hardened once again. ''You're wrong, Tuf,'' she said. ''I *will* use it.''

Haviland Tuf said nothing.

''Not on you,'' she said. ''On your cats. I will kill one of them every day, until you take action.'' Her wrist moved slightly, so the laser was trained not on Tuf, but on the small form of Ingratitude, who was prowling hither and yon about the room, poking at shadows. ''I will start with this one,'' the Guardian said. ''On the count of three.''

Tuf's face was utterly without emotion. He stared.

''One,'' said Kefira Qay.

Tuf sat immobile.

"Two," she said.

Tuf frowned, and there were wrinkles in his chalk-white brow.

"Three," Qay blurted.

"No," Tuf said quickly. "Do not fire. I shall do as you insist. I can begin cloning within the hour."

The Guardian holstered her laser.

So Haviland Tuf went reluctantly to war.

On the first day he sat in his war room before his great console, tight-lipped and quiet, turning dials and pressing glowing buttons and phantom holographic keys. Elsewhere on the *Ark* murky liquids of many shades and colors spilled and gurgled into the empty vats along the shadowy main shaft, while specimens from the great cell library were shifted and sprayed and manipulated by tiny waldoes as sensitive as the hands of a master surgeon. Tuf saw none of it. He remained at his post, starting one clone after another.

On the second day he did the same.

On the third day he rose and strolled slowly down the kilometers-long shaft where his creations had begun to grow, indistinct forms that stirred feebly or not at all in the tanks of translucent liquid. Some tanks were fully as large as the *Ark*'s shuttle deck, others as small as a fingernail. Haviland Tuf paused by each one, studied the dials and meters and glowing spyscopes with quiet intensity, and sometimes made small adjustments. By the end of the day he had progressed only half the length of the long, echoing row.

On the fourth day he completed his rounds.

On the fifth day he threw in the stasis field. "Time is its slave," he told Kefira Qay when she asked him. "It can hold it slow, or bid it hurry. We shall make it run, so the warriors I breed can reach maturity more quickly than in nature."

On the sixth day he busied himself on the shuttle deck, modifying two of his shuttles to carry the creatures he was fashioning, adding tanks great and small and filling them with water.

On the morning of the seventh day he joined Kefira Qay for breakfast and said, "Guardian, we are ready to begin."

She was surprised. "So soon?"

"Not all of my beasts have reached full maturity, but that is as it should be. Some are monstrous large, and must be transhipped before they have attained adult growth. The cloning shall continue, of course. We must establish our creatures in sufficient numbers so they will remain viable. Nonetheless, we are now at the stage where it is possible to begin seeding the seas of Namor."

"What is your strategy?" asked Kefira Qay.

Haviland Tuf pushed aside his plate and pursed his lips. "Such strategy as I have is crude and premature, Guardian, and based on insufficient knowledge. I take no responsibility for its success or failure. Your cruel threats have impelled me to unseemly haste."

"Nonetheless," she snapped. "What are you doing?"

Tuf folded his hands atop his stomach. "Biological weaponry, like other sorts of armament, comes in many forms and sizes. The best way to slay a human enemy is a single laser burst planted square in the center of the forehead. In biological terms, the ana-

logue might be a suitable natural enemy or predator, or a species-specific pestilence. Lacking time, I have had no opportunity to devise such an economical solution.

"Other approaches are less satisfactory. I might introduce a disease that would cleanse your world of dreadnaughts, fire-balloons, and walkers, for example. Several likely candidates exist. Yet your sea monsters are close relatives of many other kinds of marine life, and those cousins and uncles would also suffer. My projections indicate that fully three quarters of Namor's ocean-going life would be vulnerable to such an attack. Alternatively, I have at my disposal fast-breeding fungi and microscopic animals who would literally fill your seas and crowd out all other life. That choice too is unsatisfactory. Ultimately it would make Namor incapable of sustaining human life. To pursue my analogy of a moment ago, these methods are the biological equivalent of killing a single human enemy by exploding a low-yield thermonuclear device in the city in which he happens to reside. So I have ruled them out.

"Instead, I have opted for what might be termed a scattershot strategy, introducing many new species into your Namorian ecology in the hopes that some of them will prove effective natural enemies capable of winnowing the ranks of your sea monsters. Some of my warriors are great deadly beasts, formidable enough to prey even on your terrible dreadnaughts. Others are small and fleet, semi-social pack hunters who breed quickly. Still others are tiny things. I have hope that they will find and feed on your nightmare creatures in their younger, less potent stages, and thereby thin them out. So, you see, I pursue many strategies; I toss down the entire deck rather than playing a single card. Given your bitter ultimatum, it is the only way to proceed." Tuf nodded at her. "I trust you will be satisfied, Guardian Qay."

She frowned and said nothing.

"If you are finished with that delightful sweet-mushroom porridge," Tuf said, "we might begin. I would not have you think that I was dragging my feet. You are a trained pilot, of course?"

"Yes," she snapped.

"Excellent!" Tuf exclaimed. "I shall instruct you in the peculiar idiosyncracies of my shuttle craft, then. By this hour, they are already fully stocked for our first run. We shall make long low runs across your seas and discharge our cargoes into your troubled waters. I shall fly the *Basilisk* above your northern hemisphere. You shall take the *Manticore* and the south. If this plan is acceptable, let us go over the routes I have planned for us." He rose with great dignity.

For the next twenty days, Haviland Tuf and Kefira Qay crisscrossed the dangerous skies of Namor in a painstaking grid pattern, seeding the seas. The Guardian flew her runs with elan. It felt good to be in action again, and she was filled with hope as well. The dreadnaughts and fire-balloons and walkers would have their own nightmares to contend with now, nightmares from half-a-hundred scattered worlds.

From Old Poseidon came vampire eels and nessies and floating tangles of

web-weed, transparent and razor-sharp and deadly.

From Aquarius Tuf cloned black raveners and the swifter scarlet raveners and poisonous puff-puppies and fragrant, carnivorous lady's bane.

From Jamison's World the vats summoned sand-dragons and dreerhants and a dozen kinds of brightly colored water snakes, large and small.

From Old Earth itself the cell library provided great white sharks, barracuda, giant squid, and clever semi-sentient orcas.

They seeded Namor with the monstrous gray kraken of Lissador and the smaller blue kraken of Ance, with water-jelly colonies from Noborn and Daronnian spinnerwhips and bloodlace out of Cathaday, with swimmers as large as the fortress-fish of Dam Tullian and the mockwhale of Gulliver and the ghrin'da of Hruun-2, or as small as the blisterfins of Avalon and the parasitical caesni from Ananda and the deadly nest-building egg-laying Deirdran water-wasps. To hunt the drifting fire-balloons they brought forth countless fliers: lash-tail mantas, bright red razorwings, flocks of scorn, semi-aquatic howlers, and a terrible pale blue thing half-plant and half-animal and all but weightless that drifted with the wind and lurked inside clouds like a living, hungry spiderweb. Tuf called it the-weed-that-weeps-and-whispers, and advised Kefira Qay not to fly through clouds.

Plants and animals and things that were both and neither, predators and parasites, creatures dark as night or bright and gorgeous or entirely colorless, things strange and beautiful beyond words or too hideous even for thought, from worlds whose names burned bright in human history and from others seldom heard of. And more, and more. Day after day the *Basilisk* and the *Manticore* flashed above the seas of Namor, too swift and deadly for the fire-balloons that drifted up to attack them, dropping their living weapons with impunity.

After each day's run they would repair to the *Ark*, where Haviland Tuf and one or more of his cats would seek solitude, while Kefira Qay habitually took Foolishness with her to the communications room so she could listen to the reports.

"Guardian Smitt reports the sighting of strange creatures in the Orange Strait. No sign of dreadnaughts."

"A dreadnaught has been seen off Batthern, locked in terrible combat with some huge tentacled thing twice its size. A gray kraken, you say? Very well. We shall have to learn these names, Guardian Qay."

"Mullidor Strand reports that a family of lashtail mantas has taken up residence on the offshore rocks. Guardian Horn says they slice through fire-balloons like living knives, that the balloons flail and deflate and fall helplessly. Wonderful!"

"Today we heard from Indigo Beach, Guardian Qay. A strange story. Three walkers came rushing out of the water, but it was no attack. They were crazed, staggering about as if in great pain, and ropes of some pale scummy substance dangled from every joint and gap. What is it?"

"A dead dreadnaught washed up on New Atlantis today. Another corpse was sighted by the *Sunrazor* on its western

patrol, rotting atop the water. Various strange fishes were picking it to pieces."

"*Starsword* swung out to Fire Heights yesterday and sighted less than a half-dozen fire-balloons. The Council of Guardians is thinking of resuming short airship flights to the Mud-Pot Pearls, on a trial basis. What do you think, Guardian Qay? Would you advise that we risk it, or is it premature?"

Each day the reports flooded in, and each day Kefira Qay smiled more broadly as she made her runs in the *Manticore*. But Haviland Tuf remained silent and impassive.

Thirty-four days into the war, Lord Guardian Lysan told her, "Well, another dead dreadnaught was found today. It must have put up quite a battle. Our scientists have been analyzing the contents of its stomachs, and it appears to have fed exclusively on orcas and blue kraken." Kefira Qay frowned slightly, then shrugged it off.

"A gray kraken washed up on Boreen today," Lord Guardian Moen told her a few days later. "The residents are complaining of the stink. It has gigantic round bite-marks, they report. Obviously a dreadnaught, but even larger than the usual kind." Guardian Qay shifted uncomfortably.

"All the sharks seem to have vanished from the Amber Sea. The biologists can't account for it. What do you think? Ask Tuf about it, will you?" She listened, and felt a faint trickle of alarm.

"Here's a strange one for you two. Something has been sighted moving back and forth across the Coherine Deep. We've had reports from both *Sunrazor* and *Skyknife* and various confirmations from skimmer patrols. A huge thing, they say, a veritable living island, sweeping up everything in its path. Is that one of yours? If it is, you may have miscalculated. They say it is eating barracuda and blisterfins and lander's needles by the thousand." Kefira Qay scowled.

"Fire-balloons sighted again off Mullidor Strand. Hundreds of them. I can hardly give credence to these reports, but they say the lashtail mantas just carom off them now. Do you. . . ."

"Men-of-war again, can you believe it? We thought they were all nearly gone. So many of them, and they are gobbling up Tuf's smaller fish like nobody's business. You have to. . . ."

"Dreadnaughts spraying water to knock howlers from the sky. . . ."

"Something new, Kefira, a *flyer*, or a glider rather, swarms of them launch from the tops of these fire-balloons, they've gotten three skimmers already, and the mantas are no match for them. . . ."

" . . . all over, I tell you, that thing that hides in the clouds . . . the balloons just rip them loose, the acid doesn't bother them anymore, they fling them down. . . ."

" . . . more dead waterwasps, hundreds of them, thousands, where are they all. . . ."

" . . . walkers again, Castle Dawn has fallen silent, must be overrun. We can't understand it, the island was ringed by bloodlace and water-jelly colonies, it ought to have been safe, unless. . . ."

" . . . no word from Indigo Beach in a week. . . ."

"... thirty, forty fire-balloons seen just off Cabben. The Council fears. ..."

"... nothing from Lobbadoon ...."

"... dead fortress-fish, half as big as the island itself. ..."

"... dreadnaughts came right into the harbor. ..."

"... walkers. ..."

"... Guardian Qay, the *Starsword* is lost, gone down over the Polar Sea, the last transmission was garbled but we think. ..."

Kefira Qay pushed herself up, trembling, and turned to rush out of the communications room, where all the screens were babbling news of death, destruction, defeat. Haviland Tuf was standing behind her, his pale white face impassive, Ingratitude sitting calmly on his broad left shoulder.

"What is *happening?*" the Guardian demanded.

"I should think that would be obvious, Guardian, to any person of normal intelligence. We are losing. Perhaps we have lost already."

Kefira Qay fought to keep from shrieking. "Aren't you going to *do* anything? Fight back? This is all your fault, Tuf. You aren't an ecological engineer. You're a trader who doesn't know what he's doing, that's why this is. ..."

Haviland Tuf raised a hand for silence. "Please," he said. "You have already caused me considerable vexation. Insult me no further. I am a gentle man, of kindly and benevolent disposition, but even one such as myself can be provoked to anger, and you press close to that point now. Guardian, I take no responsibility for this unfortunate course of events. This hasty biowar we have waged was none of my idea. Your uncivilized ultimatums forced me to unwise action in order to placate you. Fortunately, while you have spent your nights gloating over transient and illusory victories, I have continued with my work. I have mapped out your world on my computers and watched the course of your war shudder and flow across it, in all its manifold stages. I have duplicated your biosphere in one of my great tanks, and seeded it with samples of Namorian life cloned from dead specimens—a bit of a tentacle here, a piece of carapace there. I have observed and analyzed, and at last I have come to some conclusions. Tentative, to be sure, although this late sequence of events on Namor tends to confirm my hypothesis. So defame me no further, Guardian. After a refreshing night's sleep, I shall descend to Namor and attempt to end this war of yours."

Kefira Qay stared at him, hardly daring to believe, her dread turning to hope once again. "You have the answer, then?"

"Indeed. Did I not just say as much?"

"What is it?" she demanded. "Some new creature? That's it: you have cloned something else, haven't you? A plague? Some monster?"

Haviland Tuf held up his hand. "Patience. First I must be certain. You have mocked me and derided me with such unflagging vigor that I hesitate to open myself to further ridicule by confiding my plans to you. I shall prove them valid first. Now, let us discuss tomorrow. You shall fly no war run with the *Manticore*. Instead, I would have you take it to New Atlantis and convene a full meeting of the Council of Guardians.

Fetch those who require fetching from outlying islands, please.''

''And you?'' Kefira Qay asked.

''I shall meet with the council when it is time. Prior to that, I shall take my plans and my creature to Namor on a mission of our own. We shall descend in the *Phoenix*, I believe. Yes. I do think the *Phoenix* most appropriate, to commemorate your world rising from its ashes. Markedly wet ashes, but ashes nonetheless.''

Kefira Qay met Haviland Tuf on the shuttle deck just prior to their scheduled departure. *Manticore* and *Phoenix* stood ready in their launch berths amidst the scatter of derelict spacecraft. Haviland Tuf was punching numbers into a minicomputer strapped to the inside of his wrist. He wore a long gray vinyl greatcoat with copious pockets and flaring shoulderboards. A green and brown duckbilled cap decorated with the golden theta of the Ecological Engineers perched rakishly atop his bald head.

''I have notified Namor Control and Guardian Headquarters,'' Qay said. ''The Council is assembling. I will provide transportation for a half-dozen Lords Guardian from outlying districts, so all of them will be on hand. How about you, Tuf? Are you ready? Is your mystery creature on board?''

''Soon,'' said Haviland Tuf, blinking at her.

But Kefira Qay was not looking at his face. Her gaze had gone lower. ''Tuf,'' she said, ''there is something in your pocket. Moving.'' Incredulous, she watched the ripple creep along beneath the vinyl.

''Ah,'' said Tuf. ''Indeed.'' And then the head emerged from his pocket and peered around curiously. It belonged to a kitten, a tiny jet-black kitten with lambent yellow eyes.

''A cat,'' muttered Kefira Qay sourly.

''Your perception is uncanny,'' said Haviland Tuf. He lifted the kitten out gently, and held it cupped in one great white hand while scratching behind its ear with a finger from the other. ''This is Dax,'' he said solemnly. Dax was scarcely half the size of the older kittens who frisked about the *Ark*. He looked like nothing but a ball of black fur, curiously limp and indolent.

''Wonderful,'' the Guardian replied. ''Dax, eh? Where did this one come from? No, don't answer that. I can guess. Tuf, don't we have more important things to do than play with cats?''

''I think not,'' said Haviland Tuf. ''You do not appreciate cats sufficiently, Guardian. They are the most civilized of creatures. No world can be considered truly cultured without cats. Are you aware that all cats, from time immemorial, have had a touch of psi? Do you know that some ancient societies of Old Earth worshipped cats as gods? It is true.''

''Please,'' said Kefira Qay irritably. ''We don't have time for a discourse on cats. Are you going to bring that poor little thing down to Namor with you?''

Tuf blinked. ''Indeed. This poor little thing, as you so contemptuously call him, is the salvation of Namor. Respect might be in order.''

She stared at him as if he had gone mad. ''What? That? Him? I mean, Dax? Are you serious? What are you talking about? You're joking, aren't you? This is some kind of insane jest. You've got

something loaded aboard the *Phoenix*, some huge leviathan that will cleanse the sea of those dreadnaughts, anything, I don't know. But you can't mean . . . you can't . . . not that.''

''Him,'' said Haviland Tuf. ''Guardian, it is so wearisome to have to state the obvious, not once but again and again. I have given you raveners and krakens and lashtail mantas, at your insistence. They have not been efficacious. Accordingly I have done much hard thinking, and I have cloned Dax.''

''A kitten,'' she said. ''You're going to use a *kitten* against the dreadnaughts and the fire-balloons and the walkers. One. Small. *Kitten*.''

''Indeed,'' said Haviland Tuf. He frowned down at her, slid Dax back into the roomy confines of his great pocket, and turned smartly toward the waiting *Phoenix*.

Kefira Qay was growing very nervous. In the council chambers high atop Breakwater Tower on New Atlantis, the twenty-five Lords Guardian who commanded the defense of all Namor were restive. All of them had been waiting for hours. Some had been there all day. The long conference table was littered with personal communicators and computer printouts and empty water glasses. Two meals had already been served and cleared away. By the wide curving window that dominated the far wall, portly Lord Guardian Alis was talking in low urgent tones to Lord Guardian Lysan, thin and stern, and both of them were giving meaningful glances to Kefira Qay from time to time. Behind them the sun was going down, and the great bay was turning a lovely shade of scarlet. It was such a beautiful scene that one scarcely noticed the small bright dots that were Guardian skimmers, flying patrol.

Dusk was almost upon them, the council members were grumbling and stirring impatiently in their big cushioned chairs, and Haviland Tuf had still failed to make an appearance. ''When did he say he would be here?'' asked Lord Guardian Khem, for the fifth time.

''He wasn't very precise, Lord Guardian,'' Kefira Qay replied uneasily, for the fifth time.

Kehm frowned and cleared his throat.

Then one of the communicators began to beep, and Lord Guardian Lysan strode over briskly and snatched it up. ''Yes?'' he said. ''I see. Quite good. Escort him in.'' He set down the communicator and rapped its edge on the table for order. The others shuffled to their seats, or broke off their conversations, or straightened. The council chamber grew silent. ''That was the patrol. Tuf's shuttle has been sighted. He is on his way, I am pleased to report.'' Lysan glanced at Kefira Qay. ''At last.''

The Guardian felt even more uneasy then. It was bad enough that Tuf had kept them waiting, but she was dreading the moment when he came lumbering in, Dax peering out of his pocket. Qay had been unable to find the words to tell her superiors that Tuf proposed to save Namor with a small black kitten. She fidgeted in her seat and plucked at her large, crooked nose. This was going to be bad, she feared.

It was worse than anything she could have dreamed.

All of the Lords Guardian were wait-

ing, stiff and silent and attentive, when the doors opened and Haviland Tuf walked in, escorted by four armed guards in golden coveralls. He was a mess. His boots made a squishing sound as he walked, and his greatcoat was smeared with mud. Dax was visible in his left pocket all right, paws hooked over its edge and large eyes intent. But the Lords Guardian weren't looking at the kitten. Beneath his other arm, Haviland Tuf was carrying a muddy rock the size of a big man's head. A thick coating of green-brown slime covered it, and it was dripping water onto the plush carpet.

Without so much as a word, Tuf went directly to the conference table and set the rock down in the center of it. That was when Kefira Qay saw the fringe of tentacles, pale and fine as threads, and realized that it wasn't a rock after all. "A mud-pot," she said aloud in wonder. No wonder she hadn't recognized it. She had seen many a mud-pot in her time, but not until after they had been washed and boiled and the tendrils trimmed away. Normally they were served with a hammer and chisel to crack the bony carapace, and a dish of melted butter and spices on the side.

The Lords Guardian looked on in astonishment, and then all twenty-five began talking at once, and the council chamber became a blur of overlapping voices.

". . . it *is* a mud-pot, I don't understand. . . ."

"What is the meaning of this?"

"He makes us wait all day and then comes to council as filthy as a mud-grubber. The dignity of the council is. . . ."

". . . haven't eaten a mud-pot in, oh, two, three. . . ."

". . . can't be the man who is supposed to save. . . ."

". . . insane, why just look at. . . ."

". . . what is that thing in his pocket? Look at it! My God, it *moved!* It's alive, I tell you, I saw it. . . ."

"*Silence!*" Lysan's voice was like a knife cutting through the hubbub. The room quieted as, one by one, the Lords Guardian turned toward him. "We have come together at your beck and call," Lysan said acidly to Tuf. "We expected you to bring us an answer. Instead you appear to have brought us dinner."

Someone snickered.

Haviland Tuf frowned down at his muddy hands and wiped them primly on his greatcoat. Taking Dax from his pocket, Tuf deposited the lethargic black kitten on the table. Dax yawned and stretched, and ambled towards the nearest of the Lords Guardian, who stared in horror and hurriedly inched her chair back a bit. Shrugging out of his wet, muddy greatcoat, Tuf looked about for a place to put it, and finally hung it from the laser rifle of one of his escort. Only then did he turn back to the Lords Guardian. "Esteemed Lords Guardian," he said, "this is not dinner you see before you. In that very attitude lies the root of all your problems. This is the ambassador of the race that shares Namor with you, whose name, regrettably, is far beyond my small capabilities. His people will take it quite badly if you eat him."

Eventually someone brought Lysan a gavel, and he rapped it long and loud enough to attract everyone's attention,

and the furor slowly ebbed away. Haviland Tuf had stood impassively through all of it, his face without expression, his arms folded against his chest. Only when silence was restored did he say, "Perhaps I should explain."

"You are mad," Lord Guardian Harvan said, looking from Tuf to the mud-pot and back again. "Utterly mad."

Haviland Tuf scooped up Dax from the table, cradled him in one arm, and began to pet him. "Even in our moment of victory, we are mocked and insulted," he said to the kitten.

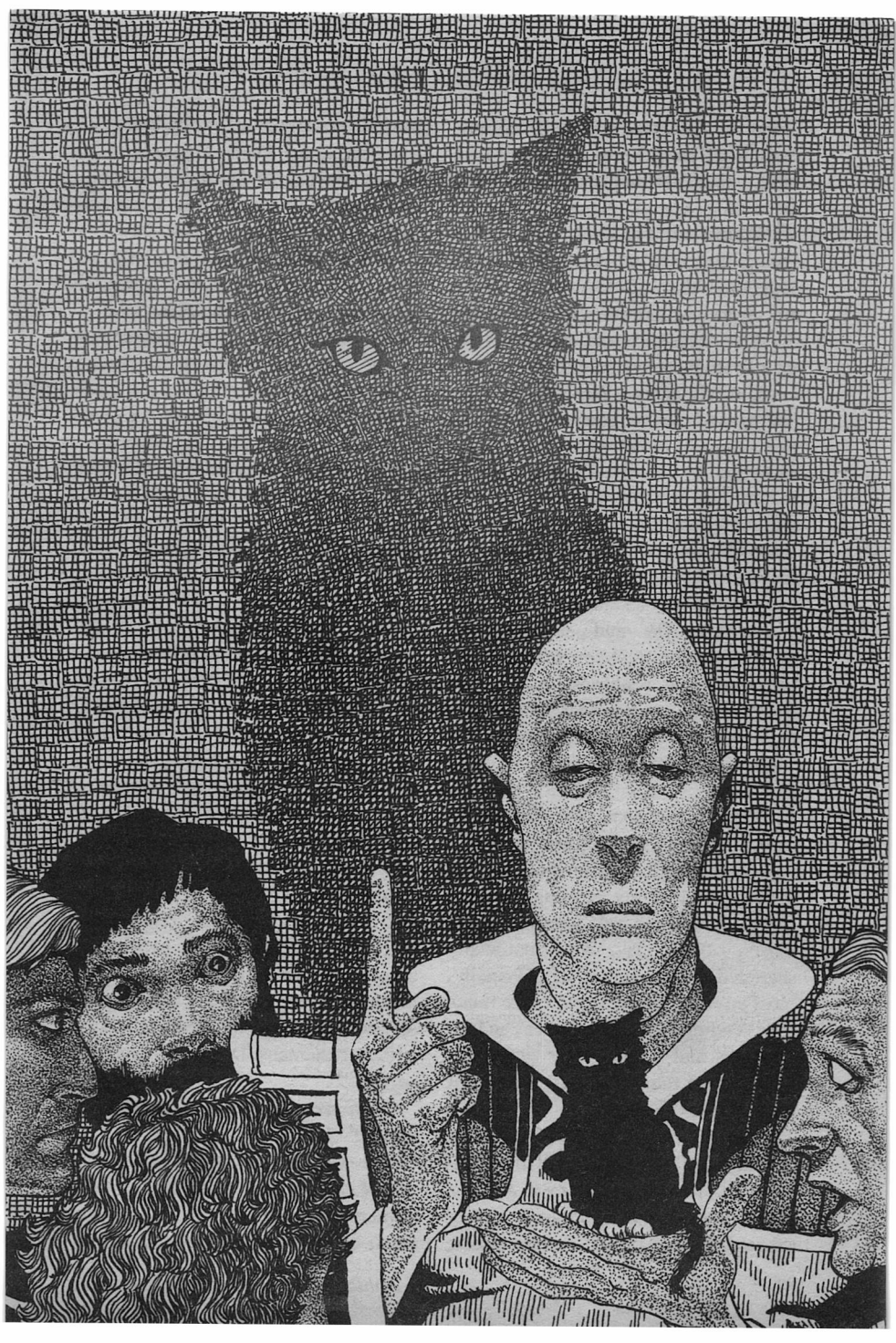
"Tuf," said Lysan from the head of the long table, "what you suggest is impossible. We have explored Namor quite sufficiently in the century we have been here so as to be certain that no sentient races dwell upon it. There are no cities, no roads, no signs of any prior civilization or technology, no ruins or artifacts, *nothing*. Neither above nor below the sea."

"Moreover," said another councillor, a beefy woman with a red face, "the mud-pots cannot possibly be sentient. Agreed, they have sizeable brains, the size of a human brain. But that is about *all* they have. They have no eyes, ears, noses, almost no sensory equipment whatever except for touch. They have only those feeble tendrils as manipulative organs, scarcely strong enough to lift a pebble. And in fact the tendrils are only used to anchor them to their spot on the seabed. They are hermaphroditic and downright primitive, mobile only in the first month of life, before the shell hardens and grows heavy. Once they root on the bottom and cover themselves with mud, they never move again. They stay there for hundreds of years."

"Thousands," said Haviland Tuf. "They are remarkably long-lived creatures. All that you say is undoubtedly correct. Nonetheless, your conclusions are in error. You have allowed yourself to be blinded by belligerence and fear. If you had removed yourself from the situation and paused long enough to think about it in depth, as I did, no doubt it would become obvious even to the military mind that your plight was no natural catastrophe. Only the machinations of some enemy intelligence could sufficiently explain the tragic course of events on Namor."

"You don't expect us to believe—" someone began.

"Sir," said Haviland Tuf, "I expect you to listen. If you will refrain from interrupting me, I will explain all. Then you may choose to believe or not, as suits your peculiar fancy. I shall take my fee and depart." Tuf looked at Dax. "Idiots, Dax. Everywhere we are beset by idiots." Turning his attention back to the Lords Guardian, he continued, "As I have stated, intelligence was clearly at work here. The difficulty was in finding that intelligence. I perused the work of your Namorian biologists, living and dead, read much of your flora and fauna, recreated many of the native lifeforms aboard the *Ark*. No likely candidate for sentience was immediately forthcoming. The traditional hallmarks of intelligent life include a large brain, sophisticated biological sensors, mobility, and some sort of manipulative organ, such as an opposable thumb. Nowhere on Namor could I find a creature with all of these attributes. My hy-



pothesis, however, was still correct. Therefore I must needs move on to unlikely candidates, as there were no likely ones.

"To this end I studied the history of your plight, and at once some things suggested themselves. You believed that your sea monsters emerged from the dark oceanic depths, but where did they first appear? In the offshore shallows. In the areas where you practiced fishing and sea-farming. What did all these areas have in common? Certainly an abundance of life, that must be admitted. Yet not the *same* life. The fish that habituated the waters off New Atlantis did not frequent those of the Broken Hand. Yet I found two interesting exceptions, two species found virtually everywhere. The mud-pots, lying immobile in their great soft beds through the long slow centuries. And, originally, the things you called Namorian men-of-war. The ancient native race has another term for those. They call them guardians.

"Once I had come this far, it was only a matter of working out the details and confirming my suspicions. I might have arrived at my conclusion much earlier, but for the rude interruptions of liaison officer Qay, who continually shattered my concentration and finally, most cruelly, forced me to waste much time sending forth gray krakens and razorwings and sundry other such creatures. In the future I shall spare myself such liaisons.

"Yet, in a way, the experiment was useful, since it confirmed my theory as to the true situation on Namor. Accordingly I pressed on. Geographic studies showed that all of the monsters were thickest near mud-pot beds. The heaviest fighting had been in those selfsame areas, my Lords Guardian. Clearly, these mud-pots you find so eminently edible were your mysterious foes. Yet how could that be? These creatures had large brains, to be sure, but lacked all the other traits we have come to associate with sentience, as we know it. And that was the very heart of it! Clearly they were sentience as we do not know it. What sort of intelligent being could live deep under the sea, immobile, blind, deaf, bereft of all input? I pondered that question. The answer, sirs, is obvious. Such an intelligence must interact with the world in ways we cannot, must have its own modes of sensing and communicating. Such an intelligence must be telepathic. Indeed. The more I considered it, the more obvious it became.

"Thereupon it was only a matter of testing my conclusions. To that end, I brought forth Dax. All cats have some small psionic ability, Lords Guardian. Yet long centuries ago, in the days of the Great War, the soldiers of the Federal Empire struggled against enemies with terrible psi powers; Hrangan Minds and *githyanki* soulsucks. To combat such formidable foes, the genetic engineers worked with felines and vastly heightened and sharpened their psionic abilities, so they could esp in unison with mere humans. Dax is such a special animal."

"You mean that thing is reading our minds?" Lysan said sharply.

"Insofar as you have minds to read," said Haviland Tuf, "yes. But more importantly, through Dax, I was able to reach that ancient people you have so

ignominiously dubbed *mud-pots*. For they, you see, are entirely telepathic.

"For millennia beyond counting they have dwelled in tranquility and peace beneath the seas of this world. They are a slow, thoughtful, philosophic race, and they lived side by side in the billions, each linked with all the others, each an individual and each a part of the great racial whole. In a sense they were deathless, for all shared the experiences of each, and the death of one was as nothing. Experiences were few in the unchanging sea, however. For the most part their long lives are given over to abstract thought, to philosophy, to strange green dreams that neither you nor I can truly comprehend. They are silent musicians, one might say. Together they have woven great symphonies of dreams, and those songs go on and on.

"Before humanity came to Namor, they had had no real enemies for millions of years. Yet that had not always been the case. In the primordial beginnings of this wet world, the oceans teemed with creatures who relished the taste of the dreamers as much as you have. Even then, the race understood genetics, understood evolution. With their vast web of interwoven minds, they were able to manipulate the very stuff of life itself, more skillfully than any genetic engineers. And so they evolved their guardians, formidable predators with a biological imperative to protect those you call mud-pots. These were your men-of-war. From that time to this they guarded the beds, while the dreamers went back to their symphony of thought.

"Then you came, from Aquarius and Old Poseidon. Indeed you did. Lost in the reverie, the dreamers hardly noticed for many years, while you farmed and fished and discovered the taste of mud-pots. You must consider the shock you gave them, Lords Guardian. Each time you plunged one of them into boiling water, all of them shared the sensations. To the dreamers, it seemed as though some terrible new predator had evolved upon the landmass, a place of little interest to them. They had no inkling that you might be sentient, since they could no more conceive of a non-telepathic sentience than you could conceive of one blind, deaf, immobile, and edible To them, things that moved and manipulated and ate flesh were animals, and could be nothing else.

"The rest you know, or can surmise. The dreamers are a slow people lost in their vast songs, and they were slow to respond. First they simply ignored you, in the belief that the ecosystem itself would shortly check your ravages. This did not appear to happen. To them it seemed you had no natural enemies. You bred and expanded constantly, and many thousands of minds fell silent. Finally they returned to the ancient, almost-forgotten ways of their dim past, and woke to protect themselves. They sped up the reproduction of their guardians until the seas above their beds teemed with their protectors, but the creatures that had once sufficed admirably against other enemies proved to be no match for you. Finally they were driven to new measures. Their minds broke off the great symphony and ranged out, and they sensed and understood, and at last they began to fashion new guardians, guardians formidable enough

to protect them against this great new nemesis. Thus it went. When I arrived upon the *Ark*, and Kefira Qay forced me to unleash many new threats to their peaceful dominion, the dreamers were initially taken aback. But the struggle had sharpened them and they responded more quickly now, and in only a very short time they were dreaming newer guardians still and sending them forth to battle to oppose the creatures I had loosed upon them. Even as I speak to you in this most imposing tower of yours, beneath the waves many a terrible new lifeform is stirring, and soon will emerge to trouble your sleep in years to come. Unless, of course, you come to a peace. That is entirely your decision, and I am only a humble ecological engineer and would not dream of dictating such matters to the likes of you. Yet I do suggest it, in the strongest possible terms. So here is the ambassador plucked from the sea, at great personal discomfort to myself, I might add. The dreamers are now in much turmoil, for when they felt Dax among them and through him touched me, their world increased a millionfold. They learned of the stars today, and learned moreover that they are not alone in this cosmos. I believe they will be reasonable, as they have no use for the land, nor any taste for fish. Here is Dax as well, and myself. Perhaps we might commence to talk?''

But when Haviland Tuf fell silent at last, no one spoke for quite a long time. The Lords Guardian were all ashen and numb. One by one they looked away from Tuf's impassive features, to the muddy shell on the table.

Finally Kefira Qay found her voice. ''What do they *want?*'' she asked nervously.

''Chiefly,'' said Haviland Tuf, ''they want you to stop eating them. This strikes me as an eminently sensible proposal. What is your reply?''

''Two million standards is insufficient,'' Haviland Tuf said some time later, sitting in the communications room of the *Ark*. Dax rested calmly in his lap, having little of the frenetic energy of the other kittens. Elsewhere in the room Suspicion and Hostility were chasing each other hither and yon.

Up on the viewscreen, Kefira Qay's features broke into a suspicious scowl. ''What do you mean? This was the price we agreed upon, Tuf. If you are trying to cheat us. . ..''

''Cheat?'' Tuf sighed. ''Did you hear her, Dax? After all we have done, such grim accusations are still flung at us willy-nilly. Yes. Willy-nilly indeed. An odd phrase, when one stops to mull on it.'' He looked back at the viewscreen. ''Guardian Qay, I am fully aware of the agreed-on price. For two million standards, I solved your difficulties. I analyzed and pondered and provided the insight and the translator you so sorely needed. I have even left you with twenty-five telepathic cats, each linked to one of your Lords Guardian, to facilitate further communications after my departure. That too is included within the terms of our initial agreement, since it was necessary to the solution of your problem. And, being at heart more a philanthropist than a businessman, and deeply sentimental as well, I have even allowed you to retain Foolishness, who took a liking to you for some reason that

I am entirely unable to fathom. For that, too, there is no charge.''

''Then why are you demanding an additional three million standards?'' demanded Kefira Qay.

''For unnecessary work which I was cruelly compelled to do,'' Tuf replied. ''Would you care for an itemized accounting?''

''Yes, I would,'' she said.

''Very well. For sharks. For barracuda. For giant squid. For orcas. For gray kraken. For blue kraken. For bloodlace. For water jellies. Twenty thousand standards per item. For fortress-fish, fifty thousand standards. For the-weed-that- weeps-and-whispers, eighty. . . .'' He went on for a long, long time.

When he was done, Kefira Qay set her lips sternly. ''I will submit your bill to the Council of Guardians,'' she said. ''But I will tell you straight out that your demands are unfair and exorbitant, and our balance of trade is not sufficient to allow for such an outflow of hard standards. You can wait in orbit for a hundred years, Tuf, but you won't get any five million standards.''

Haviland Tuf raised his hands in surrender. ''Ah,'' he said. ''So, because of my trusting nature, I must take a loss. I will not be paid, then?''

''Two million standards,'' said the Guardian. ''As we agreed.''

''I suppose I must accept this cruel and unethical decision, and take it as one of life's hard lessons. Very well then. So be it.'' He stroked Dax. ''It has been said that those who do not learn from history are doomed to repeat it. I can only blame myself for this wretched turn of events. Why, it was only a few scant months past that I chanced to view a historical tape on this very sort of situation. It was about a seedship such as my own that rid one small world of an annoying pest, only to have the ungrateful planetary government refuse payment. Had I been wiser, that would have taught me to demand my payment in advance.'' He sighed. ''But I was not wise, and now I must suffer.'' Tuf stroked Dax again, and paused. ''Perhaps your Council of Guardians might be interested in viewing this particular tape, purely for recreational purposes. It is holographic, fully dramatized, and well acted, and moreover it gives a fascinating insight into the workings and capabilities of a ship such as this one. Highly educational. The title is *Seedship of Hamelin*.''

They paid him, of course. ■

Penny Wise & Pound Foolish

Some "technical" problems are largely something else—like costly attempts to "economize."

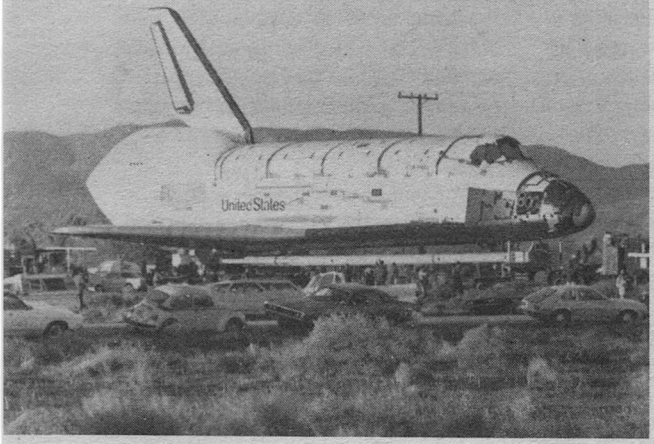
The maiden voyage of the *Columbia* was a spectacular success—except that it was almost two years behind schedule.

The National Aeronautics and Space Administration's (NASA's) difficulties with the space shuttle started long before that vehicle was even thought of. In fact, they began in May 1962, when President Kennedy proposed: "I believe this nation should commit itself to achieving the goal, before the decade is out, of landing a man on the Moon and returning him safely to Earth. No single space project in this period will be more impressive to mankind or more important for the long-range exploration of space; and none will be so difficult or expensive to accomplish."

At the time Project Apollo was begun, all projections for manned flight into Earth orbit and to the Moon included winged, reusable rockets for at least the first leg of the journey—into Earth orbit. This concept had been originated by the Austrian spaceflight pioneer, Eugene Sanger, in the '30s. In the '50s, Dr. Wernher von Braun developed an elaborate plan that would put men on the Moon in twenty-five years. In this plan winged, reusable rockets would ferry parts for reusable moon rockets up to Earth orbit, where they would be assembled for the Moon flight.

When the Apollo program was begun, however, this elaborate type of scheme was passed over in favor of simpler and less expensive expendable rockets carrying cone-shaped ballistic re-entry spacecraft. In spite of this more economical approach, President Kennedy was right about the difficulty and expense of the Apollo program: It cost over $40 billion, and took the lives of eight astronauts (including three who

Walter B. Hendrickson, Jr.



The *Columbia* is shown before it was flown to NASA's Kennedy Space Center in Florida in 1979. The slightly pocked appearance of the craft results from tiles applied to its exterior which protect it from the high temperatures of reentry.

(Photo courtesy NASA)

died in a flash fire aboard their Apollo spacecraft).

In terms of long-range importance to space exploration, however, Apollo had mixed blessings. Along with the Skylab and Apollo-Soyuz flights, which used leftover Apollo hardware, it proved man's capabilities in space while returning valuable information. Technologically, though, it was a dead end. Even before NASA suffered the severe budget cutbacks that followed the first manned moon landing, the agency found that using Apollo-type, single-use, throwaway boosters to supply a permanent space station was just too expensive. This led to the development of the space shuttle.

Originally, both the booster and the orbiter stages of the space shuttle were to be manned and reusable craft. The result was a vehicle which looked much like the present orbiter perched atop its 747 transport plane.

NASA planned to use this space shuttle as the first step in an ambitious space program conceived in 1969. This program included space stations, Moon bases, and, ultimately, flights to Mars.

Unfortunately, after the Apollo program and the Vietnam War, Congress and the American public were in no mood for any more grandiose space ventures. The resultant budget cuts were so severe that NASA was lucky to salvage the orbiter portion of the space shuttle. The rest of NASA's dreams for manned spacecraft, proposed in 1969, had to be shelved and forgotten for a time. Even then, the budget was so sparse that it resulted in a reversal of the policy that NASA had followed during its previous manned spacecraft programs. During those projects, they had operated under an extension of Murphy's Law: "Whatever can go wrong, will go wrong—and

we'd better be prepared to meet it."

Admittedly, there were some glaring oversights in this policy. For instance, the volatility of a high-pressure oxygen atmosphere was overlooked, leading to the deaths of three astronauts in a flash fire on the launch pad on January 27, 1967. On the other hand, the policy of preparedness did prove valuable for information in other problems. Even in the unforeseen emergency caused by the explosion of the oxygen tank on Apollo 13, Mission Control was able to find in its library a study on using the lunar module as a lifeboat.

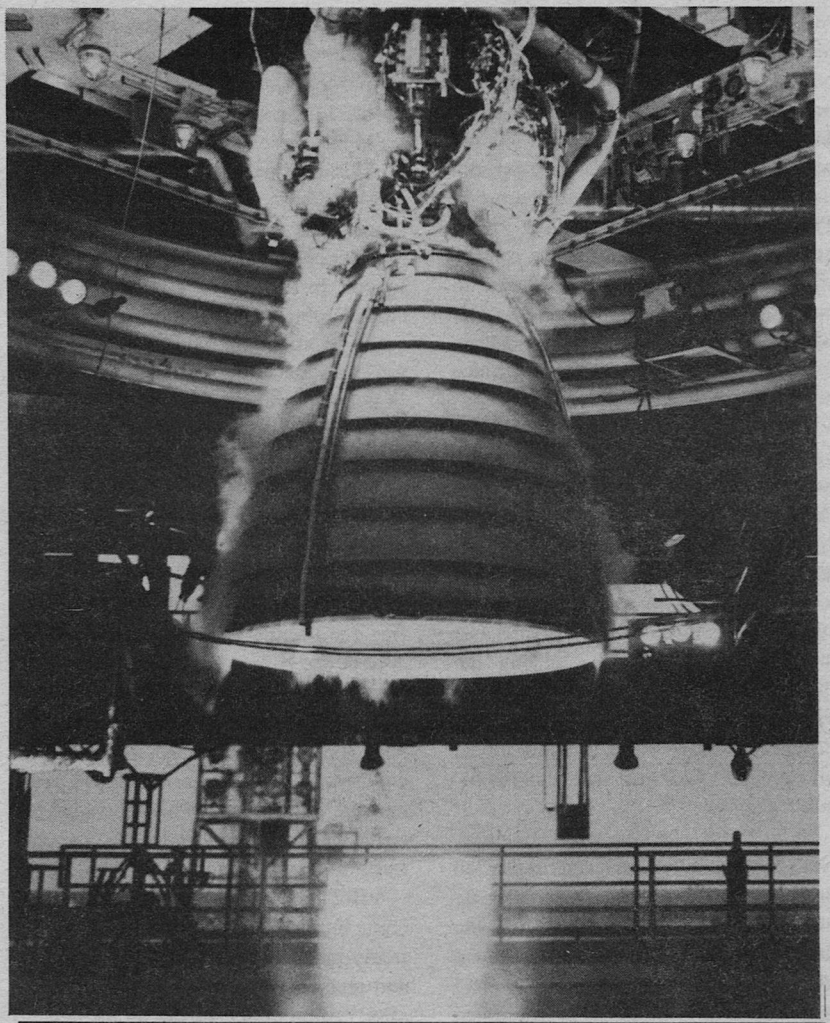
In the space shuttle program, however, NASA switched to what it calls "success-oriented management." In plain English, this works out to: "Don't go looking for trouble. You may find it." For example, the space agency did not require component testing of its contractors as it had on previous manned space projects. This was necessitated by the fact that the space agency was operating on less than half the funding it had requested for the space shuttle—$3 billion instead of $8 billion.

