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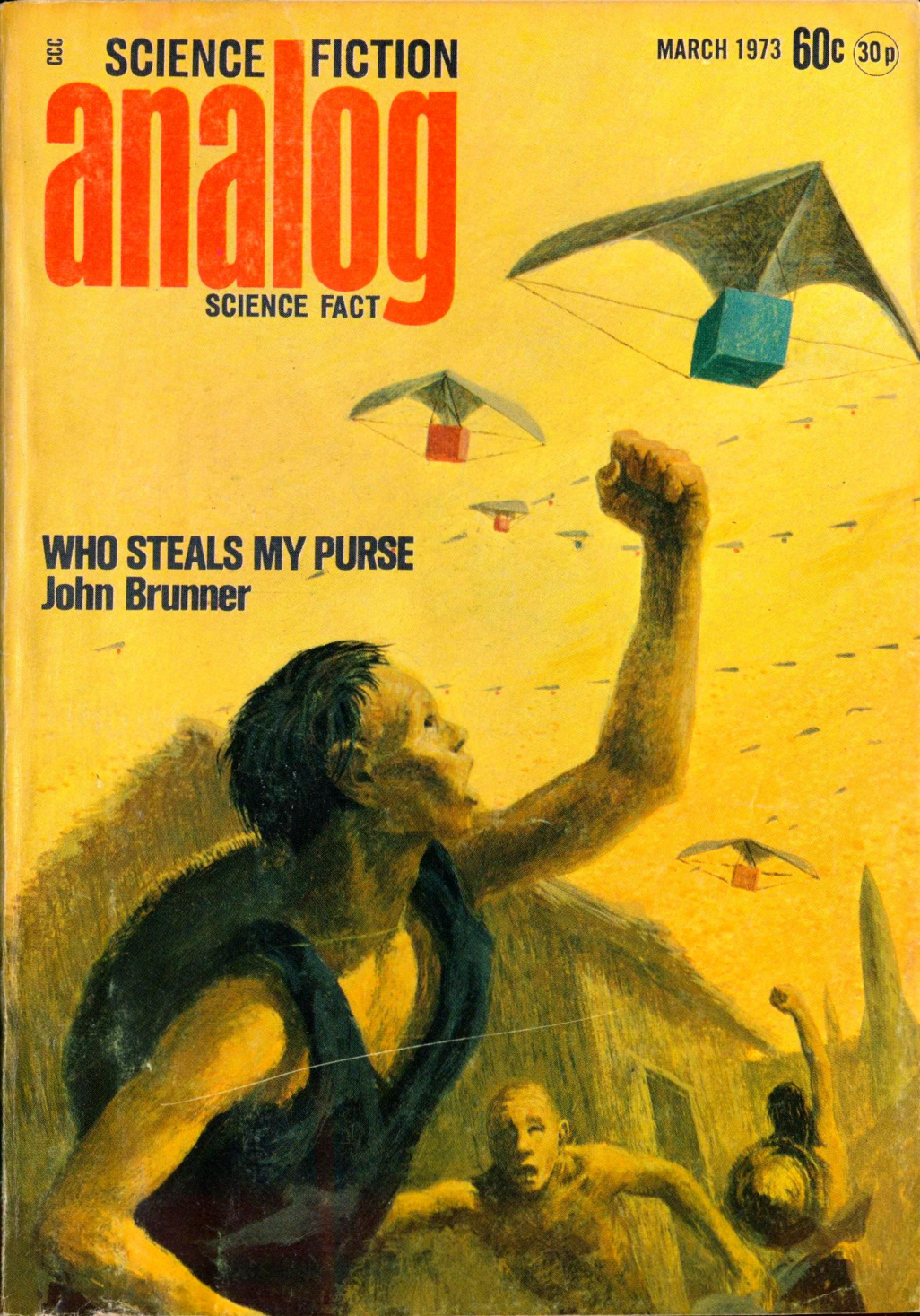
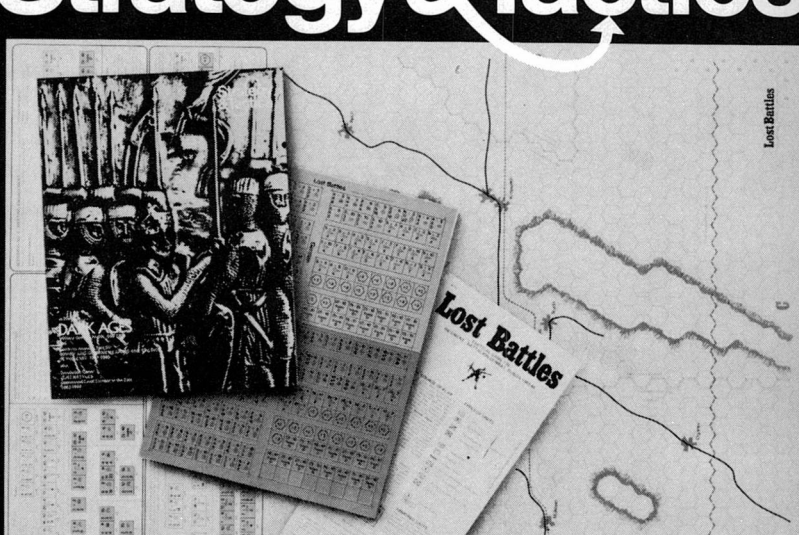
MARCH 1973 60c (30p)



WHO STEALS MY PURSE
John Brunner

Strategy & Tactics



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LAW & ORDER

The fifteenth anniversary of the Space Age slipped by last fall with hardly a whisper. October 4, 1957 was the day Sputnik I was launched.

The whole world was stunned that autumn day. And in a way they never expected, the Russians themselves were surprised.

By orbiting their satellite over various national territories without first getting permission from the nations involved, the Russians inadvertently established the concept of "freedom of space." Thus, while you cannot fly through a nation's airspace legally without the nation's prior approval, you can fly a satellite over it without even telling the nation you're doing so.

Within a few years of the first Sputnik, American satellites were leisurely cruising over the Soviet Union, photographing missile sites and everything else visible to the best optics systems that the U.S. Air Force could buy. There was no risk of a Francis Gary Powers fiasco; the Russians couldn't shoot down our satellites and even if they did, there was no one aboard to capture or kill, and the damaged "bird" would burn up completely if it ever re-entered the atmosphere.

The Soviet government complained bitterly about the American spies in the sky. But the precedent had already been set: satellites can overfly any nation on Earth, and the overflown nation has no legal way to stop it. International law, like most legal systems, depends heavily on precedents. Once the Russians established the freedom of space, they couldn't turn it off again. It was there for everyone.

Pretty soon Soviet satellites were busily photographing our territory and a sort of parity was achieved. Both sides now feel that they can watch the other guy closely enough to make him stick to the arms limitations agreements that have been signed recently.

Of course, the Russians have shown what appears to be a capability for destroying satellites in orbit. Several of their own Cosmos satellites have been suddenly shattered into nothing but debris after passing within hailing distance of another Cosmos-type satellite. The U.S.S.R. has not used such tactics on any satellites but their own, but the suspicion of our aerospace people is that the Soviets could destroy our "eyes in orbit" when they want to.

Presumably they won't choose to do so. Not until the moment before they launch an all-out nuclear strike. They're just holding onto the

capability to stick their fingers in our orbital eyes for those critical few moments—or hours—before The Button gets pushed. International law won't have much to say about it, because after The Button is pushed, the lawyers and anyone else left alive take a quick trip back to the Middle Ages—if we're lucky.

Wait a minute. There's a treaty prohibiting weapons in space, isn't there? And it has the force of international law, doesn't it? The answer is a partial yes. That is, both sides will respect the treaty as long as it's to their advantage to do so. If we thought that our national interests were being threatened, and the only way to stop that threat was by putting weapons in orbit, the treaty on space weaponry would join all the other famous "scraps of paper" that get tossed into the wastebasket just about the time the shooting starts.

What's more, the space weaponry treaty refers only to "weapons of mass destruction," which means nuclear weapons. All the signatories to the treaty have agreed not to stash nuclear weapons in orbit. The famous satellite bomber of many science fiction stories is strictly outlawed.

Well, almost. Again, the Russians have shown an enviable finesse in sticking to the letter of the law and getting their own way at the same time. They seem to view the world much in the same way that those

aliens of Gordon R. Dickson's, the Dilbians, do. The Dilbians never tell a lie yet somehow never seem to tell the exact truth, either. (And is it coincidental that the Dilbians are giant bearlike creatures?)

The treaty barring nuclear weapons in space is quite specific. It says that weapons of mass destruction may not be placed in orbit. ICBM's spend most of their mission life in space, but on a trajectory that intersects the Earth's surface at some target area; they don't go into orbit. Now, if you make that trajectory long enough, you can make an ICBM that soars around the Earth almost all the way. It flies on a fractional orbit—it never completes one whole revolution around the Earth.

The U.S.S.R.'s Fractional Orbit Bombardment System (FOBS) does just that. A FOBS missile can be launched southward, for example, and swing around Antarctica to head for the U.S. by way of Mexico. With all our radars and ABM systems pointed north to halt a conventional ICBM attack, the FOBS warhead can re-enter and strike without much opposition. Or much warning. There'd be no way to know if the FOBS bird was a peaceful satellite or an actual weapon, until it began to re-enter over an American target. Then we'd have about thirty seconds to call the lawyers.

Our own Air Force has taken a dim view of the FOBS idea. SAC experts claim that the accuracies of the FOBS system can't possibly be as good as those of conventional ICBM's. Thus, while ordinary ICBM's can be used for "pickle-barrel" pinpoint attacks on enemy missile silos and airfields, the FOBS warheads could only be used against much bigger, easier-to-hit targets. Like cities. The fact that the experts who make these reassuring noises tend to work at airfields and missile sites, rather than in large cities, has nothing to do with their judgment.

Getting back to the Soviet anti-satellite satellite (SASS?) it doesn't use nuclear weapons anyway, so it's still quite legal. To destroy an orbiting satellite, a well-placed beanbag will do the trick. After all, the satellite is winging along at orbital velocity—better than twenty-five thousand kilometers per hour. Hang some buckshot in front of it—or even better, throw the buckshot at it from the opposite direction at the same speed—and you've got a shredded satellite. No violation of any laws, international or geophysical.

Which goes to prove that when men really have a reason to do battle in space, they'll have the weaponry, even if they don't use nukes. The rapidly-growing art of high-powered lasers will no doubt be added to the arsenals of both the U.S. and U.S.S.R. Lasers will be ideal space weapons, sooner or

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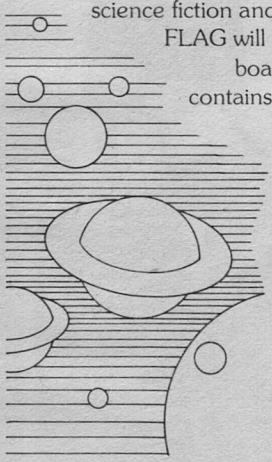
The best of all possible worlds.



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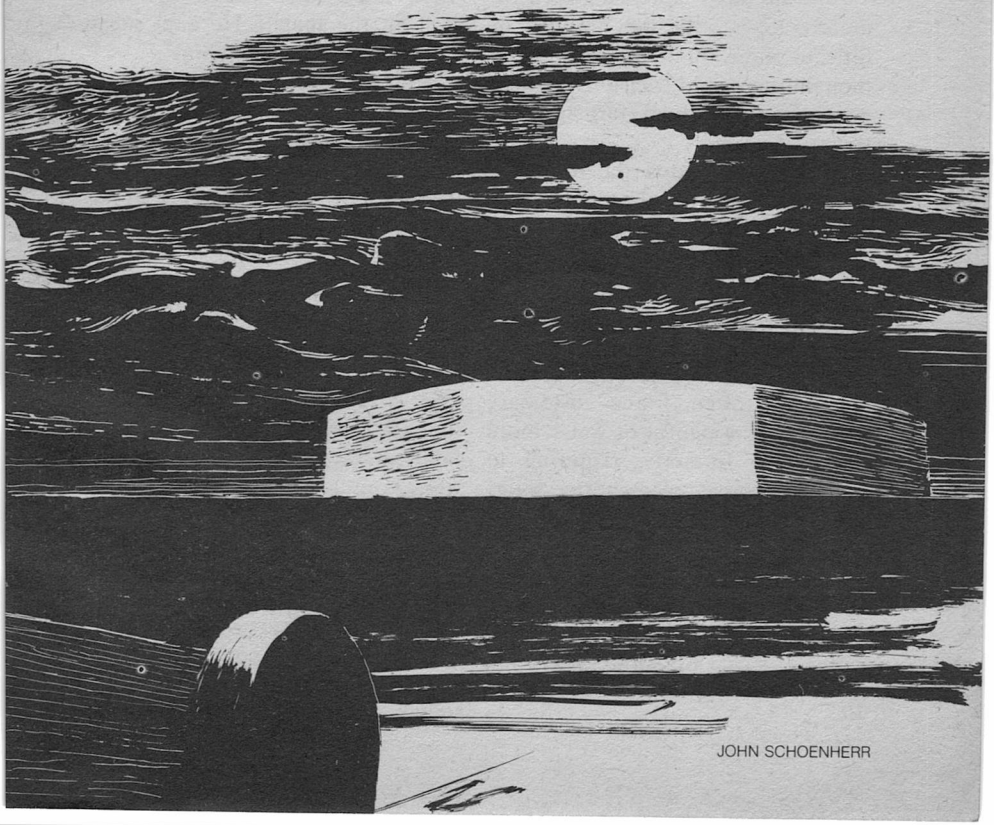
JOHN BRUNNER

The purpose of war
is to impose your will on the enemy
—by whatever means are appropriate
to accomplish that goal.

who steals my purse



JOHN SCHOENHERR

Hamlet Siao Kat

Cham Loc plodded up the winding narrow path that led from the paddies to the hillside village he called home. He had done so daily, except during the worst of the monsoon rains, since he was nine—the age of the son who now followed him. There had been two sons, but one was gone.

Today the path seemed steeper than it used to be, the rocks sharper to his bare feet, the drifting smoke of the cook-fires at its end further away.

And the day's labor had been infinitely long, with the promise of little to show for it. Sometimes he thought he could sense the sheer weariness of the land, farmed for a thousand years.

Overhead sounded the drone of a plane, and the boy excitedly called his attention to it. But Cham Loc could not summon the energy to glance up. He too was infected with the land's fatigue. He was not alone, moreover. The entire local population moved slowly, bruised easily and often, found customary weights like a pailful of water more tiring than formerly, requiring to be set down at ever shorter intervals between the river and the village.

He was thirty years old, sallow-skinned, black-haired, and thin to the point of being scrawny. He wore a loose off-white shirt and breeches belted with a bit of rope. That was twice as much as his son, who had only breeches. Cloth was expensive.

The upward trudge eventually over, he reached his house. It was, or had been, a very good, very large one, inside which a man could take seven long steps each way, built of poles lashed together and walled and thatched with many layers of braided leaves. As great an area again was sheltered by an extension of the roof to make a sort of veranda at the front. But the last rains had washed away much earth, and the poles were tilted now and there was a hole in the thatch. He kept meaning to fix it, only somehow . . .

His wife was boiling the evening rice. They had a fine big pot, as wide as his forearm was long. But today there were only about three handfuls of rice in it. A year ago they had been able to spare as much as five. Moreover, there would have been chicken or fish to garnish it. Stale vegetables were their diet now.

With barely a word, because he was so exhausted, he propped his hoe against the nearest roof-pole and sat down and closed his eyes, ignoring even the greeting his daughter gave him when she came outside. She was seven. She had been one of twins, but her sister had died.

After Cham Loc received the gift of his one luxury, the transistor ra-

dio she was carrying. It was not a satisfactory trade he had made, he'd now decided. The radio did talk a great deal, and brought them news and music, but another son would have helped him in the fields.

Too late, though, to change his mind.

As usual when he returned from work, the little girl proudly switched on, and caught in mid-sentence an address by a man with a familiar voice, the premier who lived in the distant capital city and always spoke about the greater world Cham Loc had never seen.

"—typical of their arrogant, insensitive behavior. After all, who pays for the affluence they wallow in? Why, we do, and poor people like us! What they regard as problems, we can scarcely imagine. What color should they choose for the second car? Which out of twenty or thirty television programs should they watch tonight? Which shirt goes best with the new suit—the red, the green, the blue, the yellow, the brown, the white, the striped, the spotted? While we have sickness to worry about, hunger, crop-blight, a buffalo with a broken leg! When they come to our country, they boast about how easily they've bought the honor of a girl from a good family, seducing her with a cheap watch or a pretty dress. Then back they go to their life of endless extravagance, while she—*she* has to sleep in any bed she can find, or lie out in the street, and when her child is born it must face the miserable existence of an outcast."

The words blurred into a drone, not unlike the noise of the aircraft which had lately passed by, and Cham Loc dozed. He had heard such statements over and over, particularly from the man the government had sent to Siao Kat as resident political educator. But he himself had no special desire to watch twenty TV shows a night, or even to own a car. Everybody he knew lived within walking distance, and if you wasted your time watching television, when would you have the chance to take your proper part in village affairs? You'd be failing in your clear public duty!