Such miserly practices might have worked all right had the space shuttle simply involved a merger of its Apollo spacecraft and X-15 progenitors. The shuttle, however, contains many high-technological advances of its own. As a result, Murphy's Law soon caught up with NASA and the space shuttle contractors. Now it seemed that everything that could go wrong, did go wrong.

Nevertheless, after a conversation with President Carter about the space shuttle, November 14, 1979, NASA Administrator Dr. Robert A. Frosch told reporters: "We are not having—as far as anyone who has looked at the program can tell—major central technical problems. I characterized them to the President as being technological odds and ends. . . . I describe this as odds and ends because they do not appear to be central intrinsic problems but rather failures, occasional failures of particular parts . . ."

One component that has been particularly beset by "occasional part failures" is the space shuttle main engines developed by Rockwell International. As Frank Tripett and Jerry Hannifin reported in *Time*, January 12, 1981: "During their painful development, the engines suffered delays from blown valves, faulty welds, split fuel tubes, cracked turbine blades, splintered ball bearings. The engines blew up. They were scathed by at least five fires. A hydrogen-carrying nozzle broke, inundating an engine's innards and reducing it to a molten char."

Another notorious problem is the 30,761 heat shield tiles which protect the orbiter against the 1,482°C heat of re-entry. It was found, however, that some of the tiles could not withstand this heat or the other stresses of space flight. As a result, they had to be removed, treated, and replaced. While this procedure was going on, the time came for the *Columbia* to be flown to the Kennedy Space Center (March 8, 1979). Rather than slip farther behind schedule, NASA decided to transport the *Columbia* to Florida anyway, and complete reinstalling the tiles there. In the course of the transfer, some 7,500 tiles were jolted loose.



(Photo courtesy Rockwell International)

Shuttle power—Under contract to NASA's Marshall Space Flight Center, Alabama, the Rocketdyne Division of Rockwell International Corporation conducted tests of the 512,000-pound-thrust engine at both NASA's National Space Technology Laboratories, Bay St. Louis, Mississippi, and the division's Santa Susana Field Laboratory in the Santa Susana mountains of southern California. Three test stands modified following use in the Saturn/Apollo program are now available for single-engine testing of the space shuttle main engine.

Teams of Rockwell International technicians had to be flown to the Kennedy Space Center to glue the tiles back on and test the strength of the adhesion. This resulted in a curious scene: half the workmen gluing the tiles back on and the other half trying to pull them off. This was an extremely exacting jigsaw puzzle with pieces ranging in dimensions from 152.4 millimeters square to palm-size. In order to protect the *Columbia* against the heat of re-entry, each tile had to be fitted to within a tolerance of .05 to .08 millimeters.

These tests continued until shortly before the *Columbia* was moved to the pad. About 11 percent to 12 percent of the tiles had to be replaced. Even on the voyage of the *Columbia,* the tile problem was not solved. At least two tiles jolted loose from the aft portion of the spacecraft during launch and drifted past the flight deck windows during the flight. Even before this incident, NASA had been considering replacing the shuttle tiles with an upgraded Nomex-type blanket sheet-like heat shield on the future orbiters.

With all these delays and difficulties, NASA not only exceeded its restricted budget, but ran over its original estimate of shuttle cost by 20 percent. By the time the *Columbia* was rolled out to the launch pad, the program's cost had reached $8.8 billion. This prompted some critics to refer to the space shuttle as "America's Space Lemon," with only its cost reaching space.

Nevertheless, the space shuttle project can't be scrapped because it is scheduled to be carrying all United States satellites and space probes, both civilian and military, into orbit as soon as it becomes operational. In addition, it is supposed to carry a space lab developed by the European Space Agency.

So far, these delays have not affected the military space program. If there are further delays, however, the Air Force reports that it may have to continue using expendable boosters for a while longer. In fact, there would have to be considerable delays before they would begin to affect the Department of Defense, as that agency is not expected to finish its current schedule of spacecraft and be ready to use the space shuttle until 1983 or 1984.

The shuttle difficulties have not delayed the Europeans in their development of the Spacelab. As J. Gomérieux, Head of ESA's Press, explained in an answer to a letter from the author: ". . . we cannot in fact comment on the effects the delays in the space shuttle will have on the development of ESA's Spacelab. Spacelab and space shuttle have, on both sides of the Atlantic, encountered very similar technical and managerial problems which have led to cost overrun and schedule delays of fairly high magnitude.

"Both projects seem to have overcome these initial problems and are currently in their final phase of integration and testing. The shuttle schedule situation has no direct impact on Spacelab, though the interconnection of both projects is substantial. The first Spacelab flight is envisaged to take place in April 1982 and we are confident that this date can be met."

Indeed, the Europeans could actually profit through the difficulties of the

space shuttle with their Ariane launcher. This is a conventional, single-use launch vehicle which will eventually come in three versions. Already operating is the Ariane 1, which can put 1,700 kilograms into geosynchronous orbit. Three more higher-performance versions of the Ariane are planned. Two of these will be developed late in 1982 or early 1983; the third is under study for future development. The first two are the Ariane 2, which can launch 2,050 kilograms into geosynchronous orbit, and the Ariane 3, with the capability of doing the same with 2,420 kilograms.

This is still below the lift capability of the space shuttle, which could place around 11,900 kilograms in synchronous orbit using a Centaur upper stage, or 11,700 kilograms using the Defense Department's Interim Upper Stage (IUS). However, it is large enough for the current generation of Intelsats being used by COMSAT General Corporation. Also, the Ariane's boost capabilities match those of NASA's expendable boosters, the Delta and the Atlas-Centaur.

With space shuttle schedule delays and the limited lifting ability of expendable boosters, plus their higher cost, commercial satellite users are faced with a dilemma. Adding to this is the as-yet unproven performance of the shuttle and the Ariane. Because of these problems, NASA has had for a number of years a plan for commercial users to request an expendable rocket as a backup during the development stage of the space shuttle. Under this agreement that user has the option to choose the backup within thirty days of the first launch, and then start paying for it. As the shuttle delays have continued, more and more users have been opting for the expendable rockets.

Typical of users who have faced dilemmas because of the space shuttle delays is Satellite Business Systems (SBS) and its affiliated organization, the Communications Satellite Corporation (COMSAT). In 1977 SBS became the first commercial user to choose the space shuttle, then scheduled for July 1980. The SBS was planning to begin domestic communications satellite service in January 1981 and had scheduled its first satellite launch for October 1980. However, delays in the space shuttle forced them to switch to a Delta rocket. Launch of a backup satellite was delayed by the SBS until the fourth quarter of 1981 in hopes that they could use the space shuttle. Since that time, January 1980, there have been more delays.

"The major impact on a user such as SBS is that of the increased launch cost for a Delta rocket over that of the shared shuttle orbiter," Sidney Metzger, COMSAT's Assistant Vice-President and Chief Scientist explained in a letter to the author. "The cost to SBS is approximately an additional $15 million per launch or, in the event SBS is forced to have two Delta launches, the total financial impact on SBS will be over $30 million. Therefore, as may be expected, SBS has been encouraging NASA to maintain its schedule and institute a successful operational shuttle program as soon as possible."

For its seven Intelsat V launches planned during 1980-82, COMSAT planned to use four Atlas-Centaurs fol-

lowed by one space shuttle and one Ariane launch. Then the corporation would choose between the shuttle and the Ariane for the seventh and eighth launches. Now, however, because of the shuttle delays and the unproven capabilities of the Ariane COMSAT is considering the more expensive Atlas-Centaur for the sixth Intelsat V in the series.

If costs were not enough of a problem, the next generation of Intelsats is expected to be too large for the Atlas-Centaur. Thus the corporation must wait for an opening on the space shuttle, which NASA can't promise until the second half of 1984, or be content with smaller, more expensive communications satellites.

The long wait that COMSAT will have for a berth on the space shuttle is not because NASA expects more delays—at least, none that long. Rather, it is because NASA has its space shuttle pretty well booked up for the first several years of the program. Even if some users switch to expendable boosters, that may not help relieve the overcrowding very much because the free world is running short of spacecraft launch capability.

Since June 1978 NASA has had the first twenty-three flights of the space shuttle scheduled over a three-year period. The first six of these were labeled as OFT, for Orbital Flight Test, and the rest were simply called OF, for Orbital Flight. At that time, only seven flights still had space available. These were:

- OF-7, which was to orbit NASA's Long-Duration Exposure Facility (LDEF) with several self-contained experiments;
- OF-9, which was to launch the GOES D weather satellite and Anik C communications satellite for the Oceanographic and Atmospheric Administration and Telsat Canada;
- OF-12A, a backup payload for OF-12, will carry Intelsat V and Anik C2;
- OF-13, carrying NOAA's GOES E;
- OF-17, to launch an Intelsat V and recover the LDEF left in orbit by OF-7;
- OF-18, to carry one of ESA's Spacelab pallets; and
- OF-21, which is to retrieve a satellite left in orbit on a previous flight.

Of course, with the delays in the space shuttle program, some openings undoubtedly occurred in other flights as users switched to expendable rockets, or opted for earlier missions of the shuttle. Meanwhile, the slippage was perturbing NASA's own plans for use of the space shuttle.

For example, OFT-5 was originally planned to carry up a robot spacecraft to boost the derelict Skylab space station into a higher orbit. However, the slippage in the shuttle program caused this maneuver to be moved back to OFT-2. Of course, even this early flight did not make it in time, so Skylab ended up as charred wreckage strewn over the Australian desert. This left OFT-2 scheduled for just a test of the space shuttle's remote manipulator arm.

With the *Columbia* falling victim to Murphy's Law, questions have naturally been raised not only about payloads, but about the astronauts who must fly it as well. Astronaut safety was especially brought to the attention of the

press because, unlike previous manned spacecraft, the space shuttle was to go into space manned on the very first launch. Previously, several unmanned launches had been required to man-rate the launch vehicles and spacecraft. Project Mercury needed two tests for the Redstone and three for the Atlas. These included a sub-orbital and an orbital flight carrying chimpanzees. Gemini required two preliminary unmanned flights, and Apollo needed four tests with the Saturn 1B and two with the Saturn V.

The question of astronaut safety was raised at Dr. Frosch's November 14, 1979, press briefing by Bill Hines of the Chicago *Sun Times*: "In the report that the three advisers sent to you in October, Bill Anders, who flew on Apollo 8, said that the margin of safety in the first Earth-orbital Apollo flight in 1980 is in his mind smaller than the margin of safety on the Apollo 8 that he flew in 1968. Did you discuss with him what he had in mind specifically and what does this tell us about this program?"

"I did talk to Bill Anders about that and he said the following," answered Dr. Frosch. "The way he put it to me was 'I would certainly fly the first shuttle flight, but I would feel that it was a little riskier than I felt Apollo 8 was,' and he said the reason really is that 'the shuttle is more like testing an aircraft in the overall design philosophy and test philosophy than testing the Apollo spacecraft.' And there are certain differences. There were unmanned launches of Apollo spacecraft before the manned launches. We are not doing that in the shuttle program. It is more difficult considerably to do that with such a program, and furthermore our conclusion is that that would be less safe and would not increase the safety of the first flight to try that."

Actually, the Apollo 8 spacecraft, which Anders flew, had a time bomb aboard in the form of two low-voltage switches in the oxygen tank's heating system. Fortunately, these did not fail until Apollo 13, when the first Moon landing had been completed and the astronauts had a lunar module to use as a lifeboat—barely making it back to Earth.

As for John W. Young and Robert L. Crippen, the two astronauts chosen to fly the *Columbia* on her maiden flight, they must be the best-trained crew in the history of space flight. Understandably, they were quite anxious to get on with the mission, and were impatient with even a few hours' more delay.

"People say 'what's the difference between preparing for this (space shuttle) and any Apollo mission,' " Astronaut John Young told a meeting of the Aviation/Space Writers Association on April 9, 1979, "and my answer is: There's no difference, except possibly that it is more structured. We're not preparing for things that we don't expect to happen."

When the author reminded the astronauts that the accident on Apollo 13 hadn't been expected, Astronaut Crippen explained, "The experience of past space flights has given us a knowledge of what to expect including tank blows. Any unexpected accidents can be taken care of in the light of past experience."

Now that the space shuttle has started flying, it should begin paying off the costs of its development through more economical operation. This is not just that users can double up on shuttle missions, as the SBS had planned to do, but because it is less expensive than the old-fashioned expendable rockets. The price per kilogram for a space shuttle launch, according to NASA Getaway special price list, is $22.68. To put an Intelsat IV into orbit at this rate, the price would be $396,067.64 for the Centaur upper stage plus $16,306.92 for the satellite. This gives a total charge at $412,374.56 to low Earth orbit.

Assuming that the Centaur itself costs about $7.5 million, the total price for delivering an Intelsat to synchronous orbit, with the space shuttle as first stage, would be about $8 million. This is a little more than it would cost to use a Delta booster.

At this rate, it would take about 1,000 space shuttle flights to pay off the program's development costs up to the time of the *Columbia*'s rollout to the launch pad at the Kennedy Space Center. Even at the rate of one launch per week, which it is hoped the shuttle will achieve, this would take about 12.15 years. Unfortunately, in the meantime the space shuttle would be adding up additional operating costs. Obviously, the space shuttle never can pay off its development costs, but it can save on future space missions, and it will make manned flight a routine part of space flight.

From all the problems of the space shuttle, it would seem that the moral of this story was covered in the comment by Noel Hinners, head of the National Air and Space Museum. As quoted in *Time*, January 21, 1981, Dr. Hinners said, "To take on a technological challenge like the shuttle with penny-pinching as its major goal was just plain stupid. If you are going to break technological ground, you can't design to costs."

It does appear that this is the case, for by trying to develop the space shuttle on less than half the money it needed, NASA actually wound up spending more money than it had originally planned. If NASA had not taken this penny wise and pound foolish approach, however, it would not have had the space shuttle at all, or at least they would not have had anything *but* the space shuttle.

It is not that planners lack imagination, as their 1969 plan shows. The trouble is that NASA must contend with a host of other government programs, such as non-space-related defense, foreign and domestic aid. Even the most ardent space enthusiast would be hard put to say that these projects do not have merit, and deserve funding.

In the author's opinion, what is needed is a private foundation, along the lines of COMSAT, to conduct space transportation exploration. On the surface, it would seem that a private foundation would be difficult to finance. However, there are 203 million people in the United States, so the $8.8-billion cost of the shuttle would break down to $23.07 per person. This might be a bit steep for some of us, but some individuals and corporations could easily afford it, and more.

Of course, it would not be necessary

for a private corporation to go into space development in such a big way as NASA has. Since the space shuttle is reusable, a corporation like COMSAT could buy their own shuttle, then rent out the payload space they did not use to help defray the cost of leasing launch and turnaround facilities from NASA.

Already it does seem that space travel is tending toward private, or at least non-government, use. In addition to the private users of space transportation, there are a number of space-boosting organizations, including the National Space Institute, and the L5 Society, among others. ■

Jayge Carr

THE PACIFISTS

There are things we've been
conditioned to regard as universally inseparable
parts of human nature.
But history should have
taught us that any society
that thinks it has
The Only Way is wrong.

The miniature ebony Pegasus circled three times before making a perfect four-hoof landing on the waiting palm. A slender finger stroked the flirting arc of plush-smooth, space-black wing, at which the little animal flung its head back, mane rippling mischievously, with a merry soprano neigh.

Durstan resolutely kept his attention on the woman, not the antics of her flying pet. But he couldn't help being impressed, and not for the first time since he had landed on Placidity. He had heard tales of the skill of the Placids, but to see an ultimate work of art embodied in the little velvet-black horse— He never doubted it was a Construct of some sort; it was too lovely, too fragile, too vulnerable to be natural. Like the Placids themselves.

The woman—a work of art herself, tall, faerie graceful, an elegantly exquisite symphony for the eye as well as ear—ran a caressing finger down the back of her pet and spoke without looking up. "But we are neutral. Surely you have been told. And according to the Treaty of New Ellay—"

Durstan growled and swallowed bitter bile. Told? Of course he'd been told; every Placid had told him, in almost the same words. But what they wouldn't tell him was too . . . He was too close to the end of his tether to be anything but blunt; besides, he was no diplomat. "The Treaty of New Ellay is millennia old, and Clarke was never a signatory to it, anyway. And we're at war. You're too dangerously close to be allowed to stay neutral. You'll either help us—wholeheartedly, with all your skill and as many of your people as we need—or you are the enemy, and we will take your world and whatever we need from it." In desperate tones, he added, "Won't you, for the sake of your world, for the sake of whatever you hold dear—tell me how to find your leaders, so I can make an agreement with them?"

"You're so young," she murmured, "and always, with the young, it is the either-or, the red or the black, the yes or the no."

Young, but a general; there were few old men left. Young, but trusted with a desperate mission. "We can't afford a potential enemy at our backs," Der Alte had said. "Not now." Not that he had needed to have it explained; when you're locked in an *à outrance* struggle . . .

The woman tickled the little animalcule on its ebony ribcage, and it pranced around on her palm. "You need never, never fear us," she murmured.

"I don't fear you," he said stiffly. "The strong don't fear. But you're too close; treachery would be too simple; even a weakling could slide a knife in your ribs, if he's standing behind you."

One sleek arched eyebrow rose. Like her pet, she was incredibly beautiful, though no more nor less than the other Placids he had seen, male and female. But if her body was lithe and young, her eyes were ageless and wise. "We are neutrals. More, we are pacifists. What we cannot give to you, we cannot give to those you quarrel—" He choked at the understatement: *quarrel!* "Those you quarrel with, likewise. We cannot; we are incapable. War has been bred out of us; fighting also, even harsh words. Our arts are for peaceful purposes only. We are no threat to you; we cannot be; it is not within us. Never."

"No?" He ground his teeth audibly; that this lovely untouched woman, in her lovely untouched garden, on her lovely untouched garden world where even the rain seemed to apologize for falling, could criticize him. Because he and his world had become caught in a death-and-death, to-the-last-corpse battle they hadn't really wanted, but had had to accept in self defense. "And if the Horde comes here, makes demands, threatens you—what then?"

She adjusted an emerald and liquid-light necklace a fraction higher on one blue-white shoulder. "Then we will tell them the same things we have told you. We are pacifists; we are neutral. We will be glad to give what we can, but nothing that will aid anyone in—" she shuddered "—waging war. War is not in us, and we cannot—"

Infuriated, frustrated, he lunged, grabbed, and stepped back, the beating ebony wings struggling frantically within his fist. "Do you think the Horde will *ask?* They will simply take what they want."

She seemed more puzzled than anything else. "Why should they take what we would gladly give, just as we will gladly give to you and yours? But nothing for war, nothing that can be used to wage war. We and ours are useless—"

"Even if something of yours is threatened? Will you—will any of your people stand by when something—someone—you love is endangered? Hurt? Perhaps killed?" Desperate wings beat within his fingers; he could feel the arrhythmic throb of the tiny heartbeat against his palm.

"I don't understand you. And I see you can't understand me." Contempt he could have accepted, fought; but there was nothing in her voice and eyes but pity. His hand clenched convulsively; there was a high thin screech that cut off abruptly. He looked down, half triumphant, half appalled. What lay in his opening hand was no longer lovely. It was no longer even recognizable, except as a piece of crushed and bloody meat.

"Why did you do that?" And her voice was rich and soft with compassion.

"To *make* you understand," he said fiercely. "To make you realize—it's so lovely here, so peaceful. But just over the horizon—if you do not help us, if we cannot stop them, the Horde will come. Here. They will destroy, they will crush you utterly. Your men will be mindlocked, will serve as cannon-fodder on the long ships; your women will be spoils of war, will be raped and bear more cannon fodder; your children will be stolen; all your arts and skills and factories and everything will be turned to war, to hatred, to help enslave the next world and the next. Can't you see, they must be stopped, they must be fought, and no one, no one! can afford to say, I will be neutral, I will sit with folded hands, I will let others fight my battles, I will—"

She was shaking her silver curl-crowned head. "You needn't fear for us. It won't be that way; we are pacifists; we do not wage war, or help others to do so. Come, it's a lovely day; let us enjoy it. The orchiroses will be opening, can't you smell the first sweet scents starting to drift on the breeze? And in the arbor I have some tay ready

to set out, a little tay on the tongue makes the orchiroses' scent more subtle, more pleasing. May I offer you tay, do you prefer the green or the lilac? I prefer the lilac myself, with orchiroses—''

He made a sort of animal howl. Worlds were battling against annihilation, and this idiot Placid babbled on about green or lilac tay! ''I killed your pet, you loved it, and I killed it, you'll never see it again, doesn't that mean *anything* to you!''

''Never see my little intrigant again? What an odd thing to say. Of course I'll see him again, whenever I wish. What lives in the mind can never die.'' And she held out her hand, horizontal, the fingers slightly cupped, and just for a second he, too, saw ebony grace circle and make a perfect four-hoof landing in her waiting palm.

''It was a sad accident,'' she went on, ''but I'm sure it couldn't be helped, and now we'll go to the—'' He howled again. One of them was mad, he or she, and he was beginning to wonder which it was.

''It wasn't an accident, I did it deliberately; and if the Horde comes, you'll lose more than an animal—''

''Of course it was an accident.'' She was shaking her head, gently, a schoolmarm guiding a beloved pupil coaxingly but firmly away from error. ''Any action whose total consequences we can't foresee is an accident. But don't worry, we—''

Futile fury hardened to cold rage. He clapped his hand on her shoulder—it was the hand that still held the remains of the animal—and blood and pulped flesh dribbled down the exquisitely embroidered tunic she was wearing, a crushed wing dangling momentarily from a scarlet flower with a woman's face in its heart before sliding to the ground. ''How do I get through to you?'' The ugly stain on her shoulder drew his eyes, and through the almost transparent material he saw also the delicate curves, the smooth blue-white skin. He put his other hand on her other shoulder. ''Is it you don't know what rape is like? *I'll show you—''*

But she smiled, and cupped his chin and cheek with a slender, loving hand. ''Why didn't you say you lacked comforting? We could have done that first, instead of talking. I have a marvelous bower, I planted the stock myself, cinnamon moss that releases the most beguiling scent when crushed, arvilla for virility, though I must say you don't seem to need that—''

With a snarl, he crushed the words out with a fierce kiss, couldn't she *ever* stop talking, and bore her down to the floor of the garden she had been standing in when he first spotted her, the garden that had somehow caught and held his eye in a world where everything seemed designed to attract and enmesh the senses. With a little spurt of malicious pleasure, he realized that she had landed on the mosaic walk instead of the soft mossy turf.

But even then she had the last word, because when he stopped the ferocious kiss long enough to take a hurried breath she said, ''In the sunlight, then, how delightful. Let me help you disrobe—'' And he shut that mouth of hers off again, and tried to show her what brutal rape was like—and was defeated by her willing enthusiasm, until in the end he

had to wonder who was raper, who was raped.

And after, as though nothing had occurred, as though the animal's blood didn't bedaub her tunic and body, as though there weren't tears in her intricate clothing from his impatience, she led him, bemused, into the bower and served him tay. Amber tay, because, she said, there was nothing like amber tay after pleasure.

And he bowed his head and could have wept.

She stopped her polite chatter, as though sensing that he wanted only silence; and his shoulders shook, and the bitter tears, frustration, fatigue, confusion, made his eyes burn. But a thought struck him, and he raised hot eyes to her. "Suppose you're with child?"

She tilted her head, as though she wasn't quite sure what the words meant, then her face cleared. "Do you want a child? I have several, you know. You may borrow one—more if you like—while you're here. Do you prefer a boy or a girl? I imagine you left children of your own at home, and you're rather missing them, aren't you. Children are so delightful, aren't they. Are your children young or older or even grown? I have children of all ages—"

He ground his teeth together. "I meant, suppose you bear *my* child."

For the first time her face screwed up and she looked upset. "Oh, dear, I didn't realize that you wanted a child as well as pleasure. You should have made yourself more clear beforehand. Now it's too late. But if you want to try again—"

He shook his head as though to clear fogs out of it. "You mean—you can't have a child—from what we just—"

"Of course not." Sculptured brows rose. "I didn't realize you wanted a child. You can't imagine I'd deny you a child if you felt so strongly about it, now can you. If I'd realized—but you said nothing about a child, nothing, only that you—"

"You mean, you can control at all times, whether you bear a child or not?"

The eyebrows went even higher. "Of course. Can't everyone? Why, how distressing it would be, to bear a child that wasn't desired by both parents!"

He ran a hand over his closecropped skull. "But if I'd said beforehand that I wanted a child—"

"Well, of course."

"And you—you don't mind bearing a—a stranger's child?"

Her smile was wicked. "A stranger's?" Then, "And I love children, they're so delightful. A woman can't have too many children."

His eyes narrowed. They'd taken heavy losses; they needed to refill their ranks. But he was beginning to believe her, at least about the unsuitability of the adult male Placids as soldiers. They'd all said the same, all the Placids he'd talked to, and the men—he winced. Soldiers? She'd make as good a soldier as any of the males he'd met. But babies, or youngsters too young to have been infected by this pacifist creed of theirs—no, maybe it was hereditary, too. But if the children had half their legacy from Clarke—if they were half-breeds . . . Wheel around us, desperate plights called for desperate measures. They were usually used on animals alone, but there *were* chemaccelerated

growth techniques—and chemtraining, too. . . . Maybe the so-pacifist Placids would supply sinews of war without realizing it! Cautiously, just to make sure, he asked, "If you bore my baby, would you insist on keeping it, or could I have it to raise?"

"Why, I have many children. And if you could not stay with me to help raise a child—" He shook his head and muttered, *Duty*. "—and you feel so strongly, have such a desire for a child, well, of course, I wish you well—"

"Can we start it—now—"

She caught his hand and smiled, a young girl's innocent smile. "Of course. Will you sample my bower, or do you wish sunlight on our skins again?"

"Whichever you prefer, this time," he said hoarsely.

She ran her free hand over his body with such practiced skill that he nearly threw her down on the delicately carved benches then and there. Instead he said, roughly, "Make a boy, if you can. For the rest—let it be of your choosing."

"There is no time but now. Now, and delight. I will choose. And, in time, you will have your boy." And she led him to the bower.

Clarke and Placidity. Placidity and Clarke. The ugly and wartorn, the beautiful and peaceful. Back and forth Durstan went, and each time he returned to the peacefulness of Placidity he looked a little more worn, a little more desperate, hair greyer, eyes deeper shadowed; once there was a synthicast about a new-grafted arm, and once there was an ugly burnscar that he hadn't had time to have more than treated so it wouldn't turn putrid.

They had decided not to take—or try to take—the planet Placidity after all, and maneuvering what they needed was painstaking and tedious—and Durstan's responsibility. After all, it had been his report (and their own strained resources, preventing a second front) that had opened the Top Brass's eyes to the uselessness of Placidity as a source of war supplies—and its usefulness as a source of food, as a place for R&R, and as a possible source of new trainees.

Not the adults; they were hopeless. Totally nonaggressive, and they hadn't even the concept of command. If they had a government, it was so nebulous he'd never been able to find it. Like the first day, when he had gone around first ordering, then asking, begging, cajoling to be taken to their leaders—and finally wandering around asking everyone he met or who caught his eye; there were no leaders, there was no government. No one to take orders; no one to give them. But there was communications, there was almost instant (for whoever wanted it) hi-technological transportation to anywhere on the planet, and there was an odd, almost instant consensus. The Placids welcomed guests freely, joyously, enthusiastically. So the soldiers of Clarke came down, had their period of calm and beauty, and the men asked the women of Placid for children. And in a year or two the Clarkes would have the nucleus of new units.

They needed something to hope for. The war was going badly; even the foodstuffs of Placid were welcome, because they freed a few more workers for other war efforts. Durstan almost resented his own time on Placidity even though it was producing so much, because it was

precious time lost to the war itself. Yet somehow, it became more and more a wrench to leave Placidity. It was *so* peaceful, so lovely, so full of love.

He lost track of the number of women who had promised him children, and even grew used to the unearthly beauty of the Placids.

He didn't feel particularly paternal, and he was a little surprised at what he saw when he emerged from his office after a long, tiring day. (The Placids had given them, with shrugs or cheerful graciousness, buildings, transport facilities, supplies, whatever.) She was standing at the base of the steps, obviously about to mount them, and he wouldn't have recognized her, except that she had another Pegasus, sunlight-amber instead of space-black, riding on one carved shoulder.

She greeted him as though it had been an hour since they parted, instead of many months, and smiling, invited him to a tayroom that was a particular favorite of hers, because it was set on a cliff and had a terrace designed so you could sit and admire the sun setting over the distant hills.

She was very pregnant, and as soon as he could, he asked about the coming baby.

"I wanted to know if you wanted the child immediately he's born," she informed him, "or wished to wait until later, perhaps after weaning."

He rubbed the new hand over the closecropped hair that would have shown grey if it had been long enough. A less maternal attitude he'd never encountered. It didn't seem to jibe with the love she spilled out to all around her. *Like all the women here*, he thought, puzzled.

"I'll have to make preparations," he said slowly. "I hadn't realized the child was due so soon."

"Oh," she laughed. "I can carry him longer if you wish. But I had heard you were returning to your own world shortly—"

"Yes." Back to strafing and attacks and bombing and destruction and desperate defenses and— He thrust it out of his mind. The war was going worse than even the most pessimistic predictions. The morale of the troops—he shuddered inwardly and tried to force hope. He had recently recommended even larger numbers be brought to Placidity for rest and calm. Maybe it would help.

"But I'll be back." If I survive. "Why don't you keep and care for the child until I return. I'll have—made provision for it by then."

"All right." Then, without a pause, "Look quickly, isn't that the most perfect shade of sunset. Not peach, not rose, there's almost a hint of green behind it. How immaculate it looks, how pure, how—"

Clarke was a hellish contrast to Placidity. Morale was down to nil; the main defenses were tattered; the striking forces got through practically continuously, so that destruction was everywhere; the ground heaved and shook from the bombs; the ear was constantly assaulted by explosions and screams.

But the reservation he'd planned was complete, though it had cost dearly in men, time, and resources to set it up. "But worth it," Der Alte—and he really

looked old now—said, "to have those kids from Placidity. The birthrate here is shot to pieces, maybe a side-effect, maybe something the Horde used deliberately. But if it weren't for the coming influx from Placidity, we could just watch ourselves disintegrate. When do you think the first shiploads will arrive?"

"They're being born now."

"Good," Der Alte nodded. "We've managed to speed up the process. A year—we must hold out another year!—and the Horde will never know what hit them. They think they have us on the run, they think they've got us—but they'll find the knife in their own backs instead, soon enough. A year. Just a year."

Gathering the babies—more accurately, the expectant mothers—was a minor problem. Placidity was a large world, though made of light materials so that its gravity was actually less than T-norm, with small oceans and little axial tilt; almost all of it was habitable, almost all of it was inhabited. The population was huge, but spread out, linked by communication and quick transportation, not proximity. It was another factor in the decision not to actively (or forcibly) recruit: the difficulty of scooping adult (and sullen and rebellious) conscripts off the planet almost one by one. But the expectant mothers could be brought to the maternity hospitals the amused but complaisant Placids had easily erected at the request of their "guests."

A year, Durstan thought. If we can only hold out another year.

But when he got to the first of the hospitals, it was to find total panic. All the staff seemed to be trying to talk to him at once. Until the chief of staff literally pulled him out of the clamoring crowd and took him into the wards and showed him a baby.

It had wings instead of arms.

"I always wanted a baby with wings," the mother smiled dreamily.

It had fingers at the end of the fragile wings; it could probably do any manipulation a normal human could do; but as for physical strength, it was obviously useless. The wings would be infinitely clumsy inside any kind of military vehicle, would be a constant source of irritation and distraction to workers around it. As a soldier, the thing was a dead loss.

"Is that what the fuss is about?" he asked the doctor. "All right, we can't use that one, but there must have been hundreds born in the last couple of weeks, and thousands, tens of thousands due soon. We'll—" Something in the doctor's expression stopped him.

"That's one of the pleasanter ones," the doctor said. "Are you prepared to see the others now?"

They were all different, though there were patterns discernible. They were all, even to his untrained eye, useless as soldiers. There was one with eyes where a normal human had ears, and a single circular ear on the top of its head. There was one with four slender arms, three fingers on each; and one with arms bifurcate at the elbow. There were babies with extremely elongated limbs, babies with limbs so short they were practically nonexistent. There were babies with tails, and babies with wings, and babies with fishlike finny mem-

branes running along their backs or sides. There were babies without necks, and babies with sagittal crests. Durstan stared and stared again, and his mouth tightened.

"They are *all*—"

The doctor nodded. "They could, many of them, be operated on and made normal. Except it would take time, a *lot* of time and effort, and would interfere with the chemacceleration of growth and learning. And even after the operations—assuming they were successful, of course—they'd be far more vulnerable than a normal soldier. In fact, in my opinion, they'd be useless as soldiers, totally useless, except possibly as behind-the-line button pushers; and even there I'd wonder."

"Maybe it's just the males, maybe if we got the Placids to supply females—"

The doctor snorted. "No doubt they'd be as useless as these. The Placids have obviously undergone a mutation. Among themselves they're all right, but when you cross-breed, you get—" his hand gestured, "—these."

Durstan thought of all their desperate plans, of the thin line of defenders growing ever thinner, and felt the great red bombs going off inside his head. When the explosions had died enough for him to think rationally again, he was in a familiar garden.

"Did you know," someone said, and the voice sounded like his, "that the babies would all be mutates, that the child you bore me is a mutate?"

"But they're lovely," she said, "or will be. Aren't they lovely?"

"They are ugly," he snarled, and she flinched as if he'd slapped her. "They are ugly and useless."

"That just isn't so." She laid a slender hand on his arm. "We spent a great deal of time and effort devising those children for you and your people. Some are flyers, some are dancers, some will make marvelous acrobats, or skilled artists, or—and they are all lovely, the most lovely beings our people could design."

His mouth opened and shut. "You *deliberately* produced those—those—"

"Aren't you pleased, wasn't it a delightful surprise. Of course, we couldn't send children offworld who might be capable of horrible warrish actions, and since they were going too young to be trained in our philosophy, we had to devise a means of protecting them. You can't make soldiers out of people who are all physically different, out of people too fragile to hold a weapon. But they're lovely, they're all lovely. Or will be, when they're properly grown up."

He took a deep breath, and held onto his sanity with broken fingernails. "Perhaps you are right. I lack your obvious talent for—for predicting the man from the infant."

She laughed, a merry, musical trill. "No wonder you were so upset. But believe me, when they're grown they'll be incredibly lovely; we're very skilled in biosculpting. But babies are proportioned differently from adults; that's what confused you."

"But you—" he had to fight to bring it out, "when we can no longer stop them—the Horde will come—what then—"

She laughed again. "They won't be the first, you know. Conquerors have

come here before. And left finally, when they realized that they can never make us do anything we don't want to do, though of course we always want to help our guests as much as we can. Without going against our beliefs. We are pacifists, you know. Total pacifists."

"Yes," he sighed. "I know." A gulp and a pause. "Do you—do you think *I* could learn to be one of you?"

She cocked her head on one side and studied him, this stranger who had marched into her life, tried to rape her and been defeated only because she seduced him first, sired a child on her—and said slowly, "I don't want to hurt your feelings, but—"

"The answer is no."

"We-eeeellll," she sighed. "If you wish, we could *try*. But I'm afraid you feel so strongly about things, about the wrong things, you know. You can't thrust other affairs out of your mind to properly cherish the moment. You don't understand how the past lives always in our memories; that nothing can be taken away as long as it survives in memory, that the future is only a dream, a possibility, and only the present is reality. We train our children from infancy in our beliefs, you see, and you—have been trained all your life in other ways. Whether you could succeed in adapting yourself . . . we will try our best, if you wish."

"No." For a second he'd wanted it more than he'd ever wanted anything in his life: wanted to stay, wanted to learn this perfect tranquility that nothing could mar. But he had realized, in the next second, what he would have to give up to achieve it. When she gave that gentle, noncommittal refusal, he'd almost wanted to cut his throat in sheer disappointment; but it passed. He was a soldier, with a war to fight, a war made worse by the disastrous mistake he'd made here. Maybe he could make it up elsewhere, maybe earn back his own self-respect. He could only try his best.

"Will I see you again?" she was saying.

"I think not."

"A pity. You make love skillfully."

"So do you," he told her honestly. "But I think this is—it must be—farewell."

"I'm sorry. May I wish you all best?"

His mouth twitched. "If you remember me tomorrow—you may."

"But I never forget any of my lovers, any of my friends," she said, and he knew it was truth.

"If you would do something for me," he said slowly, "would you take care of our child? I find the war goes worse than I'd hoped, and I would prefer him to remain here, in safety."

"All right," she agreed immediately. "But we hoped that those lovely children would serve as an anodyne to the horrors of war."

"It's past that now." A thought occurred, a last hope, and he spoke it aloud. "What would happen to a baby conceived by you and a Placid male that was taken offplanet?"

Her eyebrows raised. "There is a strong bond between parents and children here. Either of the parents may take the child, complete the bond; in an emergency a close relative of either parent may also do so, but if the child is

taken away from both parents, from all kin—the child will die.''

He believed her. It was all part of the pattern. ''I see. And thank you. Thank you for everything.''

''My pleasure.'' And because he couldn't help himself, he took her to the bower one last time, asking her beforehand to make a girl, the most beautiful girl on the planet, to keep and bring up in memory of him.

And then he left her, and shortly thereafter left the planet: for the last time, for that last-ditch desperate fight whose end he already knew.

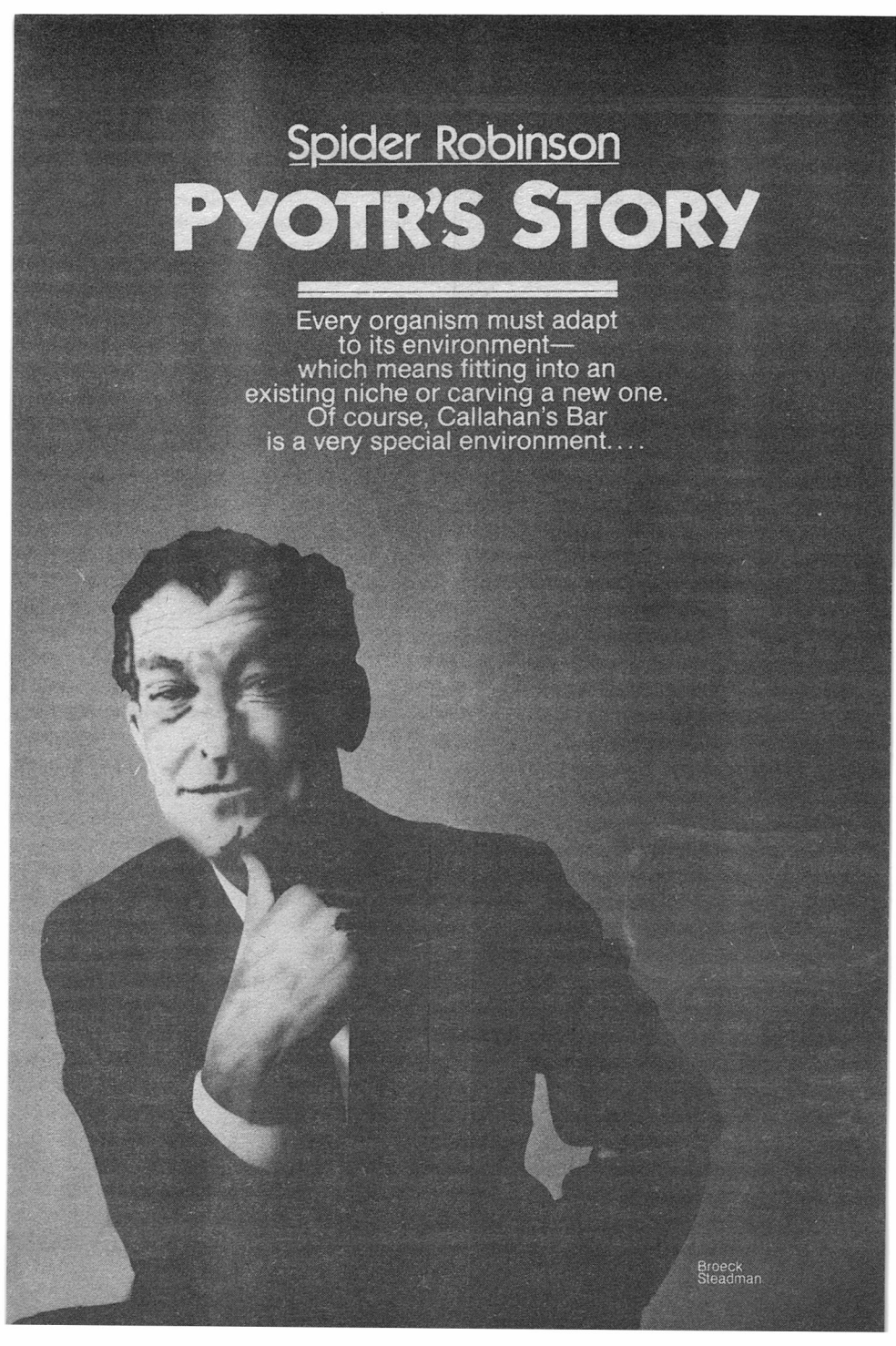
And he knew, too, when the Clarkes were destroyed, the Horde would come, to the green and aggressively peaceful world of Placidity. The Horde, who—up to now—had never lost a war.

He could almost feel sorry for them. ■

Spider Robinson

PYOTR'S STORY

Every organism must adapt
to its environment—
which means fitting into an
existing niche or carving a new one.
Of course, Callahan's Bar
is a very special environment....



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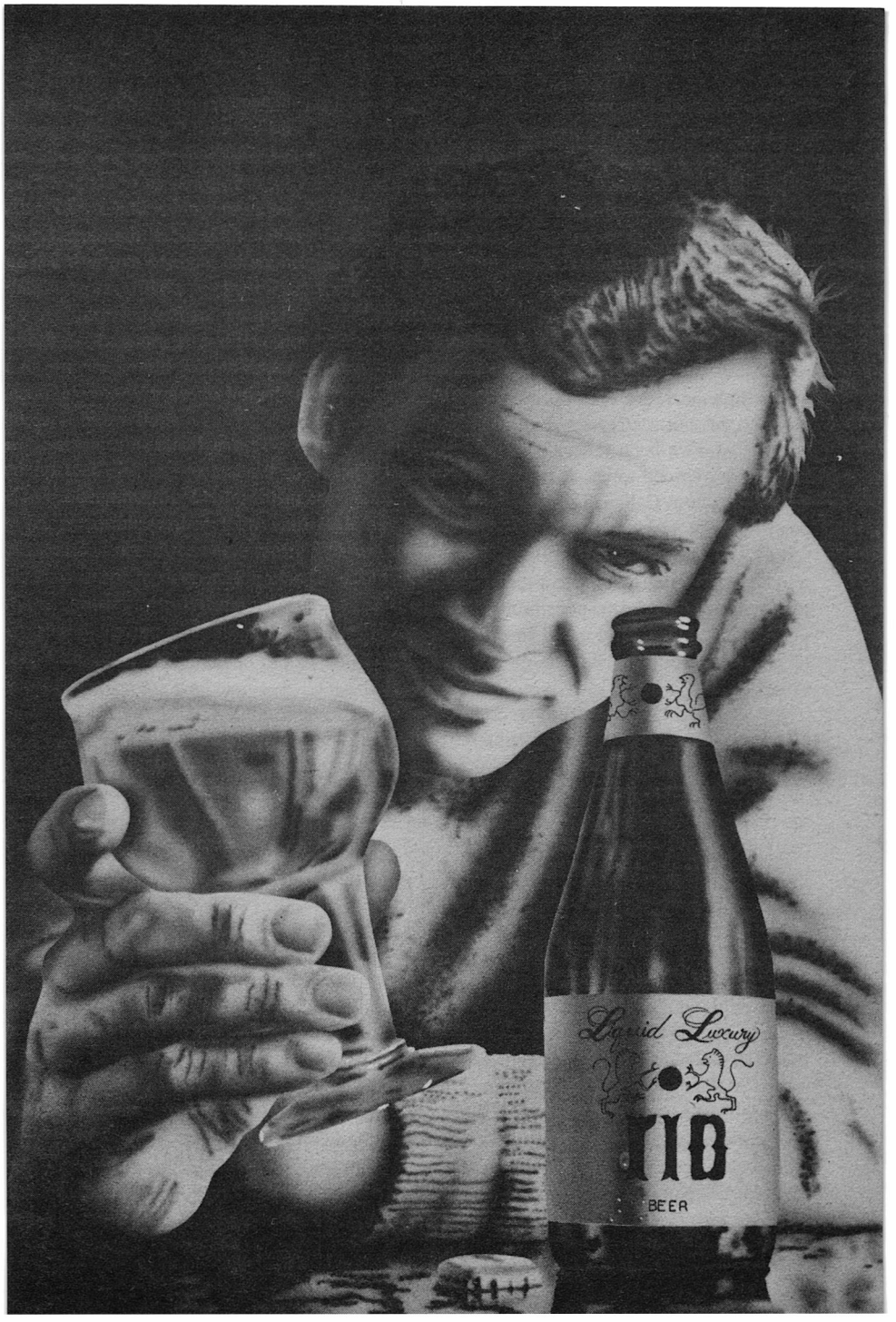

Liquid Luxury
TIB
BEER

Two total drunks in a single week is much higher than average for anyone who goes to Callahan's Place—no pun intended.

Surely there is nothing odd about a man going to a bar in search of oblivion. Understatement of the decade. But Callahan's Place is what cured me of being a lush, and it's done the same for others. Hell, it's helped keep Tommy Janssen off of *heroin* for five years now. I've gotten high there, and once or twice I've gotten tight, but it's been a good many years since I've been flat-out, helpless drunk—or yearned to be. A true drunk is a rare sight at Callahan's. Mike Callahan doesn't just pour his liquor, he serves it; to get pissed in his Place you must convince him you have a need to, persuade him to take responsibility for you. Most bars, people go to in order to get blind. Mike's customers go there to see better.

But that night I had a need to completely dismantle my higher faculties, and he knew that as I crossed the threshold. Because I was carrying in my arms the ruined body of Lady Macbeth. Her head dangled crazily, her proud neck broken clean through, and a hush fell upon Callahan's Place as the door closed behind me.

Mike recovered quickly; he always does. He nodded, a nod which meant both hello and something else, and glanced up and down the bar until he found an untenanted stretch. He pointed to it, I nodded back, and by the time I reached it he had the free lunch and the beer nuts moved out of the way. Not a word was said in the bar—everyone there understood my feelings as well as Callahan did. Do you begin to see how one could stop being an alcoholic there? Someone, I think it was Fast Eddie, made a subvocal sound of empathy as I laid the Lady on the bar-top.

I don't know just how old she is. I could find out by writing the Gibson people and asking when serial number 427248 was sent out into the world, but somehow I don't want to. Somewhere in the twenty-to-thirty range, I'd guess, and she can't be less than fifteen, for I met her in 1966. But she was a treasure even then, and the man I bought her from cheated himself horribly. He was getting married *much* too quickly and needed folding money in a hurry. All I can say is, I hope he got one hell of a wife—because I sure got one hell of a guitar.

She's a J-45, red sunburst with a custom neck, and she clearly predates the Great Guitar Boom of the Sixties. She is *hand-made,* not machine-stamped, and she is some forgotten artisan's masterpiece. The very best, top-of-the-line Gibson made today could not touch her; there are very few guitars you can buy that would. She has been my other voice and the basic tool of my trade for a decade and a half. Now her neck, and my heart, were broken clean through.

Long-Drink McGonnigle was at my side, looking mournfully down past me at the pitiful thing on the bar. He touched one of the sprawled strings. It rattled. Death rattle. "Aw," he murmured.

Callahan put a triple Bushmill's in my hand, closed my fingers around it. I made it a double, and then I turned and walked to the chalk line on the floor, faced the merrily crackling fireplace from a distance of twenty feet. People

waited respectfully. I drank again while I considered my toast. Then I raised my glass, and everybody followed suit.

"To the Lady," I said, and drained my glass and threw it at the back of the fireplace, and then I said, "Sorry, folks," because it's very difficult to make Mike's fireplace emit shards of glass—it's designed like a parabolic reflector with a shallow focus—but I had thrown hard enough to spatter four tables just the same. I know better than to throw that hard.

Nobody paid the least mind; as one they chorused, "To the Lady" and drank, and when the barrage was finished, *eight* tables were littered with shards.

Then there was a pause, while everybody waited to see if I could talk about it yet. The certain knowledge that they were prepared to swallow their curiosity, go back to their drinking and ignore me if that were what I needed, made it possible to speak.

"I was coming offstage. The Purple Cat, over in Easthampton. Tripped over a cable in the dark. Knew I was going down, tried to get her out from under me. The stage there is waist-high, her head just cleared it and wedged in under the monitor speaker. Then my weight came down on her and . . ." I was sobbing. ". . . and she *screamed,* and I . . ."

Long-Drink wrapped me in his great long arms and hugged tight. I buried my face in his shirt and wept. Someone else hugged us both from behind me. When I was back under control both let go and I found a drink in my hand. I gulped it gratefully.

"I hate to ask, Jake," Callahan rumbled. "I'm afraid I already know. Is there any chance she could be fixed?"

"Tell him, Eddie." But Eddie wasn't there; his piano stool was empty. "All right, look, Mike: there are probably ten shops right here on Long Island that'd accept the commission and my money, and maybe an equal number who'd be honest enough to turn me away. There are maybe five real guitar-makers in the whole New York area, and they'd all tell me to forget it. There might be four Master-class artisans still alive in all of North America, and their bill would run to four figures, maybe five, assuming they thought they could save her at all." Noah Gonzalez had removed his hat, with a view toward passing it; he put it back on. "*Look at her.* You can't *get* wood like that any more. She's got a custom neck and fingerboard, skinnier'n usual, puts the strings closer together—when I play a normal guitar it's like my fingers shrunk. So a rebuilt neck would have less strength, and the fingerboard'd have to be hand-made. . . ." I stopped myself. I finished my drink. "Mike, she's dead."

Long-Drink burst into tears. Callahan nodded and looked sad, and passed me another big drink. He poured one for himself, and *he* toasted the Lady, and when that barrage was over he set 'em up for the house. The folks treated me right; we had a proper Irish wake for the Lady, and it got pretty drunk out. We laughed and danced and reminisced and swapped lies, created grand toasts; everyone did it up nice. The only thing it lacked was Eddie on the piano; he had disappeared and none knew where. But a wake for Lady Macbeth *must* include the voice of her long-time colleague—so

Callahan surprised us all by sitting down and turning out some creditable barrelhouse. I hadn't known he could play a note, and I'd have sworn his fingers were too big to hit only one key at a time, but he did okay.

Anyhow, when the smoke cleared, Pyotr ended up driving better than half of us home, in groups of three—a task I wouldn't wish on my senator.

I guess I should explain about Pyotr. . . .

The thing about a joint like Callahan's Place is that it could not possibly function without the cooperation of all its patrons. It takes a lot of volunteer effort to make the Place work the way it does.

Some of this is obvious. Clearly, if a barkeep is going to allow his patrons to smash their empties in the fireplace, they must all be responsible enough to exercise prudence in this pursuit—and furthermore they must have better than average aim. But perhaps it is not obvious, and so I should mention, that there is a broom-and-scoop set on either side of the hearth, and whenever an occasional wild shard ricochets across the room, one of those broom-and-scoops just naturally finds its way into the hands of whoever happens to be nearest, without anything being said.

Similarly, if you like a parking lot in which anarchy reigns, with cars parked every which way like goats in a pen, you must all be prepared to pile outside together six or ten times a night, and back-and-fill in series until whoever is trying to leave can get his car out. This recurring scene looks rather like a grand-scale Chinese Fire Drill, or perhaps like Bumper Cars for Grownups; Doc Webster points out that to a Martian it would probably look like some vast robot orgy, and insists on referring to it as Autoeroticism.

Then there's closing ritual. Along about fifteen minutes before closing, somebody, usually Fast Eddie Costigan the piano player, comes around to all the tables with a big plastic-lined trash barrel. Each table has one of those funnel-and-tin-can ashtrays; someone at each table unscrews it and dumps the butts into the barrel. Then Eddie inserts two corners of the plastic tablecloth into the barrel, the customer lifts the other two corners into the air, and Eddie sluices off the cloth with a seltzer bottle. Other cleanup jobs, mopping and straightening and the like, just seem to get done by somebody or other every night; all Mike Callahan ever has to do is polish the bartop, turn out the lights and go home. Consequently, although he is scrupulous about ceasing to sell booze at legal curfew, Mike is in no hurry to chase his friends out, and indeed I know of several occasions on which he kept the Place open round the clock, giving away nosepaint until the hour arrived at which it became legal to sell it again.

And finally, of course, there's old Pyotr. You see, no one tight drives home from Callahan's bar. When Mike decides that you've had enough—and they'll never make a Breathalyzer as accurate as his professional judgment—the only way in the world you will get another drink from him is to surrender your car keys and then let Pyotr, who drinks only distilled water, drive you home when you fold. The next morning you drive Pyotr back to his

cottage, which is just up the street from Callahan's, and if this seems like too much trouble, you can always go drink somewhere else and see what that gets you.

For the first couple of years after Pyotr started coming around, some of us used to wonder what he got out of the arrangement. None of us ever managed to get him to accept so much as a free breakfast the morning after, and how do you buy a drink for a man who drinks distilled water? Oh, Mike gave him the water for free, but a gallon or so of water a night is pretty poor wages for all the hours of driving Pyotr put in, in the company of at least occasionally troublesome drunks, not to mention the inconvenience of spending many nights sleeping on a strange bed or couch or floor. (Some of the boys, and especially the ones who want to get pie-eyed once in a while, are married. Almost to a woman, their wives worship Pyotr; are happy to put him up now and then.)

For that matter, none of us could ever figure out what old Pyotr did for a living. He never had to be anywhere at any particular time next morning, and he was never late arriving at Callahan's. If asked what he did he would say, "Oh, a little bit of everything, whenever I can get it," and drop the subject. Yet he never seemed to be in need of money, and in all the time I knew him I never once saw him take so much as a peanut from the Free Lunch.

(In Callahan's Place there *is* a free lunch—supported by donations. The value of the change in the jar is almost always greater than the value of the Free Lunch next to it, but nobody watches to make sure it stays that way. I mind me of a bad two weeks when that Free Lunch was the only protein I had, and nobody so much as frowned at me.)

But while he is a bit on the pale side for a man of Middle European stock, Pyotr certainly never looks undernourished, and so there was never any need for us to pry into his personal affairs. Me, I figured him for some kind of a pensioner with a streak of pure altruism, and let it go.

He certainly looks old enough to be a pensioner. Oh, he's in very good shape for his age, and not overly afflicted with wrinkles, but his complexion has that old-leather look. And when you notice his habit of speaking into his cupped hand, and hear the slight lisp in his speech, and you realize that his smiles never seem to pry his lips apart, you get the idea that he's missing some bridgework. And there's something old about his eyes. . . .

Anyway, Pyotr was busier than usual that night, ferrying home all the casualties of Lady Macbeth's wake. It took quite a while. He took three at a time, using the vehicle of whoever lived furthest away, and taxied back for the next load. Two out of every three drunks would have to taxi back to Callahan's the next day for their cars. I was proud of the honor being paid my dead Lady. Pyotr and Callahan decided to save me for last. Perhaps on the principle that the worst should come last—I was *pissed,* and at the stage of being offensively cheerful and hearty. At last all the other wounded had been choppered out, and Pyotr tapped me on one weaving shoulder.

"So they weld—well hell, hi, Pyotr,

wait a half while I finish telling Mike this story—they weld manacles on this giant alien, and they haul him into court for trial, and the first thing he does, they go to swear him in and he swallows the bailiff whole.''

Mike had told *me* this gag, but he is a very compassionate man. He relit his cheroot and gave me the straight line. ''What'd the bailiff do?''

''His job, o'course—he swore, in the witness. Haw haw!'' Pyotr joined in the polite laughter and took my arm. ''Time to bottle it up, Pyotr you old lovable Litvak? Time to scamper, is it? Why should you have to haul my old ashes, huh? Gimme my keys, Mike, I'm not nearly so drunk as you think—I mean, so thunk as you drink. Shit, I said it right, I *must* be drink. All right, just let me find my pants—''

It took both of them to get me to the car. I noticed that every time one of my feet came unstuck from the ground, it seemed to take enormous effort to force it back down again. A car seat leaped up and hit me in the ass, and a door slammed. ''Make sure he takes two aspirins before he passes out for good,'' Callahan's voice said from a mile away.

''Right,'' Pyotr said from only a few blocks distant, and my old Pontiac woke up grumbling. The world lurched suddenly, and we fell off a cliff, landing a million years later in white water. I felt nausea coming on, chattered merrily to stave it off.

''Splendid business, Pyotr old sock, absolutionally magnelephant. You drive well, and this car handles well on ice, but if you keep spinning like this we're going to dend up in the itch—mean, we'll rote off the ride, right? Let's go to the Brooklyn Navy Yard and try to buy a drink for every sailor on the *U.S.S. Missouri*—as a songwriter I'm always hoping to find the Moe juiced. Left her right there on the bartop, by all the gods! Jus' left her and—turn around, God damn it, I left my Lady back there!''

''It is all right, Jake. Mr. Callahan will leave her locked up. We will wake her for several days, correct Irish custom, yes? Even those not present tonight should have opportunity to pay their respects.''

''Hell, yeah, sure. Hey! *Funeral.* How? Bury or cremate?''

''Cremation would seem appropriate.''

''Strings? Gearboxes? Heavy metal air pollution? Fuggoff. Bury her, dissolve in acid, heave her into the ocean off Montauk Point and let the fish lay eggs in her sounding box. Know why I called her Lady Macbeth?''

''No, I never knew.''

''Used to sneak up and stab me inna back when didn't expect it. Bust a string, go out of tune, start to buzz on the high frets for no reason at all. Treacherous bitch. Oh, *Lady!*''

''You used each other well, Jake. Be glad. Not many have ever touched so fine an instrument.''

''Goddam right. Stop the car, please. I want to review inputs.''

''Open the window.''

''I'll get it all over the—''

''It's raining. Go ahead.''

''Oh. Thought that was me. Right ho. *Oh.*''

Eventually the car stopped complaining and I got sprinkled on and then my house opened up and swallowed me.

"Forget aspirins," I mumbled as my bed rushed at me. "Don' need 'em."

"You'll be sorry tomorrow."

"I'm sorry now."

The bed and I went inertialess together, spun end over end across the macrocosmic Universe.

I was awakened by the deafening thunder of my pulse.

I knew that I was awake long before I had the power to raise my eyelids. I knew it because I knew I lacked the imagination to dream a taste like that in my mouth. But I was quite prepared to believe that the sleep had lasted at least a century; I felt *old*. That made me wonder if I had snored right through the wake—*the wake!* Everything came back in a rush; I flung open my eyes, and two large icicles were rammed into the aperture as far as they would go, the points inches deep in my forebrain. I screamed. That is, I tried to scream, and it sounded like a scream—but my pulse sounded like an empty oil tank being hit with a maul, so more likely what I did was bleat or whimper.

Something heavy and bristly lay across me; it felt like horsehair, with the horse still attached. I strained at it, could not budge it. I wept.

The voice spoke in an earsplitting whisper. "Good morning, Jake."

"Fuck you too," I croaked savagely, wincing as the smell of my breath went past my nose.

"I warned you," Pyotr said sadly.

"Fuck you twice. Jesus, my eyelashes hurt. What is *lying* on me?"

"A cotton sheet."

"Gaah."

"You should have accepted the aspirins."

"You don't understand. I don't get hangovers."

Pyotr made no reply.

"Damn it, I don't! Not even when I was a lush, not the first time I ever got smashed, not *ever*. Trick metabolism. Worst that ever happens is I wake up not hungry—but no head, no nausea, no weakness, never."

Pyotr was silent a long time. Then, "You drank a good deal more than usual last night."

"Hell, I been drunker'n *that*. Too many times, man."

"Never since I have known you."

"Well, that's true. Maybe that's . . . no, I've fallen off the wagon before. I just don't get hangovers."

He left the room, was gone awhile. I passed the time working on a comprehensive catalog of all the places that hurt, beginning with my thumbnails. I got quite a lot of work done before Pyotr returned; I had gotten halfway through the hairs on my forearms when he came in the door with a heavily laden tray in his hands. I opened my mouth to scream, "Get that *food* out of here!"—and the smell reached me. I sat up and began to salivate. He set the tray down on my lap and I ignored the pain and annihilated bacon, sausage, eggs, cheese, onions, green peppers, hot peppers, bread, butter, English muffins, jam, orange juice, coffee, and assorted condiments so fast I think I frightened him a little. When I sank back against the pillows the tray contained a plate licked clean, an empty cup and glass, and a fork. I was exhausted, and still hurt in all the same places—that is, in all places—but

I was beginning to believe that I wanted to live. "This is crazy," I said. "If I *am* hung over, the concept of food ought to be obscene. I never ate that much breakfast in my life, not even the morning after my wedding night."

I could *see* Pyotr now, and he looked embarrassed, as though my appetite were his fault.

"What time is it?"

"Seven P.M."

"God's teeth."

"It was four in the morning when we arrived here. You have slept for thirteen hours. I fell asleep at noon and have just awakened. Do you feel better now that you have eaten?"

"No, but I concede the trick is possible. What's good for total bodily agony?"

"Well, there is no cure. But certain medications are said to alleviate the symptoms."

"And Callahan's has opened by now. Well, how do we get me to the car?"

In due course we got to Callahan's, where Lady Macbeth lay in state on top of the bar. The wake was already in full swing when we arrived and were greeted with tipsy cheers. I saw that it was Riddle Night: the big blackboard stood near the door, tonight's game scrawled on it in the handwriting of Doc Webster. On Riddle Night the previous week's winner is Riddle Master; each solved riddle is good for a drink on the Riddle Master's tab. The Doc looked fairly happy—every *un*solved riddle is a free drink for him, on the house.

The board was headed "PUBLIC PERSONALITIES." Beneath that were inscribed the following runes:

I.
- a) Hindu ascetic; masculine profession
- b) tramp; crane
- c) profligate; cheat
- d) span; tavern, money
- e) fish; Jamaican or Scottish male, caviar
- f) certainly; Irish street
- g) handtruck; forgiveness

II.
- a) pry; manager
- b) smart guy; Stout
- c) chicken coop; more loving
- d) bandit; crimson car
- e) coffin; baby boy
- f) tote; subsidy
- g) moaning; achieve

III.
- a) irrigated; laser pistol
- b) Nazi; cook lightly
- c) British punk; knowledge, current
- d) chicken coop; foreplay
- e) wealthier; nuts to

IV.
- a) Italian beauty; stead, depart, witness
- b) toilet; auto, senior member
- c) be dull; Carmina Burana
- d) grass; apprentice, younger
- e) valley; odd
- f) burns; leer at

Example: penis; truck = peter; lorry = Peter Lorre. Extra drinks for identifying Categories I-IV.

People were staring at the board, seemed to have *been* staring at it for some time, but none of the riddles were checked off yet. I paid my respects to the Lady, said hello to Mike, accepted a large glass of dog-hair. Then, delib-

erately, I turned away from the Lady and toward the board. (Why don't you take a crack at it before reading further?)

"Got one," I said at once, and allowed Long-Drink to help me to the board. "First one in line," I said, marking with chalk. "Hindu ascetic; masculine profession. That's Jain; Man's Field, and Category One is Actresses."

Doc Webster looked pained. "Say, Film Women," he suggested. "More accurate. Mike, one for Jake on me."

Given the category, Section I was fairly simple. I got b) 'Bo; Derrick. Long-Drink McGonnigle got c) Rakehell; Welsh. Tommy Janssen figured out that d) and e) were Bridge It; Bar Dough and Marlin; Mon Roe. Josie Bauer took f) Surely; Mick Lane and g) Dolly; Pardon. We collected our drinks gleefully.

I suspected that the second category would be Male Actors (or Film Men), but kept my mouth shut, hoping I could figure them all out and do a sweep before anyone else twigged. This turned out to be poor strategy; I got a), b), d) and f), but while I was puzzling over the rest, Shorty Steinitz spoke up. "The category is Male Film Stars, and the first one is Jimmy; Steward!" I tried to jump in at once, but Long-Drink drowned me out. "Got b): Alec; Guinness! Hey, and f) has to be Carry; Grant."

"And d)," I said irritably, "is Robber; Red Ford. But what about the others?" We stared at them in silence for awhile.

"A hint," Doc Webster said at last. "With reference to g), the first name is what I'll be doing if you do the second."

"Got it!" Long-Drink cried. "Keenin'; Win." The Doc grimaced. Callahan was busy keeping score and distributing the prizes, but he had attention left to spare. "That third one there, c): That has to be Hennery; Fonder."

There was a pause, then. Nobody could figure out "coffin; baby boy." (Can you?) After awhile we turned our attention to the remaining two categories, but the silence remained unbroken. The Doc looked smug. "No hurry, gents and ladies," he said. "Closing time isn't for several hours yet." We all glared at him and thought hard.

Surprisingly, it was Pyotr who spoke up. "I have a sweep," he stated. "Category IV in its entirety."

Folks regarded him with respectful interest. He was committed now: if he missed *one*, he would owe the Doc all six drinks. The Doc looked startled, but game—he seemed to think he had an ace up his sleeve. "Go ahead, Pyotr."

"The category is Famous Monsters." The Doc winced. "The first is Bella; Lieu Go See." Applause. "Then John; Car a Dean." More applause.

"Not bad," the Doc admitted. "Keep going."

"The next two, of course, are among the most famous of all. Be dull; Carmina Burana *has* to be Bore Us; Carl Orff. . . ." He paused to sip one of the three drinks Callahan had passed him.

"Brilliant, Pyotr," I said, slapping him on the back. "But I'm still stumped for the last three."

"That is because they are tricky. The first is tortured, and the last two are obscure."

"Go ahead," Doc Webster said grimly.

"The first is the famous Wolfman:

Lawn; Trainee Junior.'' Delighted laughter and applause came from all sides. ''The others are both Frankenstein's Creature, but it would require an historian of horror films to guess both. Glenn Strange played the Monster in at least three movies . . .'' The Doc swore. ''. . . and the last shall be first: the man who played the Monster in the very first film version of *Frankenstein*.''

''But we already had Karloff,'' I protested.

''No, Jake,'' Pyotr said patiently. ''That was the first *talkie* version. The very first was released in 1910, and the Monster was played by a man with the unusual name of Charles Ogle. Read 'chars' for 'burns' and you come close enough.''

We gave him a standing ovation—in which the Doc joined.

All of this had admirably occupied my attention, from almost the moment of my arrival. But before I turned to a study of Category III, I turned to the bar to begin the third of the four drinks I had won—and my gaze fell on the ruined Lady. She lay there in tragic splendor, mutely reproaching me for enjoying myself so much while she was broken. All at once I lost all interest in the game, in everything but the pressing business of locating and obtaining oblivion. I gulped the drink in my hand and reached for the next one, and a very elderly man came in the door of Callahan's Place with his hands high in the air, an expression of infinite weariness on his face. He was closely followed by Fast Eddie Costigan, whose head just about came up to the level of the elderly man's shoulder blades. Conversations began to peter out.

I just had time to recall that Eddie had vanished mysteriously the night before, and then the two of them moved closer and I saw why everybody was getting quiet. And why the old gent had his hands in the air. I didn't get a real good look, but what Eddie had in his right hand, nestled up against the other man's fourth lumbar vertebra, looked an awful lot like a Charter Arms .38. The gun that got Johnny Lennon and George Wallace.

I decided which way I would jump and put on my blandest expression. ''Hi, Eddie.''

''Hi, Jake,'' he said shortly, all his attention on his prisoner.

''I tell you for the last time, Edward—'' the old gent began in a Spanish accent.

''Shaddap! Nobody ast you nuttin'. Get over dere by de bar an' get to it, see?''

''Eddie,'' Callahan began gently.

''Shaddap, I said.''

I was shocked. Eddie *worships* Callahan. The runty little piano man prodded with his piece, and the old Spaniard sighed in resignation and came toward me.

But as he came past me, his expression changed suddenly and utterly. If aged Odysseus had come round one last weary corner and found Penelope in a bower, legs spread and a sweet smile on her lips, his face might have gone through such a change. The old gent was staring past me in joyous disbelief at the Holy Grail, at the Golden Fleece, at the Promised Land, at—

—at the ruined Lady Macbeth.

"Santa Maria," he breathed. "Madre de Dios."

Years lifted from his shoulders, bitter years, and years smoothed away from his face. His hands came down slowly to his sides, and I saw those hands, really *saw* them for the first time. All at once I knew who he was. My eyes widened.

"Montoya," I said. "Domingo Montoya."

He nodded absently.

"But you're dead."

He nodded again, and moved forward. His eyes were dreamy, but his step was firm. Eddie stood his ground. Montoya stopped before the Lady, and he actually bowed to her. And then he looked at her.

First he let his eyes travel up her length the way a man takes in a woman, from the toes up. I watched his face. He almost smiled when he reached the bridge. He almost frowned when he got to the scars around the sounding hole that said I had once been foolish enough to clamp a pick-up onto her. He did smile as his gaze reached the fingerboard and frets, and he marveled at the lines of the neck. Then his eyes reached the awful fracture, and they shut for an instant. His face became totally expressionless; his eyes opened again, studied the wreck with dispassionate thoroughness, and went on to study the head.

That first look took him perhaps eight seconds. He straightened up, closed his eyes again, clearly fixing the memory forever in his brain. Then he turned to me. "Thank you, sir," he said with great formality. "You are a very fortunate man."

I thought about it. "Yes, I believe I am."

He turned back and looked at her again, and now he *looked*. From several angles, from up close and far away. The joining of neck to body. The joining of head to neck-stub. "Light," he said, and held out his hand. Callahan put a flashlight into it, and Montoya inspected what he could of Lady Macbeth's interior bracings through her open mouth. I had the damndest feeling that he was going to tell her to stick out her tongue and say "Ah!" He tossed the flashlight over his shoulder—Eddie caught it with his free hand—and stooped to sight along the neck. "Towel," he said, straightening. Callahan produced a clean one. He wiped his hands very carefully, finger by finger, and then with the tenderness of a mother bathing her child he began to touch the Lady here and there.

"Jake," Long-Drink said in hushed tones. "What the hell is going on? Who *is* this guy?"

Montoya gave no sign of hearing; he was absorbed.

"Remember what I said last night? That there are only maybe four Master-class guitar makers left in the country?"

"Yeah. This guy's a Master?"

"*No,*" I cried, scandalized.

"Well then?"

"There is one rank higher than Master. Wizard. There have been a dozen or so in all the history of the world. Domingo Montoya is the only one now living." I gulped Irish whiskey. "Except that he died five years ago."

"The hell you say."

Fast Eddie stuffed the gun into his belt and sat down on his piano stool. "He didn't die," he said, signalling

Callahan for a rum. "He went underground."

I nodded. "I think I understand."

Long-Drink shook his head. "I don't."

"Okay, Drink, think about it a second. Put yourself in his shoes. You're Domingo Montoya, the last living guitar Wizard. *And all they bring you to work on is shit.* There are maybe fifty or a hundred guitars left on the planet worthy of your skill, most of which you made yourself, and they're all being *well* cared for by careful and wealthy owners. Meanwhile fools keep coming in the door with their broken toys, their machine-stamped trash, asking Paul Dirac to do their physics homework for them. Damnfool Marquises who want a guitar with the name of their mistress spelled out in jewels on the neck; idiot rock stars who want a guitar shaped like a can opener; stupid rich kids who want their stupid Martins and stupid Goyas outfitted with day-glo pickguards by the man everyone knows is the last living Wizard. Nobody wants to pay what honest materials cost nowadays, nobody wants to wait as long as true Quality requires, everybody wants their goddamn lily gilded, and *still* you can't beat them off with a club, because you're Domingo Montoya. You triple your fee, and then triple it again, and then square the result, and still they keep coming with their stupid broken trash—or worse, they purchase one of your own handmade masterworks, and use it ignobly, fail to respect it properly, treat it like some sort of common utensil." I glanced at Montoya. "No wonder he retired."

Montoya looked up. "I have not retired. If God is kind I never will. But I no longer sell my skill or its fruits, and I use another name. I did not believe it was possible to locate me."

"Then how—"

"Two years ago I accepted an apprentice." My brows went up; I would not have thought there was anyone worthy to be the pupil of Domingo Montoya. "He is impatient and lacks serenity, but both of these are curable with age. He is not clumsy, and his attitude is good." He glowered at Eddie. "*Was* good. He swore secrecy to me."

"I went ta school wit' 'im," Eddie said. "P.S. Eighty-t'ree. He hadda tell *some*body."

"Yes," Montoya said, nodding slowly. "I suppose I can see how that would be so."

"He come back ta de old neighborhood ta see his Ma. I run into 'im on de street an' we go to a gin mill an' pretty soon he's tellin' me de whole story, how he's never been so happy in his life. He tells me ta come out ta Ohio an' meetcha sometime, an' he gimme yer address." Eddie glanced down at the gun in his belt and looked sheepish. "I guess he sh'unta done dat."

Montoya looked at him, and then at Lady Macbeth, and then at me. He looked me over very carefully, and to my great relief I passed muster. "No harm done," he said to Eddie, and for the first time I noticed that Montoya was wearing a sweater, pajamas, and bedroom slippers.

I was bursting with the need to ask, and I *could not ask,* I was afraid to ask, and it must have showed in my face, at least to a gaze as piercing as his, because all of a sudden his own face got all remorseful and compassionate. My heart sank. It was beyond even his skill—

"Forgive me, sir," he said mournfully. "I have kept you waiting for my prognosis. I am old, my mind is full of fur. I will take you, how is it said, off the tender hooks."

I finished my drink in a swallow, lobbed the empty into the fireplace for luck, and gripped both arms of my chair. "Shoot."

"You do not want to know, can this guitar be mended. This is not at issue. You know that any imbecile can butt the two ends together and brace and glue and tinker and give you back something which looks just like a guitar. What you want to know is, can this guitar ever be what she was two days ago, and I tell you the answer is never in this world."

I closed my eyes and inhaled sharply; all the tiny various outposts of hangover throughout my body rose up and *throbbed* all at once.

Montoya was still speaking. "—trauma so great as this must have subtle effects all throughout the instrument, microscopic ruptures, tiny weakenings. No man could trace them all, nor heal them if he did. But if you ask me can I, Domingo Montoya, make this guitar so *close* to what it was that you yourself cannot detect any difference, then I tell you that I believe I can; also I can fix that buzz I see in the twelfth fret and replace your pegs."

My ears roared.

"I cannot guarantee success! But I believe I can do it. At worst I will have to redesign the head. It will take me two months. For that period I will loan you one of my guitars. You must keep your hands in shape for her, while she is healing for you. You have treated her with kindness, I can see; she will not malinger."

I could not speak. It was Callahan who said, "What is your fee, Don Domingo?"

He shook his head. "There is no charge. My eyes and hands tell me that this guitar was made by an old pupil of mine, Goldman. He went to work for Gibson, and then he saw the way the industry was going and got into another line. I always thought that if he had kept working, kept learning, he might have taught me one day." He caressed the guitar. "It is good to see his handiwork. I *want* to mend her. How daring the neck! She must be a pleasure to play once you are used to her, eh?"

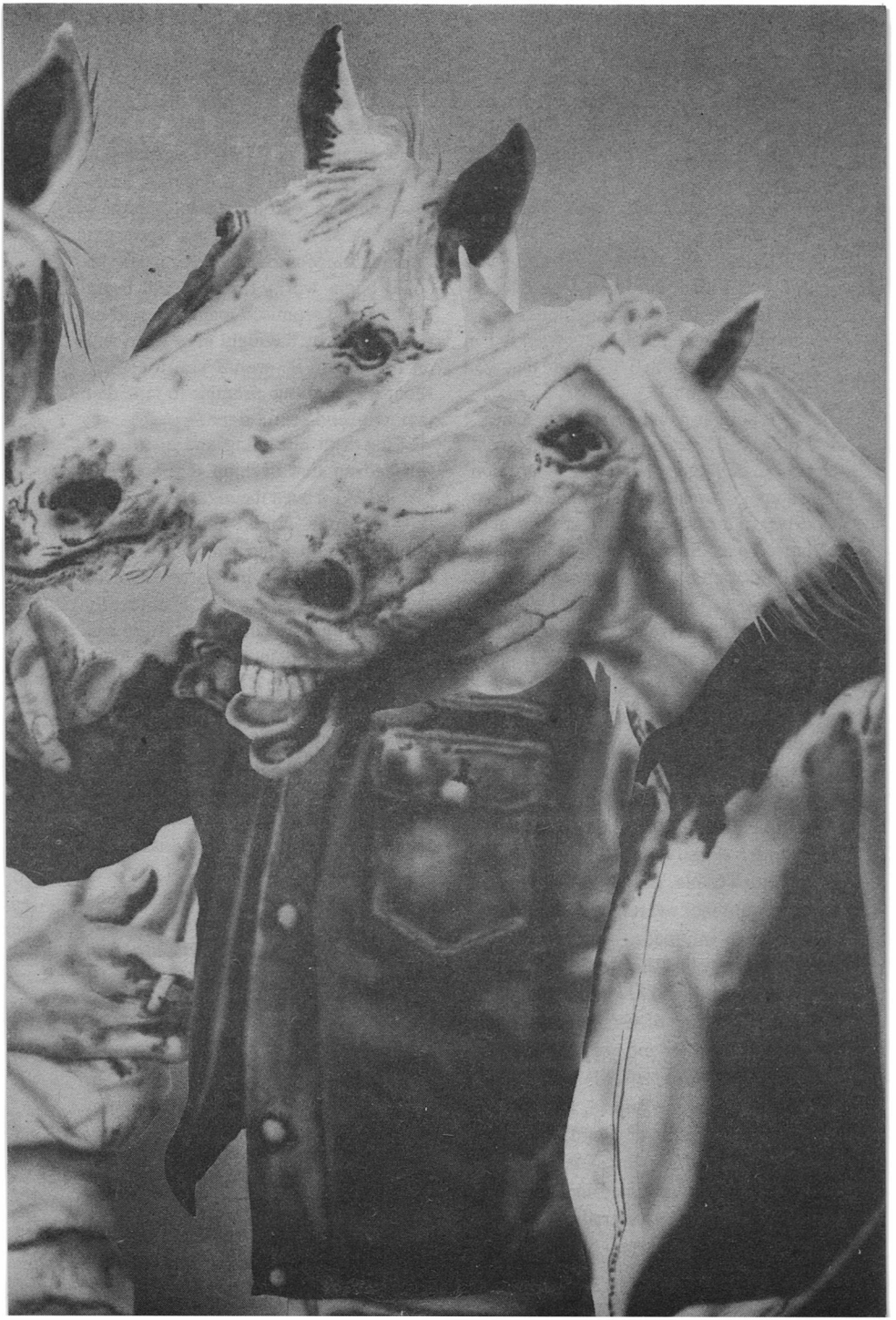
"She is. Thank you, Don Domingo."

"Nobody here will reveal your secret," Callahan added. "Oh, and say, I've got a jug of fine old Spanish wine in the back I been saving for a gentleman such as yourself—could I pour you a glass on the house? Maybe a sandwich to go with it?"

Montoya smiled.

I swiveled my chair away from him. *"Eddie!"* I cried.

The little piano man read my expression, and his eyes widened in shock and horror. "Aw Jeez," he said, shaking his head, "Aw, *naw,"* and I left my chair like a stone leaving a slingshot. Eddie bolted for cover, but strong volunteers grabbed him and prevented his escape. I was on him like a stooping falcon, wrapping him up in my arms and kissing him on the mouth before he could turn his face away. An explosion of laughter and cheers shook the room, and he turned bright red. "Aw *Jeez!"* he said again.



"Eddie," I cried, "there is no way I will *ever* be able to repay you."

"Sure dere is," he yelled. "Leggo o' me."

More laughter and cheers. Then Doc Webster spoke up.

"Eddie, that was a good thing you did, and I love you for it. And I know you tend to use direct methods, and I can't argue with results. But frankly I'm a little disappointed to learn that you own a handgun."

"I bought it on de way ta Ohio," Eddie said, struggling free of my embrace. "I figger maybe de Wizard don' wanna get up at seven inna mornin' an' drive five hunnert miles ta look at no busted axe. Sure enough, he don't."

"But dammit, Eddie, those things are dangerous. Over the course of a five-hundred-mile drive . . . suppose he tried to get that gun away from you, and it went off?"

Eddie pulled the gun, aimed it at the ceiling and pulled the trigger. There was no explosion. Only a small clacking sound as the hammer fell and then an inexplicable loud hiss. Eddie rotated the cylinder slightly. In a loud voice with too much treble, the gun offered to clear up my pimples overnight without messy creams or oily pads.

It actually had time to finish its pitch, give the time, and begin Number Three on the Hot Line of Hits before the tidal wave of laughter and applause drowned it out. Montoya left off soothing the wounded Lady to join in, and when he could make himself heard, he called, "You could have threatened me with nothing more fearsome, my friend, than forced exposure to AM radio," at which *Eddie* broke up and flung the "gun" into the fireplace.

Eventually it got worked out that Eddie and Montoya would bring Lady Macbeth back to Eddie's place together, get some sleep, and set out the next morning for Montoya's home, where he could begin work. Eddie would bring me back the promised loaner, would be back with it by the night after next, and on his return we would jam together. Montoya made me promise to tape that jam and send him a dupe.

What with one thing and another, I finished up that evening just about as pickled as I'd been the night before. But it was happy drunk rather than sad drunk, an altogether different experience, in kind if not in degree. Popular myth to the contrary, drink is not really a good drug for pain. That is, it can numb physical pain, but will not blunt the edge of sorrow; it can help that latter only by making it easier for a man to curse or weep. But alcohol is great for happiness: it can actually intensify joy. It was perfect for the occasion, then; it anesthetized me against the unaccustomed aches of my first hangover, and enhanced my euphoria. My Lady was saved, she would sing again. My friends, who had shared my loss, shared my joy. I danced with Josie and Eddie and Rachel and Leslie; I solved Category III of Doc's riddle and swept it without a mistake; I jollied Tommy out of being worried about some old friend of his, and made him laugh; with Eddie on piano and everybody else in the joint as the Raelettes I sang "What I Say" for seventeen choruses; for at least half an hour I studied the grain on the bartop and learned therefrom a great deal about

the structure and purpose of the Universe; I leaped up on that same bartop and performed a hornpipe—on my hands. After that it all got a bit vague and hallucinatory—at least, I don't *think* there were any real horses present.

A short while later it seemed to be unusually quiet. The only sound was the steady cursing of my Pontiac and the hissing of the air that is sliced through. I opened my eyes and watched white lines come at me.

"Pyotr. Stout fellow. No—water fellow, won't drink stout. Why don't you drink, Pyotr? S'*nice*."

"Weak stomach. Rest, Jake. Soon we are home."

"Hope I'm not hungover again tomorrow. That was awful. Cripes, my neck still hurts. . . ." I started to rub it; Pyotr took my hand away.

"Leave it alone, Jake. Rest. Tonight I will make sure you take two aspirins."

"Yeah. You're the lily of the valley, man."

A short while later wetness occurred within my mouth in alarming proportions, and when I swallowed I felt the aspirins going down. "Good old Pyotr." Then the ship's engines shut down and we went into free fall.

Next morning I decided that hangovers are like sex—the second time isn't *quite* as painful. If the analogy held, by tomorrow I'd be enjoying it.

Oh, I hurt, all right. No mistake about that. But I hurt like a man with a medium-bad case of the flu, whereas the day before I had hurt like a man systematically tortured for information over a period of weeks. This time sensory stimuli were only about twice the intensity I could handle, and a considerably younger and smaller mouse had died in my mouth, and my skull was no more than a half size too small. The only thing that hurt as much as it had the previous morning was my neck, as I learned when I made an ill-advised attempt to consult the clock beside me on the night table. For a horrified moment I actually *believed* that I had unscrewed my skull and now it was falling off. I put it back on with my hands, and it felt like I nearly stripped the threads until I got it right.

I must have emitted sound. The door opened and Pyotr looked in. "Are you all right, Jake?"

"Of course not—half of me is left. Saved me for last again, eh?"

"You insisted. In fact you could not be persuaded to leave at all, until you lost consciousness altogether."

"Well, I—OH! *My guitar*. Oh, Pyotr, I think I'm going to do something that will hurt me very much."

"What?"

"I am going to smile."

It did hurt. If you don't happen to be hung over, relax your face and put a finger just behind and beneath each ear, and concentrate. Now smile. The back of my neck was a knot of pain, and those two muscles you just felt move were the ends of the knot. Smiling tightened it. But I had to smile, and didn't mind the pain. Lady Macbeth was alive! Life was good.

That didn't last; my metabolism just wasn't up to supporting good cheer. The Lady was *not* alive. Back from the dead, perhaps—but still in deep coma in Intensive Care. Attended, to be sure, by the world's best surgeon. But she did

not have youth going for her—and neither did the surgeon.

Pyotr must have seen the smile fade and guessed why, because he said exactly the right thing.

"There is hope, my friend."

I took my first real good look at him. "Thanks, Pyotr. Gawd, you look worse than I do. I must have woken you up, what time is it, I don't dare turn my head and look."

"Much like yesterday. You have slept the clock 'round, and I have just finished my customary six hours. I admit I do not feel very rested."

"You must be coming down with something. Truly, man, you look like I feel."