On the other hand, it would be nice to possess a hammer . . . maybe an ax . . . a whole bolt of cloth twenty paces long . . .

Dreaming of such unreachable goals, he missed the final rousing peroration.

"This inequality, this injustice, must cease! That is why I have given them seven days to quit our country. We are sick and tired of their greed, their disrespect for our traditions, their lack of morals! We too have our pride, and no matter how rich and powerful they may be, we must stand up to them and take the consequences. Long live our nation and its noble heritage!"

By the time his wife shook him

awake and invited him to dip in the rice-pot, there was music instead, which was far more pleasant. Cham Loc knew little of affairs of state, but he was aware that whenever politicians talked about matters of inflexible principle, life was scheduled to become even more difficult than usual.

Waiting until he finished eating, as was the custom, his wife anxiously inquired whether he thought the premier's decision was wise. He could only answer that the people must put their trust in their leaders, and all would come out for the best in the end.

In his heart of hearts he was less confident than he sounded. To say anything else with the children listening, though, would have been most unfair to them. They had a hard enough time anyway: short of food, short of clothes, forever exposed to their parents' quarreling . . . Cham Loc hated rows, but the future was so dreadfully uncertain.

Could the premier—could anybody—free the people from famine, epidemics, crop-failure, the most ancient and deadly enemies of all?

The problem was too deep for him. He dozed again.

MINUS SEVEN AND COUNTING

2131 West Poplar Avenue

The President's face was calm in the window of the TV set. He wore the expression of a man who had had a rough passage across a sea of personal uncertainty and was now committed, for better or worse, to a haven of decision around which the storm of controversy would continue to rage for a very long time.

Barney Ratchett hung on his every word. Not only was this crisis the first world-scale problem the new Chief Executive had had to deal with since his election—which implied that it was a test of his declared policies, and the rest of his four-year term would depend on his judgment—but it was also the first in the nation's third century of existence, and hence it had far greater symbolic significance than its actual content might suggest. The setbacks, great and small, of the past decade had made people hungry for the taste of achievement. This was the man who had promised it to them, and they were ready to sit in judgment on him.

Reportedly, he wrote his own speeches, or at any rate rewrote them. If that was true—and having covered the last election campaign Barney was inclined to believe it might be—then at the very least he must accord the President the respect due to a fellow craftsman in communications. His style was plain and direct, and his whole address lasted no more than eight minutes, marshaling the arguments *pro* and *con* with admirable detachment. Now at the end he was summing up the reason for his choice of action into an elegant, pithy climax.

"What it comes down to is this," he said, blinking a little too often as Barney had seen him blink when confronting a hostile election meeting. "We cannot allow accusations of this kind against our nation to go unanswered. To say what has been said is insulting, not simply to the government—your government—but to you. Words are not enough. There must be deeds."

"Hypocrite!" Barney's wife Donna muttered, shaking back her dark hair and taking another sip of hot buttered rum. It was a cold day with snow thick on the ground and the sky masked by dense cloud, a somber day when the mind was more inclined to visions of disaster than of hope.

"Damn right," said their son Hal, who was seventeen and lay sprawled on the rug turning the pages of a paperback thriller as though what it said were more important than anything the President could talk about. "I bet Dad would sing a different tune if he were my age, what's more!"

Barney's heart sank. How to avoid another shouting match? It was inevitable that in the home of a political reporter there would be rows about politics. But the split here in the family seemed to be as deep as the split in the nation.

"For immediate reactions to the President's announcement," the TV said, "we're going over to our on-the-spot reporters in Washington. First of all . . ."

"Look," Barney said in what he intended to be a placatory tone, "even if you don't feel happy about the guy being elected, now he's up there we ought to give him a fair chance to show that his policies—"

Donna interrupted. "You know as well as I do how he got to the White House. He was sold to the public by a clever PR team, playing on the bicentenary mood. Back in '72 he wouldn't have stood a prayer. No more will he in 1980. That's assuming the country is still in one piece."

"If it hadn't been for our sense of desperation all the PR work in the world couldn't have won him the votes," Barney snapped. "He wasn't elected on his record so much as on his predecessors' records. What they did landed us in one mess after another. It was time somebody made a fresh start, so—"

"Oh, save the lecture!" Hal said, slapping his book shut and eeling around to face his father. "What we're talking about is something that could destroy the whole way of life of those poor peasants over there. What right do we have to do that? Quite apart from the consequences to ourselves!" And he added, pointing to the TV: "Now there's a man who does know what he's talking about. Think we could hear him instead of you?"

The screen showed the familiar features of the defeated candidate

. . . defeated to everybody's surprise including Barney's. One would have thought the country was ripe for a President of this stamp: forthright, downright and *right*, as his campaign slogan had expressed it.

He was saying to a crowd of eager reporters, among whom Barney recognized several of his colleagues: "Not only is it highly questionable whether he possesses the authority to commit our forces to this irresponsible undertaking—a matter which no doubt Congress will decide—but there is also the question of the cost, which will be incalculable. Taking the most charitable view, one can only assume that we the people suffered a momentary, and hopefully a brief, lapse of good sense when we gave this man a majority of our votes. Here now he plans to squander our precious national resources on a pointless and ill-conceived adventure. And for what good reason? None! Even he himself offers no better justification than the claim that we've been insulted. Insulted!" Throwing up his hands in disbelief. "Are we being attacked? Is our territorial integrity at stake? Are we being menaced by a nuclear power that could lay our cities waste and murder our people by the millions? On the contrary! This ridiculous, this incredible response has been provoked by a handful of dissidents armed with rocks and bottles in a run-down, backwater country an ocean's breadth away from us, of no importance to our security and virtually no commercial interest. We shall live to regret this foolishness, you mark my words."

Barney's canny professional judgment informed him that the senator must have had advance news on the grapevine. This was not so much an impromptu comeback as a polished speech which heaven had sent him the opportunity to deliver to the TV audience instead of at a private meeting.

"Talking of PR jobs," he murmured, "you do know this guy had special training from a top Hollywood drama coach—and doesn't it show?"

"It's not the same thing," Donna said obstinately.

Barney rounded on her. "I see! It's a case of 'O.K. when I do it but not when you do it'!"

The phone rang in the adjacent room. After the second ring it was answered by their daughter Lissa. It was probably for her anyway.

"Garbage!" Hal said. "What counts is not what you do but why you do it. Someone who kills a thousand people is a great guy provided he's fighting on your side, right? But if he did it because he was ordered to by someone like—well, like Hitler, say—that makes him a criminal! Ah, the whole scene makes me want to puke!"

"Dad!" Lissa put her pretty head around the door. "The boss for you

. . . oh, no!" She set one hand on her hip and glowered at them, giving a very fair imitation of her grandmother in a bad temper, considering she was only fourteen. "You're having another row about politics, aren't you? I can smell it in the air!"

"One of these days," Barney said, rising with a sigh, "you'll realize that everything is politics down to the food you eat and the air you breathe. Sometimes I wish I'd decided to be a sports reporter, though. All this is playing hell with my digestion."

The caller was Andy Scharf, chief news editor of the TV chain he worked for, and his voice was full of excitement Barney could not share.

"Barney, I guess you were watching?" And without waiting for a reply he plunged on: "It's stirred up a hornets' nest, believe me. The phones here are already ringing non-stop—protest groups saying they're going to mobilize the people against the President, veterans saying they're damned if they'll cooperate in this crazy waste of money and manpower, black militants saying it's bound to be the blacks as usual who have to pay in the end . . . it's the biggest, and I mean the *biggest!*"

"May you live in interesting times," Barney muttered.

"What? I didn't catch that."

"Nothing. Just an old Chinese curse." Barney ran his fingers wearily through his crisp brown hair. "Well, I guess you want me at the office, huh?"

"A story like this blows up and you expect to enjoy a quiet weekend? You pack a bag with enough gear to see you through a full week! They've given us this seven-day ultimatum to pull everyone out of the country, so I've had a terrific idea. I'm creating a slot called 'Counting Down', numbering the days to the deadline, and I'm relying on you to supply hard-hitting interviews of the kind you're so good at, one or two per day until the crunch comes."

"Thanks for the few kind words," Barney grunted. "Much good may they do me in the long run."

"Don't pretend to be bitter. It doesn't suit you. Just grab a pen and note down your first date. Ginger and Lucy are on the way and they'll meet you in an hour."

MINUS SIX AND COUNTING

Fielding Electronics Inc.

"All set, Barney," said Ginger Hummel, the cameraman, who was called Ginger because he was a bricktop black, one of those rare people whose heredity produces dull red hair and a skin splotched with tawny patches on a tan ground. On the way here he and Barney had been snapping at each other because of the tension in the

air, and taking opposite sides. That had come as something of a surprise to Barney.

"Fine here too," Lucy Cash the sound-girl said, tucking a stray wisp of her fair hair behind the side-piece of her glasses and poising her hand over the switch on her recorder.

Barney gave them the go signal and addressed Jason Fielding, the good-looking, well-dressed man in his late forties who sat with elbows aggressively planted on the big desk between them. This smart modern office was excellent for recording in; first-class soundproofing shut away the noise of the trucks that were coming and going literally the other side of the wall.

"Mr. Fielding," Barney said, "your company may not exactly be a household name, but I'm sure a lot of our audience would be as impressed as I was to learn just how many patents you control which are licensed to nationally-advertised manufacturers of TV sets and radios and other electronic equipment. What impact is the President's decision going to have, from your standpoint as an independent industrialist?"

"Immense. No doubt about it. And I welcome that. I myself voted for the President—don't make any secret of it—precisely because I hoped this kind of thing was likely to happen. You know we've done a great deal of work in the past for the Department of Defense. Well, now we hope to do a lot more."

"Are there new contracts for your company in the pipeline?"

"I sincerely hope so. We've been carrying on research for years in areas which are precisely what the present situation calls for. And I want to say this to the people who are objecting to the President's plan." Jutting his jaw bulldog-fashion. "I've been running my own firm since I was thirty. I'm a self-made man. I got my chance to accomplish what I've done because of what this country is and what it stands for. After two hundred years it seems the rest of the world has started to think we're in danger of forgetting the ideals we began with. It isn't true, of course. I hope to do much more than simply make my personal contribution to proving that it isn't true. I hope I'm going to create jobs and the chance to earn a decent living for a lot of people who have been less fortunate than I have. What's more, in the process I can help to restore our country's image overseas. This time the world is going to see that we mean what we say. I don't have the slightest doubt or reservation about the course we're committed to."

Half relaxed because Fielding was such a fluent talker, half tense because he didn't want his own total agreement to color what was supposed to be an objective interview, Barney countered, "Some people claim not only that the

President is not entitled to exert his authority in this manner, but also that the cost will be excessive—that we're going to squander money and manpower just to prove a trivial point."

"It's not in the least trivial! What better use is there for our tax-money than to help safeguard the trust we invite our allies to repose in us? I could go further and ask what nobler cause a man could choose than preserving the good name of his native land. Sure, some people do think insults are negligible. I don't. Our honor and goodwill have been called in question. The President would be failing in his duty if he'd acted otherwise than as he's doing."

"Thank you, Mr. Fielding," Barney said and nodded to Ginger and Lucy to switch off.

"Oh, it's a pleasure," Fielding said, rising. "I only wish I could invite you to shoot some film around the plant—sorry, I mean tape. But of course we are working at high pressure right now, and quite apart from the fact that we have some tricks up our sleeves we'd prefer not to put on TV yet, my staff might resent having to take time out to pose for you. I always walk around the factory at least once a day though, and if you'd care to join me on my morning tour you'd be welcome."

"I'd enjoy that," Barney said with a nod.

"So would I," agreed Ginger. "I use a lot of your gear, you know, and so does Lucy. But the chief wants this tape as soon as possible. Some other time, maybe."

"See you back at base, then," Barney said, and they went out.

"We'll have to dress up, I'm afraid," Fielding said as he led Barney in their wake. "We work dust-free, and that means gowns, masks and boots."

Garbed like surgeons in an operating theater, they explored the plant. To Barney it was a strange place: stark, chill, yet somehow not forbidding, because the workers were as sober as priests dedicated to the service of their machines. Keeping up a running commentary, Fielding quietly explained the purpose behind what they were seeing.

"We have three really basic problems," he expounded. "There's lightness above all, of course. The lighter and smaller you can make equipment like this, the more you can pack into a plane. What you or I would normally think of as small—pocket-sized, for instance—just is not good enough to meet our standards. When someone brings me the breadboard mockup of a promising new gadget, my first reaction is automatic. I say go back and shrink it. If it still works when you've halved the weight, I'll take a closer look."

"And the second problem?" Barney said.

"Oh, robustness. If you drop

your personal radio on the sidewalk, you don't complain if you have to take it in for repair before it works again. But this stuff we're building may have to be parachuted from fifty thousand feet. Even with a 'chute the impact is about equivalent to hitting the ground from—oh—twenty-five or thirty feet up. And it has to start working right away, no faults, no circuit-breaks, nothing. Matter of fact, we have an ex-Cardinals pitcher who spends his time literally throwing random samples at various targets: a brick wall, a haybale, a puddle of water . . . It's a publicity gimmick one of my people dreamed up, but there's a solid purpose behind it."

Long ago Barney Ratchett had decided he was a cynic. It was a novel and in some ways a reassuring experience to discover that the description of such technical expertise could make a shiver run down his spine.

In the most literal sense, it was awe-inspiring.

"And the third problem," Fielding pursued, "concerns idiot-proofing. Ever see this cartoon where there's this woman hung around with kids at a domestic-appliance exhibition? She's saying to this slick salesman type on the washing-machine stand, 'But what I want is a washing machine a child *can't* work!' "

"And there are more idiots than suckers in the world," Barney said with a rueful chuckle. "One every second, not one a minute, right?"

"Right. When you consider that the stuff we're building has to be handled by people who probably know no more about electronics than . . . well, I was going to say savages out of the jungle, but don't let me exaggerate. The fact stands, though. Our gear doesn't only have to work every time from the moment it's first switched on, but it has to be proof against ignorance, meddling, childish curiosity . . ."

"Makes me think of the Little Jiffy Fuseblower," Barney said.

"What? Oh, I know what you mean. A box with a button on top, and a pilot light, and a label that says what it does?"

"That's the one."

"Yes, we had a guy here who tried one out on my staff. It worked O.K., have to admit that. Leave it on someone's desk in the morning, next thing you knew, *pow,* all the lights out! I had to put my foot down, hard! But you're quite right. If a trained engineer can't resist doing exactly what he knows he shouldn't, how can you expect an untrained person to behave any better?"

By now they had almost completed their circuit of the plant. Ahead lay one more door which they had not yet been through. Barney was heading toward it automatically when Fielding checked him with a touch on his arm.

"Not that way," he murmured.

Barney glanced at him. At the very edge of hearing he could discern a series of regular thuds, as though something heavy and solid were being thrown and picked up and thrown again.

"Is that where you keep your tame pitcher?"

"Nope." Fielding urged him toward an exit, and as he swung it open peeled off his mask. "We're out of the dust-free zone here, by the way. No, I'm afraid you have to skip that department. As a matter of fact, so do I."

Barney stared at him.

"Don't worry," Fielding said. "If the crunch comes, you and everybody else will find out what's being hatched in there. Like I said on camera, we've been working on various items against just such a crisis as the present one."

"I see," Barney said slowly.

"Do you? I wonder!" Fielding was undoing his gown and boots; a hopper stood ready to accept them for ultrasonic cleansing. "Tell me something, Mr. Ratchett. What do you think about the President's decision? Or are you not allowed to have opinions?"

Barney hesitated. He said at length, "It's obviously a hell of a gamble. But I hope very much it will pay off."

"So do I. Which is why I'm involved. We're doing our damnedest here to make sure that this time we don't screw everything up."

Box Eastern Reserve University

The obvious background against which to pose an academic who was also held in some regard as a poet and novelist would be a book-lined wall. It took Barney approximately three minutes, from the time of their first introduction, to realize that would be entirely wrong for Melvin X. Child.

The guy simply was not what he—or anybody else not personally acquainted with him—would have predicted.

To start with, he was half-cut, and his hair was all over the place, like his beard, and in the middle of winter his shirt was open to display a vast wedge of his massive paunch, while he salted his speech with elaborately contrived objurgations. It wasn't often that an interview subject made Barney feel ill at ease. Melvin Child managed it in next to no time.

When it was suggested to him that in view of the circumstances he might doctor the image a bit (visions of maiden ladies, if any were left nowadays, fainting before the TV screen), he snapped back, "Just what you'd expect from someone feeding predigested pabulum to the puling public! You're here because when you asked if you could come I said yes, like an idiot. The minute I put the phone down I realized I must have been out of my skull. Still, I don't mind

making a few compromises where something this important is concerned. I'll go through with it, provided you don't rile me too much."

Defiant, he threw another handful of ice-cubes into the tall glass he clung to as though to a security blanket, and covered the three-inch pile of them with straight whiskey.

Barney sighed. Well, he had to put up with it. During what Andy had succeeded in having termed "Countdown Week" his assignment was to interview people who were making news in the crisis context, and this ill-mannered foul-mouthed man had done just that when he announced yesterday that he was quitting the university and putting himself at the disposal of the government "for the duration."