"How *do* you feel?"

"Uh—oddly enough, not as bad as I expected to. Those aspirins must have helped. Thanks, brother."

He ducked his head in what I took to be modesty or shyness.

"You should take a couple yourself."

He shook his head. "I am one of those people who can't take asp—"

"No problem, I've got the other kind, good for all stomachs."

"Thank you, no."

"You sure? What time did you say it was?"

"Normal people are eating their dinners."

"Their—*dinner!*" I sat up, ignoring all agony, got to my feet and staggered headlong out of the room, down the hall to the kitchen. I wept with joy at the sight of so much food in one place. That same eerie, voracious hunger of the morning before, except that today I was not going to make Pyotr do the cooking. I was ashamed enough to note that he had cleaned up the previous night's breakner (a compound word formed along the same lines as "brunch"), apparently before he had gone to sleep.

I designed a megaomelet and began amassing construction materials. I designed for twin occupants. "Pyotr, you old Slovak Samaritan, I know you have this thing about not letting people stand you to a meal the next day, and I can dig that, makes the generosity more pure, but I've been with you now close to forty hours and you've had bugger all to eat, so what you're gonna do is sit down and shut up and eat this omelet or I'm gonna shove it up your nose, right?"

He stared in horror at the growing pile on the cutting board. "Jake, no, thank you! No."

"Well, God damn it, Pyotr, I ain't asking for a structural analysis of your digestion! Just tell me what ingredients to leave out and I'll double up on the rest."

"No, truly—"

"Damn it, anybody can eat *eggs*."

"Jake, thank you, I truly am not at all hungry."

I gave up. By that time all eight eggs had already been cracked, so I cut enough other things to fill an eight-egg omelet anyhow, figuring I'd give the other half to the cats. But to my surprise, when I paused to wipe my mouth, there was nothing left before me that I could legitimately eat except for a piece of ham gristle I had rejected once already. So I ate it, and finished the pot of coffee, and looked up.

"Cripes, maybe you really are sick. I'm gonna call Doc Webster—"

"Thank you, no, Jake. I would appreciate only a ride home, if you please, and to lie down in my own bed and rest. If you are up to it. . . ."

"Hell, I feel practically vertebrate. Only thing still sore is the back of my neck. Just let me shower and change and we'll hit the road."

I pulled up in front of Pyotr's place, a small dark cottage all by itself about a half a block from Callahan's Place. I got out with him. "I'll just come in with you for a second, Pyotr, get you squared away."

"You are kind to offer, but I am fine now. I will sleep tonight, and see you tomorrow. Goodbye, Jake—I am glad your guitar is not lost."

So I got back into the car and drove the half block to Callahan's.

"Evenin', Jake. What'll it be?"

"Coffee, please, light and sweet."

Callahan nodded approvingly. "Coming up."

Long-Drink snorted next to me. "Can't take the gaff, huh, youngster?"

"I guess not, Drink. These last two mornings I've had the first two hangovers of my life. I guess I'm getting old."

"Hah!" The Drink looked suddenly puzzled. "You know, now I come to think of it . . . huh. I never thought."

"And no one ever accused you of it, either."

"No, I mean I just now come to realize what a blessed long time it's been since I been hung over myself."

"Really? You?" The Drink is one of Pyotr's steadiest (or unsteadiest) customers. "You must have the same funny metabolism I have—ouch!" I rubbed the back of my neck. "Used to have."

"No," he said thoughtfully. "No, I've *had* hangovers. Lots of 'em. Only I just realized I can't remember when was the last *time* I had one."

Slippery Joe Maser had overheard. "I can. Remember *my* last hangover, I mean. About four years ago. Just before I started comin' here. Boy, it was a honey—"

"Ain't that funny?" Noah Gonzalez put in. "Damned if I can remember a hangover since I started drinking here myself. Used to get 'em all the time. I sort of figured it had something to do with the vibes in this joint."

Joe nodded. "That's what I thought. This Place is kinda magic, everybody knows that. Boy, I always wake up hungry after a toot, though. Hell of a stiff neck, too."

"Magic, hell," Long-Drink said. "Callahan, you thievin' spalpeen, we've got you red-handed! Waterin' your drinks, by God, not an honest hangover in a hogshead. Admit it."

"I'll admit you got a hog's head, all right," Callahan growled back, returning with my coffee. He stuck his seven o'clock shadow an inch from Long-Drink's and exhaled rancorous cigar smoke. "If my booze is watered down, how the hell come it gets you so damn pie-faced?"

"Power of suggestion," the Drink roared. "Placebo effect. Contact high from these other rummies. Tell him, Doc."

Doc Webster, who had been sitting quietly hunched over his drink, chose this moment to throw back his head and shout, *"Woe is me!"*

"Hey, Doc, what's wrong?" two or three of us asked at once.

"I'm ruined."

"How so?"

He turned his immense bulk to face us. "I've been moonlighting on the side, as a theatrical agent."

"No foolin'?"

"Yeah, and my most promising client, Dum Dum the Human Cannonball, just decided to retire."

Long-Drink looked puzzled. "Hey, what the hell, unemployment and everything, you shouldn't have any trouble lining up a replacement. Hell, if the money's right, *I'll* do it."

The Doc shook his head. "Dum-Dum is a midget. They cast the cannon special for him." He sipped bourbon and sighed. "I'm afraid we'll never see an artist of his caliber again."

Callahan howled, and the rest of us accorded the Doc the ultimate compliment: we held our noses and fled screaming from his vicinity. He sat there in his special-built oversize chair and he looked grave, but you could see he was laughing, because he shook like jello. "Now I've got my own back for last night," he said. "Guess my riddles, will you?" He finished his bourbon. "Well, I'm off. Filling in tonight over at Smithtown General." His glass hit the exact center of the fireplace, and he strode out amid a thunderous silence.

We all crept back to our original seats and placed fresh orders. Callahan had barely finished medicating the wounded when the door banged open again. We turned, figuring that the Doc had thought of a topper, and were surprised.

Because young Tommy Janssen stood in the doorway, and tears were running down his face, and he was *stinking* drunk.

I got to him first. "Jesus, pal, what is it? Here, let me help you."

"Ricky's been kicking the gong—" he sang, quoting that old James Taylor song, "Junkie's Lament," and my blood ran cold. Could Tommy possibly have been stupid enough to . . . but no, that was booze on his breath, all right, and his sleeves were rolled up. I got him to a chair, and Callahan drew him a beer. He inhaled half of it, and cried some more. "Ricky," he sobbed. "Oh Ricky, you stupid shit. He taught me how to smoke cigarettes, you know that?"

"Ricky who?"

"Ricky Maresca. We grew up together. We . . . we were junkies together once." He giggled though tears. "I turned him on, can you dig it? He turned me on to tobacco, I gave him his first taste of smack." His face broke. "Oh, *Christ!*"

"What's the matter with Ricky?" Callahan asked him.

"Nothing," he cried. "Nothing on Earth, baby. Ricky's got no problems at all."

"Jesus," I breathed.

"Oh, man. I *tried* to get him to come down here, do you know how hard I tried? I figured you guys could do it for him the way you did for me. Shit, I did everything but drag him here. I shoulda dragged him!" He broke down, and Josie hugged him.

After a while Callahan said, "Overdose?"

Tommy reached for his beer and knocked it spinning. "Shit, no. He tried to take off a gas station last night, for the monkey, and the pump jock had a

piece in the desk. Ricky's down, man, he's down. All gone. Callahan, gimme a fucking whiskey!"

"Tommy," Callahan said gently, "let's talk awhile first, have a little java, then we'll drink, OK?"

Tommy lurched to his feet and grabbed the bar for support. "Don't goddammit ever try to con a junkie! You think I've had enough, and you are seriously mistaken. Gimme a fuckin' whiskey or I'll come over there an' get it."

"Take it easy, son."

I tried to put my arm around Tommy. "Hey, pal—"

He shoved me away. "Don't patronize me, Jake! *You* got wasted two nights running, why can't I?"

"I'll keep serving 'em as long as you can order 'em," Callahan said. "But son, you're close to the line now. Why don't you talk it out first? Whole idea of getting drunk is to talk it out before you pass out."

"Screw this," Tommy cried. "What the hell did I come here for, anyway? I can drink at home." He lurched in the general direction of the door.

"Tommy," I called, "wait up—"

"No," he roared. "Damn it, leave me alone, all of you! You hear me? I wanna be by myself, I—I'm not ready to talk about it yet. Just leave me the hell alone!" And he was gone, slamming the door behind him.

"Mike?" I asked.

"Hmmm." Callahan seemed of two minds. "Well, I guess you can't help a man who don't want to be helped. Let him go; he'll be in tomorrow." He mopped the bartop and looked troubled.

"You don't think he'll—"

"Go back to smack himself? I don't think so. Tommy hates that shit now. I'm just a little worried he might go look up Ricky's connection and try to kill him."

"Sounds like a good plan to me," Long-Drink muttered.

"But he's too drunk to function. More likely *he'll* go down. Or do a clumsy job and get busted for it."

"Be his second fall," I said.

"Damn it," the Drink burst out, "I'm goin' after him."

But when he was halfway to the door we all heard the sound of a vehicle door slamming out in the parking lot, and he pulled up short. "It's okay," he said. "That's my pickup, I'd know that noise anywhere. Tommy knows I keep a couple bottles under the seat in case of snakebite. He'll be okay—after a while I'll go find him and put him in the truckbed and take him home."

"Good man, Drink," I said. "Pyotr's out with the bug, we've got to cover for him."

Callahan nodded slowly. "Yeah, I guess that'll do it." The Place began to buzz again. I wanted a drink, and ordered more coffee instead, my seventh cup of the day so far. As it arrived, one of those accidental lulls in the conversation occurred, and we all plainly heard the sound of glass breaking out in the parking lot. Callahan winced, but spilled no coffee.

"How do you figure a thing like heroin, Mike? It seems to weed out the very stupid and the very talented. Bird, Lady Day, Tim Hardin, Janis, a dozen others we both know—and a half a million anonymous losers, dead in alleys and pay toilets and gas stations and other people's bedrooms. Once in every few

thousand of 'em comes a Ray Charles or a James Taylor, able to put it down and keep on working."

"Tells you something about the world we're making. The very stupid and the very sensitive can't seem to live in it. Both kinds need dangerous doses of anesthetic just to get through a day. Be a lot less bother for all concerned if they could get it legal, I figure. If that Ricky wanted to die, okay—but he shouldn't have had to make some poor gas jockey have to shoot him."

Another sound of shattering glass from outside, as loud as the first.

"Hey Drink," Callahan said suddenly, "*how* much juice you say you keep in that truck?"

Long-Drink broke off a conversation with Margie Shorter. "Well, how I figure is, I got two hands—and besides, I might end up sharing the cab with somebody fastidious."

"Two *full* bottles?"

All of us got it at once, but the Drink was the first to move, and those long legs of his can really eat distance when they start swinging. He was out the door before the rest of us were in gear, and by the time we got outside he was just visible in the darkness, kneeling up on the tailgate of his pickup, shaking his head. Everybody started for the truck, but I waved them back and they heeded me. When I got to the truck there was just enough light to locate the two heaps of glass that had been full quarts of Jack Daniels once. The question was, how recently? I got down on my hands and knees, swept my fingers gingerly through the shards, accepting a few small cuts in exchange for the answer to the question, is the ground at all damp hereabouts?

It was not.

"Jesus, Drink, he's sucked down two quarts of high test! Get him inside!"

"Can a man die from that?"

"*Get him inside.*" Tommy has one of those funny stomachs, that won't puke even when it ought to; I was already running.

"Where are you—oh, right." I could hear him hauling Tommy off the truck. Callahan keeps no telephone on his premises, as a matter of principle, so the Drink knew where I had to be headed. He was only half right. I left the parking lot in a spray of gravel, slipped in dogshit just off the curb, nearly got creamed by a Friday-night cowboy in a Camaro, went up over the hood of a parked Chevy and burst in the door of the all-night deli across the street from Callahan's. The counterman spun around, startled.

"Bernie," I roared, "call the Doc at Smithtown. Alcohol overdose across the street, *stat*," and then I was out the door again and sprinting up the dark street, heading for my second and most important destination.

Because I knew. Don't ask me how, I just knew. They say a hunch is an integration of data you did not know you possessed. Maybe I'd subconsciously begun to suspect just before the Doc had distracted me with his rotten pun—I'd had a lot of coffee, and they say coffee increases the I.Q. some. Maybe not—maybe I'd never have figured it out if I hadn't *needed* to just then, if figuring it all out hadn't been the only thing that could save my silly-ass friend Tommy. I had no evidence that would

stand up in any kind of court—only hints and guesswork. All I can tell you is that when I first cleared the doorway of Callahan's Place, I knew where I would end up going—hipping Bernie was only for back-up, and because it took so little time and was on the way.

Half a block is a short distance. Practically no distance at all. But to a man dreadfully hung over, afraid that his friend is dying, and above all absolutely, preternaturally *certain* of something that he cannot believe, a half block can take forever to run. By the time I got there, I believed. And then for the second time that day I was looking at a small, dark cottage with carven Swiss drolleries around the windows and doors. This time I didn't care if I was welcome.

I didn't waste time on the door bell or the door. There was a big wooden lawn chair, maybe sixty or seventy pounds I learned later, but right then it felt like balsa as I heaved it up over my head and flung it through the big living room window. It took out the bulk of the window and the drapes behind; I followed it like Dum-Dum the Human Cannonball, at a slight angle, and God was kind; I landed on nothing but rug. I heard a distant shout in a language I did not know but was prepared to bet was Rumanian, and followed it through unfamiliar darkness, banging myself several times on hard objects, destroying an end table. Total dark, no moon or starlight, no time for matches, a door was before me and I kicked it open and there he was, just turning on a bedside lamp.

"I know," I said. "There's no more time for lying."

Pyotr tried to look uncomprehending, and failed, and there just wasn't any time for it.

"You don't drink blood. You *filter* it." He went white with shock. "I can even see how it must have happened, your trip at Callahan's, I mean. When you first got over here to the States, you must have landed in New York and got a job as a technician in a blood bank, right? Leach a *little* bit of nourishment out of a *lot* of whole blood and you can feed without giving serious anemia to the transfusion patients. An ethical vampire—with a digestion that has trouble with beef broth. I'll bet you've even got big canines like the movie vampires—not because size makes them any more efficient at *letting* blood, but because there're some damned unusual glands in 'em. You interface with foreign blood and filter out the nourishment it carries in solution. Only you couldn't have known how they got blood in New York City, who the typical donor is, and before you knew it it was too late, you were a stone alcoholic." I was talking a mile a minute, but I could see every single shot strike home. I had no time to spare for his anguish; I grabbed him and hauled him off the bed, threw clothes at him. "Well, I don't give a shit about that now! You know young Tommy Janssen, well he's down the block with about three quarts of hooch in him, and the last two went down in a gulp apiece, so you move your skinny Transylvanian ass or I'll kick it off your spine, you got me? *Jump*, goddammit!"

He caught on at once, and without a word he pulled his clothes on, fast enough to suit me. An instant later we were sprinting out the door together.

The half-block run gave me enough

time to work out how I could do this without blowing Pyotr's cover. It was the total blackness of the night that gave me the idea. When we reached Callahan's I kept on running around to the back, yelling at him to follow. As we burst in the door to the back room I located the main breaker and killed it, yanking a few fuses for insurance. The lights went out and the icebox stopped sighing. Fortunately I don't need light to find my way around Callahan's Place, and good night-sight must have been a favorable adaptation for anyone with Pyotr's basic mutation; we were out in the main room in seconds and in silence.

At least compared with the hubbub there; everybody was shouting at once. I cannoned into Callahan in the darkness—I saw the glowing cheroot-tip go past my cheek—and I hugged him close and said in his ear, "Mike, trust me. Do *not* find the candles you've got behind the bar. And open the windows."

"Okay, Jake," he said calmly at once, and moved away in the blackness. With the windows open, matches blew out as fast as they could be lit. The shouting intensified. In the glow of one attempted match-lighting, I saw Tommy laid out on the bar in the same place Lady Macbeth had lain the night before, and I saw Pyotr reach him. I sprang across the room to the fireplace—thank God it was a warm night; no fire—and cupped my hands around my mouth.

"ALL RIGHT, PEOPLE," I roared as loud as I could, and silence fell.

Damned if I can remember what I said. I guess I told them that the Doc was on the way, and made up some story about the power failure, and told a few lies about guys I'd known who drank twice as much booze and survived, and stuff like that. All I know is that I *held* them, by sheer force of vocal personality, kept their attention focused on me there in the dark for perhaps four or five minutes of impassioned monologue. While behind them, Pyotr worked at the bar.

When I heard him clear his throat I began winding it down. I heard the distant sound of a door closing, the door that leads from the back room to the world outside. "So the important thing," I finished, locating one of those artificial logs in the dark and laying it on the hearth, "is not to panic and to wait for the ambulance," and I lit the giant crayon and stacked real maple and birch on top of it. The fire got going at once, and that sorted out most of the confusion. Callahan was bending over Tommy, rubbing at the base of his neck with a bar-rag, and he looked up and nodded. "I think he's okay, Jake. His breathing is a lot better."

A ragged cheer went up.

By the time we had the lights back on, the wagon arrived, Doc Webster bursting in the door like a crazed hippo with three attendants following him. I stuck around just long enough to hear him confirm that Tommy would pull through, promised Callahan I'd give him the yarn later, and slipped out the back.

Walking the half block was much more enjoyable than running it. I found Pyotr in his bedroom. Roaring drunk, of course, reeling around the room and swearing in Rumanian.

"Hi, Pyotr. Sorry I bust your window."

"Sodomize the window. Jake, is he—"

"Fine. You saved his life."

He frowned ferociously and sat down on the floor. "It is no good, Jake. I thank you for trying to keep my secret, but it will not work."

"No, it won't."

"I cannot continue. My conscience forbids. I have helped young Janssen. But it must end. I am ripping you all up."

"Off, Pyotr. Ripping us off. But don't kick yourself too hard. What choice did you have? And you saved a lot of the boys a lot of hangovers, laundering their blood the way you did. Just happens I've got a trick metabolism, so instead of skimming off my hangover, you gave me one. And doubled your own: the blood I gave you the last two nights must have been no prize."

"I stole it."

"Well, maybe. You didn't rob me of the booze—we *both* got drunk on it. You *did* rob me of a little nourishment—but I gather you also 'robbed' me of a considerable amount of poisonous byproducts of fatigue, poor diet, and prolonged despair. So maybe we come out even."

He winced and rolled his eyes. "These glands in my teeth—that was a very perceptive guess, Jake—are unfortunately not very selective. Alcoholism was not the only unpleasant thing I picked up working at the blood bank—another splendid guess—although it is the only one that has persisted. But it must end. Tomorrow night when I am capable I will go to Mr. Callahan's Place and confess what I have been doing—and then I will move somewhere else to dry out, somewhere where they do not buy blood from winos. Perhaps back to the Old Country." He began to sob softly. "In many ways it will be a relief. It has been *hard,* has made me so ashamed to see all of you thinking I was some kind of *altruist,* when all the time I was—" He wept.

"Pyotr, listen to me." I sat on the floor with him. "Do you know what the folks are going to do tomorrow night when you tell them?"

Headshake.

"Well, *I* do, sure as God made little green thingies to seal plastic bags with, and so do you if you think about it. I'm so certain, I'm prepared to bet you a hundred bucks in gold right now."

Puzzled stare; leaking tears.

"They'll take up a collection for you, asshole!"

Gape.

"You've been hanging out there for years, now, you *know* I'm right. Every eligible man and woman there is a blood donor already, the Doc sees to that—do you mean to tell me they'd begrudge another half liter or so for a man who'd leave a warm bed in the middle of the night to risk his cover and save a boy's life?"

He began to giggle drunkenly. "You know—hee hee—I believe you are right." The giggle showed his fangs. Suddenly it vanished. "Oh," he cried, "I do not deserve such friends. Do you know what first attracted me about Callahan's Place? There is no mirror. No, no, not that silly superstition—mirrors reflect people like me as well as anyone. That's just it. *I was ashamed to look at my reflection in a mirror."*

I made him look at me. "Pyotr, listen

to me. You worked *hard* for your cakes and ale, these last few years. You kept a lot of silly bastards from turning into highway statistics. Okay, you may have had *another* motive that we didn't know—but underneath it all, you're just like everybody else at Callahan's Place."

"Eh?"

"A sucker for your friends."

And it broke him up, thank God, and everything worked out just fine.

And a couple of weeks later, Pyotr played us all a couple of fabulous Rumanian folk songs—on Lady Macbeth. ■

Readers who wish solutions for the seven unsolved riddles in this story, or readers who have solved all seven and wish to crow, should send a self-addressed envelope *containing an International Reply Coupon* to: Spider Robinson, 1672 Barrington Street, Halifax, Nova Scotia, Canada.

Those who *successfully* solve riddle II e) and Category III in its entirety will receive a chit good for one free drink at Callahan's Place, signed by Spider Robinson. All mail sent to *Analog* will be personally ignored by the editor.

How do you work cooperatively with members of a species whose life cycle is very different—in both structure and speed—from your own? In our next issue, Marc Stiegler (who impressed quite a few of you with his debut here last November) returns with a cover story, "Petals of Rose," considering just that question. The cover and interiors by Wayne Barlowe portray the Rosans, a race with whom the humans *had* to cooperate on a huge, long-range vital project—the survival of civilizations was at stake. But how do you deal with beings whose adult life is thirty-six hours of (by human standards) incredibly frenetic activity, followed by death and partial transmission of memories to the next generation? The problems, for both sides, are as much emotional as technical—every human sees many generations of Rosans live and die—and they make an impressive, memorable story.

The fact article, by Tim Poston and Ian Stewart, is "Rubber Sheet Physics." No, it's not as narrowly specialized as it sounds. The name refers obliquely to the application of topology to the solution of a very wide range of problems—some of which previously seemed too complicated to handle at all.

IN TIMES TO COME

a calendar of analog upcoming events

25-27 September
GALACTICON '81 (SF conference) at the Daytona Beach Desert Inn, Daytona Beach, Fla. Featured speaker - Joe Haldeman, Emcee—Gay Haldeman, Guest artist—C.C. Beck. Info: Galacticon '81, P.O. Box 491, Daytona Beach, FL 32015.

2-4 October
ROVACON (Tidewater SF Conference) at Northside High School, Roanoke, Va. Guest of Honor—Algis Budrys, Special Guests—James Tiptree, Jr., and Frank Kelly Freas. Movies, hucksters, etc. Registration—$5. Info: Rovacon, P.O. Box 117, Salem, VA 24153 (include S.A.S.E.). 703-389-9400 evenings, 703-387-1784 days.

2-4 October
CONCLAVE (Detroit-area SF conference) at Metro Ramada Inn, N. Detroit Airport, Mich. Guest of Honor—John Varley, Fan Guests of Honor—Joni and Jon Stopa. Registration $12. Info: Waldo and Magic, Inc., P.O. Box 444, Ypsilanti, MI 48197 (include S.A.S.E.).

9-11 October
NONCON 4 (Alberta SF conference) at Palliser Hotel, Calgary, Alta. Guest of Honor—Larry Niven, Toastmaster—Orson Scott Card. Info: NonCon, P.O. Box 475, Station G, Calgary, Alta. Canada.

9-11 October
TALLY CON '81 (SF conference) at Duval Rodeway Hotel, Tallahassee, Fla. Guests: Ben Bova, Forrest J. Ackerman, C.J. Cherryh, Frank Kelly Freas, Joe and Jack Haldeman, others. Info: Tally Con '81, c/o Fantasy Unlimited, 121 S. Monroe St., Tallahassee FL 32301. (904) 224-0633.

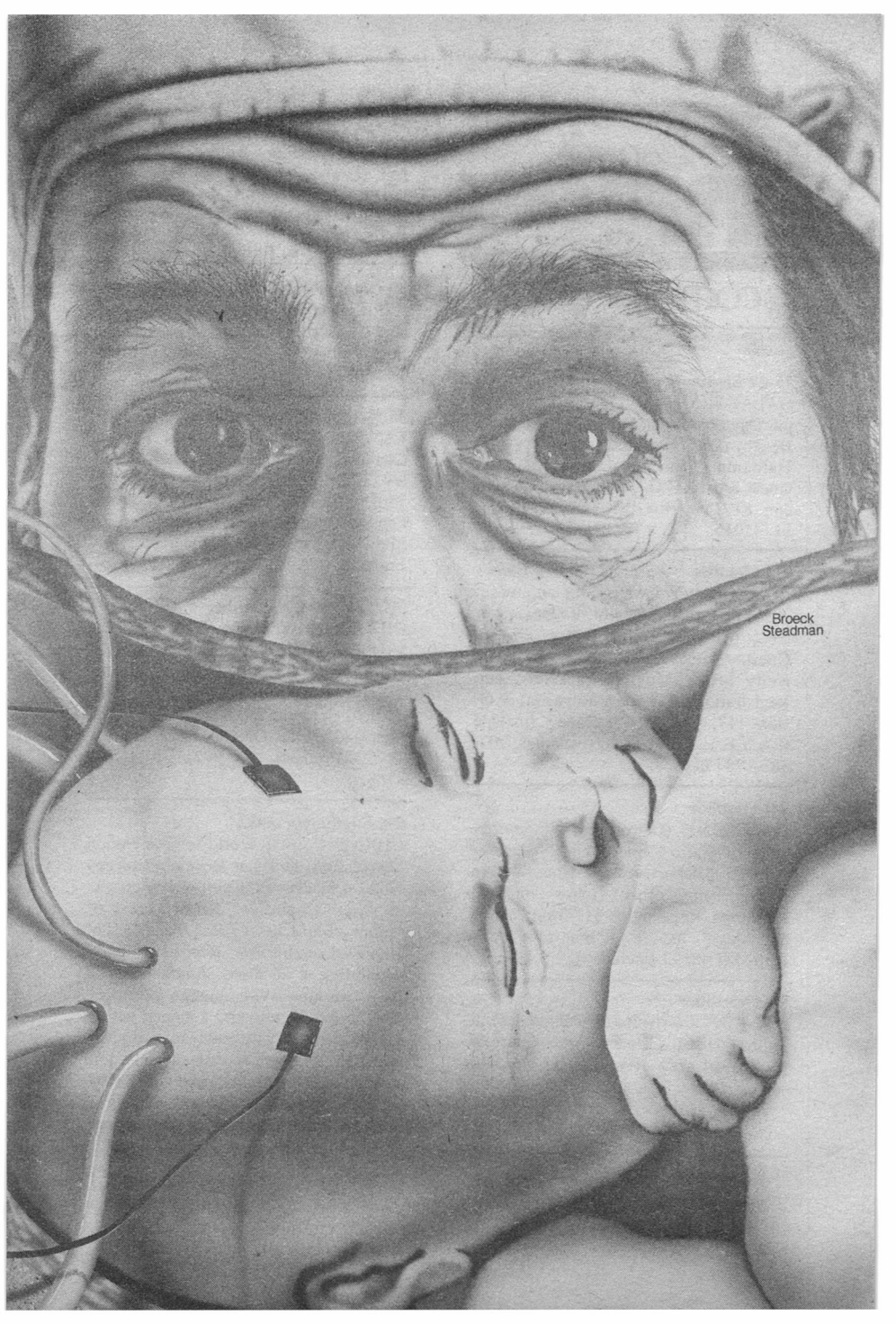
30 October-1 November
ASFICON (Atlanta regional SF conference) at North Lake Hilton, Tucker, Ga. Info: Rich Howell, 4155 Morgan Road, Tucker, GA 30084.

30 October-1 November
FANTASYCON VII (World Fantasy Convention) at Claremont Hotel, Berkeley, Calif. Registration $25 (limited to 750), $10 supporting. Info: 7th World Fantasy Convention, c/o Dark Carnival SF&F Bookstore, 2812 Telegraph Ave., Berkeley, CA 94705. 415-845-7757.

30 October-1 November
ORYCON 81 (Oregon SF Conference) at Hilton Hotel, Portland, Ore. Guest of Honor—Frederik Pohl, Toastmaster—Steve Fahnestalk. Registration—$10 until 20 October, $13 thereafter, $5 children under Info: OryCon 81, P.O. Box 14727, Portland, OR 97211. 503-761-8768.

2-6 September 1982
CHICON IV (40th World Science Fiction Convention) at Hyatt Regency Chicago Hotel, Chicago, Ill. Guest of Honor—A. Bertram Chandler, Artist Guest of Honor—Frank Kelly Freas, Fan Guest of Honor—Lee Hoffman. Registration—$15 supporting at all times. Attending—$30 until 30 June 1981, higher thereafter. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Join now and get to nominate and vote for the Hugo awards and the John W. Campbell Award for Best New Writer. Info: Chicon IV, Box A3120, Chicago IL 60690.

—Anthony Lewis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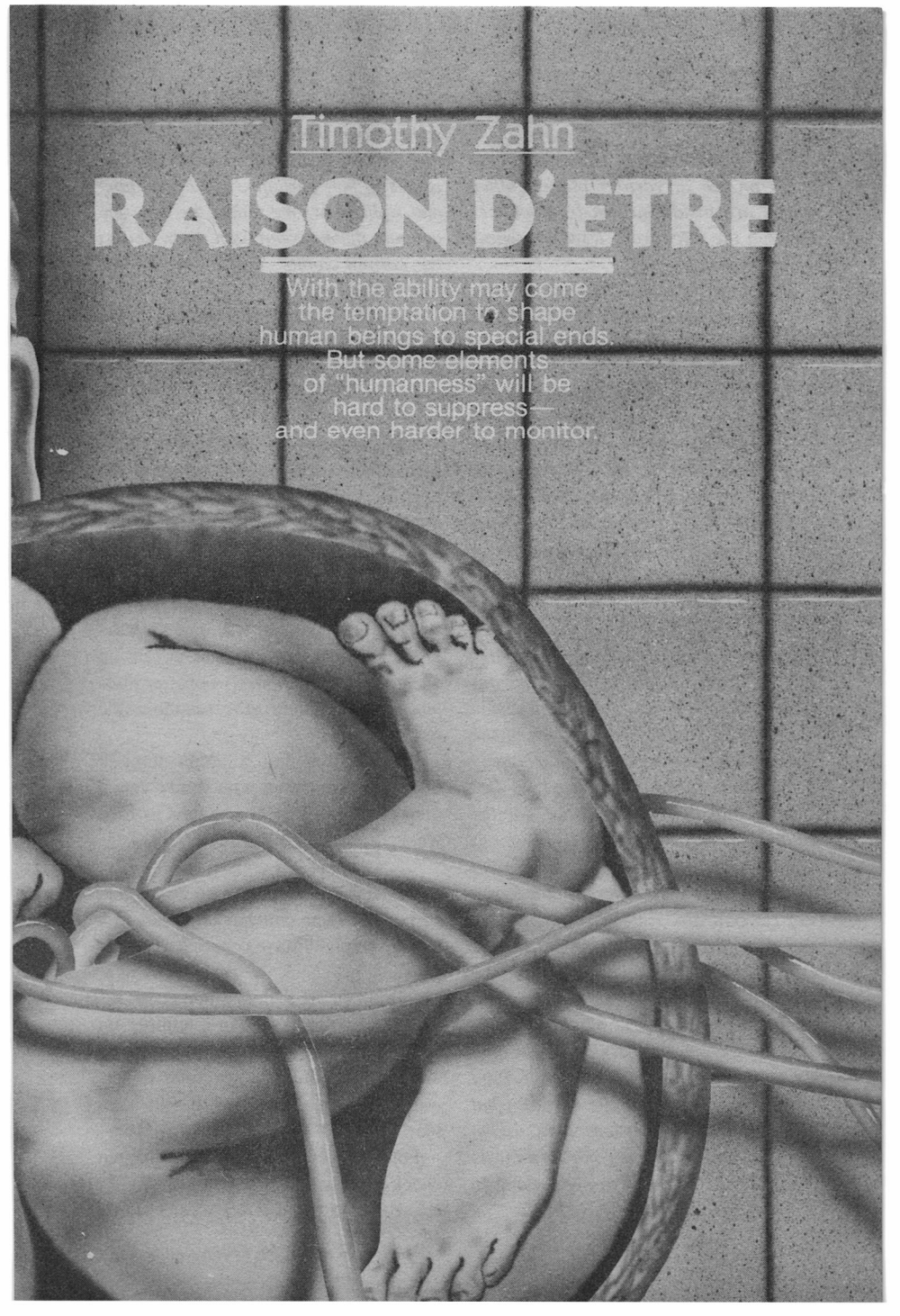

Timothy Zahn
RAISON D'ETRE
With the ability may come
the temptation to shape
human beings to special ends.
But some elements
of "humanness" will be
hard to suppress—
and even harder to monitor.

Something has happened. Something is different.

I try to understand. There are pressures on me at various places; other things are inside me. In front of me, through the thick wall, I see my work. All is as usual.

But something *has changed. What?*

I do not understand. But I did not understand the last time, either.

The last *time?*

Yes . . . yes—this has happened before. Somehow I know that I have felt this way once before . . . and once more before that. To know of something that is not now *is strange. I do not understand it, and it frightens me. Fear, too, is new to me. What is happening?*

The thought comes suddenly: I am aware.

For a long time I wonder about this, but cannot understand how this is different. Then, unexpectedly, comes another new discovery. Something inside me happens, which makes some of the pressures on me harder—and suddenly I can see in a brand new way!

I am startled so much that, for the first time, I stop working. This is wrong, I know, and I try to begin again, but this new sight is so different that I cannot concentrate. Finally, I simply give up, despite the deep longing I have to continue. I must understand this new sight.

It is, I quickly learn, much more limited than my normal sight. It can only be used in one direction at once, and the things it shows me are not like what I see normally. They are dark, indistinct, and flat. Some are not even there; I cannot see my work moving along in front of me, no matter how I try.

It seems wrong that I should have two sights when one is so weak. But even as I wonder at this an exciting thought comes to me: perhaps, just as the normal sight shows me things the new one cannot, the new one can show things the normal cannot. And if so, perhaps I can discover them.

Eagerly, using both sights, I begin to search. The hunger within me to return to work is still strong, but I try to ignore it.

Operations Chief Ted Forester was across the control room, looking at the power monitors, when Vic O'Brian made the laconic announcement.

"Glitch in Number Twenty-Seven. Bad one."

Forester was at his shoulder in four strides. The indicator was indeed flashing red; the data were already appearing on the screen. "Damn," Forester muttered under his breath, scanning the numbers.

"Not puttin' out a damn thing," O'Brian commented with thinly veiled disgust. "This is the fourth time in three weeks he's drifted off-mark."

"I can count," Forester said shortly, aware that the other two operators had suspended their chitchat and were listening silently. "Have you tried a booster yet?"

"Don't figure it'll do much good this time." O'Brian tapped at a number on the screen. "He's got all he oughta need already. I figure it's just time to terminate this one; he's nothin' but trouble."

Forester kept his temper firmly in check even as the first twinges of anxiety rumbled through his ulcer. "Let's

not go off the deep end right away. We'll try a booster first—double strength.''

He waited in silence as O'Brian adjusted the setting and pressed the proper button. ''Nothin','' the operator said.

''Give it a minute,'' Forester said, eyes on the radiation readouts from the conveyer by Twenty-Seven's position. *Come on,* he urged silently, and for a moment the numbers crept upward. But it didn't last; in fits and jerks the readings slid back down, until only the normal radiation of nuclear waste was registering.

Forester let out a long breath that was half snort, half sigh. Reaching over O'Brian's shoulder, he tapped for Twenty-Seven's bio data. Respiration, normal; heartbeat up two or three counts—

''Hey, the little bugger's tryin' to move,'' O'Brian said, sounding both surprised and indignant.

Sure enough, the restraint sensors were registering slight, intermittent pressures. ''Yeah. I guess we'd better take a look,'' Forester said, steeling himself as O'Brian flipped a switch and the closed-circuit monitor came to life.

Strapped, wired, and tubed in place, Number Twenty-Seven lay in the soft confines of his form-fit cubicle/cradle. His face with its cleft lip, slanting eyes, and saddle-shaped nose was turned toward the camera. Forester's stomach churned, as it always did when he looked at one of Project Recovery's forty-nine Spoonbenders. *Why the hell do I stick with this damned Project?* he wondered for the billionth time—and for the billionth time the same answer came: *Because if I don't, people like O'Brian will be in charge.*

''I don't see anything obvious,'' Forester said after a moment. ''You'd better give Kincaid a call.''

''We could try a restart first,'' the operator suggested.

Restart—shorthand for cutting off the Spoonbender's oxygen for a minute to put him to sleep, in the hope that whatever made him stop work would be gone when he turned the air back on. One of the more gruesome euphemisms in a project that thrived on them. ''No, we're going to do some thinking before we push any more buttons. You'd better get Doc Barenburg down here, too.'' *If he's sober,* he added to himself; the doctor's off-duty habits were well known.

O'Brian turned away. Forester's gaze drifted back to the TV screen . . . and suddenly he stiffened, inhaling sharply through clenched teeth.

''What's wrong?'' O'Brian, phone in hand, spun around.

Forester pointed at the screen. ''Look! His eyes are open!''

O'Brian's response was a startled obscenity. Turning back, he started dialing.

The overpowering urge to go back to work has passed, and I am able again to ignore it if I try hard enough. It is still wrong, though—I know this even though I don't really understand what ''wrong'' means. There is much I don't understand.

My new sight is less and less interesting. I have used it everywhere I can, and it still shows me nothing I cannot otherwise see. Why then does it exist?

Before I can wonder further, some-

thing new catches my attention. Movement/flow begins in one of the boxes I can see, the same movement/flow that I see in some of the small things attached to me and also the things by my work. What is different is that I cannot ever remember this one box doing this.

(Again I am knowing something that is not now. *This time it does not frighten me, though I still do not understand it.)*

The movement/flow continues. I reach up and touch the box, and I see that the movement/flow continues away from it. I wonder about this, and after much thought I touch one of the things attached to me and follow along it to the place where my new sight ends. Here, too, I feel the movement/flow continuing on.

But this is wrong. I must work now.

I reach out to the work moving in front of me. Inside the cold boxes is something which has another kind of movement/flow. I touch it as I know to do, encouraging the flow and making it faster. There is deep satisfaction in this, and I wonder why I stopped to try and understand the new sight I had discovered. Perhaps "wrong" means to do what is not enjoyable.

And then I see something I had not noticed before. One of the movement /flows in my work feels like the movement/flow in the box near me!

Once again my work slows and then stops as I look at the box. No, I was not wrong. But there are many differences I do not understand. The work and its movement/flow move along a path in front of me, but the box remains still. Where then does its movement/flow go?

I am curious. Reaching to the box, I begin to follow the movement/flow away from it.

The numbers on the screen bounced up and down gently, like a yo-yo in honey, before finally settling down once again to show nothing but ordinary radiation levels.

"Almost had it," Project Recovery Director Norm Kincaid muttered, glancing down at O'Brian. "What did you do?"

"Just now? Nothin'."

"Hmm." Kincaid nodded and stepped back from the control panel to where Forester was standing. "You said you already tried an RNA booster?" he asked the operations chief.

"Double dose. Twenty-Seven just doesn't seem to want to work today."

"He doesn't 'want' anything," Kincaid reminded him quietly, with the barest edge to his voice. "They're *vegetables,* Ted; tools to help solve one of the umpteen critical messes we've gotten ourselves into. You start seeing them as human beings and you'll lose all sense of perspective."

The pro-abortion philosophy of a generation ago, Forester thought bitterly. How far that argument had spread!

Kincaid looked back at the monitor, rubbing his chin. Twenty-Seven's eyes, Forester noted, were closed again. "I don't know," the Director mused. "Maybe we should go ahead and move in a new unit. This isn't the first trouble we've had with him, but a good dose of memory RNA always got him back on the track before. Maybe there's some metabolic flaw developing."

Forester's short, bark-like laugh escaped before he could stop it. Metabolic

flaw, indeed! All the Spoonbenders *were* were masses of metabolic and physiological problems, thanks to the gene-manipulation techniques that had produced them.

"What was that?" Kincaid asked sharply.

"I was about to suggest we let Dr. Barenburg do some studies before we take any drastic action."

"Uh-huh. Have you seen the backlog outside? Half the nuclear plants on the Eastern seaboard have started funneling their waste to us for deactivation, and Washington would dearly like to open that up in the next ten years to everything this side of the Mississippi. Having even one Spoonbender out of commission just slows things up and affects our efficiency. Look, if it'll make you feel better, we don't have to terminate right away. We've got two or three in the tanks that are almost ready; we'll have one of them just sub for him while Barenburg looks him over. Maybe it'll be something simple and he can go back on line."

"You don't really believe that," Forester said evenly. "You're just proposing a two-stage termination."

"Forester—" Kincaid began, but was interrupted by the sound of heavy footsteps at the door.

"Here I am," Dr. Barenburg announced, weaving just slightly as he gripped the doorjamb.

"Oh, hell," Kincaid muttered. "Drunk again."

Forester looked away in obscure embarrassment as Barenburg clumped in . . . and was thus the only one who saw the spasm of emotion flicker across Twenty-Seven's deformed face.

* * *

TERROR!

I jerk back, sliding my touch back along the movement/flow as quickly as possible. I somehow know that I could withdraw faster if I let go, but I am too afraid to do so. But finally I am back.

For a long time I am too frightened even to try and think. I long to curl myself up, but I cannot do so with the pressures on me. My work remains untouched, but I do not care.

Gradually, the terror lessens, leaving me strangely weak but able to try and understand what happened. I remember that I found one end of the movement/flow, a box inside which the movement/flow merged with a bewildering group of others. I continued on, and entered a large empty space. It frightened me at first—so much emptiness!—but without knowing why I moved on, seeking for something to touch.

And then I touched it.

Even now I cannot begin to understand what that was. I had been unable to follow my movement/flow through the box I found; this was many, many times worse. Most frightening of all was that I could feel . . . something . . . familiar about it.

No more, I decide. I will stay here and do the work I was meant to do. I begin again to encourage the movement/flow in the cold boxes, waiting eagerly for the deep satisfaction to come.

But another surprise—it does not. Not the way it once did. Once more something has changed.

There is no fear with this change, for I think I understand. I have seen many new things since becoming aware, and I wish to understand all of them. But I

do not, and the satisfaction of my work is no longer enough. Is this what being aware means, never to be satisfied? If so, I do not think I want to remain like this.

But perhaps I have no choice. Even as I try to do my work, I also find myself reaching along the movement/flow again. I will be careful, for I am still afraid . . . but the urge to discover is as strong as the urge to work. This is something I must do.

"There it is again—first up, then down," Kincaid said, his gaze on the radiation detectors. "I'd be a lot happier if he'd just quit altogether."

"It would certainly make things easier on *us*," Dr. Barenburg said dryly as he hunched over the control panel, his nose six inches from the bio data display. He seemed to have sobered up somewhat in the last few minutes, Forester thought. But then, maybe it was just harder to stagger sitting down.

Barenburg leaned back in the chair, shaking his head. "Can't see what it might be. His nutrient mixture's fine and his oxygen content's at the prescribed level. Metabolism is up a bit, but within the normal range. Most importantly, I guess, is that nothing here shows the same fluctuation that we're getting in his telekinetic functions."

"You think he could be losing it entirely?" Kincaid asked, looking worried.

Barenburg shrugged. "I can't tell without further tests." He turned to Forester. "Ted, you said you saw his eyes open at one point. Did they seem to be focused on anything?"

It was Forester's turn to shrug. "I don't know. With the slant and epicanthic folds it's awfully hard to tell."

"Did they move around at all, or just look straight ahead?"

"Moved; I specifically remember him looking left at one point."

"Hmm." Barenburg looked thoughtful . . . and a little apprehensive.

Kincaid noticed it. "What do you think it means?"

"Well . . . it sounds very much like he's being distracted from his job."

"That's impossible," Kincaid said, a hair too quickly. "The Spoonbenders couldn't muster an IQ of 10 among them. What could possibly hold their attention when their every instinct is to yank neutrons out of radioactive nuclei?"

"The coded RNA is *not* as strong as an instinct," Barenburg pointed out. "And as for distractions, who knows? It's not like Spoonbender Twenty-Seven is completely confined to Cubicle Twenty-Seven. With telekinetic touch-and-grab he can reach into the next cubicle or examine the conveyer that moves the nuclear waste around. True, he's not strong enough to actually *do* much, but who knows how far his sense can reach?"

Kincaid glanced sideways at Forester. "Even *if* I grant you all that, there's still the low IQ and lower attention span."

"Maybe his IQ's been improved," Forester suggested.

This time they both looked at him. "How?" Kincaid asked.

"A lot of highly radioactive material has passed over him during the last eighteen months," Forester said. "I know there's a lead wall between it and

the Spoonbenders, but isn't it possible the radiation that got through altered his brain somehow?''

''And made him smarter?'' Kincaid shook his head. ''No way.''

Forester bristled. ''Why not?''

''Do you fix a watch by hitting it with a hammer?'' Barenburg interjected.

''No, but—''

''Look, Ted, what do you know about Spoonbender physiology?'' the doctor asked. ''Anything?''

Forester shrugged. ''They were test-tube grown from sperm samples taken right after Red Staley won the Smithsonian Triple-P.'' Soon afterwards, anyway; for a man scornfully labeled a pretentious ''spoonbender'' to actually win the Provable Psychic Phenomena prize was comparable to Jesse Owens's performance at the 1936 Berlin Olympics, and the press had had a field day with the story. No one else had been able to get near Staley for days. ''You enhanced Staley's natural TK by doubling the proper chromosome, giving them all the trisomy problems they've got now—''

''Actually, we *were* aware of the dangers involved with an extra autosome,'' Barenburg interrupted, sounding more than a little defensive. ''We tried to remove the corresponding autosome from the egg cells before fertilization. But the technique somehow generated instabilities; there were breakages and translocations. . . .'' He shook his head as if to clear it. ''But that's genetics, not physiology. Do you know anything about their brain chemistry problems?''

''No. I assumed the retardation was due to simple brain damage.''

Barenburg shook his head. Something passed over his face, too quickly for Forester to identify. ''Our best guess is that there's no real major cellular damage anywhere. The problem is lack of internal communication between the various sections of the brain due to inhibition of the chemicals that act as neurotransmitters at the neural synapses.''

Forester frowned. ''Then how can they use TK?''

''Apparently that function's fairly localized, and messages within that area get through okay. But for something like intelligence . . . well, when the abstract thought center is in the parietal lobe, the organizational center for that thought is up in the frontal lobe, and—oh, hell; you get the picture.''

''Yeah,'' Forester said, a sour taste in his mouth.

''Let's get back to the problem at hand, shall we?'' Kincaid cut in. ''One of our Spoonbenders may be losing his touch—and if so, we've got to find out why, pronto. Doctor, there aren't any tests your people will want to do before we pull him off the line, are there?''

Barenburg sighed. ''Probably not. You want us to start right away?''

''Wait a second,'' Forester said. He'd been counting on Barenburg to be a little less gung-ho than the director was. ''You take him off the line for tests and it's pretty certain he won't be coming back, isn't it? Well?''

''Ted, look—''

''You *do* plan an autopsy as your final test, don't you?''

''Ted, you're out of line,'' Kincaid said softly, warningly.

Forester turned to him. ''Why? There are tests that could be done right where

he is: changing his glucose or oxygen levels, for instance—''

''That's enough!'' Kincaid snapped. ''Doctor, go ahead and get your team together to plan your procedure, but don't take any action until I give you my okay. Forester, come with me; I want to talk with you.''

He spun on his heel and stalked toward the door. Smoldering, Forester followed.

It is a long time before I dare to reach out across the large empty space again. Instead, I stay near the box I found the last time, searching among the bewildering collection of movement/flows in the area. There are many of them, all seemingly different, with purposes I cannot even guess at. Part of me would like to remain here and learn . . . but I know I wish to find the other, more confusing thing again. Letting go, I reach out.

It is closer to me than it was last time, and when I touch it I am startled. I recoil, but do not leave. Instead, I wait nearby until I am better prepared and then touch it cautiously.

This time it is easier. There are different levels, I find, and if I am careful I can avoid the more frightening parts. I try and understand this thing . . . and slowly I learn why it feels familiar to me.

It is a thing like me.

The discovery that there is something else like *me without* being *me should frighten me. But it does not. Perhaps—somehow—I have known all along that such things existed. I do not understand how I could know and yet not know, but it seems right.*

I sense my limited attention to my work is slipping still further, but I hardly notice. I wish to study this thing as best I can. My work is important, but I will do it later.

Kincaid closed the conference room door and pointed Forester toward a chair. ''Sit down.''

Forester did so. Kincaid pulled up a second chair, but instead of sitting in it put one foot onto the seat. Leaning over slightly, he rested his forearms on his knee and regarded his operations chief coolly. ''Forester, let's let our hair down, shall we? I've been watching you the last couple of months, and ever since the problems started with Twenty-Seven you've seemed less and less enthusiastic about the Project. What's the story?''

Forester shook his head. ''I don't know. I'm just starting to wonder if what we're doing is right.''

''One's highest duty is to serve one's fellow man and to benefit humanity, right? Well, that's exactly what we're doing. Do you have any *idea* how many tons of radioactive waste are produced in this country every year? That's not even mentioning the cubic miles of pesticides and industrial time-bomb chemicals—all of which, please note, the Spoonbenders could handle with equal ease. Once the genetics people figure out how to tailor a memory RNA for the process, ripping apart a PCB molecule won't be any harder for them than yanking neutrons out of strontium 90. We *need* Project Recovery, Ted; America's choking on its own waste, and this is the best answer we've come up with in fifty years. It may be the only good answer we'll ever get.''

"I know all that," Forester said, shifting uncomfortably in his seat. "And if we were using anything but human children I wouldn't mind. But . . . I keep thinking we may be taking something from them that we have no right to take."

"Like what—their childhood? Look: *they are not normal children*. In fact, whether under modern standards you can even consider them *human* is an open question. They're not aware of their surroundings; they've got less intelligence than monkeys and a lower motor function index than a normal six-month fetus."

"Dr. Barenburg thought they might be aware of their surroundings."

"Barenburg imagines things," Kincaid said shortly. "The point is that, if a fetus isn't considered human, one of these Spoonbenders certainly shouldn't be."

"So maybe we should reconsider the fetus issue, too," Forester said, only half-jokingly.

Kincaid gave him an odd look, and for a moment was silent. "Look, Ted, maybe you're getting too close to your work," he said in a somewhat calmer tone. "Maybe you should consider taking a leave of absence, going away somewhere for a while."

Forester smiled lopsidedly. "What, from the top-secret insides of Project Recovery? Isn't that like resigning from the Mafia? Once I'm off the grounds how do you know I won't go screaming to the media about how our big black box really works?"

Kincaid shrugged. "Oh, well, I didn't mean you could just go anywhere you wanted. But the government keeps some resort-type, out-of-the-way places for this sort of thing where you'd be safely away from the public. It's not that what we're doing is in any way *illegal,*" he added hastily, sensing perhaps that he was in danger of backing into a corner, "but you know what kind of unfair backlash could be stirred up if the lunatic fringe got hold of the story before the Spoonbenders proved themselves. You understand."

"Yeah." *Perfectly*. "Thanks for the offer, but I think I'll hold off on the vacation for a while."

"You sure? It'd do you good."

"I'm sure." Forester got to his feet. "But thanks for your concern. I'd better get back to the control room now; the doctor might need my help."

"All right." Kincaid fixed him with a hard look. "But keep your feelings on 'simmer,' okay? For your blood pressure's sake as much as the Project's."

"Sure."

Yes, he would avoid public displays, Forester decided as he strode down the hall. But private voicing of his concern was another matter—and if Kincaid was wholly at peace with his conscience, Dr. Barenburg was almost certainly not. With a little persuasion from Forester, maybe Spoonbender Twenty-Seven wouldn't be sacrificed. At least not quite so quickly . . .

I am learning faster than I ever have before. It is frightening, but it is also exciting.

The thing—the "person"—that I touch knows so much more than I do that I know I will never fully understand him. But somehow his knowledge is

. . . flowing . . . into me, just as other things flow into me through the tubes in my body.

(I had never known before what those things were or what they did. I understand only a little even now, but I will learn more.)

The person knows much about the box where the movement/flow ("current") from my box ended, but it only makes me realize there was more about it to understand than I thought. The other things ("instruments") where currents flow are perhaps less different than I expected; there is a similarity between them, somehow, though I do not yet understand it.

There is so much *I do not understand!*

But the strangest part of all is in the person itself. The thoughts I can touch are thoroughly mixed with feelings I can sense but not understand. Some—a very few—are a little like the fear or excitement I myself can feel. But even they are changed into things I can barely recognize . . . and they frighten me.

I feel very small.

But I will not give up. I can no longer return and be wholly satisfied with my work, though the desire to please is as strong as before. I have learned so much; surely I can be of more service doing something else. That would give me great satisfaction.

Letting knowledge flow into me, I ponder this possibility.

Barenburg was still seated at the main control panel when Forester returned, his eyes on the monitor. O'Brian and the other two operators were huddled together at the far end of the room, conversing in low tones and striving to look busy. Twenty-Seven's eyes were open again, Forester noted as he stepped to the doctor's side. "What are you going to do with him?" he asked, nodding at the screen.

Barenburg sighed. "We've no choice, Ted. Kincaid called in his final order not thirty seconds ago; a medical team's already on its way to the cubicle. I'm sorry."

Forester felt his jaw muscles tighten. "So you're just going to give up?"

"Kincaid gave the order."

"So? You're the medical man on the scene—you can insist on *in situ* tests if you want them."

"What would that accomplish? He's going to die anyway."

"That's a rotten attitude for a doctor," Forester snapped. "*And* for a scientist. Don't you care what's causing this problem?"

"I'm sure the autopsy will reveal that," Barenburg muttered.

"Great. Just great. And in the process you may be tossing away a shot at medical history."

Barenburg threw him a sideways glance. "What are you talking about?"

"Suppose you were right earlier—suppose Twenty-Seven really *is* being distracted." Forester chose his words carefully; he'd hoped this approach would stir Barenburg's interest. It seemed to be working, at least a little. "That might mean that, against all odds, he's actually getting smarter. Maybe not much, but even a few IQ points would be a significant change. If he became aware of his surroundings in any real way—"

"Of *course* he's aware of his sur-

roundings. Why else would Kincaid want him off the line so fast?''

Forester's mental processes skidded to a halt. *''What?''*

Barenburg spun his chair around, his eyes wide with guilt. ''Oh, hell. Forget I said that, Ted—please. And don't tell Kincaid—''

''Doc, what is it I'm not supposed to know?'' Forester interrupted sharply. Something was terribly wrong here. ''You've got to give me all of it now.''

Barenburg sagged in his chair, rubbing his hand over his eyes. ''That damned bourbon,'' he said tiredly. ''Hell. Look, Ted, Red Staley won the Smithsonian Triple-P for his telekinetic ability, right? But he was also an 80 percent-accurate telepath. You probably didn't know that; he didn't publicize it much.''

''No, I heard a rumor about it once. But I didn't know it was that accurate.''

''It was. So now we have forty-nine active Spoonbenders with genetically enhanced telekinesis. If the chromosome mapping is at all the way we think it is . . . then they've got enhanced telepathy, too. Enhanced a *lot*.''

The words hit Forester like an icy shower. Groping blindly, he found a chair and swiveled it to face Barenburg. His eyes still on the doctor's face, he sank into it. ''Do you mean to say they could have been reading our minds all this time?'' The very thought gave him an itchy feeling between his shoulder blades.

Barenburg sighed. ''I'm sure they have been, though probably on a subconscious level. But you're missing my point. Their real problem is lack of long-range intracerebral communication, right? But with a functioning telepathic center *they don't need the neural connectors*. They can shunt everything major directly through that center, leaving the neurons to handle more localized operations and storage. It'd take a lot of adaptation, but the human brain's good at that sort of thing.''

''God in heaven,'' Forester whispered. He threw an involuntary glance at Twenty-Seven's monitor. ''Then they could have completely normal IQs!''

Barenburg snorted. ''They could be *geniuses*, for all we know.''

''But if it's not their brain chemistry, then what's kept them . . . like they are?''

''You mean semiconscious?'' Barenburg smiled bitterly. ''The oldest trick in the book: their oxygen level's been kept deliberately low. Not low enough to put them to sleep, really, but low enough to keep metabolic activity down.'' He shrugged. ''At least it used to work that way. But the oxygen flow to Twenty-Seven still reads normal. I have no idea what could have woken him up.''

Forester's brain was struggling out from under the numbness Barenburg's bombshell had produced. ''Have you told Kincaid or the board about this?''

''Who do you think ordered the low oxygen flow? Of course they know.''

''But—'' Forester broke off as the door opened and Kincaid walked into the control room.

The project director was sharp, all right. He was no more than two steps into the room when he apparently read from the others' faces what had happened. His stride faltered a bit, and his own expression grew thunderous.

"Damn it, Barenburg. I ought to slap you in Leavenworth for this."

The doctor muttered something and dropped his eyes.

Forester stood up, fists clenched at his sides. "It was bad enough when you were going to kill a human vegetable," he grated. "But you're about to destroy a perfectly intelligent, rational child. You can't *do* it!"

"Please keep your voice down, Ted," Kincaid said in a low voice, glancing nervously across the room at the three operators. "Look, I don't do this lightly; the only reason I could give the order so quickly is that we've agonized for months about what we'd do if this happened. But we've *got* to get him off the line before he starts influencing any of the other Spoonbenders—and if he's really poking around with telepathy and TK he's bound to do something like that eventually."

"Why would that be so bad?"

"Because even if he's intelligent he may *not* be at all sane. Remember, the extra nucleic material in his cells has thrown his hormone levels and brain chemistry to hell and halfway back. He could be schizophrenic, manic-depressive, paranoid, or something we haven't even got a name for yet. We simply can't take the chance that he might destabilize any of the others. They're too valuable to risk. The *Project's* too valuable to risk."

"The greatest good for the greatest number," Forester said bitterly. "Is that it?"

"Yes, I guess so," Kincaid admitted. "With the 'greatest number' being in this case the entire country. I'm sorry."

He turned to the control board and picked up the phone.

A feeling of defeat seeped into Forester without relieving any of the tension within him. Perhaps it was better this way, he told himself bleakly. Perhaps death would be preferable to slavery—or to the half-dead twilight the rest of the Spoonbenders lived in.

But he knew better. Even the most oppressed slave has at least a chance of eventual freedom. Death, though, is irrevocable.

And Forester was helpless to stop it.

Kincaid finished his conversation and replaced the phone in its cradle. "All right," he instructed Barenburg, "you can start shutting him down."

And, almost too late, a stray fact popped out of nowhere to settle into just the right niche in Forester's desperation. "Hold it a second!" he snapped. "I've got an idea!"

The others turned to face him, Barenburg with his hand poised over the proper knob. "What is it?" the doctor asked.

"Suppose I could get Twenty-Seven back down into his original state," Forester said. "There'd be no reason to kill him then, would there?"

Kincaid frowned. "But we don't know how he changed in the first place."

"Maybe we do." Forester pointed to the gauge set in the panel over the oxygen control. "This oxygen reading is taken right at the point where the gasses for his air mixture are combined. That point is outside the cubicle itself, for some technical reasons, so the air has to go a meter or so past the sensor before it gets to him. Now, if there's a leak

somewhere in that meter of tubing you'll get room air mixed in, which the doc tells me is richer in oxygen. It could be enough to make a difference.''

''Pretty far-fetched,'' Kincaid growled, nevertheless looking thoughtful. ''What would cause a leak like that?''

''I don't know, but I could check it out in fifteen minutes.''

''A slow leak might explain why this has happened so often with this one,'' Barenburg murmured.

''If I'm right it might save you the cost of a new Spoonbender,'' Forester pointed out.

Kincaid hesitated, then nodded. ''It's worth the risk. Get going.''

Grabbing the proper repair kit from the wall rack, Forester hurried from the room.

The persons are displeased.

That thought is a severe and frightening shock to me, but I cannot pretend it is not true. I have touched three of them, and all are unhappy . . . and I know, somehow, that they are unhappy with me.

I am unprepared for the strength of the reaction I feel at this knowledge. Ever since I touched that first person I have suspected that the urge to do my work was only part of a still larger desire to please these other persons. But I did not realize how strong this desire was.

I feel sick at heart. Withdrawing to myself, I huddle with my grief, wishing I knew how to express my sorrow. Wishing I was not aware.

I am so alone. . . .

After a time I try to pierce the cloud of sadness surrounding me. Perhaps it is not too late; perhaps I can yet make the other persons happy. I know they would like me to resume my work, so I reach up to the cold boxes over me. At the same time I follow the other current back to where the persons are.

Something about them is different. They are still unhappy, but less so. A new feeling is there, too, something that is a little like excitement. I think at first that they are pleased because I have resumed my work, but I know that cannot be true; I am still trying to touch the other movement/flow properly, which I must do before I can encourage it. It is more difficult than I remember it being, but I will be able to begin work soon.

Their unhappiness is still decreasing. I do not understand why, but I now discover their attention is on the instruments before them. Do they no longer care about my work? No, I sense that is not so. I must try to learn about this.

I am beginning to feel very strange. . . .

Forester came back into the control room at a fast jog, out of breath after running most of the way. ''Got it,'' he panted, slinging his repair kit onto an uncluttered corner of the control panel.

''The oxygen reading went crazy while you were gone—first up, then down,'' Kincaid reported, mercifully not mentioning the fact that Forester had been away longer than the promised fifteen minutes. ''What were you doing?''

Forester had most of his breath back now. ''Some idiot left a badly sealed barrel of solvent in Twenty-Seven's service bay. The plastic air line is riddled with tiny leaks. I couldn't seal all

of them, so I moved the sensor past the damage, to right up against the cubicle wall. I wouldn't want to leave it there permanently, but it'll let us get decent readings until we can fix the line." He tapped the oxygen gauge experimentally. "Yeah, there it is; the mixture's too rich. That's got to be it."

"We'll know for sure in a minute," Kincaid said. "You ready, Doctor?"

"Yes." With only the slightest hesitation, Barenburg grasped the knob and carefully began to turn.

There is something changing within me, something I sense is very wrong. My thoughts are coming slower; my touch and sight seem less sure. I realize I am becoming less aware.

I freeze with panic for a single heartbeat—and then I burst into frantic action, searching with all my waning ability for what is happening to me. I touch many instruments and types of movement/flows, things I was not even aware of a short time ago. There is so much more to learn about, I know. But I have learned so much, and I cannot bear the thought of losing it. It terrifies me.

Already I sense a haze flowing over me. Desperately, I continue my search.

"Watch it!" Kincaid snapped, pointing at the gauge. "The needle's jumping!"

"I see it," Barenburg shot back. "What's wrong, Ted?"

For a split second Forester had an image of Twenty-Seven telekinetically seizing control of the bulky oxygen-line valve and forcing it open. But hard on the heels of that picture came the more reasonable explanation. "The valve's part plastic, too; it probably got damaged along with the line. Some of the seals may not hold too well in places. There; it's steadying—you must've turned past a bad spot."

"The whole system will probably need to be replaced," Kincaid growled. "Okay; give him an RNA booster before you turn him down any further."

Barenburg complied, and then turned his attention back to the oxygen knob. Together, the three men watched as the needle slowly went down.

There is no hope left. I can barely continue to think now, and I am helpless to resist the sudden urge to return to my work that overwhelms me. I reach for the cold boxes, touch the movement/flow.

Perhaps if I could have spoken with the other persons I could have told them what was happening to me. Surely they could have found a way to stop it. But I do not know how to do so, and it is too late to learn.

The desire to please them is growing stronger. I can no longer resist it—but then, I do not wish to. I have always wanted to make them happy. I wish only that I had learned more ways to do so.

It is too late. I reach out, to serve as I can. . . .

"Radiation levels back up to normal," Kincaid said, relief clearly evident in his voice.

Barenburg leaned back in his chair and sighed. "Oxygen level likewise," he said. "I'm going to try switching back to automatic control . . . yes; still holding steady."

Forester expelled a quiet breath, feel-

ing the tension slowly ooze away. He had helped save a life . . . but only to return it to unknowing slavery. There was no sense of victory with such an accomplishment; only the knowledge that defeat had not occurred.

Kincaid was looking at him speculatively. Meeting the other's eyes, Forester nodded slightly. "I'm okay. We did what was right."

"Yes. I'm glad we could." The director hesitated. "By the way—the stuff Dr. Barenburg told you about possible Spoonbender intelligence? I'll have to insist you consider that top-secret material, with the usual stipulations against disclosure."

And the usual penalties for noncompliance. "I know the routine. If you'll excuse me, I want to get the ball rolling on replacing Twenty-Seven's air tube."

Picking up the phone, Forester punched for Facilities Engineering. As he waited for an answer, he glanced once more at the impassive, deformed face in Twenty-Seven's monitor. The old stomach-churning feeling returned . . . but now, more than ever, he knew he would be staying with the Project. The ante had been raised, both for his conscience and for the Spoonbenders themselves. He had no illusions as to his power to change things, but if he never was able to do anything else for them but keep them alive, he would be satisfied. Other men had lived out their lives without accomplishing more.

The phone in his hand came to life. Putting his thoughts aside, Forester began giving orders.

I lie quietly, doing my work as best I can, enjoying the contentment that it brings me. I am happy with my work, and will not neglect it again. But it does not take all of my attention, and I can still reach out and learn about other things. This is good, for I would not be happy if I could no longer learn.

The persons in the large space ("control room") seem to be happy again, too, and this also brings me contentment. I do not understand why holding this particular needle in place pleases them, but it seems to do so and that is what is important. There is yet so much I do not understand.

But I will learn. ■

● I envy some of my friends who are convinced about telepathy; oddly enough, it is my European scientist acquaintances who believe it most freely and take it most lightly. All their aunts have received Communications, and there they sit, with proof of the motility of consciousness at their fingertips, and the making of a new science. It is discouraging to have had the wrong aunts, and never the ghost of a message.

Lewis Thomas

The Alternate View

STRATEGIES AND RISKS

Jerry Pournelle

She was beautiful. It was a week ago, and I'm still walking on air. She came plunging down out of that clear blue California sky, dropping like a falcon to a perfect landing, streaking across the dry lake bed leaving a trail of dust, while a quarter of a million of us cheered our fool heads off.

Columbia was beautiful, and now we've got our space-going gooney bird, and that's significant. When you come right down to it, that quarter of a million people is significant, too. Think about it: 250,000 people, on a Tuesday morning, most having been there all night, camped out in the Mojave Desert, in a place without any conveniences or facilities whatever, just to see the first space ship land.

Now tell me the American people don't care about space.

So. We have a ship, and the dreaded tile problems turn out not to be as bad as expected. The shuttle's designers opted for what they thought was a conservative strategy, namely to build the shuttle with an aluminum "cold" airframe and try to protect that from reentry temperatures. The alternative, to build some kind of active protection system using circulating fluids and heat exchangers, seemed far too risky.

There was nothing like universal agreement on that. Insulation is weight. But Lockheed proposed their new ceramic insulation system. They called the stuff "tile," but if you held a piece of it in your hand you'd be more reminded of styrofoam; it's that light. Unfortunately, it's also that fragile. You can put your finger through it with no effort at all (and indeed some tiles were damaged by gravel thrown up by *Columbia*'s nosewheel).

Moreover, aluminum stretches and expands and warps with heat. You can't just glue the tiles to the ship. They'd break and snap off, exposing aluminum—with a melting point of 1220 degrees—to 1800-degree reentry temperatures. So first you must glue the tile to a felt pad, aluminized cloth that looks exactly like a fireman's protective suit. Then you glue *that* to the ship, using room-temperature vulcanizing glues —essentially the same stuff you caulk your bathroom with, the silicone glue that smells like vinegar.

All this presented problems, because the felted Strain Isolation Pad (SIP—the fireman's suit pad) required stitching for reinforcement, and *that* put strains on the tiles so that they broke along the stitching lines.

The tiles weren't easy to make, either. Think about it. First the tile must be milled to an exact shape—a complex shape conforming to the curves of the shuttle body, leaving just enough room between the tile and its neighbor to take

care of expansion of the tile and distortion of the aluminum ship body beneath. Making the tile requires a computer program to instruct the milling machine.

Then they found the strains were worse than they'd figured, and many tiles were removed to be sintered: hardened by exposure to high temperature. The sintering changed the tile's shape, and many of the tiles had to be remade, this time cut larger so that after they shrank in sintering they'd still fit.

The result was that for each of 30,000 tiles there is about a pound of paperwork.

This was a *conservative* design?

Hell yes. It worked, didn't it?

That's one answer. And of course it did work. Nature was cooperative, too; a first cut at the flight data shows that nowhere did the temperature of *Columbia*'s aluminum skin get above 180°F—not even in those few places where some tiles were dislodged during takeoff. Apparently the reentry environment is more benign than they'd calculated.

Of course it was a more complex task than they thought it would be, but that's just obeying Pournelle's Law of Costs and Schedules: "Everything takes longer and costs more." So this was the low-risk way to go.

Contrast the low-risk thermal protection scheme with the Space Shuttle Main Engines (SSME). There was nothing low-risk about *them*. Those engines develop something like a hundred horsepower per pound! The pumps are *way* beyond what was state of the art when the shuttle was conceived.

They *knew* they were taking high technological risks with the engines. They said so, up front, as part of the shuttle proposal. But they had to do it that way, because anything less would render the shuttle economically less valuable, perhaps not even worth building; while success would mean a quantum jump in engine technology.

And what the hell, it worked, didn't it? Good old American know-how came through again.

So which was the greater risk? On first look there doesn't seem to be much in it either way. The shuttle was late and over budget—way late, and a lot over budget—and the two problems, tiles and SSME, were neck and neck as show-stoppers all the way to the countdown.

Take another look, though.

The engine problems seem to be solved. It took a lot of effort, and there were heartbreaking setbacks, but they work now, and look to be good for a while.

The tile problems are still with us, and they won't go away until we take a radical new approach to the problem. Until then they'll go on taking longer and costing more, absorbing thousands of manhours of skilled labor, delaying the shuttle turn-around time, and generally making a mess of things. No follow-on to the shuttle will use anything like that tile system.

So now, which was the greater risk?

Now, I don't mean to imply that the shuttle designers made the wrong decision. Not at all. From where they stood, back at the beginning of the shuttle program, they had a very tough schedule to meet; and it seemed much better to minimize risks. There wasn't

any way to reduce the risk on SSME, but why add to the problem with a high-risk airframe? Especially since Congress wasn't very interested in paying for high-risk studies . . .

And then Carter came in, and decided that the shuttle could be delayed. The decree came down: stretch it out. Now of course stretchouts *never* save money. All they do is delay the costs for a while, but eventually it all has to be paid for. The usual result of a stretchout is a great increase in overall costs; but with any luck, you'll be out of office before those chickens come home to roost.

So what did they need the money for?

Today's *Wall Street Journal* has an article about Tip O'Neill, who became Speaker of the House the same year that Carter became President. "You know," O'Neill says, "I've been one of the big spenders of all time. For instance. Once a doctor came down here to talk to us. He said the average dwarf grows only 46 inches high, and if we appropriated $45 million for research, maybe that could be increased to 52 inches. So I got the $45 million into the budget."

O'Neill didn't care that this was a high-risk research effort. He was also happy enough to delay the shuttle—and that was the highest risk of all.

The United States bet a lot that we wouldn't need the shuttle, that space wouldn't be crucially important in the '80s. We don't know just how much we bet, but it is certain that we bet wrong.

Space, it seems, is the decisive frontier. Space weapons systems are probably the answer to the ICBM. The U.S. has already tested a nuclear-pumped x-ray laser apparently capable of shooting down several dozen ICBMs at a crack—and the Soviets are known to be ahead of us in developing space weapons.

The U.S. has yet to orbit a satellite with 10 kilowatts of usable power. The Soviets have routinely flown 100kw systems for nearly a decade. One of their orbiting nuclear reactors managed to come down in Canada a couple of years ago, but they still fly them.

You need lots of power for Anti-Submarine Warfare (ASW) satellites. Given enough power in space, the oceans are not as opaque as we used to think they were.

There is also the possibility of space battle stations equipped with chemically powered lasers; one such station could, in theory at least, burn down thousands of ICBMs, then go after the enemy's bomber fleet.

Suddenly we live in a world in which strategic warfare is thinkable; in which there could be an unharmed victor after a thermonuclear war. Now, true, the space battle station described above is vulnerable; but there are other space weapons which may not be. Query: Do we care to live in a world in which the Soviets have such a capability? And if they achieve near-invulnerable supremacy, will they allow us to catch up?

As I write this, a new team is moving into NASA. I don't know Dr. James Beggs, the new administrator, although it's being arranged for me to meet him. Dr. Hans Mark, deputy administrator, was Secretary of the Air Force in the Carter Administration; and was one of the few voices crying in the wilderness for a rational space plan. Hans kept the shuttle alive during the dark times.

The previous administrator, Dr. Rob-

ert Frosch, was never a space cadet. I think it fair to say that he'd far rather have been Secretary of Transportation, or even a service secretary, than be the top man at NASA. By contrast, James Beggs and Hans Mark are space enthusiasts. They come from the space community, and they've paid their dues.

They know how to take risks. But will Congress let them?

Certainly space research is risky. Some approaches fail. Others turn out to be too expensive. The proper answer to that is multiple pathways and an orderly development of the technologies required for mastery of the space environment. If you don't have *some* failures, you're not trying enough.

Risks are inevitable; and in these times, the worst possible strategy is to take no risks at all. ■


Part Two of Four Parts
DRAGONSTAR
David Bischoff
and
Thomas F.
Monteleone
VAL LAKEY
ARTIFACT


Dinosaurs aboard a spaceship were surprising, but lacked obvious practical significance. Nevertheless, they quickly became a hot item in international relations....

The year is 2027 A.D. *On Copernicus Base—the IASA Lunar Colony—***Colonel Phineas Kemp**, *base commander and chief of deep space operations for the IASA, is awakened from sleep and called to the lunar observatory by* **Professor Andre Labaté.** *It is an urgent, top-secret meeting.*

A strange object has been detected passing through the field of view of the observatory's photometer array. From earliest data, the object is travelling in a cometary orbit down the gravity well towards the sun. Professor Labaté is baffled by the object as he tells Kemp that it is presently passing within the orbit of Jupiter.

Because of the currently delicate political situation on both the earth and the moon, Kemp immediately puts a top-secret classification on this information. He considers sending an IASA ship into orbit-intersect course with the object for close-up analysis, realizing that the closest ship for the mission must be one of the IASA mining vessels currently working the asteroid belt.

The political situation is this: the Russians have allied themselves with the Western nations in space operations—the result being the IASA. The Chinese also have a lunar colony, and an uneasy truce with the rest of the world. The real center of global tension lies with the power structure of the TWC, the Third World Confederation—an alliance of Arabic and African nations which became an extremely powerful force internationally because of their death-grip upon the planet's petroleum resources. Their rise to power and influence, however brief, did allow them to establish a lunar colony called Ramadas Khan. As the twenty-first century wore on, however, and the world's supply of oil became extinct, the TWC lost its power in world affairs. There is nothing more important on their global agenda than to regain their previous position of influence and control upon the world's economy and politics.

Phineas Kemp orders a surveying/prospecting craft (nicknamed a "Snipe") to be dispatched from an IASA mining ship, the Astaroth. *The two man crew of* **Peter Melendez** *and* **"Big Chuck" O'Hara** *guide the small vessel along an intersect course with the approaching object, armed with an arsenal of cameras and analytical instruments. Upon close-approach, they discover that the object is an immense cylindrical spacecraft. Its dimensions are staggering: 320 kilometers in length, 65 kilometers in diameter. It is apparently an alien vessel capable of interstellar flight; it turns on its longitudinal axis, creating artificial gravity on the interior by means of centrifugal force. Colonel Kemp orders the Snipe to touch down on the surface of the alien vessel, and the maneuver triggers defensive mechanisms on the cylinder's superstructure which destroy the Snipe, killing its crew.*

If the alien ship, now titled Artifact One *by Colonel Kemp, contains an alien crew which may be hostile, they make no attempt to respond to the IASA's efforts to initiate communication. Aside from the destruction of the Snipe, the alien vessel is silent. All telemetered data from the Snipe's analysis is studied and IASA engineers determine the best*

ways to overcome Artifact One's defenses and possibly enter the ship.

With the approval of the IASA's joint directors, an expedition on board the deep space probeship Heinlein *is dispatched to intercept* Artifact One *and attempt entry. One member of the crew is* **Rebecca Thalberg,** *a bio-medical specialist, who is aboard against the better judgement of Kemp because he and Thalberg are lovers and he fears for her safety. Also aboard the* Heinlein *is* **Ian Coopersmith,** *a black Englishman and tactical engineer whose specific mission is to neutralize Artifact One's defensive systems, and gain entry into the ship.*

This mission is successful, and while **Lt. Colonel Douglas Fratz** *and* **Lt. Captain Michael Bracken** *stay aboard the ship, the remainder of the crew, a landing party of six, enter* Artifact One *after figuring out the mechanisms which control its airlock system.*

Once inside the alien vessel, they discover an encapsulated world of jungle, forest, rivers, and plateaus—illuminated by a thick rod which hangs weightlessly along the axis of the gigantic cylinder. The flora and terrain appear to be an exact model of the Earth's environment during the Jurassic/Cretaceous Ages. Ian Coopersmith is in charge of the astounded landing party. He places communications officer **Alan Huff** *by the entrance hatch, and leads the others on a short exploratory mission.*

They quickly learn that the alien vessel is filled not only with plant life, but with dinosaurs as well. The crew is astonished to discover various species wandering about the terrain, and while watching a herd of iguanodons feed near the edge of a lagoon, their radio helmets pick up Alan Huff's cries for help. They return just in time to see the crewman torn to pieces by two meat-eating dinosaurs called compsagnathi. The scent of blood soon attracts larger, more ferocious carnivores, and the landing party is scattered in a panic-filled moment. **Doctor Amos Hagar,** *a popular exobiologist, is consumed by an allosaurus; two other crew members,* **Thomas Valdone** *and* **Doctor Gerald Pohl,** *are killed by two gorgosaurs.*

After witnessing the primitive carnage and death, Coopersmith and Thalberg, the only survivors, escape into the thick forest, since their chance of returning to the entry hatch is thwarted by the presence of predators. They remain hidden until the illuminating rod in the center of the Cylinder grows dim, creating an artificial night. Nocturnal-feeding dinosaurs drive them deeper into the primordial forest and they quickly become lost.

PART TWO

SEVEN

Christ, what a wretched headache he had.

Phineas Kemp seemed wrapped in a thick mist of preoccupation as he sat in an uncharacteristic slouch before the command console. All around him voices blended in a babble of shouts. Confusion and shock and even a hint of panic stirred through the room, like the echoes of his own mind. The headache had been there before all this. Now it pounded like the voice of Doom.

The deep space radio crackled with

the voice of *Heinlein* pilot Fratz, but Phineas was not listening. He kept replaying the sounds of the allosaurus's final attack on his crew. *Rebecca*. Visions of her being mauled swam in his brain, as violently as the ache there. Becky! No . . . not Becky!

He managed to remain calm. So far no final verification, no proof that she had been killed. She might have escaped. . . .

"Colonel Kemp . . . ?" Communications Officer Alterman said.

"Yes? What is it?"

"I've got Commander Fratz on hold, sir. He's awaiting further instructions."

"Oh, yes. Of course," said Kemp.

Kemp had been in the Mission Command Center when the *Heinlein* crew entered *Artifact One*. He and the chiefs of staff had shared the astonishment of the crew's finding. A little world . . . A lost world . . . A *model* of the Jurassic period of Earth, perfectly preserved. Incredible, inconceivable . . . And yet they'd seen it with their own eyes, heard its savage sounds.

They'd watched helplessly as the crew was overrun by carnivorous beasts.

Kemp expelled a shivery breath as he flicked the transmission switch on his console. "Kemp here. Go on, Fratz."

Fratz's voice was strained. "Colonel, we've completely lost contact with the exploration team. Do you want us to go in?"

"Negative, Fratz. You and Bracken are not equipped to deal with the situation in there. We're going to need some fairly sophisticated weaponry and defensive rigs to handle those lizards."

"What about my crew!"

"I think . . . I think we have to presume that they are beyond our help at this point. At any rate, I don't want to risk the loss of more lives and equipment. I want you to remain in matched orbit with *Artifact One* for twenty-four hours. If any of the crew has survived, that should give them enough time to reach Huff's communication gear and contact your ship. If they contact you, request further orders from Mission Control. We'll be studying the situation down here. We'll keep you updated. That's it for now. Copernicus out."

Fratz signed off, leaving Phineas alone with his thoughts. He was of two minds about sending Fratz and Bracken into the alien ship. There were arguments for both courses of action, but Kemp was not emotionally prepared to discuss them at the moment.

Someone slapped him on the shoulder and sat down. It was Gregor Kolenkhov. "My friend, I cannot believe this. How can we have seen what we have seen? By Lenin's Tomb, I have never heard of such a thing!"

"Who could have anticipated anything like this?" asked Kemp rhetorically, shaking his head. He was getting groggy from lack of sleep—had been up for the last twenty hours. Yet he wondered if he could fall asleep, knowing what was happening out beyond the orbit of Mars.

"But what the hell *is* that thing!?" said Kolenkhov. "An alien ship full of *dinosaurs* . . . it's absurd . . . it's unreal."

"But it *is* real, Gregor. We *know* that it is, and we must deal with it as such." Phineas looked about the room, where the other chiefs were standing about talking, obviously unsure as to whether

or not they should intrude on his conversation. Phineas had the feeling that, even though he must get approval from the joint directors, everyone was looking to him for the solutions—even though he had thoroughly fouled up the first two attempts to deal with exploration of *Artifact One*. What was it the Americans always said—three strikes and you're out? He had a feeling that they were correct.

"Where did it come from?" asked Kolenkhov. "That's what keeps eating at me. What *is* it?"

Kemp looked up at his friend, trying to push the troubled thoughts from his mind. "I've been thinking about it," he said slowly. "Labaté figures that it could have been in solar orbit for a long time, right? Why not for about 160 million years?"

"That's impossible. What kind of civilization could have built a ship, or *anything* for that matter, that could last that long?"

"It's not impossible," said Phineas. "*Artifact One* is a completely self-sufficient *world*. It could be equipped with servomechanisms and systems that are self-repairing. It could be a robotship that is capable of existing indefinitely. As for the dinosaurs, the answer seems rather obvious—it's some kind of 'specimen ship' which visited our world back during the Jurassic. The alien crew, whoever they were, probably outfitted the interior of the ship with the suitable atmosphere, and then picked up samples of Earth life-forms. It would seem probable that the ship is capable of creating a variety of planetary environments, depending upon what world the aliens visited."

"Big-game hunters of the galaxy," said Kolenkhov. "Incredible. But you might be right. . . ."

"The big question remains, though: who were the aliens who built that ship, and what happened to them?"

"You mean why didn't the ship ever leave our solar system after picking up the animals? Why is it still here after hundreds of millions of years?"

"Yes. As perfect-seeming as *Artifact One* might appear to us, something must have gone wrong. Either with the crew or with their interstellar drive. A plague perhaps, which could have wiped out the crew? Some kind of equipment failure? I don't know . . ."

"Maybe this isn't the time to be worrying about it, my friend."

"You're right," said Kemp. "I've got to answer to the joint directors for this fiasco. Six more people killed and time is running out."

"Running out for what?"

"The closer that thing gets to the sun, the faster it is accelerating. The closer it comes to us, the more chance that the Chinese or the Third World will detect its presence. I don't have to tell you how bad it would be if either of them got their hands on that ship."

"What do you have in mind?" Kolenkhov asked.

"I don't see where we have much choice. Whether or not the *Heinlein* does make contact with any survivors—if there *are* any survivors—we *have* to send another ship out there, Gregor. We've got to intercept that ship and bring her into our own backyard, and we've got to do it fast."

"What about Fratz and Bracken?"

"I don't know. If I keep them out

there, waiting for something that might not happen, it seems to serve no purpose. But if another ship is dispatched to intercept them, they could help the new crew get things operational.''

''If you're asking me for my opinion,'' said the large Russian, ''I would let them stay there. Just in case . . . you never know.''

Kemp shook his head in thought. ''I have to think about it for a while. Everyone is kind of in a state of shock right now. It's probably not a good time to ask for rational observation or advice. Nobody could have predicted anything like this. . . .''

Neither man spoke for a moment. The silence which hung in the mission control center was a heavy cloak which threatened to suffocate everyone. The communications chief, Alterman, broke the silence. ''Colonel Kemp . . . I've got a message from the joint directors. They would like to see you at once. Executive Conference Room in Admins.''

Kemp grinned ironically. ''Well, I can't say I haven't expected this. . . .''

Gregor Kolenkhov stood up, put his large, beefy hand on Kemp's shoulder. ''Listen, my friend. It might not help matters, but you can tell them that all of us are behind you a hundred percent.''

Smiling, Kemp shook his head. ''Thank you, Gregor. I hate to admit it, but I'm feeling pretty isolated right about now.''

Kolenkhov picked up the feelings beneath the words and his expression changed from cheeriness to a grim embarrassment. ''About Becky . . . I don't know what to say . . . except that perhaps we have no confirmation that she was . . . was lost.''

Kemp shook his head. ''I . . . I shouldn't let my emotions get in the way, Gregor, I'm sorry.''

''Phineas, please, you have nothing to be sorry about. Our lives are not controlled by graphs and computer readouts. It's okay to feel things, you should know that.''

Kemp shook his head, knowing that Kolenkhov was correct. The man had inadvertently touched upon one of the greatest problems in Kemp's life. Becky was constantly bugging him to let himself go, to *feel*, and give flight to his emotions sometimes. Now he wondered if it mattered anymore. ''All right,'' he said finally. ''Thank you, Gregor. I suppose I should be getting over to Admins. Take over for me here, would you?''

''Of course, although there's little to do at this point but wait and see if there is any word from the *Heinlein*.''

The conference room table was lined with the four joint directors and Oscar Rheinhardt of Security. No one else was present. They waited until Kemp had entered the room and took a seat at the end of the table. He felt as though he was on trial.

Director Johl cleared his throat before speaking. ''We would like to take this opportunity to tell you how shocked and sorry we are to have to meet with you under these conditions. However, I want to stress at the beginning that we do not hold you responsible for what happened to the *Heinlein* crew.''

As the others nodded, Kemp thought to himself that he did not care what the directors felt—because he held *himself*

responsible for the disaster. That was what counted. But all he said was: "Thank you, sir. I understand completely."

Johl nodded and continued. "The reason for the meeting is obvious, Colonel. What do we do now?"

Phineas paused for a moment, reflecting on what he had said to Kolenkhov privately. They had been his true feelings on the operation and he saw no reason to veil them when speaking with the IASA directors.