He glanced around the room, reviewing the décor. What would make a suitable backdrop? Those Mexican bullfight posters were very striking, but that hideous glaring Japanese mask holding a foot-long knife between its teeth might be more appropriate—

From outside there came a screech of brakes, and someone shouted at the top of his voice, and a hammer-blow on the wall followed, a flung rock that narrowly missed shattering a window. Gasping, Lucy—who was nearest—twisted around to look out at the mall before the building, and her urgent gesture summoned Barney.

A station-wagon full of students had arrived, and they were producing from the back of the vehicle placards and banners denouncing Child. Another bunch joined them on foot, panting. Suddenly an instant demonstration was in progress, complete with leafleters who offered literature to passersby. There were few of those. The weather was dry, but it was terribly cold and the forecast said there would be more snow before nightfall.

Regardless of the icy wind, the students chanted and clapped and stamped and sounded the horn of the station-wagon and one way and another contrived to create a considerable disturbance.

"Hey, Lucy," Ginger said doubtfully. "Think you can shoot tape against that racket?"

Before she could reply, Child snapped, "Racket? What racket? You mean those wet-behind-the-ears kids? Forget 'em—like I've done. They've been turning up every hour on the hour since yesterday breakfast-time, but I swear I didn't lose any sleep over them last night! Besides, I can shout into the mike loud enough to drown them out."

"O.K.," Barney said in a tone of resignation, and kicked a chair into position to start the interview.

"Professor, your interest in Asiatic art, language and literature dates back, I understand, to the time the Army first sent you to Saigon."

"That's right," Child replied.

"And you voluntarily undertook a second tour there as a result of your response to the richness of the area's culture?"

Mockingly: "If you mean I didn't *have* to go back the second time, yup!" With a slurping gulp at his drink.

"Since then you've become recognized as one of our most outstanding authorities on the languages of Southeast Asia. You've published translations of plays, poetry and novels, and you've written a highly-esteemed novel of your own set in that part of the world."

"Sure. My publishers are proud of me. Cavour and Pilley, by the way. Never miss the chance to slip in a plug! And don't forget that cock-fighting manual with all the traditional ritual in it, because it outsold all the others put together."

"Ah . . . yes!" Barney blinked several times in quick succession. It crossed his mind, though he did not have the chance right now to reflect on the point, that he had seen someone else do that recently. "But your chief fame has been confined to the academic world, where your linguistic studies are extremely highly thought of, so it came as a surprise to many people when you announced—"

"That I think I can do a better job by working for the Army again than sitting in my ivory tower," Child cut in, and sauced the words with the rest of his whiskey. "Of course! Just because I'm a poet, among other things, doesn't mean I'm a guy who skulks in corners and watches the world go by hoping *he* won't get singed in the next conflagration! Me, I believe in involvement. When a cause appears that's worth committing yourself to, you have to stand up and be counted. That's the long and short of it, and the middle-sized as well. If you've finished I want another drink."

"Flag that for deletion," Barney snapped at Lucy. "In fact, professor, I *haven't* finished." He waited a beat to allow editing-space on the tape. "Professor, one gets the impression that the stand you've taken is none too popular. Right now a bunch of students outside can be heard chanting slogans against you—"

"Think I'm worried? 'Sticks and stones', damn it!"

"Well, it's no secret that some of your colleagues on the faculty—"

"It's no secret that some of my colleagues are bloodless time-servers with hardly enough red corpuscles between them to satisfy a crab-louse!"

Another rock, and this time a pane of glass shattered, letting a wave of freezing air into the room. But Child's only reaction was to thumb his nose and stick out his tongue.

"More they do of that, more it makes me want to go on saying what I think," he grunted. "Don't

let 'em interrupt. They'd call it a great victory if you did!"

What was this supposed to be—bravado on the firing line? But he had a point, Barney privately conceded. Ginger and Lucy both looked as though they wished today's stint could end right here; he himself, though, had a point in mind which Hal had raised, and he was determined to get it on tape because, like so many kids of his generation, Hal was only impressed by what he saw and heard on TV . . . if at all. In this case he ought to be; he was a sort of sub-fan of Melvin Child and owned three or four of his books.

"Some people have pointed out that if we follow the course the President has committed us to we risk destroying a whole precious traditional culture, indeed a way of life. It's been said that we have no right to—"

"Destruction be damned," Child broke in. "Culture has to evolve under pressure, same as everything else. What's good lasts; what isn't goes under. Do we feel any the less able to appreciate Shakespeare because we go to see his plays in an air-conditioned theater instead of a modified bear-baiting pit? As a matter of fact it's smart of you to remind me of Shakespeare, because he said everything that needs to be said about this situation in *Othello*."

An almost magical change overcame him. Setting aside his glass, he leaned back in his chair and declaimed with such relish one would have said he could taste the words as he uttered them.

"Good name in man and woman, dear my lord, is the immediate jewel of their souls! Who steals my purse, steals trash. 'Tis something, nothing! 'Twas mine, 'tis his, and has been slave to thousands. But he that filches from me my good name robs me of that which not enriches him, and makes me poor indeed!"

Equally swiftly he reverted to his normal manner, and jabbed a finger through the air toward Barney.

"These cost-efficiency creeps drive me out of my skull! 'Is it worth it, is it going to pay a dividend?' " He hoisted his voice toward a febrile falsetto to provide the quotation marks, then let it drop back to its regular booming baritone. "What's at stake is our country's reputation—our honor, to use a word those castrated wonders wouldn't know the meaning of without a dictionary! If we're ever going to stand up like men again, we have to do this. And the hell with what it costs. If it pans out the way we hope, it'll be cheap at any price."

"Which is why you—"

"Which is why I, tomorrow morning, propose to bid farewell to the groves of Academe and put my uniform back on, of my own free will, and sit in a horrible little government office doing elementary

translations when I would far rather be working on my new novel. I have half of it written, by the way, and I wish I could advertise the title, but so far I haven't made up my mind!"

MINUS FOUR AND COUNTING

Perdido Petrochemicals

The sidewalks were lined with protesting demonstrators, despite the continuing bitter weather. Like oversize flowerbeds they bloomed with colorful placards, banners and flags, and every fifty yards another speaker with a bullhorn was addressing the crowd: here a young black, there a shrill-voiced girl, yonder a middle-aged factory worker in a tartan mackinaw. Barney caught snatches of what was being said as their car, an obvious target with the TV chain's company insignia on its doors, crept the final mile toward their destination. Luckily no worse weapons than words had been aimed at them as yet. Elsewhere in the country, though, there had been shooting and bombing . . .

"—doesn't matter to them how much it costs, oh no! It's underwritten by your tax-dollar and mine! Aren't there better ways to spend the money? You might as well pile it on a bonfire!"

"I hope we make it," Lucy said with forced cheerfulness from her seat beside Barney. Up front next to the driver, Ginger scowled.

"Me, I wish it was worth going through with!"

"It is!" Barney snapped.

Something clanged on the car's roof: a rock, an empty bottle . . . something loud, anyway. Ginger ducked and grimaced.

"Ginger, what's eating on you?" Lucy demanded. "Would you rather be out there with the demonstrators?" She attempted a chuckle. It was unconvincing. And Ginger took her seriously regardless.

"In some ways I would. I think we're all set to make fools of ourselves on the grand scale. I think we're going to be laughed at for suckers."

"For rising to the bait?"

"Sure, for rising to the bait and getting well and truly hooked. They breed a keen style of hooker over there. You never met them. I did." Ginger rubbed his chin, brooding morosely. "Honor! Good name! The hell with *that*!" he added after a pause.

Another speaker by the roadside raised another bullhorn and bellowed, "Look, look! They're from TV news! Show 'em what we think of the lies they're spewing out, the bill of goods they're trying to sell the people!"

A cry of execration followed, and a shower of dirt, garbage and snowballs with rocks inside that almost made their driver swerve into oncoming traffic. But they were close to the factory entrance now

and eager company guards were rushing to admit them.

"All the time and everywhere, these demonstrations against the President," Ginger said with gloomy relish. "What about the demonstrations in favor, hm-m-m? What happened to all the people who voted for him? I don't see them out here freezing their asses off!"

Which gave Barney his lead when he sat facing Peter Perdido, chairman of this nationally-famous corporation: almost a caricature of a tycoon with his huge cigar and his ultrastylish suit and his incredibly lavish office. In addition he was very fat.

Making his voice harsh by pure reflex—the mood of the country was such that he knew the viewers would expect a hostile tone whether or not he personally had contrary opinions—Barney said, "Mr. Perdido, seldom in the history of our nation, certainly not in our own time since the so-called Tonkin Gulf episode, has a President taken a foreign-policy decision which has created such a deep division in the mind of the public. Your company has just secured a contract to supply vast quantities of chemicals, from gasoline to glycerine as one of your own spokesmen has put it, to the Department of Defense. It's being said loudly and openly that you should have refused to cooperate."

"Who says so?" Perdido snapped. "Them lamebrains out on the street?" Jerking his cigar toward the office window. "They can drop dead for all I care. I'm in business. My company makes chemicals. You name it, we make it: fertilizers, herbicides, pesticides, preservatives, not to mention explosives and rocket-fuel. And gas! Sure we make gas. Been making it since 1917."

"It's been argued," Barney said doggedly, "that you'd be performing a greater service for the nation by refusing this contract. A number of your competitors have publicized the fact that they declined to tender—"

"That's their privilege." Perdido folded his arms on his chest. "Equally, it's my privilege to say they're being holier-than-thou! I could name a good few corporations that . . . but I won't. I'll just remind you that they're around. Dig into the records, you'll find some of the firms concerned made fortunes out of Vietnam, Korea, even World War II. So they don't have any right to tell me what I can and can't do. It's a question of the national interest, and looking back at what they did I feel I'm better justified."

He was breathing heavily, almost snorting.

"If I didn't believe that, I wouldn't be doing what I've agreed to do. If my competitors don't like it—well, this is a democracy, and

they could make a better impression by bowing to the will of the majority, the majority that elected the President, than by hiring gangs of loudmouths to picket our plant!"

"It's been rumored," Barney said delicately, "that you'll be facing trouble with the unions, too. There's been wild talk not simply of strike action but even of sabotage."

"Let someone try it—let just one guy try it—and he'll be out on his ear and very probably in jail." Perdido leaned back, firming his lips into a thin line, and Barney took his cue to wind up.

MINUS THREE AND COUNTING

Route 5, Pegasus, Wisconsin

One could sense the sinews of the nation growing taut as the seven-day deadline drew to its close and the moment of inevitable action neared. Fierce argument had swept around the world like a tsunami. The rights and wrongs of the course the President had committed them to were the sole topic of conversation from Hawaii to New England, from Alaska to Puerto Rico. Keen eyes belonging to calculating statesmen watched from Moscow, Paris, Peking, Canberra . . .

It was known that behind the scenes there was frantic diplomatic activity. Even someone in Barney's position, though, could learn little of what was actually being said and done at the "quasi-official" level, that strange half-world where the most alarming threats and lunatic promises were tossed around like images in a dream, not meant to be taken literally.

The ordinary public had to be content with what actually appeared in the daily news, and that amounted to a fuzz of predictable generalities. From the President's supporters, defiant and perhaps not altogether convincing patriotic assertions that this was the only recourse the country could adopt and preserve its self-respect. From his opponents, shouts of "Blackmail!" and "Crazy waste!" and "Unconstitutional!"

Overseas comment was more restrained. The major European powers had decided to maintain their detachment for the time being, this not involving the various alliances, so their spokesmen confined themselves to expressions of keen interest, sympathy and good will, tinged with cynical doubt. The further eastward one looked around the globe, the more that doubt grew dominant. In the Socialist countries, climaxing with Russia, the uniform standard comment was, "Hah! What a lot of hot air! We'll believe it when we see it!"

As for the Chinese, they had temporarily reverted to their traditional inscrutability. But it was known that they regarded the whole of Southeast Asia as lying within their sphere of influence, so

doubtless they would speak up in opposition out of sheer principle, even if they did not directly intervene. It was authoritatively asserted that they would not; however, one could never be certain where the Chinese were concerned.

Barney, who had mirrored so much small detail of the frenzied debate for the enlightenment of the TV audience, was glad he did not have to endure the load the President now bore, the knowledge that he had embarked the world's richest nation on a venture which had alienated at least half its population from him and which even his own supporters were half-inclined to regard as an idiotic gamble.

Here in Wisconsin, though, all that seemed to be a long way off, not just in space but in time too. In winter one could never have guessed that under the blanket of snow lay some of the most fertile land on the continent. Apart from a few modern structures—tall silos, a globular water-tank on a high pylon—the landscape looked much as it must have done before the advent of cars and electricity. The farmhouse where the Swen family lived was timber-built, and its interior, though disorderly, was snug and breathed a feeling of welcome. There was a huge warm stove. There was a piano draped with a lace-trimmed cloth. The walls bore a display of family portraits. Immediately on their arrival their hostess had insisted on serving the visitors hot soup and home-baked rolls. Waiting for Ginger and Lucy to set up their equipment, Barney found himself overcome by a powerful nostalgia. The surroundings belonged to an age when life was simpler, whem morality could safely be discussed in terms of sharp blacks and whites. Now the world seemed to have shaded into a depressing series of lighter and darker grays.

Mr. Swen, whom he had come here to talk to, was elderly, slow-moving and slow-spoken. In youth he must have been tremendously muscular, and despite an increasing tendency to stoop he still overtopped Barney by a head and a half. But the years had wasted him. His work-clothes of drab dark blue, doubtless identical to what he had worn all his life, hung loose around his gaunt frame, and the huge boots whose thick soles clumped as he crossed the wooden floor seemed an over-heavy burden for his legs.

It would be great, Barney thought, to catch some of the atmosphere of this house on their tapes. But over the past few days Ginger had been growing more and more hostile, and had declared his disapproval of the way these interviews were being handled, so Barney dared not put a straight request to him. He would just have to rely on the man's sense of crafts-

manship to make the most of the material offered to them.

Eventually everything was ready, and—talking from a rocking-chair which Mrs. Swen normally used, twin to the one in which the old farmer sat—he cleared his throat and began.

"Mr. Swen, the whole country has heard by now of your magnificent gesture in donating your farm to the national effort: everything from corn to cattle and from beets to barley. What decided you to do this?"

Mr. Swen shrugged his thin shoulders. "We-ell . . . well, it's this way, y'see. Me and m'wife, we don't have any kinfolk to leave it all to, and we're gettin' on, so the work here is more'n we can handle now. So we talked it over and made up our minds."

"You"—this had to be handled very tactfully—"you say you have nobody to leave it to."

"We did have two sons. One got killed in Korea." He said "keeled," more or less. "Then the other got killed in Vietnam. Got pictures of 'em both on the wall yonder." He jerked a calloused and bony thumb. Prompt, Ginger swung his camera. He was adept at that; he could stop the tape, zoom in, restart a heartbeat later so that one barely needed to edit. It was a minor relief to Barney to see his professional reflexes overcoming his personal opinions.

"Me, I came here when I was a kid," Mr. Swen said. "Along with my folks. I was born in Dalarna, Sweden. Right here is where I met my wife, and we've been together more'n forty years. All I got, I owe to this here country where I've spent my life. I guess the way I feel is this. If a country gives you as much as I been given, you don't stop giving back what you can to it just 'cause some things didn't work out like you hoped."

He spread his hands, and just in time Ginger focused on him again.

Barney hesitated. He had come here expecting to collect no more than a curio, maybe even the senile ramblings of a complete crank. He'd been pleasantly surprised. It seemed like a shame to spoil such a perfect capsule declaration of faith, but . . . well, the tape could always be edited if he did overdo it. He said, "And how do your neighbors feel about what you've done, Mr. Swen? I mean the other farmers in this area."

The lined old face turned sour, mouth twisting down at corners.

"They been calling up on the phone, sayin' all kinds of things I guess I better didn't repeat. But the hell with 'em. I stand by what I've done, and so does m'wife."

"Thank you, Mr. Swen. On behalf of us all."

MINUS TWO AND COUNTING

Rosebush Air Force Base

The wind blew from the direc-

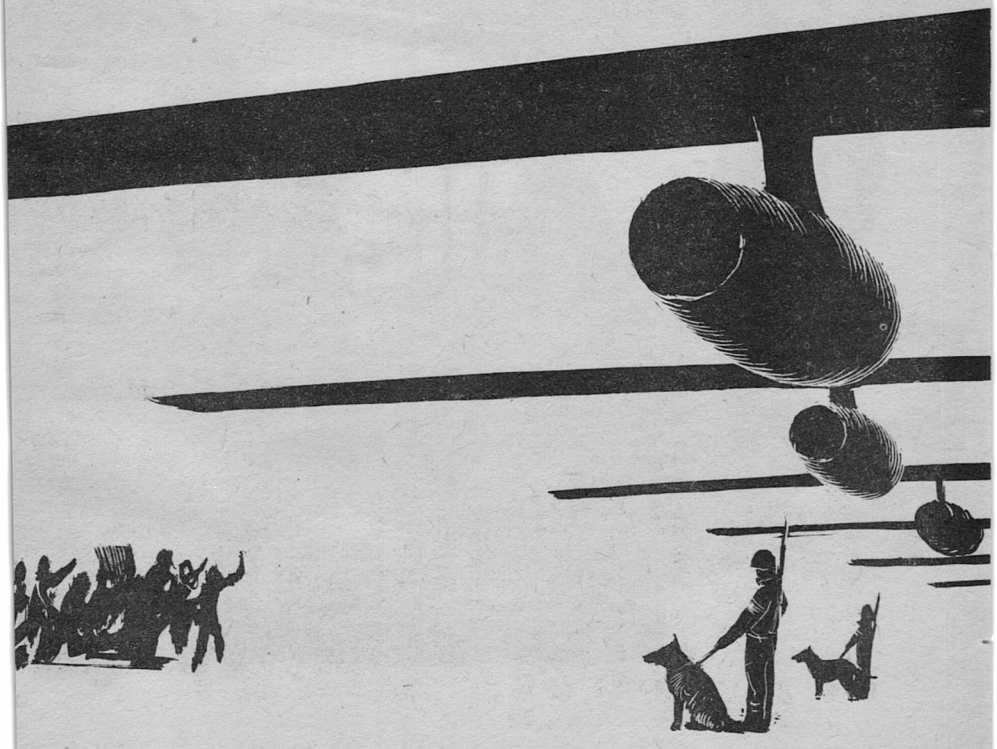
tion of the Pacific, but it brought no scent of the sea. Instead, it carried the stink of jet-exhausts, the sound of engines, voices raised to make orders heard above the continuous roar of trucks, cranes, now and then aircraft taking off at the further end of the long spiral runway traversing the field.

Barney's guide here was an affable young black officer, Captain Monk according to the name-badge pinned to his overalls. He himself, Lucy and Ginger had also been issued with protective garb; owing to the haste with which the operation had to proceed, there was a risk that drums of chemicals might be dropped and burst open, or a crate of powder dangerous if inhaled.

"But there hasn't been an accident so far this week," Captain Monk was at pains to emphasize.

His explanations of what was going on were clear and simple, and Lucy recorded them and Ginger taped pictures to correspond, and one way and another today's stint was going very smoothly indeed.

"As you know we don't have any land facilities to speak of in the area any more," Monk expounded. "So this is going to have to be almost exclusively a carrier-borne operation. This field is essentially a staging-post right now. Over there"—pointing at the full stretch of his arm—"we're bringing in bulk cargo. You can see one of our transports lining up for its



approach at this very minute."

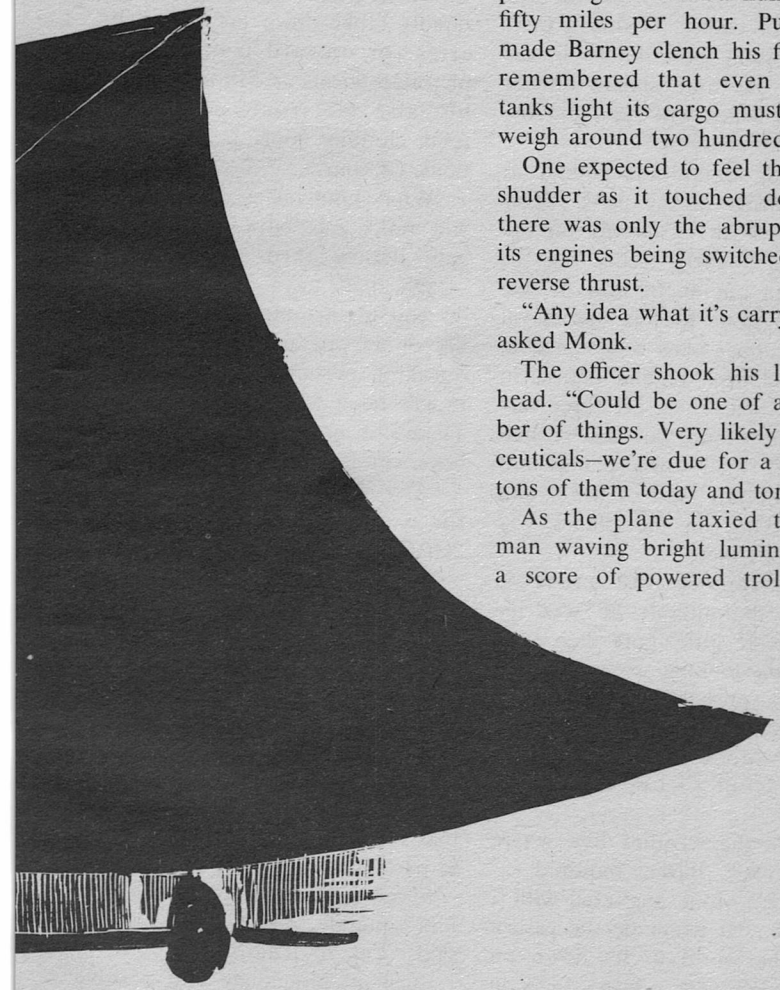
Shrunken by the effect of distance, a dot appeared on the skyline. It grew—and grew—and grew, a vast four-engined freighter approaching at about a hundred and fifty miles per hour. Pure reflex made Barney clench his fists as he remembered that even with its tanks light its cargo must make it weigh around two hundred tons.

One expected to feel the ground shudder as it touched down. But there was only the abrupt roar of its engines being switched to full reverse thrust.

"Any idea what it's carrying?" he asked Monk.

The officer shook his lean dark head. "Could be one of any number of things. Very likely pharmaceuticals—we're due for a thousand tons of them today and tomorrow."

As the plane taxied toward a man waving bright luminous bats, a score of powered trolleys and



fork-lift trucks converged on it. Monk continued his explanation.

"What they'll do now is break down the consignment into smaller units and repack it. Most of it will have to be air-dropped into the target zone, of course. Within a matter of hours at most it'll be in the air again, this time aboard one of the planes which will carry out the actual strike missions."

He swung around and pointed to another corner of the field. "Over there, the 657th is already on the move. Since early today they've been flying out about four or five planes an hour to join the naval task-force that's been re-assigned to this project from regular patrols in the China Sea. There are three carriers in the group, but they've had to fly off their own planes—not suitable for this kind of work—and they're taking on the planes you can see over there."

Compared to the massive freighter, the aircraft he was indicating were little more than toys. But deadly-looking toys, painted matt-black, purposive, efficient.

"Naturally they've retained their 'copters," Monk added. "We'll be flying a hell of a lot of 'copter missions."

"What's the weather like where they're going?" Barney inquired.

"Windy," Monk answered with a thin smile. "It won't be the easiest job in the world to set down on those carriers with a heavy load on board. Matter of fact, it's pretty windy out here, isn't it? Let's go in one of these packing-sheds and see what's being readied for shipment."

For the next half-hour they toured the huge converted hangars where men and women quietly and rapidly broke down the bulk deliveries for onward transmission: pharmaceuticals as Monk had said, but also electronic equipment, food, clothing, tools . . . no munitions. Of course.

"What kind of a reception do you think our boys are likely to get?" Barney asked.

"Oh, that's anybody's guess. How do you predict the success or failure of an operation like this one? Speaking personally, I'm confident it will be a huge success, in fact. There's a great spirit among our boys, you know."

"Any hint of Soviet intervention, for example?" Barney persisted. "Or Chinese?"

"I'm not sure I'm the right guy to ask about that," Monk parried. "Of course it's an open secret that our task force is under constant surveillance, but beyond that . . . Well, to be candid, I don't believe they'd dare to meddle."

Barney hesitated. He said eventually, "Captain, it's been rumored that some of our men are reluctant to participate in this operation."

Monk halted and turned to face him squarely, and the camera. He said, "Yes, sir. That is so."

Such an immediate and positive answer was not what Barney had

been expecting. He was caught momentarily off balance. The best he could come up with was, "And what do you think of their reaction?"

"All I can say is I don't understand it. Of course, it's their right to request alternative duty, and I'm advised that in all such cases so far the request has been granted. It's a matter of policy. To offset that, though, you might take my own case. I did two tours in 'Nam, and my term of service was due to expire at the beginning of this week. In view of the circumstances I requested an indefinite extension of my engagement. I'm very happy to be involved in this operation. If I'm reassigned to active duty I'll accept with enthusiasm."

Before Barney could put another question, the air was battered by the screech of a jet taking off, and then another, and another, *en route* to their rendezvous across the ocean.

MINUS ONE AND COUNTING

Point Benefit Missile Station

Now the tension was so terrific, it was as though one of those ancient siege-engines—a ballista, would it be?—had been wound up to the point where its bunched ropes threatened to snap. The image came readily to mind. They had baptized the payload of the giant rocket that stood on its launch-pad three miles from here, "The Dead Horse," after the kind of impromptu missile such siege-engines had sometimes been called on to deliver. Barney couldn't help shuddering when he imagined a half-rotted horse's corpse splashing after being thrown over a castle wall.

Some very, very high-speed alterations had had to be carried out on that rocket. It had never been intended for such a precise—surgically precise—operation. But the job had been accomplished, and its countdown was proceeding smoothly, and an hour and a half still remained before the midnight expiry of the seven-day ultimatum.

For good and logical reasons maximum publicity had been given to every stage of the preparations. Tonight, as though this were nothing more than a grandiose firework show, people were milling around in hordes, chatting, sometimes uttering loud laughter that betrayed a hint of nervousness . . . and small wonder. Air Force and Army personnel, of course, were everywhere; additionally, though, there were scores of civilians, wearing thick coats and hats with fur-lined earflaps, hands plunged deep in their pockets for protection against the sub-zero wind.

Around and among them Barney led his camera team, Ginger looking more despondent by the minute—as though only tonight had he realized that this scheme he regarded as crazy would actually be carried through—and Lucy looking

by contrast more and more cheerful. Barney himself was poised on a knife-edge between the two moods. While he still supported the idea, now that its execution was upon them he found doubt preying on his mind. Suppose there were an unforeseen snag? Suppose the response were not as had been calculated? After all, nothing like this had been attempted ever before. Nothing *quite* like this, anyhow.

Someone walking past was carrying a transistor radio. The instantly-recognizable voice of the President's defeated rival issued from it, hammering away at his constant theme.

"–apart from the patent idiocy of the idea, what about the *cost?* It's frightening to see money thrown away like this! You might as well take a pile of bills up the Empire State Building and consign them to the mercy of the wind!"

Ginger gave a vigorous nod of agreement, but at the same moment Barney caught sight of one of the people he had been hunting for among the crowd and rushed toward him.

"Mr. Fielding! I've been looking for you all over, ever since they told me you'd arrived. Would I be right in guessing that behind the door you said even you were not allowed through–?"

"Something to do with this?" Fielding cut in with a grin, waving toward the immense silhouette of the flood-lighted rocket. "Oh, sure! We designed and built special electronics for that bird. I'm told there's never before been a rocket or missile, bar the Mars and Venus probes, that called for such needle-point accuracy. So we supplied gear for it that will function under five or six times the maximum expected g-load."

"Hm-m-m. That certainly is impressive!"

"Even more impressive than you probably imagine," Fielding said. "And, by the way! I've been watching out for your interviews since you called on me–not that I've had much time for TV, of course–and I remember you also talked to Peter Perdido, didn't you? He's around somewhere, too. It was his company that supplied fuel for the rocket."

"Mr. Perdido!"

"What? Oh, hello, Mr. Ratchett. Might have expected to find you here, I guess."

"Look, I'm told your firm provided the fuel for this bird. Could you–?"

"No. Definitely no. Not until she's been safely fired. But if you want someone who'll talk to you, there's someone around here who notoriously never stops talking–someone I believe you know, what's more."

"Who?"

"I think you said that the day before you called on me you'd

been to interview Professor Melvin Child–"

Blaring from wall- and pole-mounted PA speakers, a voice cut in. "One hour and counting at the mark . . . Mark! Repeat, one hour and counting. All personnel to sixty-minute stations!"

"Professor! Professor Child!"

"Who the hell . . . ? Oh, it's the master of instant news." Child looked very strange in his Army uniform, with major's rank-badges, particularly since he had retained his beard–though at least it was more neatly brushed than before. Several times while in his company Barney saw other officers catch sight of him and have to do a double-take.

"What in the world brings you here, Professor–or I guess I should say Major?"

"Me? Oh, they sent me an invitation to join the gang. Think I don't deserve it? Hell, I've had almost no sleep since I last saw you. You'd think the Army would keep a full-time staff of competent linguists, wouldn't you? But you should have seen some of the stuff their so-called propaganda experts had in draft. Full of elementary errors of grammar, vocabulary, phrasing–and as for style . . .! I can just picture one of those blockheads in a peasant village over there, trying to make friends with the people. Everybody would be laughing at him, even the kids!"

He bundled his greatcoat closer around himself.

"So since they said I could come along and see the shot . . . crazy, you know. Bad as England, this. They have their firework shows on Guy Fawkes' Day, November Fifth, and of course the weather is filthy nine years out of ten. At least we had the good sense to pick the Fourth of July." He hesitated, then added in a lower tone, "Say, do you know anywhere around here I could get a drink? I'm frozen to the marrow!"

Hiding a smile, Barney said, "We're operating out of that big trailer over there. It's our mobile HQ. And I know my chief Andy Scharf keeps a stock of Jim Beam for–ah–VIP's."

With alacrity Child said, "I'm one!"

"Thirty minutes from the mark . . . Mark!"

Child was a fascinating talker. He held forth with such verve that even those members of the news-team who had privately declared he must have made his recent notorious gesture purely for publicity were won over in a matter of minutes, and more than once Andy Scharf–who himself gave the impression he'd have enjoyed listening–had to recall them sternly to neglected duties.

"Hard to get accustomed to, isn't it?" Child said after that had hap-

pened a couple of times. "I mean the fact that an operation like this is taking place in the full glare of the media. That's a breakthrough, if you like!"

"Operation," Barney echoed thoughtfully.

"A good term. The only possible term. Because of its medical overtones."

"That's the point which had just struck me," Barney agreed.

Child was nodding fervently. "You know the old French proverb, *il faut souffrir pour être belle?* You must suffer to be beautiful! We want this planet of ours to be beautiful for mankind to live on, but there's no doubt that here and there it's riddled with the counterpart of cancer. So now and then it's essential to undertake the equivalent of a surgical operation, because otherwise the disease will spread and the result will be disaster for us all. All this talk about our 'right' to destroy the way of life of those people yonder"—a vague easterly gesture,—"I've been there, and I've seen. For most of them it's not a way of life. It's a way of death—at an early age!"

"Fifteen minutes, counting . . . Fourteen . . . Thirteen . . ."

The talk began to die away until at last there was no sound in the big trailer except Andy Scharf's commentary for the viewers and occasional whispered instructions. Everybody was under cover now; only the remote cameras gave a view of the looming bulk of the rocket, tipped with its ridiculously small payload. The service gantry was withdrawn, the count reached thirty seconds, twenty, ten . . .

"—five, four, three, two, one, fire."

And after that it was impossible to hear anything for a long while except the incredible thunder of the engines, until at last a calm official voice said, "On course, on course. We have a bird."

"The die is cast," said Melvin Child, and somehow, coming from him, the phrase did not ring at all false.

After all, when in history had a nation taken a greater gamble?

ZERO

Hamlet Siao Kat

During the past week they had been warned, over and over, by the premier, by official spokesmen, by generals, by a panicky visitor from the capital, and on the day it happened exactly as they had been told to expect. Very faint, very high, there were aircraft; one caught a glimpse of them now and then between the drifting clouds.

Today Cham Loc had not gone to work in the paddies. Instead he had remained at his house with his wife and children, anxiously scanning the sky. Everyone in the vil-

lage was equally on edge, and the transistor radio—which at the risk of running down its battery he had kept switched on since dawn—mingled its declarations of defiance with still more warnings.

"Stay under cover as much as you can. Beware of anything that falls from the sky. No matter how innocent it looks, treat it as dangerous. Keep a careful eye on your children. It's been known for anti-personnel bombs to be disguised as toys and dolls!"

Cham Loc shuddered. He rarely had the chance to see a newspaper, but recently some had been brought to the village, and he had been appalled by photographs showing scarred and maimed children, many of them no older than his own two. How could anybody be so cruel? Yet there the evidence was, plain in the pictures!

The day wore on. By late afternoon he was half-convinced that nothing was going to happen in this area after all, that the planes were all bound for the capital city, the ports, or the country's few industrial centers, and this poor agricultural region was going to be ignored.

Neither he nor his wife had had much sleep last night. He dozed, and so did she, when the waiting grew unbearable. Both of them were lost in dreams before the white of parachutes bloomed in the rays of the declining sun.

Overhead quiet voices spoke from plane to plane: "Electronics One through Three, commence your delivery run now . . . Chemical One through Chemical Five, stand by to follow them . . ."

It was planned as a saturation mission. From now on it would continue every day from dawn to dusk until the government admitted the people had had enough. Aboard the carriers at sea, men stripped to the waist in subtropical heat sweated and cursed as they struggled to turn the planes around within the permitted half-hour deadline. Refuel, reload, and off again . . .