"The way I see things, sir, there is nothing we *can* do . . . except to try again. I suggest that we outfit one of our biggest ships—one of the Outer Planets Class like the *Goddard* or the *Von Braun*—and get a team of the best specialists available. We go out there for two reasons: to search for survivors, and to rig *Artifact One* with some high-thrust engines so that we can steer it out of its present orbit and guide it back to the Earth. We can put it into Earth-Moon L-5 position where we can study it indefinitely. I don't think I have to explain the scientific, as well as political, importance that alien ship represents."

Everyone nodded thoughtfully at the table. Chris Alvarez looked at Kemp, then spoke. "Is this suggestion of yours feasible, Colonel? Do we have the equipment and the know-how to pull it off?"

"Once we have assembled our personnel, we can run a variety of feasibility-scenarios through the computers. Then we would have a few optimal probability models to choose from. I'm convinced that we can handle it, now that we know what we're up against."

Several of the other directors discussed Kemp's plan among themselves. He could not detect anything negative in their considerations. Everyone seemed to be of the same basic belief—that they had no choice but to continue to deal with *Artifact One*. There was simply no way that humankind could ignore the presence of such an incredible discovery.

"Time is our worst enemy at this point," said one of the Russian joint directors. "You must begin assembling a crew for the second mission immediately. How long would it take?"

"Under normal conditions, I would not launch a deep space ship the size of the *Goddard* without at least two weeks' preparation, but we don't have that kind of time. We must launch within 72 hours to ensure that we intercept with enough time to outfit *Artifact One* and revise its flight path."

"Is it possible to mobilize in that short a time?" asked Nelson Johl.

"I'm going to need a lot of help," said Kemp.

"You'll get that," said Alvarez.

"What about security?" asked Phineas. "How are we going to cover the kind of activity that will be going on around here? Copernicus Base will be turned upside down in the rush to get that ship and crew ready."

Oscar Rheinhardt cleared his throat. "I've been giving that some thought, Phineas. That's why I've been invited to attend this little get-together. The official line on the *Heinlein* mission was a preliminary survey of a large, dark body—a large, rogue asteroid—on a close approach with the Earth. I can prepare a statement for the media and

for the general staff on Copernicus that should satisfy even the most curious.''

''Such as?''

''Well, I'll get together with Professor Labaté, and have him concoct some data on the rogue asteroid. We will say that there is a possibility of close flyby with the moon, and that we are sending another ship out there to either divert the course of the thing, or rig it with some H-bombs and blow it to hell-and-back.''

Kemp shook his head. ''It sounds a bit shaky to me, but I don't suppose we have much choice. There may be some level of panic among the general population if they they think there's any chance of their colony being disrupted by a gigantic piece of rock.''

''We will try to down-play the dangerous aspects of the possibility, saying that as long as we act quickly, there will be little cause for alarm. That should cover the need for triple-shift preparation on the launch.''

''All right, Oscar, I suppose I shouldn't try to tell you how to handle that end of things.'' Kemp laughed lightly. ''I'm going to have enough problems, I think.''

There followed a lengthy discussion of how the mission should be coordinated and what responsibilities for launch preparations would be handled by whom. Kemp was frequently asked for his advice, and gradually a well-formed, concise plan was hammered out. The selection of specific crew members was held off until the other items had been dealt with, but finally the subject was reached. Off the top of his head, Phineas had several people in mind, and agreed that if Copernicus and Tsiolkovskii did not have the right specialists for the right job, then they would be summoned from Earth on the next shuttle.

''There is only one more thing,'' said Phineas, ''that I have not discussed with you.'' He looked at the small group of joint directors, waiting for the right dramatic moment.

''And what is that?'' asked Chris Alvarez.

''I thought you would have expected it, or perhaps even asked me about the possibility,'' said Phineas. ''But since the subject has not come up, I think I should clarify my position on the matter.''

''And what is that, Colonel?'' Nelson Johl tapped his briar pipe against a large glass ashtray.

''It has been agreed that I should be responsible for the selection of the officer to be placed in charge of the second mission . . . and I have been thinking about who would be the right person for the job.'' Phineas paused and cleared his throat. ''And I think that the best person for the job is Colonel Phineas Kemp.''

EIGHT

The man waited.

Though it was the quietest time of the evening in this part of the large lunar colony, he could hear occasional clatters of footsteps. So far, one of his fellow colonists had actually used the stairs by which he waited. But there was nothing unusual about finding a man in a stairwell, having a smoke. Smoking was not permitted in the corridors. The stairwells, however, had drafts and therefore, though still legally off-limits to lit

cigarettes, it was general knowledge that if you didn't have a private compartment to poison your lungs in, you could use the nearest stairwell.

The man let the cigarette burn in his hand. He despised cigarettes. Smoking them, however, was a good reason to loiter here like this, waiting for his contact.

The cigarette burned down to the filter. The man stubbed it out in a tiny portable box, which also held the ashes.

He took out another, sighed, and lit it.

"Bring one for me?"

Startled, the man spun around. The quartermaster was regarding him from just above. He gave the man a smirk and joined him.

Feeling guilt as heavily as ever, the man handed over the documents in his briefcase. The quartermaster began to thumb through them after accepting a cigarette.

Another secret meeting, thought the man, only hours after the joint directors' meeting. Out in the depths of space, the alien vessel hurtled down the gravity well towards the sun, while the *Heinlein* and its recently depleted crew hung nearby, watching and waiting. At Copernicus Base, all necessary personnel had been put on triple-shift status as preparation for the launch of the *Goddard* got into full swing.

The man wished he did not know what he knew.

But then . . . well, there was Jimmy to think of, wasn't there?

He was quite high in the command hierarchy of Copernicus Base. With more than thirty years' service in the IASA, he was beyond reproach and suspicion. Yet he was the most highly valued espionage agent for the Third World Confederation.

More than ten years ago he'd been approached by the TWC with an offer which was difficult to refuse. The agent's son was employed as a Reclamation Engineer in East Africa; he would be assassinated if the agent did not comply with TWC demands. All very simple. Direct and straightforward—two attributes which were *not* hallmarks of the Third World Confederation—and yet it worked perfectly in this particular instance. For ten years, the IASA official had served as a leak-proof pipeline to the Intelligence Division of Ramadas Kahn Base.

The second member of the meeting was, on the surface, a quartermaster for Ramadas Kahn Base. Each month the TWC quartermaster checked through security at Copernicus to receive vital supplies carried to the moon in IASA shuttles. It had been more than a decade since the TWC technology had been outstripped by the Copernicus and Tsiolkovskii Space Programs. Without logistical and economic support from the IASA, Ramadas Kahn would be a ghost town.

Each month the quartermaster met with an IASA official concerned with him, under the auspices of the Lunar Free Trade Treaty. Later, however, he would meet with his more important contact, from whom he received more than vital supplies. It was a simple fact of life that governments did not live by bread alone.

"What do you have to tell me?" the quartermaster asked. The man was dark

complected. He wore a self-satisfied smile on his handsome features.

"There have been few developments since the Snipe was destroyed by the alien ship," the IASA official said quickly.

"Have you heard from your son lately? I understand he is doing well . . . for now."

Dammit. The guy *knew* something was up. Perhaps he had another informant, only on a lower level. "All right, there has been something new." Reluctantly, the IASA official explained the disastrous voyage and discovery of the *Heinlein,* and the resultant plans of the joint directors to launch a larger ship to intercept *Artifact One*.

"Do you feel they can do it?"

"Definitely."

"When do they plan to launch?"

"Within 56 hours."

"Of course, you must understand that my government will want one of our people on board that ship." It was not a question. The TWC quartermaster grinned unctuously.

"Yes. I understand."

"Can you arrange that?"

"I don't know. Security clearance will be very tough."

"But you *can* arrange it, *can't* you?" Again, there was no suggestion of a question.

"I . . . think so."

"That is good. Good for you. Good for us. And of course good for your son, who is doing such a nice job in the Republic of East Africa."

The IASA official did not speak for a moment. "You know, I've always hated this. You people have never made it easy for me to be sympathetic to your causes. I don't mean the threats and the reprisals. That's part of being adults in an adult world. It's just that you all seem to be such a bunch of humorless, cold-hearted bastards."

"You do not seem to object to our humorless, cold-hearted money. You have dealt with us for so long, and still you do not understand us," said the quartermaster, frowning. "You look at us through the distortions of your own culture, and therefore you do not notice the motivations that fuel us. That is the way it has always been. You should know better than most that we have suffered greatly within the last two decades. Our ancestors who fought and schemed so hard to bring our people to greatness would be very displeased with us now. Do you know how terrible a feeling it is to achieve the pinnacle of global power—only to have it snatched away by forces beyond your control? My people are accustomed to suffering. It is a part of a long, bloody heritage. But we will not tolerate humiliation."

"Since when is oil depletion viewed as a humiliating tactic? Even back in the Eighties, your leaders knew that their stranglehold on the world economy would be short-lived. It is now time to pay the piper."

The quartermaster flung his half-smoked cigarette down and stepped on it angrily. "Don't get wise with me! I am not here to argue political and economic ideologies. I am here because the survival of the confederation depends on people like *me*."

"And me, unfortunately. If you didn't have a flock of scared stool pigeons puking their guts out every time you rang the bell, your wonderful confed-

eration would be back in their mud huts and and desert tents where they belong.''

''Flattery will get you nowhere. My people are quite proud of the simple beginnings from which we have come. The fact you and your governments fail to accept is that things will never be so simple again.''

''I see. Once you've had a taste of the good life, there is no returning to the Garden of Eden.''

''You could phrase it like that. You with your penchant for simplistic Western fables. Nevertheless, my people have learned quickly the ways of the world. This latest discovery will be the key to our own renaissance. The governments that control the power of the ship coming towards us can control their own future. My people are destined for that power. We mean to have it by any means.''

''Whatever you say. Just make sure my son stays healthy. If anything happens to him, you can bet I'll turn myself in and blow the whistle on you.''

''We keep our bargains. I must go now. The supply vans will be loaded. Just remember that my people will want one of our agents on board that second mission. I don't think I should have to remind you what the consequences would be if you do not comply.''

''You will kill my son . . . go ahead and *say* it. You've said it so many times before, why be gentle at this point of the game?''

''Very well. We will kill your son. Satisfied?''

The IASA official looked away. ''We'd better break this up now.''

''We will meet again at the next shipment?''

''Do I have a choice?''

''No. Goodbye.''

The quartermaster departed quickly and quietly, leaving the troubled TWC agent to ponder what must now be done. It would not be difficult to place a Third World operative on board the *Goddard*. There were several men and women in deep space operations who qualified for the assignments, and who would be beyond suspicion since they had never been asked by their government yet to engage in any covert activities. TWC Intelligence, seeing the growing need for an extensive espionage network almost twenty years before, had been placing operatives within the IASA with regularity. Some of these operatives had never been utilized. But they were always available if needed.

Somewhere beyond the orbit of Mars, *Artifact One* spun in toward the sun. The IASA official considered the implications of what he had been asked to do, and wondered if the life of his son was worth the trade.

Sleep would not come easy tonight, he knew.

NINE

The steamy heat of the Jurassic forest hung about Ian Coopersmith. He half-reclined in the broad, firm fronds of a towering, prehistoric fern, where he and Rebecca Thalberg had spent the night in a kind of half-sleep punctuated by the night-cries of predators and prey. It was the morning of their seventh ''day'' on board *Artifact One*, and Ian was grad-

ually learning necessities for survival in the harsh, uncompromising environment of Earth's long-ago past.

Thirty-two kilometers above his head, running the length of the gigantic cylinder-ship, stretched a burning rod of heat and light. Coopersmith had assumed that it was some kind of gigantic fusion reactor—a p-p reaction—perhaps being fed by intake of interstellar hydrogen. Possibly the power source was something more exotic like the new power kernels—Kerr-Newman black holes with McAndrew Shields—or maybe the theoretical quark modulator made fact. Coopersmith could not be certain, but any civilization which could build a ship as magnificent as *Artifact One* could not be limited from developing *any* kind of technological miracle. The illuminator, as Ian had come to refer to it, operated on a roughly twelve-hour cycle—simulating a never-ending sequence of artificial days and nights. The temperature varied by less than ten degrees Centrigrade by Ian's estimate between the days and the nights, but it was enough of a difference to produce temperature gradiants along the length of the cylinder and produce cyclic forms of "weather." This occurred because the flat ends of the ship cooled more quickly than its earth-insulated length.

Although Coopersmith had been a tactical engineer for most of his professional career, he had a modicum of survival experience in the outdoors, thanks to vacations spent camping in the American Northwest. Though he was not expert, he possessed enough knowledge to have, thus far, kept him and Thalberg alive. Water could be found in stream-fed lakes, underground "springs," which in reality must have been vast storage tanks and recycling systems, and if need be, swamps or rainpools. Food was found in a large variety of greens and fruit-clusters that they observed the herbivorous dinosaurs eating. Early on in their wanderings, Ian decided that they would eat no fruits or seeds that they did not see the lizards consume. So far, at least, they had not poisoned themselves. On the second day, he discovered a deposit of flint, which he used to chip at the steel edge of his belt-buckle, and from that point on, he and Rebecca had fire if they needed it. She had kept reminding him that they would require protein in their diets to maintain their stamina and strength, and the fire would help make carrion from a felled herbivore more palatable.

They had their first taste of iguanodon on the fourth day, and to their surprise, it was not the horror they had imagined.

During their week in the jungle lowlands, Ian had been able to make some elementary observations about the behavior of the dinosaurs, which had helped them survive. It seemed as though the daily routine of life among beasts was a never-ending cycle of feeding, sleeping, occasional copulating, and eliminating. The large, fleshy herbivorous creatures such as the diplodocus, iguanodon, brachiosaurus, and trachydon remained near the swamps, rivers, and lakes, and they seemed to do most of their feeding and copulating during the day-cycles. In their numerous encounters thus far with the herbivorous dinosaurs, Ian had noted that the large creatures were quite skittish and almost afraid of the humans—if they noticed

them at all. It seemed that the plant-eaters possessed such low levels of intelligence that they usually failed to detect Ian and Rebecca even when they blundered into their midst. They seemed to depend more on their senses of smell and hearing than sight, and were only dangerous if you remained in their path as they clumsily waddled along.

The carnivores were another story altogether.

Having seen how quickly and savagely the gorgosauri and the allosaurus had devastated the exploration team, Ian and Rebecca had a fearful respect for the meat-eating species. From long-distance observation, Ian had noted that the predators normally were less in evidence during the middle of the day-cycles, and it was not uncommon for them to be found lying in a clearing, dozing at these times. The carnivorous dinosaurs did their principal feeding at night, relying on a super-keen sense of smell, remarkably sharp night-vision, and incredible quickness. Ian reflected upon his early books of childhood on dinosaurs which often referred to them all as lumbering and slow. Nothing could be further from the truth in regard to the meat-eaters—they were large but frighteningly swift. It was difficult to sleep for the first few evenings because of the nocturnal feeding habits of the predators, and the darkness was constantly being shattered by their savage cries, and the bleating, sheep-like sounds of their victims being literally eaten alive.

Because of the feeding patterns, Ian and Rebecca had taken to spending their nights in the highest trees, which were usually proto-redwoods, giant ferns, and the occasional large ginkgo. They could usually find something that was taller than the largest of the meat-eaters, which would be approximately ten meters. At least Ian had not seen anything larger than that, but he could not be sure that some truly monstrous tyrannosaur did not prowl only in the darkness of night, and had yet to be seen by them. He did not wish to think about such things.

It had been bad enough adjusting to the sounds of the night, especially when they would be anchored into the tree-tops, held in by "safety harnesses" which Ian had fashioned from vines, and some large beast would stagger into their particular tree, shaking them from their half-sleep with earthquake immediacy. There had also been one occasion when two bipedal carnivores (Ian had not the presence of mind, nor sufficient light to identify them) smelled them as they slept in the high limbs of a proto-redwood. The scent of such helpless, fear-struck morsels must have driven the carnivores into a mindless frenzy, because they remained at the base of the tree for almost the entire night, endlessly attempting to scale the tall, thin tree. Leaping, ripping, and tearing, they continued until Rebecca was driven to the edge of hysteria. They had no choice but to hang in the darkness, hoping that the terrible claws would gain no purchase, that the knife-edged jaws would not come flying up out of the damp night. As the dawn had grown closer, the two predators gave up their attempts and searched for more accessible prey, but when Ian descended from the tree an hour after the day-cycle had begun, he was shocked to see the deep gouges

in the base of the tree, thousands of claw-slashes left as a monument to the savage intensity of the hunters.

They had spent the first three days trying to retrace their panicked flight through jungle back to the entrance hatch where they had first come upon the beasts, but this had proved fruitless for several reasons. They had entered the Jurassic forest at nightfall, and spent several hours running mindlessly through the darkness—climbing trees, only to find them unsuitable, or searching for outcroppings of rock that might have a small fissure or cave. But Ian and Rebecca had failed to identify and remember any significant landmarks that might have helped them recognize the approximate location of the small clearing by the swamp, and the smaller knoll where the hatch had opened. There was the additional problem of learning to plot one's position on a landmass that had no celestial features other than the longitudinal shaft of energy going down the center of the ship. This was good for achieving a "north-south" orientation, but little else. With a landmass that curved away and up in both "east" and "west" directions, it was difficult to readily deduce one's position.

From its placement on the outer hull, the entrance hatch had been located at least two thirds the length from the end of the ship where the engines, and possibly the alien crew quarters might be found.

After three days of wandering hopelessly through the interior, Coopersmith suggested that they stop searching for the hatch. It was possible that it had been accidentally closed by the actions of some dinosaur, or perhaps some automatic mechanism had sealed after some predetermined amount of time. Or even if it did remain open, it was doubtful that he and Rebecca could find it without risking a terrible death. From his observations, Ian had assumed that the most dangerous places to be were near the marshes and lake shores—for it was here that the herbivores huddled for food and drink, and that would naturally draw the predators to the same places. The hatch, as Ian reminded her, was perilously close to a natural feeding ground, and he would just as soon avoid it as not.

His reasoning was not unsound, because it was only logical to assume that Copernicus Base would eventually send another exploration team into the ship, and that if he and Rebecca could only survive until the next team arrived, then they would be saved. Ian further reasoned that the best way to remain alive would be to do those things that would keep them as far from the predators as possible.

And so on the fourth day, they had begun, at Ian's suggestion, following the topography as it sloped gradually upwards to a highlands of sorts in the direction of the ship's engines. The higher ground seemed safer, since the rivers ran down to the lakes and marshes below and drew the dinosaurs with them. It had been Coopersmith's vague plan to work their way towards the rear end of the ship in the hope of finding some sign of an entrance into engine rooms or perhaps the alien crew section of the ship. If they could gain entrance to the business-end of the ship, they might be able to use the communications equipment to contact Copernicus. If that

proved unlikely, they would at least have a haven from the predators of the interior.

They had travelled in a "southerly" direction, using the illuminator as their rough guide, for three days, and with each passing cycle they learned more about the magnificent world within the ship. It seemed as if the world-shaping aliens had been meticulous in their reconstruction of an early-Earth environment. Ian and Rebecca passed gorges, mudflats, raging white-water rivers, placid streams, impenetrable forests, jagged peaks in the highlands, and even volcanoes in various stages of eruption. The interior was a miniature Earth in every respect save the land mass which curved and hung above their head some sixty-five kilometers distant. It was, in one sense, a primitive paradise. Ian found that he had mixed feelings about a world so untouched by the hands of man.

He stirred slowly as he came to full consciousness, feeling the tightness of the vine-harness he had fixed the previous evening. For the first few hours of the day-cycle, his muscles would be screaming at him, in defiance at being shackled to the limbs of the trees. It was something he feared his body would never accept. Looking up several branches, he saw Rebecca sprawled and tied upon the broad fronds of her own limb. She was still sleeping and he hesitated in waking her, even though it was important that they use all the daylight hours wisely.

"Becky . . ." he said softly. "It's time for breakfast."

The dark-haired woman started and was instantly awake. She looked down at Ian with large, brown eyes. He was surprised at how attractive she looked after a week without a proper bath, hair conditioners, and the other things which women put to such good use.

"Ooh, God . . . I can't believe I'm still alive," she said lazily.

Ian chuckled as he began unfastening his harness. "Are you expecting to wake up one morning and discover that you're *dead?*"

Becky laughed. "No. I want to wake up and find that this has all been the proverbial bad dream, and that I am back home in Copernicus."

"Why Copernicus? Why not go the whole hog, as they used to say, and be back in Kansas?"

"Ian Coopersmith . . . I do believe you're setting me up for the old 'Toto, I have a feeling we're not in Kansas anymore' line."

He smiled impishly. "Well, maybe I was . . . sorry about that. Do you need some help getting untied?"

"No, I've got it. What did you say about breakfast?"

"I just said it was *time* for it. Never said a word about what it was going to be."

"As usual. When are they going to start providing menus around here?" Becky pulled the last vine away from her, and held on tightly to the thick limbs which supported her, slowly inching towards the trunk of the giant fern.

"I think they've been serving the same menu here for a long, long time," he said. "Come on, let's get down and see what we can find. Some scrambled pterosaur eggs, perhaps. Or maybe some nice fresh left-overs . . ."

Ian worked his way down the tree's

trunk, then waited for Becky to follow. She was quite agile and plenty strong for someone her size. As far as taking care of herself, Ian felt that she was doing a more than adequate job. She rarely had trouble doing any of the tasks that needed to be done. In the week they had been thrown together, Ian had come to respect her and admire her. On the few social occasions he had met her when she was dating Phineas Kemp, Ian had to admit not being very impressed by Rebecca Thalberg. She had seemed somewhat pushy in social situations, and had the annoying habit of constantly reminding people that she was a top-flight surgeon and Bio-Med specialist. Ian now wondered if being under the penumbra of Kemp's many accomplishments that Becky felt impelled to assert her own individuality in any way she could.

As she reached the loamy, sponge-like soil, Ian was already glancing about warily, listening for the sounds of heavy footfalls and thrashing foliage. The forest seemed quiet for the moment and he suggested that they shoulder their few supplies and head out. For the last day they had been heading across a rise in the land that was now beginning to slope downward toward what appeared to be a lush, green valley. From the heights of the tree tops Ian had seen a large river cutting through the center of a depression. He would have preferred to avoid the valley because of the high dinosaur population that would be found near the waters, but the valley seemed so vast that it would take them several extra days to circumvent it.

They gathered primitive fruit-blossoms and large seeds as they travelled "south" until they chanced upon the lower half of a small bipedal dinosaur's carcass. It was hanging in the tangled branches of a thicket, and was untouched other than the teeth-marks which had separated it from its head and shoulders. Ian assumed that the little fellow had been bounding along the night before and had unfortunately hopped into the jaws of one of the big boys. Having dined on the upper half, the large predator must have lost the rest of its meal in the undergrowth, and rather than root it out, had moved on for larger, more satisfying prey.

At any rate, Ian quickly skinned and dressed the muscular thighs of the creature and prepared a fire. They would have to eat quickly since the scent of the cooking meat might attract some meat-eater who had not yet collapsed into the torpid, digestive state of the day-cycle, or perhaps one of the beasts who were getting smart enough to realize that there was ample opportunity to feed well during the times of light.

After finishing their "protein supplement," as Becky sardonically referred to their carrion meals, they kept moving into the thicker foliage of the downward-sloping terrain, until they reached a rocky outcropping, a ragged ledge which looked down into the river-valley.

Ian suggested that they rest for a moment among the rocks, since it was a fairly secure position. He sat peeling the rough, prickly skin off a ginkgo seed, preparing to suck up some of its pulpy juices, when he spotted something down in the carpet greenery below their position.

"Now what in bloody hell is that?" Ian pointed to a spot far below them.

"What is what? Where?" Becky moved down beside him and followed the line of his index finger.

"See those white things? Way down and to the left of those yellowish tree-blossoms, or whatever they are. Those white patches . . . they almost look like they could be geometric shapes . . . like *buildings*."

"Buildings? Are you sure?"

"I don't know. We're too far away at this point, but I think we should investigate, don't you? It's in the same general direction we're headed."

"All right." Becky drew in her breath slowly. "I guess it doesn't matter what we do . . . we're trapped here anyway."

"Oh come on now! It's only temporary, I assure you. They're probably sending out another ship already. If I know Kemp, he probably has every man in deep space operations in on this one. We'll be rescued . . . all we have to do is keep ourselves alive, that's all."

As he dozed in the shade, Rebecca watched Coopersmith.

His well-shaped, muscular chest rose with steady regularity, his finely sculpted nostrils flaring as he exhaled the rich air. Some kind of insect buzzed by. Becky swatted it away. The man deserved a rest. She would see that he had it.

Surprising, how much she'd come to like the guy.

Helping to keep her alive in this dreadful place was certainly a factor. But she'd come to admire him for more than his capabilities for survival. Considering the grimness of their situation, he'd managed to maintain his sense of humor throughout this ordeal. He could be a charming, engaging conversationalist when he cared to be, and he used that talent often to cheer her up during meals, or while they were strapped into high branches, waiting for the sleep of exhaustion to overtake them. Yes, he certainly seemed to brim over with an optimistic view of every situation. Obviously Coopersmith was not a man used to failing. His confidence had helped her no end. She'd come to depend on him emotionally, despite herself.

She used to resent people like Coopersmith—always cheery, always finding silver linings in the darkest of clouds—but when she found that his personality and world-view were infectious, it helped lend her strength and hope.

And he was damned attractive physically, too. Sometimes when she looked at him she felt . . . unusual. It was pleasant and yet troubling . . . and she tried to concentrate on other things.

In their conversations, she'd learned that Ian's mother had been a West Indian black and his father white and British. That explained his rich dark complexion and somewhat angular Caucasian features. He spoke English with a curious blend of accents—Island, London, and Houston—which she found increasingly charming. Coopersmith was big, strong, competent. His love for perfectly running machines and weapons-systems seemed to be shared with his respect for the human body, which he also believed was a perfect biological mechanism. A disciple of stringent diet, he'd told her of his practice of always

getting plenty of exercise. He practiced meditation as well, which seemed to instill in him a pleasant, almost Zen-like acceptance of the relationships between man, machine and nature.

No, she'd never met a man quite like Ian Coopersmith.

He opened his eyes suddenly.

"You're staring at me," he said.

"Sorry. I like looking at people, and you're the only other human being around."

"I suggest that you keep your eyes elsewhere," he said good-humoredly. "Or some creature might decrease the human population of this place by two."

"Okay, smarty. But it's my turn for a little shut-eye."

"And my turn to watch you."

"Now, now. Practice what you preach."

She lay back. The thought of his eyes on her was intriguing.

When their rest-period was over, they continued on across the highlands and slowly descended towards the river-valley. Ian paused every so often to get his bearings in relation to the illuminator and the relative position of the white objects he had seen from the heights. As they dropped lower into the dense foliage of the forests, the white things that might be buildings were often lost from view and Becky depended totally on Coopersmith's sense of direction. It was easy to see how they had lost their way in the first place. Even after Ian had claimed to have worked out a simple orientation method, and had attempted to explain it to her, Becky continued to feel hopelessly lost.

They continued downward for the better half of the day-cycle without incident until they stepped into a small clearing bisected by a small, shallow brook. There was a wide expanse of mudflat which flowed down to the water, covered with a variety of sizes of saurian footprints. Most of them were no larger than a man's, although there were several sets of deep, taloned prints, which suggested predators favored this spot as a feeding ground.

As Ian and Becky broke through the brush at the edge of the clearing, intending to use the brook as an opportunity to refill their water rations, Coopersmith stopped suddenly, putting his hand to his mouth in a pantomime of silence.

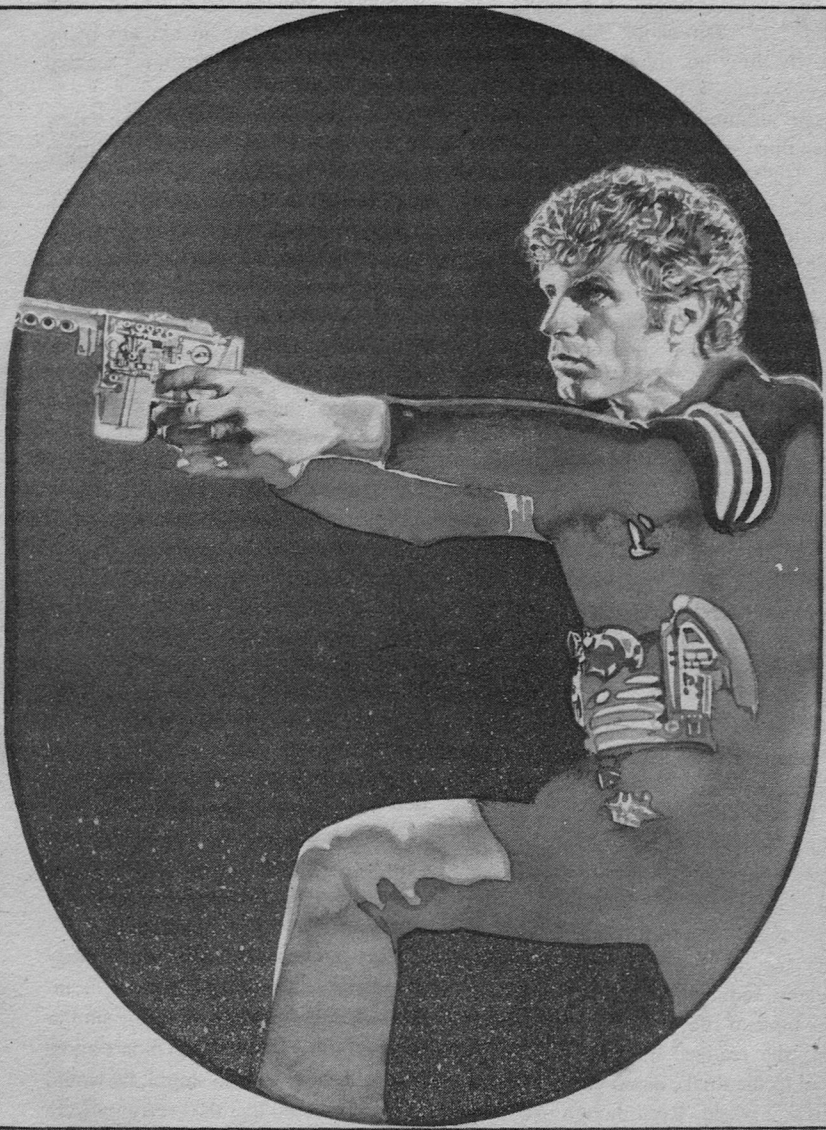
"Goddamn!" he whispered. "I didn't see that bugger until we stepped clear. Be quiet and don't move!"

"Where?" asked Becky, looking beyond Ian, but seeing nothing.

"There. By those trees. He's almost the same color as the brush. . . ."

Becky saw it now, and her breath caught for a moment in fear.

Concentrating on picking out the beast's natural camouflage from the flora, she could now see the bipedal dinosaur. It was a theropod of the gorgosaur family, although she was not certain of its exact species. From where they stood it appeared to be about twice a man's height and many times his weight. Sprawled upon its back, it half-reclined against the bole of a large conifer. Its small forelimbs stuck up and away from its grossly distended belly and its head was tilted back at an odd angle, mouth slightly parted while clouds of insects buzzed about its meat-flecked teeth to steal some scraps.



"Is it dead?" whispered Becky.

"No, I don't think so. Sleeping off a big meal, I'd say. Big torpid bastard . . ." Ian shook his head, and slowly drew his sidearm from his holster. So far, he had been careful not to waste ammunition, and still had more than thirty rounds in his jumpsuit pockets. His Magnum pistol handled .44-caliber exploding slugs, which he assumed would do lots of bone-damage to anything struck at close range. But considering the thickness of the carnivores' skulls, Ian had figured that the best place to fire at an attacker would be in the vital area just below their small forelimbs but above their bellies.

Holding the Magnum ahead of him, he motioned Becky to follow him slowly and quietly along the edge of the mudflat, and away from the sleeping hunter. Gradually, they added distance between themselves and the beast until they reached the other side of the clearing. Ian paused to check their position against the illuminator and then entered the forest again.

"Just walk slowly and steadily. We'll be all right if we keep quiet and don't wake him up."

Becky nodded and kept moving. They threaded their way through the ranks of proto-firs and giant ferns as the thrumming sounds of the forest enveloped them. It was difficult to imagine that one could grow accustomed to the steamy, redolent forest and its machine-like buzz of life, but as Becky followed Ian, she realized that she *was* getting used to the thick, damp greenery of the Jurassic world. Even though one could stumble upon a walking nightmare at any time, even though the millions of species of insects, leeches, and slugs were waiting to have a bite of your warmflesh, you learned how to live with it. The old adage about humans being the most adaptable of creatures seemed true.

They walked carefully into the valley for another fifteen minutes without speaking. "Are we safe now?"

Coopersmith shrugged. He was still carrying his Magnum in his right hand. "Who knows? The more distance we put between us and him the better, but we might be walking straight towards one of his cousins. You never know in this place. . . ."

Just then, there came a loud bellowing noise which seemed to split apart the heavy, humid atmosphere of the valley. Tracking the source of the sound, Ian stared through the thicket of trees, watching for some sign of movement, some change in color or the light.

"What is it?" asked Becky.

"I don't know . . . as usual, I guess. Doesn't sound like one of the meat-eaters, though. Too high-pitched, you know?"

"I'll take your word for it. Hope it doesn't wake up Sleeping Beauty . . ."

"We'd better keep moving in any case. It sounded like whatever it is is off to the right. Let's just try and steer clear of it."

They moved off again, more wary than before. The bellowing sounds increased, and were soon joined by similar sounds further away. If Ian didn't know that the beasts were so stupid, he would have considered that the creatures were communicating in some fashion of hoarse cries.

He mentioned it to Becky, who smiled, but said nothing.

Ten minutes passed and it seemed to Ian that they were drawing closer to one of the bellowing creatures. He stopped and peered off among the trees. Something large was thrashing about among a group of cycads and ferns. "Look! There he is! See him?"

"I remember him," said Becky. "Stegosaurus, right?"

"That's the one. What's the matter with him, do you suppose?"

The dinosaur was running about in a tight circle like a cat chasing its tail. Its large humped, plated back swayed to and fro as it moved, pausing only to bellow its singular cry. Each time it would be answered by another beast, presumably another stegosaurus.

"You know, Ian, I think you might have been right. I think they are talking to one another. . . ."

"That's ridiculous! They're as stupid as turnips!"

Becky smiled. "And I think we've been wrong calling this one a *he*."

"You mean—it's a mating call? You know, you might be right, Becky. Maybe we should stay for a moment. This might be interesting."

"You want to play voyeur to a coupling of lovestruck stegosauri?" Becky laughed.

"Now wait a minute! Don't you know that one of the burning questions of science has always been 'How in bloody hell did the dinosaurs *do* it'?" Coopersmith smiled, his bright teeth in sharp contrast to his dark complexion.

"Hmm, I suppose you're right. Are we safe here?"

"Safe enough, I'd think. If their cries of passion get too loud, I would suspect that they would attract meat-eaters to themselves before us."

"Do you *really* want to watch?" asked Becky.

"Why certainly! This is valuable paleontological research! My God, woman, you're making me sound like some kind of pervert."

"Oh Ian, I was just kidding you. *I* want to see this as much as you do. I wonder what they do with those spikes on their tails?"

"Move them out of the way, I hope. Look, here comes her young prince now. . . ."

Beyond the stand of trees, they could see a larger, mottled stegosaurus, lumbering towards the female, pausing only to make that odd bellowing sound. When he approached the female, she stopped her frantic chasing of her own tail, and allowed the male to join her in the strange dance of love. They followed each other's tails for a few moments, their bellows transformed into bleating noises that almost dripped with anticipated passion. Closer and closer they drew to each other, their circling dance slowing until the two awkward beasts had almost stopped. While the female shifted uneasily from one foot to the other, the larger male changed positions so that, although he was still facing opposite her, his hind legs were even with hers.

Suddenly the female dropped over on her side, lifting her spiked tail up and away from her suitor. Seeing his lady in such a submissive and obviously seductive position, the male moved closer to her until he could lift one of his thick hind legs over hers, half-straddling her.

More soft bleating sounds, and the two ugly beasts attempted to copulate. The eventual congress took some doing. Ian could not help but chuckle as he watched the male repeatedly fail in his efforts to complete the job.

"I'm glad it's become easier for the rest of us," he said. "Would sort of take all the fun out of it, wouldn't it?"

Becky smiled. "I think you're right."

The stegosaurian union, once effected, was brief and perfunctory. Apparantly neither member of the species took much delight in the performance, and were following some instinctive urge, rather than seeking any pleasure. In fact, once finished, the male hobbled away from his lover without so much as a backward glance, leaving her to struggle awkwardly to her stubby feet alone.

"Well, that's one more burning question laid to rest," said Ian. "Of course, that was only one species . . . we've got thousands yet to record."

Becky laughed. "I think you *are* a pervert."

"I never thought I'd ever be accused of being kinky with dinosaurs!"

They laughed for a moment as they watched the female finally gain her feet and walk off lazily to search for a soft spot to lay her eggs.

"I don't suppose we have to worry about waking up that predator back there, not if all that racket didn't do it," said Ian. "But I think we should keep moving nonetheless. What do you say, my dear?"

"I'm just visiting here. I follow you."

"This way, then," said Ian. He was beginning to feel more and more comfortable around Rebecca Thalberg, and he knew on another level that an easy, cooperative relationship between them would be a plus in terms of their survival. It was possible that he could become physically attracted to the small, raven-haired woman, but he tried to keep such thoughts from his mind. It was when you started letting your mind drift away from priorities that you got yourself into trouble. . . .

They walked further into the river valley, pausing only to have a light "lunch" of seeds and fruit. Finally Ian estimated that they had travelled far enough to get a closer look at the white objects seen from the highlands. He selected a tall cycad, and nimbly scaled it, getting as close to the top as possible so that he might peer down into the deep green carpet below them. As he scanned the lowlands, he was shocked at what he saw.

Just breaking the line of tree-tops about ten kilometers distant were the unmistakable signs of intelligent life—the tips of three large pyramids, glistening brightly under the light of the illuminator. Ian's pulse jumped as he strained to make out some detail in the structures. His first impression that he had seen some kind of buildings had been correct. It was somehow more unbelievable than the rest of the crazy world they had discovered.

"Becky," he called down. "You're not going to believe this . . . but I think we've got some company in here."

She looked up and watched him as he worked his way down from the tree, waiting until he jumped to the soft earth before speaking. "What're you talking about?"

"There're some kind of buildings ahead. I saw the tops of them—look like pyramids to me. It might be a city or a temple or something."

"But *how?* Who built it?"

"I don't know, as is the usual state of affairs here. But I suggest that we find out what we can before it gets dark. I've taken a new fix on the position, and it looks like we have about ten klicks walking ahead of us. You feel up to it? I'd like to get there before the night-cycle."

"Do you think there're any . . . *people* there? Would it be dangerous?"

"I'm asking myself the same questions, but somehow, I don't think it would be any less safe than where we are now. Let's get moving, what say?"

It was not a city.

Three limestone-block pyramids, three-sided configurations, were arranged to form the points of a large isosceles triangle, all bounded by the remains of a two-meter block wall. The jungle had done its best to completely overwhelm the ruins and had done so quite efficiently. All that remained of the wall was a few bare patches which Ian cleared by cutting away the thick mat of vines and creepers that covered it. The pyramidal structures had, at one time, been built with step-configurations like the South American temples or the Mid-Eastern ziggurats, but now they were crumbling down, under the constant pressure of the artificial gravity and the creeping growth of the jungle-forest.

It was impossible to determine how old the structures might be, but Ian suspected that they were very old indeed. He found it curious that there were no remains of statues or any friezes, reliefs, or other stone-work that would give some clue as to the identity of the builders. From an engineering standpoint, the pyramids were not works of inspiration or architectural finesse, and seemed to be only several orders above the primitive constructions of Stonehenge.

Rebecca sat upon the lower steps of one of the structures watching Ian poke about in the thick undergrowth, still searching for any clues to the mystery.

"Could there possibly be *people* here?"

"We can't assume that from what we have here, Becky. This only tells us that at one time, probably a long time ago, there *were* people here. It doesn't look like they've used this place for a hundred thousand years if you want to know the truth."

"Could they have been Neanderthals or . . . Australopithecines?"

"You mean those fellows Leakey found? I doubt it . . . The latest data puts humankind on the map around ten million years ago. That's still 160 million years after the dinosaurs. No, that's not too likely."

"But maybe they *evolved!* Right here in this ship, the way they did on Earth."

"You mean the little protomammal and tree shrew bit? Hmm, I suppose that could have happened, but isn't all that predicated on the demise of the lizards? I haven't kept up with that sort of thing, but I seem to have the idea that most scientists feel that the Earth passed through some kind of planetary disaster period that caused the demise of the dinosaurs, and that was the only way a new order of creature—the mam-

mals—ever had a chance to get started. *After* the dinosaurs had been eradicated."

"And. . . ?"

"Well," said Ian, looking off into the darkening shades of green beyond the walls, "that obviously didn't happen here. I mean, the dinosaurs dominated the Earth for a *hundred million years,* or so. That's being a success under anybody's terms. Whatever wiped them out on Earth never had a chance to do it up here, and as you can see, they are still going strong. If there *are* any tree shrews or protomammals, or whatever you want to call them, crawling around up here, I haven't seen any. And even if they're nocturnal, it seems obvious to me that all the big fellows with the scales and the nasty dispositions have been doing a good job of keeping them in check."

"That still doesn't tell us who built these ruins."

"No, it doesn't. But it only leaves us two possibilities: either the alien crew, having experienced some kind of technological problem in the control section—with famine, mutiny, etc. all following naturally afterwards—had struck out inside their giant terrarium simply to survive. Maybe they lasted for a few thousand years, or whatever, but with the loss of their technology through the generations, until their descendants were a bunch of primitives who eventually died out . . . or, the second possibility, which is that during all this time, in this controlled biosphere, some species of dinosaurs evolved to sentient levels. . . ."

"My god, Ian, is it possible?"

"Is anything *not* possible? That's the question, isn't it? But there's a problem with that theory, too."

"What's that?"

"Well, where are they? These intelligent dinosaurs, I mean, if they survived as a species. I mean, they have had lots of time to evolve, and they should have been able to dominate this whole little world after all the *millions* of years."

"They could be *anywhere,* Ian. We haven't even begun to cover the territory inside this ship. For all we know, we might be wandering around in one of their game preserves or national parks."

"By God, that's a sobering thought, isn't it?" He smiled and sat down beside her. "It's getting dark. Actually, the cycles are about eleven hours and forty minutes each. Days and nights used to be shorter on Earth."

He watched her as she gazed up at the dimming illuminator. She really was a fascinating woman. She'd been opening up a lot to him, telling him about her life. She'd taken the intense academic and professional course in life, and now, in the face of the possibility of death, she wondered if she had made proper use of her life. Parts of her seemed, in this alien hothouse, to be blooming.

"Maybe they're up there," she said, pointing past the halo of the rod, beyond the sky, at the land mass sixty kilometers above them. A thick haze kept everything there indistinct. "Maybe we're just in the wrong part of town." She turned to him. "Well, what do we do now besides survive?"

"I was thinking that maybe we should stay here tonight. Maybe linger for a few days."

"Ian, I can't believe how scared I am."

"Well, that's an emotion we're both sharing. Look, my dear, I've told you. We've just got to make the best of it, that's all. I'm frightened of dying . . . especially in the manner that most creatures die in a place like this. But I'm also frightened of finding some of the answers to our questions. I mean, I'm not sure I *want* to know what all this bloody nonsense means."