And down they came like the seeds of some inconceivably huge thistle, sifting through the clear air, and thumped or banged or skidded or tangled or splashed according to the direction of the breeze and the nature of the terrain. It was a cry from his son which awoke Cham Loc in horror—a cry of pain! And, less loud, a voice that spoke in the sole language he understood, saying something about . . . but never mind! What was important was that his son was holding up his hand, bright red with smears of blood!

Shouting for his wife to wake up too, he ran toward the bulky container which, by the look of things, the boy had foolishly dared to open, and stopped dead as he realized that was where the strange

voice was issuing from, uttering strange but perfectly plain words.

It was roughly cubical. It had a large square lid. The lid was upright. On its interior face, there were moving pictures.

"This container is blue," the voice was saying. "That means it holds tools. There are also yellow containers. They hold medicines for common diseases. There are also green containers. They hold good seed. There are also brown containers . . ."

The boy's injury, on inspection, was no more than a scratch. Puzzled, but with growing courage, Cham Loc ventured to take a look inside the open box . . .

And gave his son a thorough dressing-down. At his age he should have known better than to snatch at the gleaming steel of a saw-blade.

On the upright lid, a picture of just such a saw: a smiling man using it to cut a log. After that, a picture of the same man using an ax; that too was in the box. And a hammer, and an assortment of nails, and a mallet and a chisel and a pair of pincers and a folding carpenter's rule and half a dozen pencils and . . . It was too much for Cham Loc. Faced with such unimaginable wealth, he could only gape as the picture-show in the box's lid demonstrated the proper use of each of these items, and then began the explanation all over again.

"This container is blue. That means it holds tools . . ."

Clothes, shoes, buckets, cookpots, scissors, needles, knives, pans, soap, looms, thread and yarn, buttons, plastic pipe, map-books, pen-pencil-and-compass sets, writing-paper, rope, disinfectant, fishing-line, wire, water-purifying tablets, lens-grinding kits with instructions on how to make simple spectacles, microfilm libraries, one per village, complete with magnifier, containing data on agriculture, medicine, hygiene, weaving, building, pottery . . .

The list was two thousand items long. Later, there would be instructions on how to detach the lids from the containers so that they could be set up permanently to receive the signals which were now emanating from the broadcasting satellite put tidily into stationary orbit by the converted ICBM code-named "The Dead Horse."

PLUS ∞ AND HOPING

Planet Earth

"I'm pleased to report to the nation," the President said from the screen of the TV set, "that at nine o'clock this morning I was able to give orders to discontinue all Navy and Air Force missions except those currently in progress. An hour earlier, I had received a full, frank, and I may say handsome apology from—"

"Smug bastard!" Hal Ratchett muttered resentfully.

"In his position," Barney countered, "wouldn't you be?"

"—spoken personally by phone to the premier, and he assured me that diplomatic relations will be resumed tomorrow. Moreover the first of our aid-and-counsel teams are presently on their way by scheduled, or maybe I ought to say rescheduled, commercial flights. They include doctors, nurses, agronomists, engineers, civil engineers and teachers. It goes without saying that all of these people are volunteers."

The President leaned back in his chair, beaming.

"As you know, my authority to commit our forces to a venture of this kind has been called in question, and I am required by Congress to present a detailed accounting of its cost—as is just and proper, of course. But I can give you the public a preliminary report here and now."

He lifted a single sheet of paper from a table at his side with conscious theatricality.

"I see we have flown nine hundred and fifty missions. I see we suffered nine casualties, none fatal, due to such accidents as badly-secured crates falling from a crane, while nineteen have been reported from the target areas—including, I regret to say, one fatality when an elderly man was pinned down by one of our air-drop packages and seemingly died from shock. I have authorized compensation for his widow, naturally."

Laying the paper aside, he concluded, "All in all, it appears that the total cost amounts to one billion dollars."

"A billion bucks!" Donna burst out. "He didn't have any right to—!"

Almost as though he had heard her, the President gazed straight into camera and concluded, "I should like to remind those who feel that a billion dollars is excessive that at the height of our commitment in Vietnam we were spending a billion dollars, on average, *every five days.* I leave you and the world to judge which investment has secured the better return. Good-bye."

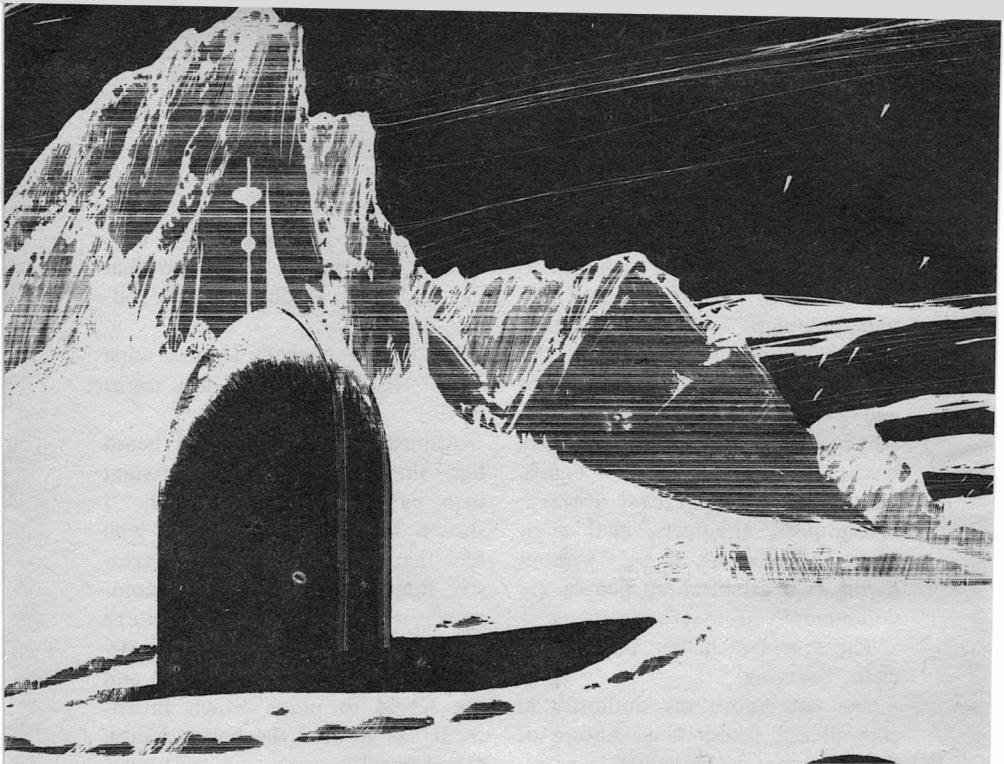
There was dead silence for a long moment in the Ratchetts' living-room. At last Barney rose, yawned, and stretched on tiptoe, before turning down the TV sound.

"I think it's cheap at the price," he said. "Does anybody care to argue?"

At which moment Lissa—who had as usual declined to stay and listen to the President when he came on—opened the door just in time to catch the last word. Her face fell.

"Oh, no! You're not arguing about politics *again*?"

"The argument," Barney said contentedly, "is over." ■



VINCENT DI FATE

HERBIE BRENNAN

A phenomenon that's inexplicable to a "sophisticated" society can fit into the broader pattern of a "simple" society quite easily.

death of god

I

On the fourteenth day, with rations running low, they reached a plateau. It swept away, gray and arid, to a distant horizon, blending into the persistent Himalayan backdrop.

"Well," said Corporal Skinner. "Well, well, well." He sniffed and wiped his nose with the back of a gloved hand. A harsh, dry wind insinuated itself inside the greatcoat and he shivered. "Still bloody cold," he remarked.

"Make camp!" Sergeant Young said shortly and Corporal Skinner passed the order on to the men. They pitched their tents and managed to light fires and broke out the rations. Morale was high, considering.

The deep, clear, Himalayan night set in and the wind died. Eventually the moon rose over the mountains. Skinner tossed restlessly for a while, then went outside his tent. It was bitterly cold, but not nearly so unpleasant as the day. Stillness enveloped him like a cocoon so that when a sentry snapped to attention, he started nervously. Then he grinned and called out, "Evening, George," leaving his Cockney accent to identify him.

"Sah!" the sentry replied crisply.

"Just going for a little walk," Skinner told him mildly. Two days ago, any man in the Company would have called him Tom. Two days ago he hadn't been second-in-command.

"Sergeant's out there," the sentry volunteered.

"Might get a chat with him," Skinner said. "Anything else moving?"

"Not a thing, sir." Moonlight highlighted a youngish face.

"Good," Skinner nodded.

The ground was rocky and almost barren. Just a few tufts of wiry grass clung to the brittle topsoil. He wondered what it would be like when the snows came.

Up ahead he saw the sudden, feeble flaring of a match and Young's face flashed briefly into granite relief. Another match flared and Skinner grinned. Jock was trying to light a pipe. He walked over with calculated lack of stealth.

"You'll never manage it, Sarge," he said softly. "Bloody things won't stay lit at this height." His hand went, quite involuntarily, to the pocket of his greatcoat and curled around his own cold pipe. Even through the heavy gloves, the curve of the bowl gave him some faint comfort.

A third match flared, went out. "You're right, Tom." The pipe vanished into a pocket. "Ah'm probably better without it." The sergeant half turned and stared silently out across the moonlit plateau.

"Where do you think we are, Jock?" Skinner asked him quietly.

"Too high for a start." The harsh, gravel voice with its soft Scots burr floated through the stillness. "According to the maps, we should be coming into the foothills by now." He coughed suddenly and spat. "The trouble with fighting a war in this

Godforsaken country, laddie, is you can't trust your ordinance. Move off the track a mile and you're good as lost."

"Pity we moved off the track, then."

"Didn't have much option, did we?"

"No," Skinner agreed, thinking of Captain Dennis.

They stood, hands deep in great-coat pockets, listening to the silence.

"Think we'll see any more action, Sarge?" Skinner asked eventually.

In the moonlight the big, broad sergeant shook his head. "I'd wager my last bawbee that Younghusband's into Lhasa now." He chuckled. "Give him a week or two to make terms and the way we're going, we might meet him coming back."

"If we can get out of these mountains."

"Aye," Sergeant Young agreed.

The noise roused him before reveille in the morning. He peered sleepily around his tent flap and saw Morgan dragging a young Tibetan boy across the compound. The lad was struggling wildly. Skinner ducked in again and began to dress hurriedly. He had a feeling he was going to be needed.

He came out to find Sergeant Young sitting on a knapsack, staring impassively at the boy. Morgan was standing to one side, fingering his rifle. The boy's eyes flickered nervously from the big, ugly Scotsman to the ludicrously grim-faced guard.

"Ask him what he was up to, Corporal."

Skinner put the question in Nepalese, which he spoke fluently, but the boy looked blank. He switched, haltingly, to the local Xhampa dialect. The boy glanced at him in surprise, then began to chatter wildly.

When he had finished, Skinner told Young, "His name's Losang and he has a big brother who'll beat the hell out of you." Then, because Morgan was listening, he added, "Sir."

The sergeant grinned. "Ask him where his brother is. Tell him we might bring him back."

"That way," Skinner translated laconically and pointed.

"Any idea how far?"

"Just a short way, he says. But distance doesn't mean much to these people."

Sergeant Young rubbed a gloved hand across his chin. "It can't be more than a mickle. A lad his age—"

One of the sentries came racing over, stopped and snapped to attention. "Party approaching, sir!" He caught his breath. "Northeast direction."

Young stood up. "How many strong?"

"Can't say for sure, Sergeant, at the distance."

"Get the men fell in, Corporal." To the sentry he said, "You can show me where to look, laddie."

Morgan coughed. "What about this one, Sergeant?"

Young glanced back at the boy.

"Tell him you'll shoot him if he moves, Corporal." He turned away so the youngster could not see his smile. "But if he's the nerve to try, let him go and good luck to him."

Skinner watched the sergeant walk off, then translated the threat. The boy spat disdainfully, but did not move away. Skinner turned and went off to organize the men.

By the time the party came within hailing distance, the men had been deployed in a semicircle around the camp, using boulders for cover. It was purely a precaution. The approaching party looked too small to start a fight. Unless, of course, there were reinforcements coming up behind.

Skinner strained his eyes. Only the leader was mounted, a slight figure in a yellow robe straddling a shaggy pony. The rest walked beside him or straggled in an uneven line behind. They were all smallish men, dressed alike in russet robes. As they came closer, Skinner noticed the shaven heads and began to wonder suddenly if they might be monks. Not that it mattered: they were outnumbered more than two to one.

They stopped, quite suddenly. He wondered if they had just noticed the rifles pointed in their direction.

"Corporal Skinner! To the front rank!"

Skinner moved up obediently to join the sergeant. "Looks as aye big brother has arrived," Young remarked dryly. "We'll go parley."

"Any more coming up behind?" Skinner asked, a little nervously.

"Not that we can see, Corporal," Young said briskly. Then, in an undertone, he added, "What's the matter, laddie—surely you don't want to live forever?"

"Bloody sure I do!" Skinner whispered back.

The rifles came up reassuringly as he and the sergeant walked across the shrub. The wind was in their faces and now, in contrast to the clear night sky, a thick gray cloud cover was nestling on the mountain peaks. The only movement in the party ahead came from two of the men who were helping their leader dismount.

"Tell them we want to talk," Young instructed out of the corner of his mouth. "Tell them they can send one man or two and we guarantee they won't be harmed." He drew breath in the biting wind. "And tell them if they mess about with us, Ah'll have them mowed down like field mice."

Skinner shouted the message in his halting Tibetan, then waited. After a moment, the leader detached himself from the group and began to walk slowly forward. He was dressed in a high fur hat and wrapped in a heavy purple cloak around his saffron robe. "Might have a knife under that cloak, Sarge," Skinner murmured. But as the man came closer, his fears eased.

"That one's a lama," Young whispered. "The uniform would tell you."

"Must be a hundred if he's a day."

"In his seventies I'd say, laddie . . ."

The old man walked slowly, with great dignity, to within a few yards of them. He watched them for a second or two with glittering black eyes, then bowed.

"Don't bow back," Skinner cautioned in an undertone. "It's important to show who's boss."

The old man came erect and said something in a high, musical voice.

"He offers greetings from his Abbot and wishes to present us with scarves," Skinner translated. "He comes in peace and wishes to know if the boy novice from his party is unharmed." He sniffed. "That one's educated, Jock. You can tell by the way he sounds his vowels."

"Tell him we'll gladly take his gift of scarves—" The big sergeant's composure slipped for a moment and he asked cannily, "Do we have to give him something back?"

"Yes," Skinner said. "More scarves."

"Please do not worry about needless formalities," said the old man in heavily accented English.

Sergeant Young curled his hands around the little silver bowl of lukewarm tea, sipped from it, scowled. "What do you make of it, laddie?" he asked suddenly.

Skinner was sitting with his back propped against the gray stone wall and his toes, curling with reflex pleasure, held out to the brazier. His boots were beside him, near his Sam Browne and his pistol. He had his rifle across his knees, cleaning it. "I think it's solved our rations problem, Sarge," he said.

Young snorted and frowned thoughtfully. "If you found a troop of enemy soldiers parading through your back yard, would you invite them in for tea?"

"Nope." Skinner took a tin of grease from his knapsack and began to apply it to the bolt of his rifle.

"No, you wouldn't. Nor would I."

"Of course," said Skinner, "I'm not one of these mad wogs." He worked the bolt vigorously. "I'm a mad Englishman and there's a lot of difference."

"Not when it comes to basics, laddie. We're part of an invading force—at least we were until the captain got us lost. So why the red carpet?"

"I suppose they know?" Skinner asked abruptly.

"Know what?"

"That there's a war on—it's pretty remote up here."

"Bad news travels," Young growled shortly.

Skinner said nothing. He had not been entirely happy with the sergeant's decision. It was a shade too much like walking into the spider's parlor. At the same time the monastic life had its advantages. He curled his toes again.

"What do you think of the Abbot?" Young must be feeling jumpier than he showed: he was

talking far, far more than usual.

"Not a patch on the old geezer who met us."

"Ah think he's sly," the sergeant said sourly.

Skinner clicked the bolt of his rifle and sighted along the shining barrel. "They always give that impression. It's the religious training."

The monastery housed two hundred and thirty monks, according to the figures given by the Abbot, and was built like a small medieval town. It was walled, with several buildings opening off a central courtyard. Some of them, including the temple, were actually cut into the rock face.

"You appreciate," said Gyalo Thondup in his measured, high-pitched tones, "that there had previously been many caves in the mountain and these aided the builders. It was, you might say, a task of conversion."

"German!" Skinner said suddenly. "Bloody must be!" He leaned forward and jabbed a finger toward the old lama sitting cross-legged opposite. "You've got a German accent!"

Thondup smiled, bleakly. "I was taught your language—along with his own—by an Austrian who visited Lhasa fifteen years ago."

Impatiently Sergeant Young cut in. "Gyalo Thondup Lama, my men have rested themselves. Now we must press on to join the remainder of our expeditionary force." He hesitated, then said bluntly, "Ah'll need maps of the district."

"My Venerable Master the Abbot has instructed me that guides will naturally be at your disposal."