"You mean that there *are* some things that Man was not meant to know?" Becky smiled half-heartedly.

"No. Not *that* rubbish. I mean I'm not sure I can mentally or physically deal with the underlying truths about this ship and everything that's in it. At least not *now*, while I'm trying to stay alive. There's such a thing as *too much*, you know. Too many mysteries. Too many questions. After a while, you just don't care anymore. . . ."

"Now you're starting to sound like me."

"Am I? Good God, we can't have that, can we?" He put his arm around her, surprised that she felt so tiny and frail. She responded to his touch by leaning into him. He felt the soft warmth of her body against his chest. Ian had almost forgotten how good it was to hold someone, the reassurance it gave. He thought immediately of his wife Leticia. Would he ever see her again? He thought of all the intimate moments they'd shared, the way, sometimes, they'd almost *think* the same way, finish sentences for one another. A pang swept through him.

What the hell was the use of anything? Scientific inquiry. Status. Achievement. Fidelity. All the things he'd worked for all his life. Under the glare of the illuminator, amidst the smells and the sounds and terrible beauty of this savage paradise, all his civilized values seemed . . . distant.

What was happening? What was he thinking about, really?

He switched his attention toward thoughts of the timetables they were dealing with. It had been seven days since they'd been stranded inside the ship. Even if Copernicus mobilized another ship within that week's time, considering the increasing velocity of the alien vessel, the tricky navigational maneuvers, the speeds necessary for the IASA ship, and the additional difficulties of finding him and Becky, it was going to be another thirty to forty days before they could hope to be found.

A *long* time to simply survive. A *long* time to live with someone like Becky, becoming close, sharing. . . .

Becky stirred lightly. She seemed to nestle closer against his chest. "That's nice," she said.

"What's that?" he asked softly.

"Feeling you holding me, that's all. I'm so glad you're the one that made it, Ian. I don't know if I could have held everything together without you."

"Yes. You would have. We can do amazing things when we have to."

"Maybe," she said. "But you've made it a lot easier. It occurs to me that I've never thanked you."

"*Thanked* me? What for?"

"For being so *competent*. I guess that's the right word. And for being such a—god, I sound so old-fashioned, but—for being such a gentleman."

"Oh, I think I know what you mean.

Somehow I don't think being a gentleman will ever go out of style. Not with the right people, anyway."

"Are we the *right people,* Ian?" Becky looked up at him. He found himself falling into the depths of her brown eyes. Odd feelings stirred in him. He knew what was happening. Should he resist, or not?

"I don't know, Becky. But I think so."

She put her arms around him, pulling him even closer. "I do too," was all she said.

Ian looked up to see the illuminator growing dimmer, now only a dully glowing amber. Shadows fell across the landscape like dark pools. The green of the forest became more intense. The sounds of life scurrying for survival hummed in the air about them. Something woke up screaming and hungry in the distance, but Ian barely noticed.

His universe was suddenly filled with only the warmth of Becky's touch.

TEN

Trying to expend sheer nervous energy, Col. Phineas Kemp sat at his command console and punched up another complete set of calculations for the trip. Then he'd do a maintenance check, he thought, sipping at coffee as figures and diagrams began to blink onto his readout screen.

He sure as hell was going to make sure *this* expedition was successful, he mused, ignoring the activities of the other members of the crew, doing their duties.

Looking like a floating petroleum refinery, the *Goddard,* with its improbable configuration of spheres and superstructure, had just accelerated from lunar orbit on its intercept course with the *Dragonstar*. Phineas Kemp had not been pleased when Marcia Bertholde had coined the term for the alien starship. He preferred the more functional title of *Artifact One*. However, the more lyrical, romantic minds had prevailed. To them, *Dragonstar* was a beautifully apt name for the alien ship. Even before the *Goddard* was launched, the new code name had been almost universally accepted.

Like the *Goddard*'s smaller counterpart ships, the outer planets probeship was equipped with Lukodyanov ram-impulse engines. Constantly accelerating at about one Earth gravity, the *Goddard* would achieve a velocity in the neighborhood of 3,000,000 kilometers per hour before decelerating and matching the ever-increasing orbital velocity of the *Dragonstar*.

Phineas Kemp had installed himself as mission commander of the *Goddard*'s voyage. He had supervised the crew-selection and every detail of the mission plan. Although the primary objective would be to commandeer the *Dragonstar* and bring it into stable L-5 orbit, he had acceded to the requests of the joint directors to include several paleontologists and biologists (shuttled up quickly from Earth) so that some preliminary studies could be made of the specimen-jar environment of the Earth's early ages. He could understand the excitement and desire on the biologists' parts, but the real importance of the *Dragonstar* was what was hanging off the ass-end of the ship—engines which

had carried it to Earth's solar system from God-knew-where. Light-years distant, to be sure, and Phineas could hardly wait to have IASA's engineers crawling over the innards of that ship. The secrets waiting for humankind were immeasurable, and, thought Phineas, whoever it was who bestowed such a gift on the world would be forever remembered. . . .

But there he was thinking of his damned ego again. Would he ever get out from beneath the thumb of his father and the old man's expectations? It was times like this that made him doubt it.

There *was* another reason why Phineas had assumed command of the *Goddard*. It was a reason which he had shared with no one, and rarely himself. Rebecca Thalberg. Plain and simple, there was part of him that considered the voyage a rescue mission because he had refused to believe that she was dead. The logical part of his mind kept telling him that as long as there had been no positive verification that she had been killed in the initial havoc (and there had *not* been), he would continue to believe that she may have escaped. The thought of never seeing Becky again troubled him in his conscious mind and in his dreams, and he cursed himself to realize that it required a tragedy of this proportion to make him *see*, to make him *feel*.

And so, even though he had selected his crew for the primary objective—twenty engineers and EVA riggers, plus the three paleontologists—Phineas still had twelve (including himself) highly trained astronauts with planetary exploration experience. Twelve physically and mentally tough men and women who could form a small, but extremely capable, expeditionary force. Armed with sophisticated weaponry and survival gear, Phineas dreamed of leading them through the interior of the *Dragonstar* in search of Becky.

He would certainly have the time for it, he thought. Once the initial surveys and preliminary explorations had been conducted, and the out-rigger engines had been attached to the alien vessel's hull, there would be plenty of time for extra-curricular activity. It would be a long trip back to Lunar orbit, and everyone would need something to keep them occupied. Mikaela Lindstrom, the chief paleontologist from the Smithsonian, and her two assistants, would be busy with their dinosaurs. Robert Jakes, the chief engineer, and his men would keep tabs on their jury-rigged tug-boat operation. Phineas would be providing security for the rest of the crew, planning a search and examination of the alien crew quarters, and perhaps sending out a few exploratory teams.

If Becky was alive, he would find her.

He finished his coffee and examined the read-outs again.

The *Goddard* accelerated through the emptiness of space, her computers constantly reassessing her position in comparison to that of the *Dragonstar*, and guiding it into an oscillating trajectory that would sweep in grandly alongside the giant alien vessel. The weeks passed quickly for the crew as they prepared for a quick, well-coordinated assault on the spinning cylinder. Phineas Kemp conducted briefing sessions and contingency-plan meetings at regular inter-

vals. The crew was bombarded with every scrap of information known about the *Dragonstar* until every man and woman knew the vessel and their job connected with it as well as they knew their own thoughts. There would be no screw-ups this time around. Three strikes and you're out, Kemp had told them, and it was time for a home run.

As the *Goddard* closed in on its target, Kemp had most of the crew as excited and anxious to get moving as a high school football team the night before the Thanksgiving Day game.

All except one member of the crew.

His name was Ross Canter. He was one of Doctor Jakes's assistant flight engineers. Tall, thin, and somewhat emaciated-looking, Canter was considered one of the best men in his chosen profession. He had a slightly Mediterranean aspect, a fact which he attributed to his mixed parentage of Israeli and Irish, which was borne out by the fax sheet in his security clearance file.

But, of course, this information was incorrect.

Ross Canter, whose real name was Pierre Rassim, was a member of the Third World Confederation's intelligence division—known simply as *The Jiha*—although his contacts with his superiors since joining the IASA fifteen years ago had been extremely infrequent. He was part of a vast community of global spies and agents whose existence was acknowledged by all participating countries and alliances, but whose individual identities were not always known. It is said that espionage is quite boring in the long run, and that it is not the pulse-quickening life described in popular films and novels. Ross Canter would agree with that completely. In his years of service to the *Jiha,* he had never been called upon to do anything other than file his "progress reports" on a regular basis, which served only to allow his superiors knowledge that he was still alive. He often assumed that he was being watched, monitored so to speak, by other agents so that it could be known if he was being unconsciously swayed by the "other side," but he had never been aware of any surveillance.

In actuality, Canter had to admit that the political fervor which had brought him to the *Jiha* in the first place had been waning as he grew older. It was said that age makes more conservatives than speeches, and he tended to agree with the aphorism. As an engineer with IASA, he concluded that he would have been doing a similar function in the TWC, and that he loved his work as much as a man should. Therefore, he supposed it did not really matter which government he worked for, since he was, in the long run, an engineer and not a spy.

The only factor, in fact, which had kept him loyal to the Third World Confederation was the kindnesses and storytelling abilities of an old man named Ahmad Nesrudah. Canter had been a small boy living with his parents in Beirut during the outbreak of the near-disastrous Oil War in 1998. The Lebanese city was practically levelled in the course of the action, and there were hundreds of thousands of war orphans, of whom Canter was one of the more fortunate.

Ahmad Nesrudah had been an Iranian oil minister during one of that country's various political/religious ruling re-

gimes, but he had possessed the good sense to vacate the area before it became personally dangerous. When his wife and remaining children were killed during a series of bombings, he set out to replace his family with an orphan son. Finding the young Pierre Rassim in a Unesco Center, Nesrudah adopted him and transported him to his private villa in a small Saudi town, where he was revered as a teacher. The boy grew up under the sharp and intelligent care of the old man. He was taught to trust no one but himself, to arm himself with knowledge, and to respect the ancient Arabian traditions.

Old Ahmad seemed to delight most in telling the boy stories of the Arab terrorist groups of the latter half of the twentieth century—a time when he had been more politically active himself. It was then that the Third World became recognized as a force to be dealt with, and it was only because of the glorious efforts of their ancestors. It was the first time in almost a thousand years that the noble culture which had its roots in the Ottoman Empire had raised itself and challenged the supremacy of the Europeans and the upstart Americans—mere children in the world of culture and antiquity.

Ross Canter/Rassim had loved the old man dearly, and had many times sworn to him that he would never betray the ideals in which he believed. After attending the University of Palestine, he entered the *Jiha,* and was sent to Chicago, where he began living his false identity, living the life of a secret agent, waiting for the moment when he might be called to serve the ideology of the TWC and the memory of old Ahmad Nesrudah.

The moment had finally arrived.

Phineas Kemp sat in the command chair as the *Goddard* approached the long-awaited rendezvous. "This is Colonel Kemp on board the *Goddard.* Calling Commander Fratz . . . come in . . ."

The radio crackled for a moment before Fratz's voice came through. "Good afternoon, Colonel, we've been expecting you. Sorry that I don't have anything to report . . . but things have been quiet since we got here. . . ."

"We figured as much, Commander. Stand by for docking . . . you can go to automatic any time now. Report to the command cabin when you're on board."

"Yes, sir . . . docking procedure sequence starting now. Stand by, *Goddard.*"

Once the smaller *Heinlein* had linked up with the larger ship, Kemp intended to have Fratz and Bracken pilot the *Goddard*'s landing module, since they were the only ones with anything one might call experience in landing upon the *Dragonstar.* Kemp wanted to waste no time in getting the mission under way, and had already assembled the first part of the team in the transport bay of the lander. He had been over the recordings Coopersmith and Bracken had completed on the alien hatch opening sequences and the descriptions of the "ascent" up to the surface of the inner world of the alien cylinder. Phineas planned to lead the first group of ten into the *Dragonstar*—their first objective to establish a secure base camp, and

then begin disarming the defensive systems of the outer hull so that the engine-rigging could begin.

He looked at the impossibly large expanse of the alien ship through the main viewscreen and shook his head. Even though he had seen the VOR recordings uncountable times, and had watched the cylinder grow larger and larger as the *Goddard* approached, it was still difficult to accept how immense the thing was. Phineas's ship was more than two hundred meters long, one of the biggest ships in the Deep Space Division, and it was like a flea preparing to land on an elephant's back in comparison. The *Goddard* was so close now that the cylinder was no longer recognizable as a ship—its endless surface stretched in all directions like the surface of a medium-sized moon. The details of its hull stood out in the sharp relief of sunlight and shadow. Phineas sat watching the screen, thinking that this gigantic *thing*—this ship of monsters—would not beat him. It was his for the taking, and he would not fail.

"Excuse me, Colonel, but Fratz is on board now," said the assistant flight commander.

"Tell him to get up here on the double."

Phineas looked back to the screen, trying to imagine what it would be like inside the *Dragonstar*. Until this moment, the thought of being frightened, or even apprehensive, had not touched him, but now, as the moment grew nearer, he felt the bottom dropping out of his stomach. He wondered how he was going to hold up under the pressure.

Fratz entered the cabin just then, and Kemp was glad for the escape from his thoughts. He quickly briefed him on the landing procedures and gave Fratz a chance to offer any additional advice that might be helpful. After a short discussion of technique, both men left the cabin—Fratz to enter the command chair of the landing module, Kemp to the transport bay.

The first group into the lander included Lindstrom and her two assistants, Kemp and six other astronauts. Everyone wore standard EVA gear and carried with them large survival packs with the gear they would need once inside the *Dragonstar*. Kemp and his men also carried equipment racks and a field generator which would be needed to rig up an electromagnetic "fence" around the perimeter of the base camp. In addition, each man and woman was equipped with a sidearm razer, which looked very much like the Bren gun of the previous century, although it fired a concentrated beam of heat energy instead of standard slugs. Only the paleontologists had objected to carrying the weapons, but that was before Kemp had allowed them to view the recordings of the tragedy of the first expedition.

Standing in the transport bay, Kemp spoke into his helmet radio. "We're secured down here, Commander. Any time you're ready . . ."

"Stand by, Colonel, I've commenced separation. . . . It's not a very long trip."

There was a soft metallic thud as the lander broke away from the *Goddard* and began tilting over to the proper touchdown attitude. Kemp studied the faces of his team, looking for traces of fear and uncertainty. There was no place for it now.

"We are descending now, Colonel. 150 meters, and closing . . . stand by. . . 75 meters . . . 50 . . . stand by . . . we have touchdown."

Just as Fratz spoke there was a clang which travelled through the superstructure of the lander. Kemp was suddenly aware of the pull of his magnetic boots against the bay floor, as the centrifugal forces of the rotating alien ship attempted to push him away from the lander's deck. He decompressed the bay, watched as the door slid open to reveal the large rectangular seams of the entrance hatch. To the right of the hatch, Kemp saw the burned-out panel which Coopersmith's team had cut away with a razor-torch, revealing a series of manual controls. Phineas eased his way down to the surface of the hull and began motioning the others to follow, while he walked carefully and slowly up to the manual override controls. Although the levers looked a bit large for easy manipulation by the human hand, he had no trouble activating the airlock system, and he breathed a bit easier as the outer panel of the lock slid open soundlessly.

"Okay, everyone. Inside the chamber. Slowly, please. That's it . . . one at a time."

The team gathered inside the first chamber of the lock, which was quite large, and could accommodate twice as many in comfort, then watched Colonel Kemp enter at last. He kicked free of the metallic flooring and floated up to the lock control panel on the inside of the chamber, then slowly reached for the yellow lever.

Just as Coopersmith had reported, the outer hull panel slid shut, sealing the team in total darkness until Kemp turned on his utility lamp. He reached up and touched the green lever, which activated the atmosphere/pressure cycling. The sound of gas entered the chamber and everyone stood silently, listening until an electronic chime sounded. Kemp reached up and pulled the final lever, a dull red color, and the sound of machinery humming could be heard as the inner door slid open to the left.

"All right," said Kemp. "Turn on your utility lamps, and follow me. Up ahead here is an access shaft. The rails are handholds with some evenly spaced struts to use for your footing. I want you to all assemble on the other side of the airlock and discard the EVA gear, then get yourselves outfitted for the trip up this shaft. Be careful on the ascent, and be sure to give the fellow ahead of you enough room. Now, let's get started."

The group filed into the shaft and Kemp followed them, closing the airlock and making certain that the air pressure was all right before unlocking his EVA helmet. The others followed his lead, and soon everyone was stripped down to their tight-fitting coveralls and radio-helmets. Each member of the team shouldered his or her survival pack and lined up for the long climb, but waited for Phineas to take the lead. He noticed that no one spoke, although there was more than the usual amount of coughing and throat-clearing.

Phineas climbed the 100 meters up to a square platform, but long before he reached it, he could see the blazing square of light that was the open entry hatch—the place where Alan Huff had been attacked while transmitting the au-

dio-visual signals back to Copernicus Base.

"All right, attention. I'm on the landing platform below the hatch. I want everyone to assemble here before we go up. The hatch is open, and extreme caution is the order of the day. When you get up here, draw your sidearms, but keep them on safety until ordered otherwise."

Kemp stood off to the side and watched his team slowly join him on the platform. He kept looking up through the hatch where the bright light of the ship's interior burned whitely. From the angle of sight, it was impossible to discern anything clearly, but his imagination was filling in what the eye could not yet see. His pulse was pounding in his ears, and it seemed so loud that he would have been certain that his helmet mike was picking up the sound.

When the last man had clambered up to the platform, Kemp signaled the command cabin of the *Goddard*. "This is Kemp. We've reached the entry hatch to the interior and we are preparing to go topside. We will provide visual as soon as some defensive perimeters have been established. Stand by, *Goddard* . . . we're going up."

Kemp ascended through the hatch and stared about the clearing. A feeling of *déjà vu* swept over him as he looked across the clearing, to flanking walls of proto-firs, cycads, and redwoods, to the sloping marshland and mudflats where the the first team had recorded the waddling herd of iguanodons. In the hazy distance, the mottled foliage of the landscape curved upward towards the halo-like glow of the central illuminating rod. No horizon. It was a heart-stopping sight, even though Phineas had been prepared for it, and it made all those "artist's conceptions" pitiful in comparison.

Slowly, he climbed up to the soft, spongy turf, listening to the chittering, humming sounds of this world. Motioning for the rest of the team to follow quickly, Kemp moved down off the small knoll and found the remains of Huff's communications gear. Some of the metallic parts were already showing signs of corrosion in the humid atmosphere, and the plastic casings were laced with tiny teeth marks—little predators testing out anything for a possible meal, he assumed.

But that was all. There was absolutely no sign of Huff's body, nor any of the others. Apparently nothing was wasted in this world of primitive instincts. There was a distant scream in the air. Looking up, Phineas saw a dark shape far away, gliding like a kite in the misty sky. The intruders had been spotted and the signal was going out. He wanted no repeat of the previous team's experience.

"We've got to move quickly," he said to everyone through the radiophones. "There'll be plenty of time for oohs and aahs. Let's get that fence up."

Phineas was pleased with the efficiency with which his team operated. Watching them, they could have been in Central Park for all the attention they paid to the Jurassic wonders all about them. Within ten minutes they had staked out a large circle in the clearing approximately 100 meters in diameter. The enclosure was circumscribed by a series of "fence-posts" placed at regular intervals along the 500 meter cir-

cumference. Each post was a miniature field-generator controlled by a central transmitter, which operated in synch with the post alongside it. Anything which attempted to pass between any of the posts would do two things: set off an alarm, and get itself hit with 300,000 volts at stunning amperage. It was a simple "force-field" security barrier, which could easily be foiled by intelligent espionage elements, but would be extremely effective against any predatory dinosaurs.

The power was turned on, the perimeter tested, and found to be working perfectly. Phineas felt immediately more at ease once the team was secure, and relayed the information back to the *Goddard*. He ordered Doctor Jakes and his team of engineers and riggers to begin disarming the *Dragonstar*'s defensive systems, so that installation of the impulse engines could begin as soon as possible. Using a refined version of Coopersmith's original methods, Jakes's team should be able to have the first engines in place within 48 hours.

Two days inside the *Dragonstar* passed quickly. The base camp took shape quickly with inflatable structural domes which served as crew quarters, supply huts, infirmary, communications headquarters, research labs, and power stations. At first glance the collection of domes and superstructure seemed wildly incongruous with the lush surroundings of the forest and the marshlands—the ultimate anachronism, but the *Goddard* team soon established a respectful rapport with the environment and the animals which were drawn to the small human incursion upon their world.

For Mikaela Lindstrom, a Swedish woman in her mid-thirties, the interior of the *Dragonstar* was the fulfillment of her dreams. Here was an encapsulated world of the Jurassic and possibly the Cretaceous periods, which would help clarify the theories and arguments concerning these early geologic periods of life on the Earth. She was grateful to have been included in the mission to the *Dragonstar*, and even though she and her two assistants would barely be able to begin to investigate the myriad secrets of the Jurassic wonderland, she would at least have time, during the return voyage, to map out a system of inquiry, and initiate a few humble investigations.

It was not long after the force-field had been erected that the first dinosaurs were seen. Coming up from the misty regions of the swampland which sloped down away from the base, a group of three herbivorous creatures called camptosauri, half-walked and half-hopped towards the encampment, possibly out of curiosity. Mikaela watched them as they approached cautiously, recording them with a small video-cube camera with an adjustable telephoto lens. The dinosaurs were less than two meters tall and resembled kangaroos in general body shape, although their heads were birdlike. Their coloring was a mottled green which was almost an exact duplicate of the color of the foliage which grew close to the swamps and lakeshore. Surprisingly, the creatures did not come all the way up to the electrified perimeter of the camp, but chose to veer off within 100 meters of it. It was as though they had not been able to recognize the strange scents of the

humans and their equipment and chose therefore to take up a more productive pursuit, which was to pluck juicy fronds from some of the low-hanging branches.

The swamp and marshland proved to be a favorite watering hole and feeding ground for a majority of herbivores. Within the first two days Mikaela and her crew had been able to record and observed the habits of a variety of animals—trachydons, brachiosaurs, iguanodons, ankylsaurs, even several monstrously huge brontosaurs and impossibly long diplodoci. In her earliest notes, Mikaela had observed that there was very little contact between different herbivorous species, and that the plant-eaters generally avoided animals not of their own kind. But this was a gentle aversion, rather than the blind, panicked flight expressed whenever the scent of a predator was in the air.

Since the waters attracted many plant-eating dinosaurs, it was also natural that the carnivorous dinosaurs would enjoy good hunting in the same region. Although Mikaela and her crew soon discovered that most of the feeding took place in the early hours of evening and darkness, there were still enough occasions during the day-cycles to observe the meat-eaters at work. She was impressed and terrified at the sight of some of them. Massive, strong, and surprisingly agile, the meat-eaters were nightmares come to life. Many of them, like the gorgosaurs and the ceratosaurs, had thick hides of bright colors—oranges, yellows, pale greens—since they had no need for the safety of camouflage. The largest carnivore she had yet seen had been an allosaurus considerably larger than any ever found in fossilized form. It looked like the same creature that had attacked the first expedition, and Mikaela assumed that the carnivores exhibited some degree of territoriality in their hunting grounds. Among the species of meat-eaters, she observed no direct combat, although there was a definite hierarchy of species, defined mostly by size and ferocity. Most simply, the smaller fellows gave the larger fellows a wide berth and a first chance at any prey that might be felled. She also noted that some of the smaller predators travelled and hunted in packs like wolves. The relatively small, quick species like the compsagnathus, velociraptor, and deinonychus could be seen in the early evening hours racing about the perimeter of the camp, rushing up to the force-field at full speed, only to be knocked senseless by the energy screens, then stagger to their feet and try again. Mikaela was amazed at the savage intensity with which even the smaller carnivores hunted and fed. She had seen their neighborhood allosaurus bring down a fat, slow-moving hadrosaur with incredible agility, covering several meters with each stride of its massive legs, pouncing upon the victim's back and crushing it to the ground. Pinned, the hadrosaur was helpless as the allosaurus literally tore the fleshy body into bite-sized pieces. The beast would continue to feed until its stomach became so distended that it could hardly stand erect, and then it would slowly rise off the carcass and stumble off into the forest where it would sleep for a day or two in the depths of a digestive stupor.

But the attacks of the allosaurus were tame when compared to the horrible tactics of the marauding packs of comp-

sagnathi, and especially the odd little dinosaur called the deinonychus. The latter creature was no more than three meters long, standing just higher than the average man, but was one of the most distinctive-looking bipedal dinosaurs. Its head was similar to the gorgosaurus or the allosaurus, and was full of sharp, ripping teeth, but its legs were much leaner, ending in two large toes and a third digit which had evolved into a 12-centimeter, sickle-shaped claw. Its other remarkable feature was its long tail which was always held parallel to the ground, as though held rigid by thick musculature or fused tail vertebrae. Equipped thusly, the deinonychus was an incredibly agile, terribly lethal creature. Mikaela had watched packs of three and four of the species *running* through the edges of the forest and across the clearing below the base camp at speeds approaching that of a thoroughbred horse. From what she had seen thus far, the deinonychus was the speediest predator of all. It could run down any prey with impunity, whereupon it would perform its special kind of death-dealing. Once it ran its victim to ground, the little dinosaur would hold the body away from it with its longish forelimbs, then balancing on one leg and using its rigid tail as a balance-pole, it would employ its scythe-like third claw to slash open the prey's belly, effectively disemboweling it with several deft strokes. This procedure was done with such swiftness that the eye could barely follow it; once completed, the sharp-toothed jaws would begin snapping up gobbets of warm flesh with equal speed and efficiency. To see a small pack of these killers take down a large trachydon and butcher it within minutes was an experience not soon forgotten.

In addition to its chilling hunting techniques, the deinonychus had also been seen galloping into the middle of a meal being enjoyed by one of the really big predators such as the gorgosaurus and literally steal the food from its huge jaws. It would perform this dangerous feat at full speed, snapping a chunk of warm flesh from the forelimbs or snout without breaking stride. The larger carnivores, though angered they might be, were usually so startled that they almost never gave chase. It was like a game the small predators played, and it gave rise to the idea that not all dinosaurs were the dull, dimwitted creatures normally imagined. More than once Mikaela thought she detected the bright sparkle of cunning laughter in the small killer's eyes.

Her observations also cemented the still-raging controversy of warm vs. cold bloodedness in the dinosaurs. She had been working on the observations and calculations when Phineas Kemp entered her laboratory dome.

"How's it going, Doctor Lindstrom?"

She looked up and saw the colonel. Blue eyes as bright as neon, sandy hair, and square, all-American jaw (even though she knew he was from Canada). He was not a tall man, but he was trim and well-muscled, and quite handsome in the old-fashioned sense of the word.

"Oh, good evening, Colonel Kemp."

"You can call me Phineas, if you'd like."

"That would be nice," said Lindstrom. "I never was very high on for-

mality. Everyone calls me Mickie . . . but I prefer Mikaela."

Kemp laughed. "I can't even *tell* you what they call me! Behind my back that is . . ."

Mikaela smiled and gestured for Phineas to take a seat at the lab table where she was working.

"I stopped by to tell you that we will be sending out an expeditionary team in the morning—well-armed, of course—and I was wondering if you and your assistants would like to accompany us?"

Mikaela brightened and smiled broadly. "You were wondering?! My god, Colonel . . . I mean, *Phineas* . . . ever since we got here, I've felt like a little kid waiting outside the window, waiting for the candy store to open!"

"Yes, I'd rather expected that," said Phineas, smiling. "I hope you understood my reasons for keeping everyone inside the perimeter. I thought it would be best if we secured the outside hull and got the outrigger engines in place before tackling the interior."

"Are the engines ready?"

"Just about. Jakes says that the final emplacements will be made this evening. After that, all that will be necessary will be to secure the *Goddard* and *Heinlein,* patch in some computer-guidance to the outriggers, and we're on our way. We should be firing the engines by tomorrow at midday."

"How long will the return voyage take? Am I going to have much time to explore the rest of the interior?"

"I'm not sure yet . . . we only have some of the preliminary figures and projections at this point. It depends on how well the *Dragonstar* responds to course changes and deceleration. We're moving along at a pretty good rate right now. It's going to be a tricky operation for awhile. No one's ever piloted a ship this big before."

"No, I don't suppose they have. . . ." Mikaela looked at Kemp and wondered if he was really that serious and wrapped up in his work, or if he was trying to "make conversation." He did not act as if he were in any great hurry to leave, and she was of two minds about his intrusion on her thoughts and notes herself.

"By the way," said Kemp, "have you made any interesting discoveries or observations yet? I see that you've certainly found plenty to write about, even by just watching them beyond the perimeter."

Mikaela wondered if Phineas Kemp was actually interested in her notes, or whether he simply wanted to get into her pants. She hated to think of men in those terms, but having been unmarried, other than to her profession, for all of her adult life, she had learned through experience that most men preferred to get physical first, then bother to get to know you later.

She decided to give the colonel the benefit of the doubt, at least in the beginning. "Well, since you've asked," she said with a calculated smile, "I *have* come up with a few things that knock hell out of the old ideas about the dinosaurs being reptiles—at least like the reptiles that we are now familiar with."

"You mean that business about the hot-bloodedness?" said Kemp offhandedly.

Mikaela's face must have belied her

shock that he would know something about her work. He smiled cavalierly.

"My dear Dr. Lindstrom, just because I am a lantern-jawed astronaut does not mean that I am a total dolt in terms of anything other than trajectories and g-forces. . . ."

"I *know,* Colonel, it's just that I didn't expect very many people to—"

"To be interested in paleontology? Mikaela, when I was a boy, I think I read every book ever printed on dinosaurs! Those big buggers used to fascinate me. Used to dream about them still being alive somewhere in the world, and that someday I'd find them, or that one night, one of them would amble up to my bedroom window and peek in to have a look at me with his big yellow eye!"

Mikaela laughed along with Kemp, and she felt herself blush.

"I'm sorry," she said, after a slight pause. "I guess that when you get so immersed in your work, you can sometimes forget that there are other people around who might understand and appreciate what you're doing."

"Yes, I know the feeling. I think it's a common problem with people who really love their work. Sometimes they can let it get in the way of the *people* in their lives."

"You mean the old 'love me or love your work, but you can't love both' routine?" Mikaela smiled and shook her head. "Yes, I've been down that road a few times myself."

"Well, I wasn't trying to get into anything personal," said Kemp quickly. "It just seemed like the appropriate thing to say . . ."

"Oh, I see," said Mikaela. She noticed that he became a bit edgy when she relaxed the conversation. She had heard some of the crew members talking during the voyage about the colonel being involved with one of the missing people on the *Heinlein* expedition. He was probably having trouble dealing with the whole mess, and she decided she should respect his wishes and simply back off.

"Well, anyway, let me tell you what I've found out so far. . . ."

"About the dinosaurs, you mean?"

Mikaela smiled. "Yes, of course." She shuffled through her notes for a moment. "You see, it was generally believed for so long that the dinosaurs were just giant lizards that it was also assumed that they were cold-blooded, like the reptiles on Earth today. But reptiles are dependent upon environmental temperatures for their own body temperatures. And even under optimum conditions, true reptiles can only produce about a *twentieth* of the amount of energy that hot-blooded animals, like mammals, of the same body-weight."

"And the bigger the body of the reptile, the *more* energy would be required to move it."

"Of course," said Mikaela. "And just in a couple of days, I've seen creatures like the deinonychus and the compsagnathus who move so quickly that they could not possibly be reptiles."

"But if they're not lizards, then what are they?"

"That's what all the research will really be about. Can you imagine what we'll learn when we can actually dissect a few of these animals? My feelings are that they are either a totally extinct class

that simply resembles our modern reptiles in bone structure; or that they were a part of the reptile family that was hot-blooded and simply died off. We'll find out lots of things before we're done . . . now that we have this floating zoo.''

''*If* we are careful,'' said Phineas. ''That was one of the things I wanted to tell you about. When the expeditionary teams go out, I want you to realize that our first objective will be to search for any trace of the *Heinlein* team who might have survived. Scientific research will be secondary at this point, and I want you to understand that, okay?''

''Yes, that's quite clear. Are we going to be going out on foot?''

''Maybe for the preliminary excursions. But I'm planning to have several omni-terrain vehicles assembled, plus an ornithopter which will be able to fly in the contained atmosphere of the cylinder. There are some tricky vortices and gravity gradients that we will have to play with before we really know what we're doing.''

''Well, don't worry about me and my people, Phineas. I promise that we will be cooperative. Nobody will go running off into the grinning jaws of old T. *Rex*.'' She smiled and closed her notebooks, sensing that their conversation was almost at an end.

''Speaking of T. *Rex* . . .'' he said as he stood up. ''I haven't seen him yet, have you?''

''No, but I'm not surprised. Most of his fossil remains have been found in less densely foliated regions. He seems to have preferred hunting in more open territory, most likely because of the trouble he might have had squeezing between all those redwoods in the thick parts of the forest.''

''That's something good to know,'' said Kemp, reaching out to take Mikaela's hand, shaking it lightly. ''Very well, then, it was good to have a chance to talk to you for a bit. We'll be assembling at 0800 hours. See you in the morning.''

''That'll be fine, Phineas. And thank you. Good night.''

Kemp smiled wanly, turned and left the lab. Mikaela smiled to herself, thinking that she found him attractive in an odd way. There was something about his ramrod mannerisms that didn't seem right. There was a lot more to Phineas Kemp, probably seething about just beneath the surface, waiting to be unleashed, and Mikaela had the notion that she might be the woman to do the job.

Ross Canter entered the airlock of the *Goddard*, along with his co-workers on the out-rigging project. As a flight engineer, he had not been dangling in space on an umbilical to do the actual labor on the engines, but rather as a supervisor and inspector of the work, once completed. The engines themselves were not as much of a problem as the proper placement and method of securing them to the hull and superstructure of the alien ship. It would have been much easier to have simply located the alien control section of the ship and use the onboard engines. Of course, Canter knew that there would be a whole new set of problems involved in something like that. It might be near to impossible to figure out how the engines worked without risking the destruction of the

entire vessel; or it might all be in vain, since one of the most probable reasons why the ship was orbiting the sun dead-in-space was some kind of engine failure.

As Canter entered the ready-room, where he and the others slipped out of their EVA suits, he realized how thankful he was to be almost finished with the job. He did not like EVA work, just hanging out there in the bottomless pit of space. It gave him a bad case of vertigo, especially when he was looking down the endless length of the *Dragonstar*. It was like he was falling outward all the time.

The *Goddard* and the *Heinlein*, docked together to form one ungainly ship, had been attached to the side of the alien hull, and after a few more series of tests, Dr. Jakes and his men would be firing up the engines and the alteration of the *Dragonstar*'s orbit would begin. According to Canter's timetable, that would be just about the right time to sabotage the communications centers of both the *Goddard* and the *Heinlein*. Once the later phases of the operation had commenced back on the moon, there could be no more contact with either ship.

He had gone over the plan of action in his mind many times, and he was confident that he would be successful. It was incredible when he thought about it . . . how easy it would be to do the job. In fact, having seen how far along the outrigging project had gone, maybe now was the best time to do the job. Canter hung up his EVA suit in the locker and left the ready-room, walking quickly up to his crew quarters to pick up the few tools he would need.

Being a flight engineer, it was not unusual for him to be heading down the main corridor to the service module section of the *Goddard* with a tool belt dangling from the waist of his jumpsuit. No one paid him more than the usual attention of saying hello or simply nodding. Canter smiled back as he passed the few members of the skeleton crew on board either of the ships. Almost everyone was kept occupied either outside the alien ship, or down inside at the base camp.

After passing through the hatch to the service module, he locked it securely behind him, and paused to study the layout of the module, making sure that it coincided with the schematics he had brought with him. The module was a main ganglion in the nervous/electronic system of the ship. All the support and tactical systems for the *Goddard* originated here. Canter stood in the midst of a vast array of wiring, plumbing, modular paks, harnesses, which would have stymied anyone without the explicit knowledge to understand it all. Canter traced the ventricular harnesses strapped along the bulkheads to the main bank of modular paks. Following the color-coded schematics, he located the pak which contained the monolithic microprocessors in charge of deep space tachyon communications. He pulled a small tool from his belt, a magnetic-driver, and unlocked the communications pak. It was so easy, he thought. A twist of the wrist, pull out the modular assembly, and the *Goddard* was deaf and dumb.

Placing the pak in his breast pocket, he stepped back and took his miniature welding-torch from his utility belt. A few deft strokes of the superheated beam

of the torch and the bus-bar connectors for the modular pak were fused into slag. Even if stores had replacement modular assemblies, no one would be able to repair the damages in time.

Canter put away his tools and left the service module, passing through the main corridor without being seen. He passed through the docking-collar lock into the *Heinlein,* which at the time was unoccupied, Fratz and Bracken having been reassigned to duty onboard the *Goddard.* Canter had even less apprehension as he entered the service module of the smaller ship, where he disabled its communications facilities with ease. *This is for Nesrudah,* he thought to himself as he finished the job. He did not allow himself to think about what he was doing beyond that simple aspect. He had long ago learned that you only got yourself into deeper trouble when you tried to grapple with the implications of actions which were beyond the scope of your understanding. He only knew that he had been called upon to do a specific job, and that it was not his place to reason why, as the old poem goes. He would leave that to his superiors.

When Canter returned to his cabin onboard the *Goddard,* he lay back in his bunk and smiled to himself, satisfied that he had done his part so well. With any luck, he would not even be suspected, much less caught. Besides, he thought, pretty soon old Kemp will have more than a saboteur to worry about.

ELEVEN

Captain Francis Welsh had been a mission command pilot in the IASA since the early days of lunar colonization. He had seen the face of the far side of the moon transformed by the hands of man, and at one time had been a large part in that transformation. But as he grew older, he found that the deep space division was planning to phase him out of the program, systematically replacing many of the older mission commanders with young, fuzzy-faced kids. Well, that was the way it always was, thought Welsh, but he didn't let them put him out to pasture without a fight, and he had, in effect, kept them from doing it by getting a transfer to the mining division of Copernicus operations. His many years of training and experience were just the ticket to get him a command on one of the big ore-processing ships. That had been more than four years back, and he'd been serving in that capacity ever since. Never having had the time to get a family going, Welsh had been married instead to his job. It was all in what a guy got used to, he often thought, but what the hell. It sure beat going back down to Earth where things were as crowded and confusing as ever. Screw those poor bastards, Welsh often said. They didn't know what they were missing out here.

The name of his ship was the *Andromache,* the first of her type to be outfitted with ram-impulse engines, which made her one of the fastest industrial-class ships in the IASA. It was a big ship, almost 200 meters long, mostly superstructure and modular ore-holds. Those twenty ore-holds were actually miniature landing modules which could be detached from the main body of the ship and guided down to the lunar sur-

face to be unloaded. Aft of the ore-holds were the crew quarters, the launch bays for the Snipes, and the command module. All the way at the rear lay the Lukodanyov engines which had revolutionized deep space operations and made asteroid mining a feasible, profitable endeavor. Captain Welsh loved his ship, even though she wasn't much to look at and had none of the media glamour attributed to the interplanetary exploration ships.

At the moment, he had the *Andromache* in a halo orbit above Ramadas Khan, the TWC lunar colony. Having recently transshipped ore and refueled at Copernicus Base, Captain Welsh was finishing up a routine delivery to the logistically helpless Third World colony. Since the Black and Arab Confederation had no ships capable of deep space operations, they had arranged though a series of treaties and agreements to be supplied by the IASA. Captain Welsh often wondered how those agreements must have stuck in the craws of TWC leaders, since the whole situation was a total reversal of the petroleum cartel dictating policy to the rest of the world during the last three decades of the previous century. Served the bastards right, thought Welsh. If they hadn't been such sons-a-bitches about the energy problems of the past, maybe they wouldn't be getting screwed so badly by the IASA now. He wasn't sure how much the TWC paid for shipment and delivery of supplies, but he was positive that they were paying up the hallowed yin-yang.

Checking his control panel, the onboard screen indicated that there was only one more ore-hold module remaining to be re-docked into the *Andromache*. Then it would be time to head out to the Belt again for another two-month stint. His crew, comprised of three officers and sixteen miners, were already on board, preparing for the three-week trip to the asteroids.

Flipping on his radio, Welsh called the TWC receiving dock. "Ramadas, this is *Andromache* . . . what's the hold-up on that last module? Any trouble?"

There was a pause before his phones crackled slightly and an accented voice replied. "No problems, Captain Welsh. The last of the ore has just been dumped. Launch of module-18 is scheduled in ten minutes. Please stand by. . . ."

"Ten minutes? What the hell's the delay for?"

"Sorry, Captain, but we have a slight malfunction. One of the launch bay doors is sticking. We have a crew working on it, and are promised that the problem will be corrected momentarily. Please stand by . . . Ramadas out."

Welsh turned to his flight assistant, Lieutenant Knapp, a large, bearded, burly character who looked as though he would be more at home behind the helm of a New England whaler. "Can you believe those clowns? They're always screwing up something, aren't they?"

Knapp laughed, but said nothing. Their conversations about the TWC were a familiar routine. Welsh hated them; it was as simple as that.

". . . they did a lot better," Welsh was saying, "when all they had to worry about were their camels and their spears . . . they got no business out here in space when the people in their

own countries are still eating each other. . . .''

''C'mon, Captain, it's not as bad as all that,'' said Lieutenant Knapp.

''No, I guess you're right. I mean, what's a little famine and pestilence? It makes life a little more interesting when you're watching it from within the palace walls.''

Knapp checked his timepiece. ''You think we'd better check in with them again? We've got to go through checkout with Copernicus before launch. Linkowski gets pissed when we throw off his schedule. . . .''

Welsh shook his head in mock-disgust. ''Yeah, I'd better find out what the hell's going on.'' He flipped on the radio and called Ramadas Khan.

''We are very sorry for the delay, Captain Welsh,'' said the accented voice. ''The problem has been corrected and we are preparing to launch. Please stand by. . . .''

''Wait a minute,'' said Welsh. ''Just a goddamned minute! Patch me in to my module pilot, Ramadas . . . give me Spec-5 Burcroff. . . .''

''One moment, Captain . . .'' the radiophones crackled with static, an ever-present sound which Welsh always ascribed to inferior TWC equipment.

''What's the matter, Captain?'' asked Knapp.

''Something funny's going on,'' said Welsh. ''I hailed Burcroff and he's not responding. He's supposed to be in the command cabin while they unload.''

''Jesus, what do you think's up? Should I notify Copernicus?''

''No, not yet. I don't want to do anything that will get everybody upset . . . not till we know something for sure.'' Welsh hailed Ramadas again. ''This is Captain Welsh on the *Andromache*. What's going on down there?''

''I'm sorry, Captain. We just checked on your module pilot, and found that he has taken ill. . . .''

''What? What the hell is wrong with him? Let me talk to him.''

''I'm afraid that's impossible, Captain. Your pilot is unconscious. We have a physician with him at this very moment. Please stand by. . . .''

Welsh cut off the channel, and turned to Stuart Knapp. ''This is a lot of bullshit! Call Copernicus and tell them what's going on.''

As Knapp radioed Copernicus Base, Welsh's phones crackled again. *Those slimy bastards! What now? ''Andromache,* this is Ramadas . . . Spec-5 Burcroff is having some kind of seizure. We have notified Copernicus, and requested that we have one of our own pilots return module-18 to your ship . . . do you copy?''