"The Abbot's kind," said Young, "but Ah'll still want maps."

Thondup's glittering black eyes glazed and his features grew expressionless. "I shall speak of it to my Venerable Master."

"What was all that about?" Skinner asked when the old lama had left.

Sergeant Young got up and walked across to the window. Because the room was on an upper floor, he could see over the wall and out onto the steep trail leading down to the plateau; and beyond it, the sweep of the plateau itself. Despite the cold and frequent frosts, they were well below the snow line here. But the first storms were due soon. "Lord knows what a guide would walk you into," he said. "But maps are maps."

Skinner came over and joined him at the window. He was a smallish man and far more lightly built than the sergeant. "Tsk! Tsk!" he said. "You've got a nasty suspicious mind, Jock."

"Aye," Young muttered dourly.

Less than an hour later, they were examining maps, frail, beautiful scrolls that crackled as they were unrolled. Skinner felt a creeping chill. If these maps were accurate, they were miles from where they should be. Captain Dennis had a lot to answer for. But then, of course, he'd answered for it.

"What do you think, Tom?" the sergeant asked him gravely.

Skinner scowled. "Nice to know where we are anyway—up the flipping creek without a paddle!"

"It's not as bad as that, laddie!" Young said heartily. "There are three possibilities here as far as I can see. The shortest one is pressing on and hoping the Good Lord lets us make it through here—" He stabbed at the map with a broad, thick finger. "Or we could cut across the plateau and try to reach this trail—" The finger jabbed again. "Or we could double back the way we came and branch off where we went wrong: which Ah'll vow was about here—" The finger pointed, then came up off the map to help scratch the close-cropped head. "The trouble is we're going to hit the storms soon whichever way we go."

"Please forgive my interference, Sergeant Young," Thondup put in smoothly, "but it would not be advisable to cross the plateau without guides. The area is exceedingly treacherous for those—" He coughed drily. "—unfamiliar with its perils."

The big sergeant glanced at Skinner, but said nothing.

They had difficulty getting rid of the old lama without downright rudeness, but he left them eventually with obvious reluctance. Skinner and the sergeant walked from the hall they had commandeered to private quarters. Once inside, Young said, "So our friends don't want us roaming round the plateau." He rubbed his chin thoughtfully. "Now why do you suppose that is, Corporal?"

"They don't want us to fall down and get hurt," Skinner told him, deadpan.

"Ah see," Young nodded with dry humor. He began to pace up and down, frowning, his bulk too large for the room. Skinner propped his back against the wall and waited. Eventually Young said, "Suppose they have military installations out there?"

Skinner wrinkled his nose and shook his head. "Makes no sense, Sarge. If there's a secret army on the plateau, why not call them in to put us in our place? We haven't that many men and they can't be worried about our main force when they know bloody well we've lost them. But they didn't do a thing except invite us in and let us take over their monastery."

"There's *something* out there they don't want us to know about."

"Maybe it's where they keep their women," Skinner grinned.

The sergeant started pacing again. When he stopped, quite a long time later, his expression had fallen into its familiar lines. "Corporal," he said crisply, "send word to the Abbot we won't be moving for a while yet—"

"What about the storms, Sarge?"

"Ah worry about that when Ah have to. Tell the men to stand by, but not to make it obvious we're expecting trouble—"

"Are we?" Skinner asked.

"Maybe." Young paused, then

added, "When you've got that organized, come back here. I've another job for you."

It happened on the fourth night, just long enough for him to convince himself nothing was going to happen. He watched the little torchlit procession file out through the main gate, watched the gate closed silently behind them. When they moved—hopefully—out of earshot, he climbed the rope and dropped down on the frozen ground. Beyond the torchlit snake, the night was pitch black, still and deadly cold.

He moved after them stealthily, feeling the weight of the rifle slung over his back, the weight of the pistol in his belt. He felt nervous and very much alert.

It was hard enough going, but despite his exertions, the cold wormed its way inside his clothing and once, briefly, he thought he felt a flurry of snow against his face. But he had no trouble following. The torches shone like a beacon across the plateau and, once they had moved a distance away from the monastery, the monks in the party ahead began to chant softly. The sound traveled eerily in the night.

They had been on the move for almost an hour, as near as he could judge, when he noticed a curious lightness in the sky ahead, like the first faint hint of dawn before the sun begins its climb above the horizon. As he moved on, it occurred to him that the source of the light was on the ground, yet it seemed far too steady for a campfire.

He was still wondering when, abruptly, the torchlight party vanished. He could still hear the chanting, but the torches had winked out abruptly, leaving nothing but the cold, steady glow. Seconds later, he found himself climbing and concluded the party had simply dropped behind a ridge.

With nothing but the chanting to guide him, he slowed, fearful of walking into any stragglers and raising an alarm; and after a moment he found he could not hurry anyway, for the path had become very steep and rocky.

Ahead of him, the glow grew stronger.

He topped the ridge breathlessly. He stood for a moment, staring down, then, with a curious deliberation, began to scream.

II

Gyalo Thondup was solicitous, on his own behalf and on behalf of his Abbot. It pained him deeply that the corporal's mind now showed signs of derangement. What a tragedy that he had attempted to cross the plateau at night—and alone! The effect of exposure.

Sergeant Young listened impassively. Behind him, on the straw mattress, Corporal Skinner lay staring at the ceiling. He had stopped screaming now, but his eyes were glazed and he would not reply to

questions. So far, he had completely failed to respond to stimulus—even pain.

"My Venerable Master the Abbot has, of course, ordered prayers sung on his behalf," Thondup was saying.

The old lama was lying, of course. Not about the prayers, which conceivably had been ordered for show, but about the night on the plateau. Something had happened to Skinner and Thondup knew exactly what. But he wasn't likely to change his story now. As far as anyone was concerned, Skinner had been found near the monastery at dawn, dazed and wandering.

Was it, the sergeant wondered suddenly, the result of drugs?

He was still thinking of drugs when Thondup left him—a herbal mixture brewed to produce delirium. It would make sense provided Skinner had stumbled onto something he wasn't supposed to see. His mind reverted to the old notion of a military encampment—reserve forces, possibly, drawn up for a surprise counterattack against Younghusband. Whatever Skinner said, it was the most likely explanation. On reflection, Skinner's objections didn't make all that much sense anyway. Why divert troops to deal with a few of the enemy, lost in the mountains and relatively harmless, when every man would be needed to hit the main force on the plains?

Young began to pace again. If there were Tibetan soldiers out there, his duty was clear enough.

A little later, he issued orders to move out. Two men were ordered to commandeer a stretcher for Skinner.

As an afterthought, looking into Skinner's blank eyes, he made Morgan an acting corporal and second in command.

The Abbot, dutifully flanked by Gyalo Thondup and several other dignitaries, met them in the courtyard, bowing and smiling.

It was with deep regret, Thondup explained, effusive in his Oriental courtesy, that his Venerable Master the Abbot had learned of his guests' decision to depart. Guides would, of course, be provided to ensure their safe—

Sergeant Young cut him short with an impatient gesture. He towered above the lamas like a giant over pygmies. "No guides, if you please. We'll find our own way with the help of your maps."

Surprisingly, Thondup only shrugged and bowed. The Abbot and his party stood aside and the little British force marched in strict formation through the main gate, down the trail and onto the plateau.

The ambush hit them only fifteen minutes later.

Sergeant Young deployed his men in a huge, sweeping arc across the plain, each one just within sight of two others. They moved forward slowly, searching.

He felt sick. He kept seeing the bodies lying on the frozen ground, bleeding slowly, dying. He'd shot

men in the Crimea, in India, even here a few weeks earlier. But it had never been like this before: always the enemy had been armed.

In his mind's eye he saw the young monks fling themselves, open-handed, on his men. So many of them. Too many, so that guns had to be used. And then the slaughter, the unarmed men bleeding onto the arid ground.

If they were attacked now, his own men wouldn't stand a chance. But Young had changed his mind about what they were facing. If anything made any sense, the unarmed ambush ruled out the possibility of a military encampment. Now the men had simply been instructed to search, with no one—least of all Young—sure what they might be searching for.

The line moved slowly forward.

In the middle of the afternoon, the sergeant heard a shout. He swung round. Hitchen, one of the youngest privates, was standing on the top of a steep rise, waving. The nearest men were converging on him at the double. Young began to run.

As he topped the rise, he realized instantly what had caught Hitchen's attention. Below them, nestling in a shallow, natural crater was a low, round, domed building, beautifully designed and recently painted silver. It reflected fluidly.

Young stopped and stared. He'd seen nothing like it anywhere else in Tibet—or even India, for that matter. It had no doors or windows on the side he could see and the silvering was a work of art, so beautifully done that the whole structure might have been made of metal. He guessed at a wooden framework covered with silvered cloth, possibly silk. A sickening suspicion was rising in his mind.

He circled the building slowly. The lack of doors and windows on the other side confirmed his suspicion. The building was not practical at all, but religious. His stomach churned. He'd had a hundred unarmed monks shot so his men could violate a religious taboo.

Woodenly, he went through the proper motions of approach. He deployed men at the ready in a full circle round the construction. When they were in position, he ordered them to fire at the first sign of danger. Then, departing from the rule book, he walked down himself to take a closer look.

A hundred yards away from the dome, his depression vanished abruptly to be replaced by a wary alertness. The illusion of metal was too perfect for the distance. But if the thing *was* metal, how had the monks worked it? And what process kept the metal fresh, fluid, glistening in this ghastly climate?

It was metal! He struck it with his rifle and it rang like steel. With a caution honed fine by years of training, he broke and ran back toward his men. The sudden movement startled them and he could see the rifles come up, but no one fired without an order.

"What's wrong, Sergeant?" Morgan asked him as he reached the top of the ridge again.

"Nothing's wrong, laddie, except Ah don't know what that thing is yet. Until Ah do, Ah feel safer at a distance." His accent thickened with the heavy breathing.

"What do we do, Sarge?"

"Make camp on the other side of the ridge. Ah want six men posted to keep an eye on that thing. Then Ah want time to work out what to do about it."

But he got no time. Just after his tent was pitched, Gyalo Thondup and the Abbot arrived, incongruously escorted by two grim-faced sentries. The sight of them brought back the full pain and horror of the ambush. Young waved them to sit down and called for tea. But he cut the formalities short by stating bluntly, "Ah'm sorry about your men. They gave me no choice."

"You had no choice," Thondup nodded.

The big sergeant stared into the old, glittering black eyes. "Why did you send them against me?"

Thondup sat silent, his face as blankly innocent as a newborn child.

"All right," Young sighed. "Then what's the metal thing over the ridge?" He jerked his head.

Thondup looked towards the Abbot and translated the question. In the half-light of the tent, they seemed very frail, very strange old men. With their shaved heads and their little gray beards, they might have been brothers—even twins.

There was a long pause before the Abbot spoke and then he spoke very slowly. When he had finished, Thondup said simply, "It is the home of the gods."

The gods, Gyalo Thondup Lama explained, first visited Tibet in prehistoric times. The land itself had not been formed. What was now a country was then an inland sea, surrounded by uninhabited forests and mountains. The gods, who came from beyond the sky in a fiery celestial chariot, had landed on the bed of this sea, for water and land was all one to them.

Knowing all things past, present and future, the gods realized that one day this primeval seabed would be a land inhabited by a humble and pious people. So they decided to make the land their own and set their special signs upon it.

Slowly, over millennia, the waters departed. So too did the gods. But they gave a promise to the spirits of the land that they would assuredly return.

Men gradually began to appear in this remote region. Tribes settled and squabbled amongst themselves for many years, forgetful of religion and unmindful of law.

But one glorious morning, more than two thousand years ago, the gods returned, riding their celestial chariot in above the Himalayan ranges to claim their birthright.

In the year of the Wood Tiger (or,

as the Indians measured time, four hundred and eighteen years after the death of the Lord Buddha) the gods unified the warring tribes and set one of their number, King Nya-Tri-Tsenpo, to rule over the land.

Taking wives from amongst the daughters of men, King Nya-Tri-Tsenpo founded a dynasty which ruled without a break for forty generations. As an immortal, the king could not die, but when his appointed time arrived, he was again taken beyond the sky in a fiery chariot, leaving his son to rule after him.

Until the advent of the twenty-eighth king of the dynasty, the people of Tibet worshiped the gods, honoring them along with the nature spirits of the region and the spirits of their ancestors. Then, in the reign of Lha-Tho-Ri-Nyen-Tsen, a tragedy happened. Buddhist scriptures were introduced into Tibet.

Sergeant Young's jaw dropped. "Tragedy? The first scriptures of your own religion?"

Thondup frowned, then answered mildly, "We are priests of Bon, the Venerable Abbot and I."

Young shook his head. He was no expert on this Godforsaken land. Just one of the soldiers Curzon sent in to persuade Lhasa into a bit of trade. "Go on," he murmured.

The rot, Thondup said, did not really set in until the reign of the thirty-third king, Song-Tsen-Gampo. Although born of the line of the gods, he embraced Buddhism totally and established many temples.

But the gods continued to appear to their faithful followers. In the reign of Tri-Dhi-Tsuk-Ten, for instance, three generations after the accursed Song-Tsen-Gampo, war broke out between China and Tibet. The king's minister, Ta-Ra-Lu-Gong, was a secret follower of Bon and, helped by certain machines loaned to him by the gods, he pushed with Tibetan forces deep into Chinese territory and conquered a number of provinces.

Buddhism continued to gain strength, however, and, coincident with its penetration into every corner of the state, Tibet's power grew. At that time, the old gods had not shown themselves for many generations and the simple people considered they would never return.

Yet return they did. A great celestial chariot sailed into the remote vastness of northern Tibet in the year of the Iron Bird. The gods themselves instructed Lang-Dar-Ma, forty-first king of their ancient line, and he attempted, during his reign, to reverse the tide of events and uproot Buddhism from Tibetan soil.

But the task proved too great for him. After six years he was assassinated. The gods were angry and withdrew from the sight of men for a period of fully five hundred years. For more than three hundred and forty of these years, Tibet was in turmoil, split into dozens of tiny, quarreling kingdoms.

When the gods eventually returned, however, it was to find Tibet

reunified. The task had been accomplished almost two centuries earlier by a high lama from Sakya monastery, who became the country's first priest-king.

Mortals might be tempted to imagine the gods would have been distressed at this victory of a rival religion. But mortals could not know the thoughts and plans of the gods. They made no further move to overthrow the established religion, and were content simply to claim the help of their followers during those periods when they revealed themselves.

Even when there was a return to secular monarchy between (in the Christian calendar) 1435 and 1641, the gods made no move to intervene in the country's affairs. Nor did they attempt to intervene in the Water Horse year (1642) when a Dalai Lama first took control of the state. Indeed, at that time, the gods had entered one of their many withdrawn periods. They revealed themselves to no one and their chariots came no more over the high Himalayas.

Yet from time to time they did return to instruct the faithful and reward those who had kept alight the lamp of their teachings. The ancient records showed that the great chariots had appeared briefly in 1652 at a time when, coincidentally, the Dalai Lama was out of the country on a state visit to China. Again, as Bon priests recorded, the gods appeared to men in 1780, 1785, 1786 and 1840. A celestial chariot had, some said, been seen by goatherds in 1855, although there was no record of its having landed.

Thondup paused, his dark, hooded eyes staring thoughtfully into those of the big sergeant.

Young shifted uneasily and coughed. "Do Ah take it that the thing over the ridge is a special temple to the gods?"

For the first time, Thondup's features betrayed surprise. "Oh no," he said in his high-pitched, accented voice. "That is a celestial chariot."

He left an armed guard watching over the two old priests, although neither of them seemed very interested in going anywhere. He had the bulk of his men stationed along the ridge now. He was more nervous than he showed. With the fall of darkness, the metal structure had begun to glow, a hard, bluish light which illuminated the immediate area as adequately as a full moon.

Sergeant Young went up to join the men, worried by his thoughts. Gyalo Thondup still insisted that it must have been the sight of the gods that drove Skinner—an unbeliever—insane. Young listened, but thought it . . . unlikely.

"Anything happening, Peters?" he asked the man nearest him.

"Nothing yet, sir. Nothing stirring."

"Hm-m-m," Young said. The bluish halo had to be electrical. Maybe a static charge built up on

metal in the rare atmosphere. But then why didn't the rifles show halos?

"Excuse me, Sergeant . . ."

"Aye, Peters?"

"What are you expecting to happen, sir?"

The burly sergeant thought about it for a moment, then shrugged. "God knows, laddie. Nothing probably." He wished he had cannon. A rifle bullet wouldn't even dent that shell. Instantly he wondered why his instinct was to attack it. And what was he doing with thirty British soldiers watching a religious artifact?

He half turned and almost missed seeing the door open out of sheer metal. (There hadn't been a door before—without doubt there hadn't been a door before!) He swung round and watched as Satan walked out into the luminous blue glow.

Instantly, panic broke out among the men. Several of them started shooting wildly, and the heavy, brass-jacketed slugs ricocheted off the metal wall. Someone ran past Young, stumbling down the ridge into the darkness. There was a lot of shouting as military discipline, drilled in with months of training, broke down in seconds under the impact of a single, impossible sight. From somewhere in the darkness, a man started screaming.