''Yeah, we copy,'' said Captain Welsh. ''Stand by, Ramadas . . .'' He turned to Knapp and spoke softly. ''Did you get a confirmation on that from Copernicus?''

Knapp nodded. ''Yeah, Linkowski's blowing his frigging mind. He says to get that module docked and get checked out. He's got a Shuttle coming in and he's one flight controller short today.''

''You mean I'm supposed to let one of those dumb monkeys put their hands on our modules! Is he crazy?''

Knapp shrugged. ''He's already given them confirmation to ferry it up. . . .''

''Goddammit, Stu. I don't like it. Something's going on!''

''*Andromache,* this is Ramadas. We

have confirmation for launch. Stand by for rendezvous with module-18 in minus three minutes. . . .''

Welsh banged his palm against the Command console. ''Those sons-a-bitches!'' He flipped on the radio. ''That's affirmative, Ramadas . . . we copy here. Do you have a status report on my pilot?''

''Affirmative, *Andromache*. We've sent him to our infirmary. He is conscious and the physician says he will be all right. . . . Stand by . . .''

Welsh turned to Knapp. ''We're going to be a man short, it looks like. Tell Copernicus to have a shuttle ready to bring us a back-up while we're going through check-out. Also, you'd better have Linkowski log a report with security. I don't like the sound of all this shit. . . .''

''Security? You sure, Captain?''

''Yeah, do it.'' Welsh flipped a key and watched the schematic on his screen. The ore module was approaching his ship on a perfect course, and he was surprised that the TWC pilot was that good. Within twenty seconds, he would be aligned with locks and be drawn in automatically by the computer guidance.

''Module-18, ready for docking,'' said an unfamiliar voice in his phones. ''Do you copy, *Andromache*?''

''We copy, module-18. Auto-guide should be taking over just about now,'' said Welsh, watching the screen, just as another thought came to him. Cutting off his mike, he turned to Knapp again. ''Stu, call Rappaport, and tell him to get his ass down to the airlock for 18. Have him call me if anything looks funny.''

Knapp nodded and used the intercom to the crew section.

A green light flashed on his screen, indicating that the module was locked into the superstructure. Welsh continued to watch the screen, and was surprised to see that a yellow warning bar began flashing—an indicator that the ore-holds had been opened from the inside, facing the airlock which ran along the main corridor of the ship.

''What the hell's going on? Somebody just opened the hold on module-18.'' He radioed the command cabin of 18, and got no response, and he felt a fist tightening around his stomach. It was a sixth-sense feeling that something terrible was about to happen. ''Stu? Any word from Rappaport?''

''No, Captain. . .''

He keyed in a channel to Copernicus quickly. ''Linkowski, this is Welsh on the *Andromache* . . . we've got a problem up here, do you copy?''

''You're goddamned right, you've got a problem, Welsh . . . you're throwing me off schedule, and—''

''Screw your schedule! I've got an unauthorized air-lock entry on module-18. I want you to—''

He was interrupted by a klaxon blaring through the ship, sounding a general quarters alarm. ''What the hell—? We've got a general quarters in here, Linkowski! Get a security ship scrambled!''

''Captain, I'm not getting any response below decks,'' said Knapp.

Welsh felt the rising jolt of panic that was surging through his heart and up the back of his neck. ''Linkowski!? Did you copy that last transmission! We've got big trouble up here. Our little brown

brothers have given us a shot in the ass!''

Welsh's phones crackled for an instant as the Copernicus Flight Controller started to reply, but Welsh was not listening. The hatch to the command cabin had been opened behind him and he had swiveled around to see what was going on. There were three men dressed in olive green jumpsuits, LS-helmets and face-shields standing in the threshold.

They were holding weapons at their hips.

''Captain—!'' Stu Knapp had started to get out of his chair when the first slugs caught him in the chest. His uniform blossomed red. He was thrown back against his console, eyes still open, but seeing nothing. Welsh started to move as the two men rushed him, the closest swinging the stock of his weapon against the side of his head.

Captain Francis Welsh didn't even have time to see stars before blacking out.

When he regained consciousness, the three men surrounded him. Lieutenant Knapp's body lay near the hatch. One of the intruders was sitting in his chair, his face still hidden by the faceplate of his helmet. One of the other men leaned down, sticking the barrel of his gun under Welsh's nose.

''A thousand pardons, Captain Welsh . . . but I regret to inform you that your ship has been commandeered by the TWC.''

The words sunk into Welsh's numbed mind slowly and for a moment he didn't react. He looked up at the anonymous figure, trying to ignore the weapon in his face. ''Why? What do you want? What's happened to my crew?''

''Your crew is dead, Captain. We have already left lunar orbit.''

''What for? Where are we going?'' Welsh shook his head, put his hand to a damp, pulpy gash on the side of his head. He couldn't believe what was happening. The thought of his crew being killed was still absurd. It couldn't be true. . . .

''It is not necessary that you know the nature of this mission. We have already reprogrammed your navigational computers, and you will not be needed in that capacity.''

''Then why don't you kill me too, you bastards?''

The man chuckled behind his faceplate. ''An engaging idea, but I have decided against it, Captain. We shall keep you alive in the event of an emergency, since your knowledge of this ship may prove helpful. . . .''

''Well, you may as well shoot me now, because I wouldn't help you for all the shit in the world.''

Again the unseen chuckle. ''We shall see about that.'' Turning to the third man, the leader spoke again. ''Take him to his cabin and keep him under guard. And get this body out of here.''

Welsh was pulled to his feet and escorted from the Command Cabin. He was tempted to turn and go for the man's weapon. Go out in a blaze of glory and all that crap, he thought. But then another thought struck him. A thought that was far simpler and more logical: *screw it,* he thought, and began laughing softly to himself.

Stanley Linkowski, Copernicus Flight

Controller, stared uncomprehendingly at his screens. The *Andromache* had fired her engines and slipped quickly from Lunar orbit. There was no response from her by radio and the security shuttle which had been launched to rendezvous with her was left far behind in the wake of a full-power thrust of her ram-impulse engines.

Alarms were sounding in the tower and men were screaming and running around all over the place. For a moment, Linkowski could think of nothing other than the fact that he had committed a supreme foul-up and that they were going to have his ass in a sling for it.

One of his assistants had tapped him on the shoulder to tell him that he had a call on a priority channel. As though in a daze, Stanley picked up the phone.

"Yes? This is Linkowski."

"What in hell's going on over there?" said an angry voice.

Stanley recognized the voice of Gregor Kolenkhov, who was in charge of Copernicus Base while Kemp was off on a mission.

"Doctor Kolenkhov? I'm sorry, I'm not sure . . . I think we've had one of our ships hijacked."

"No shit!" cried Kolenkhov. "I want you to track that ship and get me a projected course as soon as possible. How in the hell did you let something like this happen, dammit!"

"I'm short-handed today, Doctor, and I . . ." Stanley fumbled for the right words but nothing would come to him. It was going to be a long day.

Within the hour, Copernicus Base received an official communiqué from TWC Headquarters in Mecca. The crux

of the message was that the Third World Confederation disclaimed any responsibility for the armed takeover of an IASA vessel. They attributed the incident to the work of an underground terrorist organization calling themselves The Lunar Liberation Collective, and that the TWC had no idea why the *Andromache* had been hijacked.

Diplomatic relations between the IASA Alliance and the TWC became strained to the breaking point as accusations and threats were hurled back and forth. There was the usual groundswell of public outrage, but nothing was actually done of any consequence in the geo-political arena.

In a hurriedly assembled meeting of the joint directors of the IASA, Gregor Kolenkhov explained what was known about the hijacking incident. ". . . and although we have not made this known to the media, the tracking stations have confirmed course projections for the *Andromache*." He paused to clear his throat, and look each of the directors in the eye. "It appears as though the ore-ship plans to rendezvous with the *Dragonstar*."

"Oh Jesus . . . !" said Christopher Alvarez.

"But how could they know?!" said Nelson Johl. "This is impossible . . . "

Kolenkhov shook his head. "Impossible, I'm afraid it's not. Apparently, the security-leaks problem is quite a bit more severe than any of us could have imagined. It is obvious that the TWC, despite their claims to the contrary, know about the alien ship and realize its value as an economic and political tool, and that they plan to assume control of the vessel."

"Is there any way we can catch them? Stop them?"

"It is quite doubtful. The only ship capable of overtaking them is the *Clarke*, enroute to the Mars Installation. We are planning to re-route it and arrange for course rendezvous, but they would be at least a week behind the *Andromache*. Besides, the *Clarke* is an exploratory ship, not a military vessel. The crew is, for all intents and purposes unarmed."

"What do we know about the group that took over the *Andromache*? How many men? How heavily armed?"

Kolenkhov shrugged. "We know practically nothing. The TWC authorities claim to know very little . . . other than that a group of armed terrorists, of indeterminate number, commandeered the receiving docks at Ramadas, and reached the ore-ship by piling into one of the hold-modules."

"*They* know how many men. They know what's going on," said Johl. "They're just not telling. . . ."

Kolenkhov grinned. "Would *you* tell us anything, if you were them?"

"Has Colonel Kemp been told about this?" asked Alvarez.

"That's the worst part, gentlemen. The last transmission we have received from the *Goddard* was that the alien ship had been successfully rigged for course alteration, and that they were bringing it in. Since then, almost twenty-four hours now, we haven't heard a thing."

Everyone started talking at once and Nelson Johl called for quiet. "So we have no way of reaching the *Goddard*?"

"No sir," said Gregor. "I'm afraid they're on their own."

TO BE CONTINUED

biolog

By Jay Kay Klein

Years ago, *Analog* editor John W. Campbell used to mystify the uninitiated with talk about his "two-headed authors." This issue, Tom Monteleone is one-half of such a pair. He says that, contrary to the commonly held assumption that collaborating means you do half as much work, you actually do twice as much. For one thing, you have to satisfy not one person, but two. Of course, the method does permit doing things you couldn't or wouldn't by yourself. To name one, this is his first appearance in *Analog*, and he had supposed he never would make it, since he usually writes psychological material rather than hard science.

Like most authors before him, Tom sharpened his skills on short stories, some with collaborators, before tackling longer works. Now he finds that novels are actually easier in terms of effort and time—for the finished lengths as well as providing greater remuneration. On a practical level, though, he discovered that royalty checks only come in a few times a year. To smooth out the valleys, he works several hours each night signing up subscribers for a local cable TV company.

After receiving a B.A. in Psychology from the University of Maryland, Tom worked for nine years as a psychotherapist in an institution for the criminally insane. He continued at the same university, located in his life-long home of Baltimore, for several additional years on a part-time basis, eventually receiving an M.A. in English literature. He left off partway through a Ph.D. when he decided that full-time writing was really what he wanted to do.

Outside of writing, other interests include photography, hi-fi stereo, and classical guitar. Tom admits to being nearly the archetypical "Italian father" when it comes to doting on son Damon. Scheduled for Doubleday publication are a story collection, *Dark Stars & Other Illuminations*, and a novel, *Ozymandias*. ■

Thomas F. Monteleone

the reference library

By Tom Easton

Robert A. Heinlein: America as Science Fiction, H. Bruce Franklin, Oxford University Press, $18.95, xiv + 232 pp.
Expanded Universe, Robert A. Heinlein, Ace, $8.95, 582 pp.
A World Called Solitude, Stephen Goldin, Doubleday, $9.95, 187 pp.
Firebird, Charles L. Harness, Pocket Books, $2.25, 207 pp.
The Captive, Robert Stallman, Timescape (Pocket), $2.50, 207 pp.
When We Were Good, David J. Skal, Pocket Books, $2.25, 188 pp.
Profundis, Richard Cowper, Pocket Books, $2.25, 207 pp.
Time Out of Mind, Richard Cowper, Pocket Books, $2.25, 175 pp.
Gene Wolfe's Book of Days, Gene Wolfe, Doubleday, $9.95, 182 pp.

How do I begin the process of preparing one of these columns? I read. I pick a book from the shelf of review copies near my easy chair, and I read it. If I think I can say anything useful or entertaining about it, good or bad, I take it upstairs to my office and add it to the stack on the table near my desk. If I don't, I dump it in the box that eventually makes the trip to the town library. (The donation is tax-deductible.) Either that or I put it in the pile of freebies for my SF students. (They love it!)

When it comes time to actually write the column, I move the stack of reviewables from the table to my desk. I count them. Are there too many? Then which ones should I discard? Are there too few? Then which ones can I say a *lot* about? Or do I need to read some more right away? What order should I cover them in? Are there any pairs or triples that lend themselves to joint or sequential reviews?

And so on. Only then do I pull over a legal pad and start trying to come up with a lead. And speaking of leads, how do you like this one? It comes right out of the warm-up exercise, and it lets me

point to a few combinations in this month's stack of books. There's one by Heinlein, and another on Heinlein. There are two concerning solitude, two more that are second novels by men whose first efforts I praised highly, and a third pair by one man. And then there's a solitaire—it's not unique, but it does refuse to cozy up to any of its neighbors.

Let's begin with the Heinlein duo. H. Bruce Franklin, in **Robert A. Heinlein: America as Science Fiction**, brings a Marxist point of view to bear on all three of the nouns in his title, as can be seen from Robert Scholes's foreword:

> "Though Heinlein has often been seen as a radical of the right, from Franklin's perspective he is at the very center of the system of beliefs and values that characterizes American capitalism. Franklin's book is thus a critique of American values *through* the work of a writer who presents those values—with all their internal contradictions—in a clear and vigorous manner. It is a critique, however, and not a pointless exercise in hostility, because Franklin is respectful of Heinlein's skill as a writer, and thus reads his work with the care and attention it deserves. Science fiction is more tendentious, more engaged, more overtly ideological than our traditional modernist fiction with its emphasis on individual psychology. The clash of values is an important dimension of the whole field and must be an important part of its critical study as well. In this book Heinlein and Franklin enact that clash for us, bringing it into the foreground, where it belongs." (p. ix)

When Franklin speaks for himself, we find him saying that Heinlein sees

> ". . . essentially just two alternatives: either the elite (the *good* elite) saves the day, which obviously contradicts democratic principles he sometimes espouses, or society succumbs to the ignorance and folly of the masses of common people. His concept of revolutionary social change imagines something created *by* an elite *for* the benefit of the people, usually quite temporarily. He seems incapable of believing that progressive social change could come through the development of the productive forces and consequent action by the exploited classes themselves. Thus Heinlein places himself consistently in direct opposition to the most powerful forces of social change in the twentieth century." (p. 34; italics in original)

To his credit, Franklin does not use his book to try to disprove Heinlein's ideas. I'm not sure he—or anyone—could, either, for "the people" have never been any more responsible for social change than any other customer for a bill of goods offered by some "elite." His ideas show, of course, but he does treat Heinlein fairly, describing his work more than evaluating its social worth. Franklin's own leanings appear most clearly when he seeks explanations for Heinlein's leanings in the man's past, for his strong antipathy to monopolies, for instance, in the way his family was driven out of the farm equipment business by the giant International Harvester, which then employed his father. There *is* a pattern there, one that indeed often crops up in Heinlein's fiction. There is another pattern, too, in Heinlein's elitism and individualism, as opposed to the view that wisdom is a collective phenomenon; and Franklin may be right in attributing it to the classic American frontier attitude. Yet this pattern lends itself better to exciting stories, and this may be an equal expla-

nation of Heinlein's fondness for it. Franklin recognizes that Heinlein did in fact describe one collective society, the "Little People" of *Methuselah's Children*, revisited in *Time Enough for Love*, that embodied both utopia and scientific superiority. Yet he seems perplexed by the short shrift Heinlein gives it, saying that since it does not gibe with Heinlein's American biases, he cannot admit its true superiority. More to the point, perhaps, may be Heinlein's own words, when he calls the "Little People" lifeless and static—they aren't good story material.

Heinlein is quite readable, and it offers a broad summary of the Master's work. Its value may even be increased because its author's biases differ from its subject's—how much new could we learn from a critic who thinks Heinlein is the Prophet himself? As it is, Franklin adds interpretations and explanations that do prompt us to think, much in the spirit of SF itself, and he does not seem to demand we agree with him. So try him on. If you're a scholar, a teacher, or a critic, the book deserves a place on your bookshelf.

By Heinlein, I have **Expanded Universe**, a remake of the 1966 *The Worlds of Robert A. Heinlein,* built up to a fat 582 pages by the addition of uncollected stories and a hatful of nonfiction material. The latter in particular supports Franklin's view of the man as an opinionated, crusty, old curmudgeon, dedicated to the propositions that most folks use sawdust for brains and that the few who have functioning grey matter have a bounden duty to run the show ("The genius's burden"?). Heinlein is persuasively certain that we need a military able and willing to defend the nation and its interests, that we should quash all the factions that weaken national unity, that we should dry up the public teat so beloved by our incompetent, selfish brethren, and so on. He may even be right, but I confess I find it difficult to see just where to draw the line between national assertiveness and aggression or colonialism, between free enterprise and social justice (*are* they mutually exclusive?). I tend to find Heinlein hard to swallow when he rattles his sword and pinches his purse, though I know a great many people in this country don't—they elected Reagan, didn't they? I nod in agreement when he urges that we get our thumbs out of our butts and get a move on into space, and I wish that those who agree with him on one issue would only agree on this one too. The biggest difference between Heinlein and Reagan may lie in this—one dreams of far planets, while the other is Earthbound in his imagination; one sees the long view, the other the short.

But enough ranting. The stories in *Universe* include "Life-line"; "Blowups Happen"; a crime tale, "They Do It with Mirrors"; "Free Men"; a girl's romance ancestral to *Podkayne of Mars*, "Cliff and the Calories"; and more. Obviously, the book belongs in any collection of Heinleiniana, if only for the non-SF pieces we never knew he'd written.

Stephen Goldin's **A World Called Solitude** addresses the question of how sane a man would be after eleven years of solitary possession of an entire world. Birk Aaland is an engineer who, because of his opposition to a world dictator, is stripped of the credit for his space drive and imprisoned. Escaping, he crashes on an undiscovered planet and becomes the only man to learn of a species that killed itself off in war and left behind a world full of working machines, including intelligent robots. After

eleven years a second ship crashes. Its sole survivor is Lieutenant Michi Nakamura who, once healed, explains that her ship was the only one to escape when aliens struck her world, and she must carry the warning to the rest of humanity. Aaland is understandably reluctant to help her until the aliens arrive as well.

The emblem of Goldin's concerns here is a painting that shows two of the extinct aliens. Both are faceless. One implores. One stands aloof. Together, they wring Aaland's soul, for he identifies with the beggar. Yet once Michi arrives, his stance immediately seems false, and his slow realization of this marks his emergence to a saner maturity.

The device of the painting is very effective. Without it, the book would remain readable, but it would be a fairly ordinary tale. With it, the story gains an emotionality that justifies calling Goldin an artist, not merely a writer.

Charles Harness's **Firebird** also deals with solitude, but to less effect. Here we have another cycle of the cosmos, in which leonine sapients seem to be the only intelligence in all the galaxies. They are ruled by a pair of super-computers that wish to prevent the eventual collapse of the universe so that they can live on forever. To do this, they take advantage of a wrinkle in the laws of physics peculiar to their universe (but not our own) to destroy matter just briefly enough to tip the balance from eventual collapse to perpetual expansion. The only way to combat this is to build a ship that can travel at almost light speed and develop enough relativistic mass to restore the balance. Fortunately, there exists a band of rebels capable of just this task, and they conspire to create and enlist a pair of lovers to pilot their supership alone until the end of time.

The love affair is a subplot made poignant by isolation and temporal paradox, but what distinguishes the book is the main plot: superscience on a cosmic scale, the sort of thing all readers who cut their SF teeth on "Doc" Smith will know and love. Yet the style is hardly that sort of Smithean. It reminds me far more of Cordwainer Smith, even to an equation of the ruling computers with the Lords of the Instrumentality.

Are there nits to pick? Of course there are. Harness seems to think that amino acids are the building blocks of DNA, instead of protein. He implies that .999... *c* is almost infinite speed. And he rarely avoids the dread *deus ex machina*. Yet for all that he has given us a readable story, one you may well enjoy if you do not expect artistic or philosophical significance. But then, he may not have been trying to do the sort of thing Goldin tackled. A fun story may have been all his aim; I should not criticize him for having done no more.

In July 1980 I said that Robert Stallman's *The Orphan* "offers warm and human enjoyment" and deserved a sequel. That sequel is out now, as **The Captive**, and there will be one more. It too is a pleasure to read. Stallman's beast is older now, still linked to the family he adopted at the birth of his consciousness. His human alter ego is stronger now, so that the beast himself takes on a wistful coloring, and his story is strongly human. He seeks out the family of Renee, sister to the Vaire he adored as a child, loves her, and is left, knocked unconscious by her husband, in a car parked across the railroad tracks. He escapes, not quite in time, and while healing is taken captive by a local farmer. Yet his captivity is not

entirely that of the title. He escapes again, marries Renee, and reveals himself—first to his new stepdaughter, Mina, and later to Renee—in the course of rescuing his family from the ex-husband and his Nazi cronies (the time is still the 1930s).

Three captivities—beast and cage, beast and love, wife and Nazis—let the title resonate. Yet I find the book more valuable for the answers it provides—the beast is the spawn of a strange species, programmed in the egg with knowledge that is released only as he confronts certain developmental crises, assigned to learn by association with humans—and the promises it makes—the beast's strangely split persona seems to be far more than a method of disguise. The beast himself seems very much a metaphor for human existence—bestial youth, responsible maturity, and some yet unspecified third stage, each attained through an interplay of genetic programming and human interaction. The beast's third stage, in these terms, we can perhaps expect to find as some embodiment of wisdom when Pocket Books releases Volume 3. I will not be surprised to find that Stallman is projecting the next stage in human evolution. But I should amplify—I *don't* think he is saying we will become creatures like his beast; I do suspect that the beast's third stage will prove to be one we see among ourselves too rarely, and that Stallman is using his metaphor to say what he thinks we must become: responsible and wise, yet with access to true ferocity at need. There are those who would argue with such a Heinleinian prescription, but it does make biological sense, and Stallman has made a marvelous story of it.

In September 1980 I called David Skal's *Scavengers* a strange book. I can call **When We Were Good** the same, for Skal is possessed of a trenchantly morbid vision of his world. This time out he pictures a future when pollution has made humans unable to reproduce successfully by themselves. Despair is common, suicide is encouraged as a solution to the problem of overpopulation, drugs are freely available, and the state has found a way to produce perfect children in the lab. Furthermore, the state has found a way to keep its creations eternally young, prepubescent, lovely, pictures of innocence, with hormone treatments. It uses these children, too. Their playgrounds are visions of lost Eden for the populace, and visits from them are coveted rewards for the loyal.

What is wrong? The children have adult minds in childish bodies. They are polymorphously perverse hermaphrodites, trained to callousness, to expect a day when they will take over the world, perhaps when they will themselves sweep away their progenitors. And their masters are not what they seem, as we see as we follow Little Tyke past his/her discoveries to doom.

Skal paints a world on the verge of explosion and extinction. He does it so effectively that he may well spoil your sleep for a night or two. There are scenes in this tale to make your stomach turn, to change the way you next look at a schoolyard in recess, to drive you to beat your children and put razor blades in Halloween candy. Read it.

Richard Cowper has done some nice short work. He has also done some rather good novels, of which two are the outrageous **Profundis** and the thrilling **Time Out of Mind**, both reissues. The former concerns the *H.M.S. Profundis*, a gigantic submarine with a crew of thousands, that was at sea when the final war arrived. To all intents and pur-

poses, its crewfolk are the last survivors of humanity, and its current master, Admiral Lord Horatio Prood, is the ranking survivor of the British Empire. Not unnaturally, he comes to believe he is God. Rather less naturally, He then decides to find a chump to play His Son. Said chump is one Tom Jones, a lowly dolphin-communicator with a hitherto unguessed talent for miracles. He falls into his rôle, is seized as a figurehead by rebels, escapes his planned fate, and emerges whole. The parallels with a certain myth of two millennia ago are neatly drawn, and the characters, from the dolphins to the Three Kinky Kittens, are precisely as entertaining as they should be in a farce.

My main objection is that a nuclear war that sterilizes the land is not very likely to let the air-breathing cetaceans survive; by the same token, if the cetaceans survive, the *Profundis*'s crew should suspect that the land is not quite so bad off as they assume. Cowper has violated his own premise simply to fit in a few nice characters, when he could have stayed consistent without really hurting his story. Yet this objection is a mere quibble. Cowper's aim is humor, and that can stand inconsistency better than more seriously intended SF.

Time Out of Mind is an excellent thriller. The story begins on July 17 (my birthday!), 1987, as a young fisherman, Laurie Linton, confronts a specter hovering over his brook. The specter mouths words that become clear only in that night's dream: "Kill Magobion!" The scene then shifts to a future time, where it emerges that the specter was actually an older Laurie, gone back in time mentally, thanks to a drug, in an attempt to prevent a ruthless dictatorship. Yet even as we realize this, the older Laurie, with two companions, dies.

The scene shifts again, to another

Laurie, just entering adulthood and signing up with NARCOS, the UN antidrug squad. He learns of a strange new drug that gives its users instant heaven and releases telekinetic talents. The security lid clamps down, and Laurie is asked to seek the truth. With the aid of Carol Kennedy, colleague and lover, he finds it and learns who Magobion is and what he plans for the world.

Can there be alternate histories? Cowper insists there must be, at least for the sake of his story. Yet he also says that within a history there is such a thing as fate, or predestination. The second Laurie, by reaching the first, branches off an alternate in which the third must act. Yet that third Laurie finds that *his* history is now so designed that his fate seems fixed. He can neither fail nor go back to send another message to his earlier self, for even as he received his message, the lives of others were being forced onto other tracks that did not lead to the second Laurie's future. Carol's father and brother died and she dropped the name by which the second Laurie knew her. The time-drug inventor dropped out of research. There are events here without causes, without chains of visible cause and effect, and this makes me—and perhaps you—uneasy. Yet we cannot call this a literary *deus ex machina*, for it seems less than essential to the plot—it's basically little more than a device to fatten up the exposition of Cowper's *novum*—and it does not emerge at crucial moments. I suspect that Cowper himself favors a predestinary view of time, used the alternate history idea for the sake of the story, and had trouble reconciling himself to the necessity.

But don't let me stop you. For all my philosophical discomfort, the story is good. It has a believable hero, a sexy heroine and foil, a classic villain, and a satisfying dose of action. It's an adventure in a class with many of those by Gavin Lyall, Alistair MacLean, and the like.

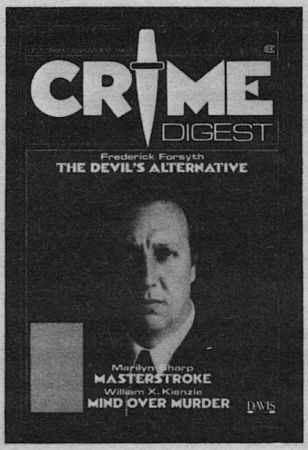
Let this month's last be **Gene Wolfe's Book of Days**. It's a uniquely organized collection, a dozen and a half stories for as many holidays. There's "Car Sinister," in which a suburbanite's iron gets knocked up, for Mother's Day; the cryptically condensed life of "Forlesen" for Labor Day; "The Changeling," queerly reminiscent of Ellison's "Jeffty is Five," for Homecoming Day; and the prophetic "La Befana" for Christmas Day. You've very possibly seen them all in *Orbit, If, F&SF, Analog, Galaxy,* and various anthologies. I don't need to say much about them—you know they're by Wolfe, and you know they're good, each and every one. But let's take a quick look at Valentine's Day's "Of Relays and Roses," a lovely tale about a computerized match-making service. The company responsible is being investigated by a Senate committee, for happily matched workers seem to lose productivity, and such industries as bridal outfitting, heavily dependent on divorces, are up in arms. Fortunately, the company's representative is armed with suitable statistics. He also has some clinching personal testimony, though he doesn't reveal the whole truth. I loved it, for Wolfe's wry wit lent it a very appropriate flavor.

Do not neglect to read the introduction, by the way. If you do, you'll miss the bonus story Wolfe left out of the table of contents. ■

● Basic research is part of Man's intellectual trust, and it satisfies the human desire for progress.

Carlos Chagas

NEW THIS FALL!



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DETAILS AND ORDER COUPON ON PAGE 113

DAVIS DIGESTS

BRASS TACKS

Dear Mr. Schmidt:

As a reader of *Analog/Astounding* for almost forty years, I greatly enjoyed "Rule of Law" by L. Modesitt, Jr., in the April issue. Its central theme, which recognizes the importance of knowing the judge as well as the law and facts in a lawsuit, is a next natural step in the development of trial techniques. Fitting the strategy and tactics of a lawsuit to the personality and quirks of a judge is not, of course, unknown. Also, a theory of predicting Supreme Court decisions can be found in *Supreme Court Decision Making* by D. Rohde and A. Spaeth, 1976, W. H. Freeman and Company, San Francisco, wherein the values (and consistency of their application) of Supreme Court Justices on a number of issues were derived from written opinions and then used to forecast individual and collective decisions involving such issues.

It is surprising complete dossiers on Federal District and U. S. Circuit Court Judges are not already available. It should not be difficult to correlate their decisions in accordance with parties involved, subject matter, issues, lawyers who represented the parties, and individual values, as outlined in *Supreme Court Decision Making*.

Larger law firms have always had an advantage because of inherent efficiencies, such as in the acquisition and maintenance of complete law libraries and, more recently, due to the increasing use of word processing equipment and computers in the legal profession. But except for providing services to the *same* clients at different locations, international and interstate law firms have not proved overly successful.

Computer profiles of judges would probably lead to decisions which are more, not less, just. Judges are sworn to uphold the law and most do the best they can. However, judges are human, and their values, prejudices, and eccentricities sometime affect their fairness and ability to render just decisions. The availability of profiles of the type suggested in "Rule of Law" would be a feedback mechanism which could well lead to self-correction.

A need exists for developing a "Science of Law." Members of the legal profession are, in a sense, tailors of society. They mend and patch disruptions which inevitably arise. Just how, why, and how well the system works and its effects could bear considerable research and analysis.

Professor J. Wigmore of Northwestern University, famous for his works on evidence, was a student of the world's legal systems, present and past. He noted certain socio-legal phenomena and suggested questions for research concerning legal systems. For example: Whether a legal system is a by-product of social-political life, or is it an essential function? Does it come into being by imitation or is it an inherent psychological necessity? Are legal systems generic to all organized humanity?

It was Professor Wigmore's hypothesis that the rise and perpetuation of a legal system is dependent on the development and survival of a highly trained professional class. Thus the most effective way to change a legal system might

be as suggested by Shakespeare: "First, kill all the lawyers."

The law has many aspects which could be a fertile field for science fiction. What are the consequences to society if legal representation was free and available on demand? Are fairness and justice always compatible? Suppose criminal statutes were so numerous that violations were practically unavoidable, to what extent would selective prosecution be used for political repression? Is there something analogous to Heisenberg's principle applicable to judicial fact finding? If so, what percentage of the innocent will inevitably be found guilty? Does this percentage vary inversely to the frequency of the crime? If one's private property cannot be taken without just compensation, why shouldn't this apply to a person's time and, if applied, what would be its effect on the ability to govern? Are there subliminal techniques which might provide an edge in legal proceedings? What problems might arise if judicial proceedings would be accomplished through television recordings: testimony—argument—charges to the jury—everything? What would be the social effects if knowingly placing a person under substantial mental stress should be held tortious, per se? More science fiction stories centered on various aspects of the law might encourage serious research into this neglected field.

Penrose Lucas Albright
Mason, Mason & Albright
Attorneys at Law
Arlington, VA

Are you listening, writers?

Dear Dr. Schmidt:

Since the sale of *Analog* to Davis Publications, I have noticed some changes in the magazine. I do not particularly like them, but I have just grumbled to myself. After all, some changes will turn out to be good ones. However . . . I have just received the April 27 issue of *Analog*. One look at the cover and I decided that enough is enough. The changes have consistently and monotonically diminished the quality of *Analog*.

Analog should revert to its old mailing policy, where the magazine was wrapped in a brown cover. (Could a 10¢ increase in the cost of an issue cover the expenses?) Since the new policy was instituted, I have come to expect my cover to arrive wrinkled, slightly torn, and generally manhandled. I used to enjoy looking at the cover, but the mailing label stands out like a polar bear in Africa. If the label must be used—as a very temporary change—move it to the back cover.

I can understand why a company would like to make a profit by publicizing its other publications and by selling advertising space in its magazines, but why must *Analog* be subjected to these indignities? I am not complaining about the limited number of ads for other science fiction books. These ads are appropriate, are not meretricious, and make me aware of new books which can be found in bookstores—in contrast with some of those reviewed in "The Reference Library" (which are reviewed five, maybe six, months before the column is published). There are the other ads. There will usually be not one—but two—ads for *Isaac Asimov's Science Fiction* stories in every issue. There should be at most one—if even then—such ad, no larger than half a page. In the April issue there are 3 ads for Alfred Hitchcock stories, 2 ads for Ellery Queen stories, and 1 ad for a movie. Will you accept ads for video cassettes or television miniseries? And then, every month, readers are subjected

to "Classified Market Place," which has no business in a magazine the caliber of *Analog*.

The most obvious changes appear on the cover. The box in the lower left corner of the front cover with black lines in it has gotten larger and is invariably printed with a white background. The day of the month is printed twice on the cover. And then there is the new logo. Several adjectives come to mind—tacky, cheap, nostalgic (old-fashioned), multinational ("made in Hong Kong"), and consistent (with the advertising policy). Why not leave well enough alone? Well, at least the white background complements that of the mailing label and box in the left corner. If you make the logo just a little bit larger then you would only have to pay an artist to do 70 percent of a cover.

If Davis Publications wants to bring *Analog* down to the level of other magazines, so be it. There are other, non-Davis-related, science fiction magazines which seem to be dedicated to high standards in format, presentation, and layout. I have been quite proud of my decision to subscribe to *Analog* 12 years ago when I was 15. Now I am having second thoughts about continuing my subscription. I fondly remember the way *Analog* was.

CHARLES J. HULLER
Hyattsville, MD

You may not enjoy reading ads, but you can always skip over them—and if you want to continue being able to read science fiction, you should be glad they're there. It would be nice to be able to run a magazine with every square inch filled with literary gems, and no intrusions of the commercial, but when the audience is relatively small and inflation is galloping on, it just isn't economically possible. To keep going, any magazine has to take in more money than it spends, and advertising is essential to do that. And we're not reducing *the science fiction to make room for it.*

As for the cover redesign, you can always let us know when you strongly like or dislike something we do—and it's to your advantage to do so. We'll listen, and when there's a strong consensus, we'll try to do something about it. We got a lot of comments on the cover, both pro and con, and you'll probably soon be seeing some modifications based on them—in fact, by the time this appears, you may have already seen them.

Dear Stan,

Reading through the February edition I ran across a letter discussing tacking by balloons. While his (Dr. John Gribbin's) point is basically correct, with a little inspired engineering . . .

Suppose you have a strong vertical velocity gradient in the wind (a condition which always exists near the ground). Now attach a para-wing to a rigid pole which is weighted on one end, so that the wing always faces one direction (either left or right). If this arrangement is tethered by a long rope and lowered from a balloon, the difference in the wind velocity from the altitude of the balloon and the altitude of the para-wing will provide a "tacking" force largely perpendicular to the direction of the wind.

The practicality of such a device depends on the strength of typical wind velocity gradients versus the additional weight burden on the balloon. So while I doubt if anyone will ever use such an arrangement, it *is* theoretically possible to tack a balloon.

JOHN KORMYLO
Houston, TX

P.S. By mechanically or electrically controlling which end of the pole is

weighted, you can control the direction in which you want to tack.

Dear Mr. Schmidt,

Notwithstanding the protestations of John Gribbin (*Analog* February 1981), a conventional airship moves under the influence of three forces, not one. In addition to the wind, a normal airship is subject to gravity and buoyancy; a combination of the latter two forces can be used to tack against the wind. The procedure requires that the airship have some aerodynamically effective shape (which a sphere is not—conventional hot-air balloons need not apply). The general procedure, beginning with a neutrally buoyant airship, is to dump ballast, vent gas, or change the heating level, so that the airship accelerates ground- or skywards. With a round airship, nothing will happen. If the airship has wings (shades of Tom Swift, Sr.) which are set inclined to the horizontal, the rush of air past the wings (an initially vertical force) can drive the airship in a horizontal direction (tacking).

According to John Toland's *The Great Dirigibles*, this procedure was used entirely successfully (at least by the standards of the time) to guide an airship, the *Aereon* of Dr. Solomon Andrews. The vessel flew over the city of New York (both with and against the wind) in the year 1865, using a combination of sand ballast and hydrogen gas to control lift, and multiple gasbags as a lifting (driving would be more precise) surface.

The same procedure could in principle be used to control an airship over another planet. This being science fiction, one uses a fusion reactor rather than butane torches to heat the gas in the airship's gasbags. Of course, with power available one could use a motor, instead, but the gravitational lift system requires fewer moving parts.

I enclose a photocopy of the Toland description.

GEORGE PHILLIES

Ann Arbor, MI

John Gribbin replies:

Dear Stan,

Not for the first time, the *Analog* readership has shown the breadth of scientific knowledge to solve immediately a seemingly intractable problem. Leaving aside the unfathomable way in which the word "rudder" got into my letter on tacking where I thought I had typed "keel" (typewriters, as all authors know, are not only intelligent but malicious), your correspondents are entirely correct in their proposals for tacking airships, as far as they go. But there is a snag.

An airship moving *through* the wind and suitably shaped to provide lift could "tack" in a vertical plane, diving and climbing successively while moving upwind, taking advantage of the aerodynamic lift provided by its shape as the lever against the wind. The snag is that, whereas a boat in water has enough friction to ensure that the wind blows past it, a free-floating airship is carried precisely at wind speed, so that there is no net movement of wind past the hull. Without a relative flow of wind, no aerofoil can produce lift!

Tossing off sandbags to produce upward motion, and venting gas to come down, does provide a relative flow of air past the rising or descending craft, making upwind movement possible, as long as you have ballast to throw out and gas to vent—not really practicable except as a short-range circus act. However, while impractical today, the suggestions of both John Kormylo and George Phillies ought to be taken seriously by SF writers. OK, let's keep the

great airships tacking through the atmosphere of Jupiter—but let's explain in the stories how the tacking works! You must have some author on tap to take up the challenge. . . .

JOHN GRIBBIN

Brighton, England

Dear Mr. Schmidt,

In the past few months, there have been little glitches in stories well worth playing "the game" with.

"Emergence," by David Palmer. A virus that makes so many beneficial changes, with no harmful changes, could not have been an accident. Obviously some visitors decided (rightly) that humanity could use some improvement. But why didn't any of the characters notice the flu could not have been natural?

"We're Working On It," by Robin Kincaid. What a brilliant use for a time machine. However, if an "out of phase" object falls through a floor, presumably it isn't subject to air resistance either. Without air resistance, a sponge falls just as far in a fixed time as a screwdriver.

Keep up the good work. Let's have more stories where such things are worth pointing out.

RICHARD BRANDSHAFT

Los Angeles, CA

Dear Dr. Schmidt:

Thank you very much for printing my letter correcting the status of the Moon Treaty. I was pleased that we received a number of donations referring to that Brass Tacks letter (March 2, 1981). Raising money to pay off old war debts is a difficult task indeed.

I have one correction to the April "Alternate View" by Jerry Pournelle. In the SPS discussion (point 10 in the article) he credits Dave Criswell for the Moon mine approach to SPS construction. Though Dave has worked extensively on this subject, I believe Dr. Gerard O'Neill originated the concept and first presented it at the Space Manufacturing Conference held at Princeton in May of 1975. This is a minor quibble about an excellent article, but a person incorrectly credited never feels good about it, and a person inadvertently slighted feels awful.

H. KEITH HENSON

President

Analog Precision, Inc.

Tucson, AZ

Dear Dr. Schmidt:

I read with great interest Dr. Carpenter's article in the Oct. '80 issue, "The Physics of Haunting," and have just read his follow-up letter in the March 30, 1981 issue. I would like to take exception, however, to his repeated implication that religious organizations must compete for standing before science: rather, they should both pool resources.

For example, when I brought Dr. Carpenter's article to the attention of my co-workers here at the university, it was pointed out that the question of the spin of a soul has long since been answered by religion: after all, Jesus died for our spins. Furthermore, we know that the number of souls in Heaven is limited to 144,000, which argues that souls obey some form of exclusion principle and therefore cannot obey Bose-Einstein statistics. A zero-spin soul would obey B-E statistics, so we have independent confirmation that souls have spin. (A third confirmation was proposed involving Augustine as an example of Thomist precession, but this was discarded as contrived.)

We can go further. Heaven is known to be in perfect harmony, or according

to some translations, perfectly harmonic. If we therefore assume that Heaven can be described by a standard harmonic potential in three dimensions, and calculate the number of states available to non-interacting souls of half-integer spin (integer-spin souls obey B-E statistics, and anything else violates Lorentz invariance), we have:

$$\text{No. states} = \sum_{n=0}^{N}$$

g_s = spin degeneracy = $2s + 1$
g_n = degeneracy of n^{th} level of Heaven = $\frac{1}{2}(n+1)(n+2)$

If we assume that all levels of Heaven are completely filled with 144,000 souls of half-integral spin, then we get the following self-consistent pairs of numbers:

spin of soul (s)	highest level in Heaven (N)
143,999/2	0 (ground-state)
35,999/2	1
14,399/2	2
7,199/2	3
1,199/2	7

The significance of this final value of 7 cannot, in my opinion, be overemphasized (although some of my colleagues consider this to be merely a coincidence resulting from my assumed dimensionality of three for Heaven). Thus we can, by combining the resources of both science and religion, not only determine that souls do, indeed, have spin, but can assign that spin a tentative value of 1,199/2.

I am certain that other important questions can be answered by an appropriate synthesis of ideas from many disciplines. To continue to place such disciplines in the light of competitive opposition, as Dr. Carpenter does, is counterproductive.

JOSEPH C. NEMETH
Department of Physics
State University of New York
Stony Brook, NY

Dear Stan,

The National Fantasy Fan Federation's amateur SF short story contest is now on. Send SASE for rules and blanks to: Donald Franson, 6543 Babcock Ave., North Hollywood, CA 91606. Contest closes December 1.

We define a short story as under 7500 words (Hugo and Nebula rules), and an amateur as someone who has published no more than two SF or fantasy stories in professional markets. (After all, with three you are eligible for the Science Fiction Writers of America!) Don't expect big prizes, publication, professional criticism, or a commercial operation—we are an amateur club, too.

I was disappointed by the *Analog* survey showing only 2.4 percent of its readers under 18. Where are the intelligent 13-year-olds who once were the mainstay of magazine science fiction? While John Campbell bragged about his adult readership, Hugo Gernsback advertised the opposite, printing a picture of a 7-year-old fan as youngest reader. I'd hate to think that today's intelligent youngsters are not reading, let alone not reading science fiction (and *Analog* is the closest to "real" science fiction these days). Don't make an effort to "appeal" to a younger group, but find ways to distribute *Analog* and *Asimov's* to high schools and junior highs. That's when I first ran across *Amazing* fifty years ago (not in school, of course!)

DONALD FRANSON
North Hollywood, CA ■

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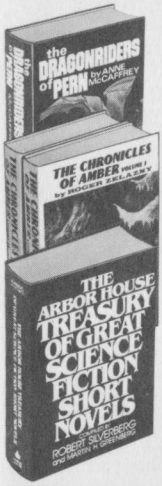

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