Sergeant Young snapped an order to stand firm, but it had no effect. The panic spread like wildfire. Within seconds, the men were streaming past him, tripping, stumbling, falling, half insane in their desire to get as far away from the creature as possible.

Young let them go. To his surprise, all his previous uneasiness had vanished. He stared down from the height of the ridge at Satan. Satan was tall and brown and slender, with huge bat wings the full size of his body. His head was perfectly bald, perfectly smooth, perfectly ovoid. His eyes were enormous and strangely beautiful. There were no horns.

Satan walked fluidly a little way away from the doorway. Was he wearing clothing—skin-tight brown clothing? It was difficult to be sure at this distance in the half light.

Very calmly, Sergeant Young lifted his rifle and aimed carefully at the heart region. As Satan turned to face him full on, he fired once. Satan slammed backward and the bat wings spread wide in some dying reflex. Behind him the doorway vanished instantly. Satan crumpled in a leathery heap on the frozen ground.

Sergeant Young began to run down from the ridge. The entire silver metal building rose into the air and rushed toward him with a shriek of tortured air. He threw himself to the ground and rolled over and over as the huge bulk passed above him. It hummed, like a multitude of angry bees. His back and part of his left side began to itch, then burn. It was an irritating pain, but not a crippling one. By the time he pulled himself, shaking, to his feet, the glowing

metal dome was little bigger than a florin in the sky. He was in total darkness. Somewhere ahead of him was Satan's corpse.

Young wept. He stood in the cold Tibetan darkness and wept.

III

Morgan, crimson with shame, led the advance party over the ridge at dawn. There was nothing to show where the flying machine had rested. (God in heaven, these natives had flying machines and Curzon had sent an expedition against them!) But down there on the frozen ground were the crumpled remains of the thing he'd seen the night before and near it, prostrate, was Sergeant Young.

Morgan approached gingerly. He was more or less an atheist, but even so the sight of the bat wings in the half light had thrown a medieval terror into him. Now, in the dawn light, he had vague thoughts of unknown animals. But he still hoped it was dead. Even at a distance, the leathery skin revolted him, making his spine crawl as if he had been forced to touch a snake.

He stopped and knelt by Sergeant Young, sliding his hand inside the clothing in search of a heartbeat. Young was almost rigid with the cold and one hand, where he had pulled the glove off, was bright blue. But the heart beat strongly, so strongly that there seemed no doubt he would live.

Acting Corporal Morgan called two of his men and ordered them to carry the sergeant, at the double, back to camp and warmth. Then, keeping his voice firm with an effort, he ordered two others to lift the bat-winged corpse and carry it back as well.

He turned his back as they lifted it and ignored the surprised comment from one of them about how light, how very light, it was.

Young woke, in his tent, weighed down by a mountain of blankets.

Morgan was kneeling over him holding a steaming mug of tea. The sergeant took it and drank gratefully, although it wasn't hot enough. Tea was never hot enough in the mountains: water boiled at a lower temperature than it should.

He looked around. "What happened?"

With only a small hesitation, Morgan said, "We're not sure, Sarge. You shot the animal and then something got at you. Your back's all burned and we found you pretty stiff."

He could feel the discomfort across his back, although there was little enough pain now. He grinned. "Ah thought the whole dome went for me!"

"It was a flying machine, Sergeant!"

There was silence in the tent as they stared at one another without understanding. Young flexed the muscles of his left hand, which seemed to have lost all sense of feeling. "What happened to the thing I shot?"

Morgan swallowed. "I had it brought back to camp."

"Did the natives see it—the old priests?"

"They watched us bring it in."

"Get upset, did they?"

Morgan frowned. "Not that I noticed, Sarge."

Another ruddy mystery. Young pushed the blankets away from his body and heaved himself upright. He felt remarkably well, considering. All except the numbness in his left hand.

With no further reason to cross the plateau, Young led his men on the direct route through the higher mountain pass. They carried two stretchers, one bearing Skinner, still blank and oblivious to his surroundings; the other with the weird, winged body strapped to it, perfectly preserved by the bitter Tibetan cold.

They were almost through the pass when, a little early, the first storm of winter broke and trapped them.

IV

Next spring, when the thaw came, two young acolytes searched out the body of the winged creature and carried it with great reverence back to the Bon monastery above the plateau.

There it was embalmed according to the traditional rites, gilt and placed, facing north, in a niche in the main temple.

And there it remained, from that soft spring of 1904 until the harder spring of 1959 when, piqued by the flight of the Dalai Lama, the Chinese burned down several monasteries, that one amongst them.

A few artifacts survived the flames, but the 'gilted, carved-wood statue of a demon', as the Chinese inventory described it, was not amongst them. ■

THE EYES HAVE IT

Most of what we know about the world comes to us as optical data. When you apply information theory to optics—well, one picture is worth how many words?

R. I. MACDONALD

The Eye and the Ear

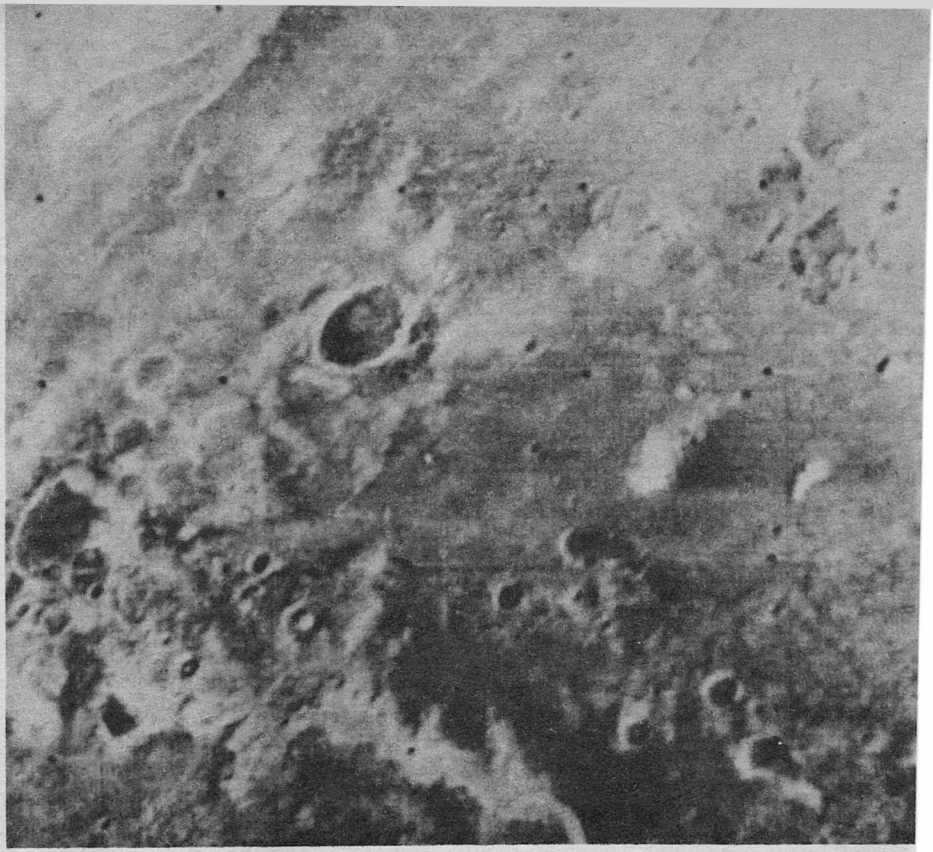
Beginning as a middle-sized monkey of no particular note, man has worked himself up the evolutionary ladder by developing his intelligence. This nebulous weapon proved as effective as any of the biting, stabbing, kicking and scratching equipment carried about by other beasts. It may yet prove altogether too effective.

Consider the significance of this. A set of horns is of no survival value without a bull's neck to drive them home. Tiger's claws would be useless on the weak, stiff legs of an antelope. Survival characteristics are complete systems rather than mere objects. If intelligence is to be used for surviving, it must rest on its own firm base: information.

How does man get information about the surrounding world? He can't smell as well as a dog, nor hear as well as a deer. Touch and taste are contact senses, of little use for warning of predators. That leaves sight. Man sees better than most animals. And this is another example of nature providing the necessary. It turns out that sight has far more information-carrying potential than any other animal sense.

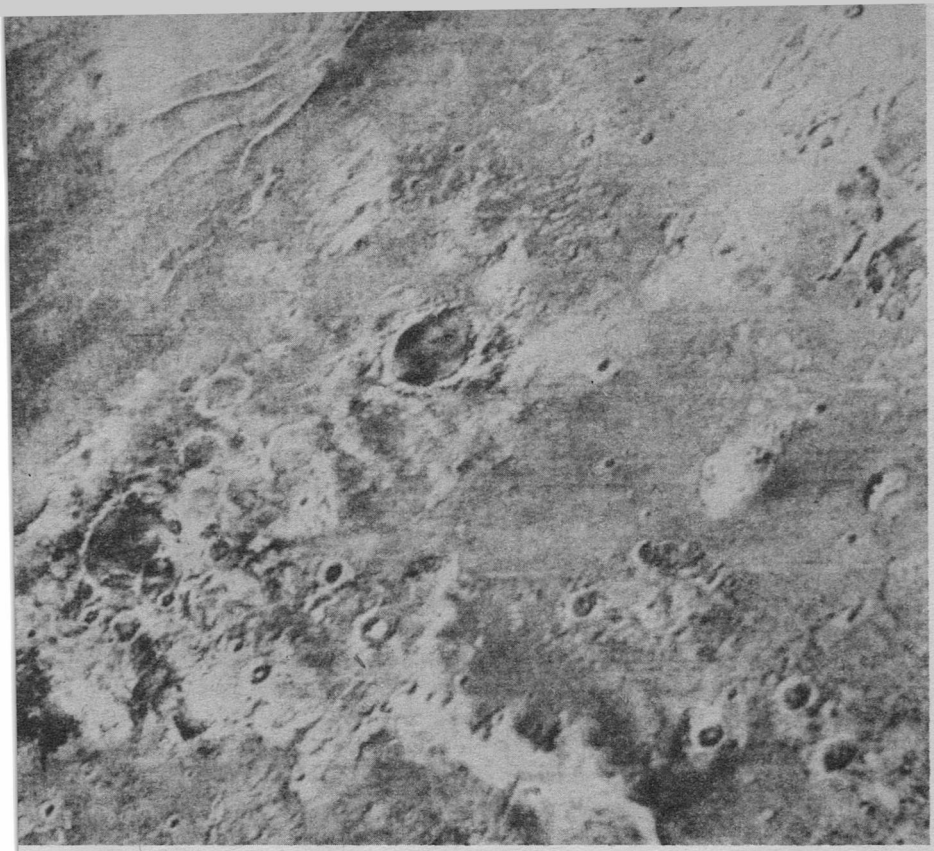
It has been estimated that we receive at least ten times more information from seeing than we do from hearing, the next most developed sense. An example of this, though perhaps not a very good one, is the fact that you can read this page to yourself much faster than you can read it to someone else. This difference is not entirely due to the problem of enunciating clearly at high speed. If you were to record a reading and speed it up to the rate of silent reading, it would become almost unintelligible; like listening to a long playing record of a poetry reading at 78 rpm. The hearing part of the mind simply isn't geared to such speeds.

Since we depend on information so heavily, as fuel to our intelligence, it is just as well that we have concentrated on seeing over hearing. At the low sound frequencies which can propagate for any appreciable distance through



air, there can be very little bandwidth to carry information. The bandwidth is the maximum possible deviation in pitch which can be heard. It is thus limited to the audible range, between about 20 Hertz (Hz) and about 16 kiloHertz (kHz). A fundamental theorem of information-carrying systems shows that the maximum rate at which information can be put through a channel is directly related to the bandwidth of that channel.

For comparison, note that microwave radio relaying systems have bandwidths of millions of Hz due to the high frequencies at which they operate. Thus they can do much better than the ear with its sixteen thousand Hz or so. Over such channels many simultaneous television programs can be carried. Imagine trying to shout orders at someone fast enough that he can draw the pictures and imitate the sound of three different television programs. Aside from the fact that your mouth and his pencil won't move that fast, your mind, designed around processing audible



The results of optical enhancement show in these two views of the same photograph of Mars' surface, taken by the Mariner 7 spacecraft. The original photo transmitted from the spacecraft (left) lacked detail and contrast; the information was present in the photo, but it was hidden by "optical noise." The print at right shows the results of noise removal and contrast enhancement; the quality of the picture is sharper, more of the information is visible. (Photo courtesy National Aeronautics and Space Administration)

information at the ear channel rate, can't think up orders that fast. It simply can't handle the data that can be transmitted over a million-Hz channel.

Information theory is a relatively new study. To a great degree its practical side deals with electronic equipment. Generally, electronics has developed around the same notions as are used in the study of sound. (One of the first noteworthy applications of electronics was in the transmission of sound by radio.) Information theory has gener-

ally followed along the same route, but it is becoming apparent that its scope is really much wider than the first work implies.

The nature of electronic signals is that they are electrical quantities, voltages or currents, that change with the progression of time. Similarly, sound waves are manifest at the ear as air pressure varying with time. The first approach to information theory was the general description of information as coded into time-varying quantities. The signals processed by the eye do not fall into this category.

In view of the fact that we get so much more data from seeing than from hearing, it might be considered peculiar that the general study of information led to a theory based on the type of signals one hears rather than those one sees. The simpler problem was attacked first, perhaps only by chance. As it turns out, the theory of information as developed for time-varying signals can be generalized very easily to describe the sort of signals one receives optically. This line of thought has been pursued vigorously since about 1960 with some remarkable results. It has caused a revolution in optics.

In order to see the parallel between seen and heard information it is first necessary to understand the difference between them. An audible signal can carry information through three properties of a sound wave. Volume and pitch carry information about what message the source is trying to send. What may be less well known is that the two ears also detect the phase difference between them and use this to locate the source.

A sound wave traveling through air is really a string of high and low pressure areas following each other along at equal spacings. If high pressures or low pressures are reaching both ears simultaneously, then the head must be facing the source of the sound. If, however, a high or a low pressure is received by one ear before it is received by the other, then the first ear must be closer to the source than the second. This is equivalent to saying (for people whose ears are in the usual place) that the head is turned to some degree away from the source. Thus the source has been located. The phase difference used to determine how much the head is turned is the length of time between the occurrence of a high pressure or low pressure at one ear and the same occurrence at the other.

Oddly enough, in view of its role as prime information gatherer, the eye simply cannot detect the phases of light waves. Some further remarks are in order to explain this deficiency.

The two ears can detect the phase difference of a sound wave between them because the coherence length of most sound is longer

than the distance between the ears. This means that the regularity of the sound waves holds true over a longer distance than the width of the head, so that one can make a valid subconscious calculation of the angle of the source from the phase information.

One might imagine a situation where the ears received signals which were not coherent with each other. Suppose you were wearing headphones arranged so that each phone was supplied by its own individual tone generator. Both generators operate at the same frequency, but switch off and on at random intervals independently of each other so that the relationship between the occurrence of a certain phase at one ear and the other is random. The mind can make no sense of it for locating an apparent position for the source. It boggles quietly between the earphones.

This approximates, however, the sort of wave received by the eye. Almost all sources of light (excluding lasers) are in fact made up of umptillion light-tone generators which operate in exactly this way—off and on at random intervals. These are of course the excited atoms of whatever is glowing, which at random de-excite themselves and send out a wave-train. When all these wave-trains are added up, there is no sense to be made of the phase. The relation between the phase at one point on the eye lens and another is completely random.

It will be noted that only one eye was mentioned, while phase detection of sound required two ears. This is because in order to get good phase information the detector should be able to compare phases at points at least a few wavelengths apart. The phase detecting set of ears should really be considered as one instrument operating over a baseline a few inches long to meet this requirement. The wavelength of light, on the other hand, is so short that the diameter of a single eye lens is measured in tens of thousands of wavelengths, and if the phase could be detected, a single eye is big enough to do it.

In fact, we need two eyes to locate objects in space, at least as to distance. Not having phase information available, they use the extremely good directionality of the eye and some elementary geometry (and some pretty sophisticated psychological effects) to locate objects. This process does not concern us from the point of view of optical information theory. It might be considered as evidence of the inability of the eye to detect phase.

Not having phase available, then, the eye must operate on frequency and intensity information alone. And still it gets ten times more information than the ear. One might glibly say that this is all right. The frequency of light is so high that the eye has a colossal bandwidth

available, and this accounts for it all.

That approach is a red herring. In fact the eye interprets light frequency as color, and it is a very coarse detector of frequency at best. In terms of Hertz the visible frequencies span a few teraHertz. Yet not even the most tone-deaf of artists would be able to distinguish more different colors from each other than musical pitches, which span a few kiloHertz.

The eye is an even worse detector of changes in frequency. If you take a light bulb—say an ideal light bulb emitting a light frequency corresponding to green, and turn it off and on more than about ten times a second, your eye won't even notice a flicker, even though the frequency is varying from ten thousand billion Hertz to zero. Anyone who has watched a movie has verified this for himself.

Here one must make an apology for the eye. We have been casting it in a role which it does not and cannot play. We have been treating it like the ear, as a processor of time-varying signals. This is hardly fair. You cannot expect flesh to be able to handle the sort of time intervals which would be involved to do this with light. Phase differences detected by the ear are a few milliseconds, which is within the sort of time interval you might expect nerve impulses to run around in the brain. For the eye this corresponds to a few millionths of a millionth of a second, which is way out of line. In fact the eye does what it can do very well and manages to extract a great deal of information from the elusive light wave by cunning.

The rather obvious thing which the eye does do has only recently been thought of by the apes who invented information theory, and who carry the eyes. It is rather poor at handling time-varying signals because it doesn't have to be good at it. It is very good, however, at detecting shape, and form, and things which are associated with space. Accordingly it processes *space-varying signals.* That is, signals which are measured in cycles per *meter* rather than per second. When this was grasped it became apparent that most of the work previously done in information theory based on the audio bias of electronics could be translated into optics by simply substituting meters for seconds and carrying on. From this has been developed a whole new science, which hasn't yet got a name (unless it be "Fourier Optics"). It has presented some fascinating devices already.

Before trying to clarify the concept of space-varying signals, a further point should be made in defense of the eye. Time goes only in one direction; if you like, it is one-dimensional. Conversely, space goes in three. Therefore, a time-varying signal is obviously more limited than a space-varying one. A

simple example: My eye (the other one is closed) sees in three dimensions. Mary is to the left of Tom. Tom is taller than Mary. Peter is out of focus, therefore he is closer or farther away than Tom and Mary. My ear hears only in one dimension. Peter said "Let's go" before he said "for a swim."

Actually the eye sees in the fourth dimension, time, as well. My single eye tells me that Peter has left the boat. But the time resolution of the eye is poor. He left by jumping out, and it happened so fast that I didn't actually see him going. One moment he was standing on the edge of the boat, then a blur and he was swimming. The time resolution of the ear is better. If I had had my eye closed, I would have noted quite clearly the interval between his kick against the boat and the splash.

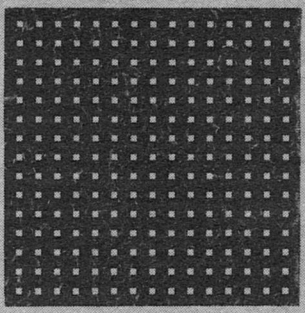
The eye then processes "space-frequency" information, and has three dimensions to work in. It resolves well in space and rather more poorly in time. The information available, however, in a single still image such as a photograph may be very high in terms of "space-bandwidth" compared to the bandwidth available to the ear. A picture, as they say truly, is worth a thousand words. Or more. Very many more indeed.

Space Frequencies

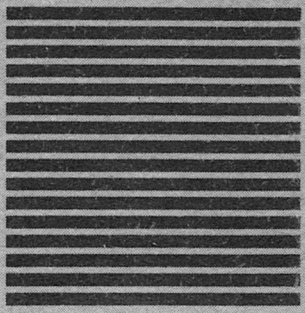
The word frequency implies that something is occurring repeatedly. When the air pressure at the ear goes up and down at a regular 440 times per second, one perceives the pitch *A*. Pitch, of course, is frequency as detected by the ear. If one looks at a screen door, one also perceives a frequency. In this case there is a horizontal wire every five millimeters in the vertical direction, and a vertical wire every five millimeters horizontally. One might say that "pitches" of 200 cycles per *meter* are perceived. Note that there are two such pitches in this case—the horizontal and the vertical. This is an extension beyond the musical parallel.

The fact that the screen door is less than one meter wide is of no significance. It parallels the situation where the 440 cycles per second of middle *A* is sounded for less than one second. The frequency can be detected as long as the occurrence, air pressure or wire, repeats itself at least once. Naturally the more times it repeats, the more securely the frequency can be identified. Two cycles of middle *A* can be heard, but it is rather hard to tell what it is you are hearing. Two wires five millimeters apart might be part of a screen door grid, or part of a wire brush with a random distribution of wires.

It is pretty well known that one can build an electronic filter which will eliminate all the middle *A's* in particular, should one want to. (Usually the problem is the reverse; that of building a high fidel-



GRID



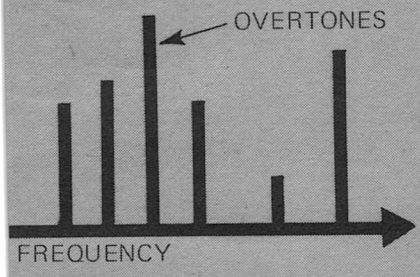
GRID with
vertical wires removed

FIGURE 1.

ity system that *doesn't* discriminate against certain frequencies and thus cause distortion.) It is also true that an optical filter can be built to do the same sort of thing. Such a filter might, for example, discriminate against 200-cycles-per-meter space frequencies. With such a device one could produce an image of the screen door in which all 200-cycles-per-meter space frequencies have been removed. Furthermore, in this case one can specify whether one means horizontal or vertical frequencies. If 200-cycle-per-meter horizontal frequencies are rejected, then the image will contain only the horizontal wires, which repeat every five millimeters (in the vertical). The vertical wires will not appear at all, since they correspond to the space frequency rejected. This is not just a thought-experiment. It can be done. (See Figure 1.)

Furthermore, this is not just an exercise—it can be used. Suppose you have a photograph taken from a television screen, maybe the first from the Mars landing. The scan lines bother you. Frankly they make the picture, good though it is, look pretty cheap considering the billion-dollar budget for the project. Congress will whack off another 200 percent of the appropriation unless you can do better. So you get out your optical filter and simply remove all the vertical frequencies which correspond to the scan line vertical frequency. All you lose is the scan lines. Nothing else in the picture is likely to repeat vertically at exactly the width of the scan.

FIGURE 2. **SOUND SPECTRUM**



The choice of an obviously regular object like a piece of wire screening to demonstrate the concept of space frequency may seem to be a rather special case. Most objects exhibit no visible regularity in form. But in fact it is not a special case. It is well known that sound waves of the most complex nature, such as a rock band overdriving a few kilobucks' worth of amplifiers, can be dissected into a sum of simple sine wave overtones of various frequencies and intensities. In exactly the same way, any picture, however complicated, can be considered to be composed of a set of space-frequency overtones.

In the case of sound waves it is possible to display with complicated equipment, a plot of the sound frequency spectrum. This plot shows the intensity of each overtone on the vertical axis, and its frequency on the horizontal axis. An example of such a plot is sketched in Figure 2. A modification of this technique is used in the "voice-print" equipment which is being studied in the hope of providing identification of speakers by the tonal quality of their voices.

It is possible to generate a similar display for the space-frequency components of an image. For simplicity we consider a two-dimensional still image—a photographic transparency. When this is placed in a hypothetical optical space-frequency analyzer, a plot of space frequency versus intensity is produced. Since, however, in this case the space frequencies are associated with directions in the image we need the entire plane of the plot, both axes that is, to plot the frequencies. The intensity will be plotted as brightness. In this display, sketched in Figure 3, we have a field of varying brightness. At each point of the field the brightness indicates the intensity of a particular space frequency, the direction from the origin to the point

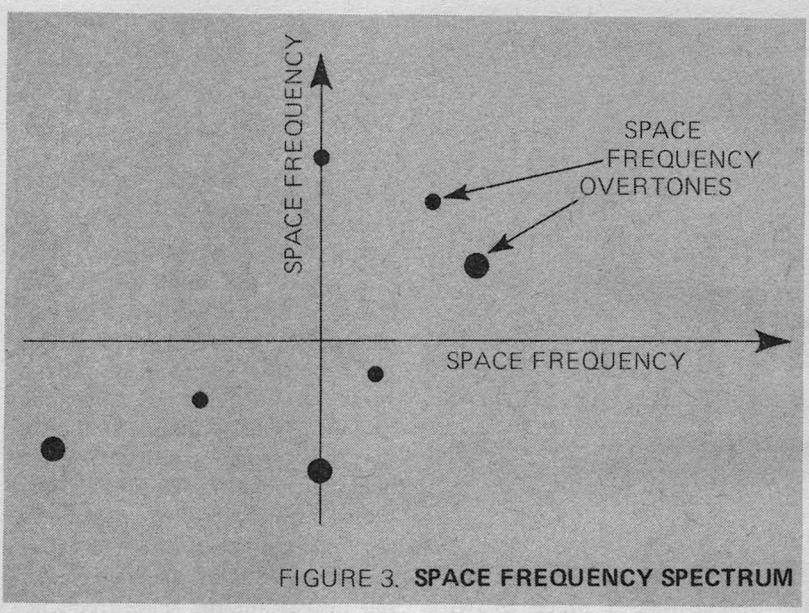


FIGURE 3. **SPACE FREQUENCY SPECTRUM**

gives the direction of that frequency, and the distance from the origin to the point indicates the frequency itself in cycles per unit of length.

The fact that most mathematical functions, such as could have been used to describe the original sound wave or picture, can be decomposed in this fashion into simple frequency spectra was one of the contributions of Jean Baptiste Fourier (1768-1830) to mathematics. The technique is known as *Fourier analysis.* It has become basic to the electronics art, and through the medium of information studies has brought electronics and optics very close together in many ways. It is a fact that a great deal of recent optical work has been done by electronics engineers, not physicists.

It turns out that the construction of an optical space-frequency analyzer is ridiculously simple. But the practical use of it had to await the coming of the laser with its two astounding properties—incredible light intensities, and, more important, coherent light.

Unlike all other sources of light, the laser generates light waves which have an appreciable coherence length. This can be of the order of a few meters. Unique possibilities are thus opened up for the use of phase information with light. One has to be a bit cunning about

the method. Neither the eye nor any other conceivable detector of light can react fast enough to detect phase directly, but the information is at least there if you can figure out how to use it. Making holograms, which is a subject only slightly outside the scope of this article, is really a stunt for doing exactly this. For that particular piece of cunning Dennis Gabor won the 1971 Nobel physics prize, and well deserved it was.

But having coherent light to work with provides a handle on the phase which can be employed in another way. By simple arrangements of lenses it can be arranged that all points of the photographic transparency mentioned before can be illuminated with light which is in the same phase. One might imagine that in this case the light beam illuminating the transparency could be represented by plane surfaces which run through all points of a cycle which have the same phase, and which move through space with the propagation of the wave. The transparency can be placed in such a beam so that it is parallel to these planes.

A light beam such as this is truly a beam. It does not spread at all, since the direction of travel of light is always perpendicular to the phase surfaces. The extremely small angle of spread of laser beams is a well-known phenomenon. Coherence is at the root of it.

A little thought shows that if you could transform such a beam so that the plane parallel phase surfaces became concentric spheres, then the directions of travel would become radial lines and the previously wide, parallel beam would converge to a single spot of light. This could be done by delaying the phase at the center of the beam by a fair amount, and the phases farther out from the center by lesser and lesser amounts so that the flat phase surfaces curved forward to make spheres. A mathematical analysis of this situation shows that if the original parallel beam has information impressed on it by passing it through the photographic transparency as mentioned, then the transformed beam converges to form exactly the Fourier space-frequency analysis plot of the transparency. This plot lies in a plane perpendicular to the direction of the parallel beam, and passing through the spot formed by the converging beam. Such a transforming device would thus form an optical space-frequency analyzer.

The common convex lens is just such a device. Being thick in the middle it slows down the light there, retarding the phase, more than it does in the thinner parts toward the rim, since light travels slower in glass than in air. The result, with a good lens, is just the spherically convergent situation described. An optical Fourier analyzer is thus extremely simple. The

only problem has been to get around to thinking of lenses in these terms.

A parallel beam passed through a lens converges to its focus at exactly the focal distance behind the lens. In order to get a good Fourier transform, it turns out that the best place to put the transparency is the same distance in front of the lens, (though anywhere else will work to some degree). If another lens identical to the first is placed one focal length behind the plane of the Fourier transform, it performs the inverse Fourier transform and an image of the original transparency appears one focal length behind this second lens. See Figure 4.

Now we can both analyze an image into its space frequency components and, using the second lens, synthesize the same image from the components. With this arrangement it is possible to block off or modify some of the components and see what happens to the synthesized image. This is called *spatial filtering.*[1]

Optical Information Processing

Supposing one had a picture upon which it was necessary to perform some correcting operation—the television image with its scan lines is a good example. There are two possible approaches. One would be to divide the picture up into tiny squares, measure the degree of blackening in each square, and go through an elaborate computer routine to generate another set of squares of various levels of grayness which could be used to form the corrected picture. In this

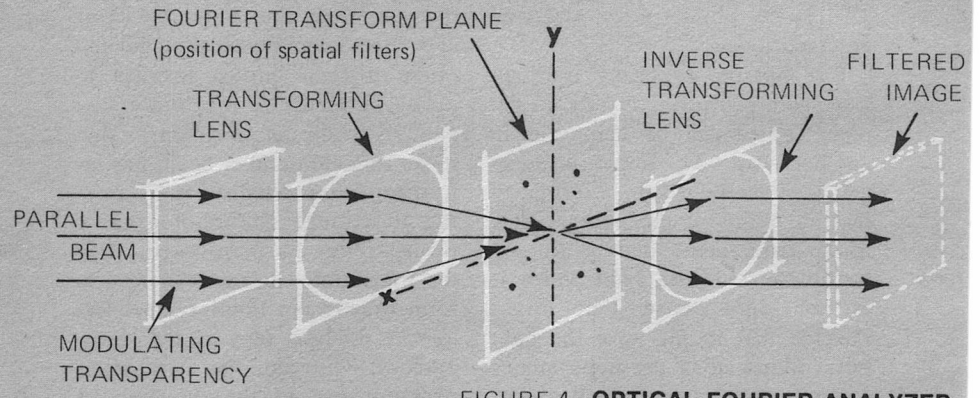


FIGURE 4. **OPTICAL FOURIER ANALYZER**

procedure the picture is in effect translated into a string of numbers which represent the grayness of each element. The computer takes up each one in turn, remembers it, corrects it with relation to others, and puts it out again.

In the case of "Mars landing" type photographs, this is the preferred procedure, because having a computer in the system gives a great deal of latitude in what you can do to the image. However, in this case one is dealing with only a few images which can be corrected at leisure after they have been recorded from the spacecraft's signals. And leisure is necessary. Converting the picture to a series of numbers requires time, computing requires more time, and still one has to turn the series of numbers of the output back into an image, requiring time again.

The other approach is the one already described—simply removing all unwanted space-frequency components by blocking them out of the plot produced by a Fourier transforming lens, and then reconstructing the corrected picture with another lens. The great advantage to this is that it is fast; all the points of the picture are processed at the same time—in parallel, if you like. With the computer operation one is restricted to handling them one after the other, serially. Furthermore, it is cheap—no computer time at all, and hence no computer, is required. Just a few lenses, a darkroom, and also a small laser.

In practice what one would do is take a photograph of the blank TV screen, showing only the scan lines. This would be made as a transparency and placed in front of the first lens of the Fourier transforming system. At the plane where its Fourier transform appears, a photographic plate would be placed. This would be exposed at the positions of all space-frequency components belonging to scan lines. After development it would be black at those positions and clear everywhere else. Then the transparency made with a picture on the TV screen would be Fourier transformed with the lens, and the developed plate replaced at the transform plane to act as a mask. It would block off all components due to the scan lines, and pass everything else. When the picture is reformed by the second lens—no scan lines! Furthermore, the same mask can be used to remove scan lines from *any* image taken from that TV. You could even project a movie record of the screen through the spatial-filtering system, and watch it as it happens, without scan lines. The computer, on the other hand would have to analyze the movie frame-by-frame, serially. No computer would be fast enough to keep up.

This type of spatial filtering is useful when you have a picture of what it is you want to remove. Electronically, it is equivalent to

band-stop filtering, since you are stopping all space frequencies in unwanted bands. Useful filtering can be performed, however, even if the exact picture of what you want to remove is not available.

Suppose you have an image which has a very small structure on it which you want to remove. Perhaps it is dust, or graininess, or perhaps the dots produced by photoengraving processes used in newspaper reproduction. Whatever it is, it is annoying, and is smaller than the detail you require to see in the picture. It happens that small objects Fourier transform to high space-frequency components. Therefore you can do as for the scan line problem, only in this case you can use as a mask simply a clear disc surrounded by an opaque field. This blocks out of the reconstruction all space-frequency components which lie a long way from the center of the transform plot, and thus correspond to high space frequencies.

This system is an optical low-pass filter. You are passing only low spatial frequencies. An optical high-pass filter is of course simply the reverse—an opaque disc on a clear field to stop spatial frequencies near the center of the transform. Such a filter would enhance dust or grain and eliminate the picture. This might sound silly, but it could be useful if what you were trying to do was count the number of dust particles deposited on a filter paper, as you might if you were monitoring air pollution by sucking a known amount of air through a filter and counting what you picked up. You could eliminate the coarse fibrous structure of the paper and concentrate on the dust. Such a system would also be of use in delineating sharp edges in images, which correspond to high space frequencies, and eliminating areas of relatively constant tone.

There is one other possibility for removing spatial frequencies—band-pass filtering. A band-pass filter, for example, might be a positive print of the mask used to remove the scan lines before. This would take any picture and eliminate everything *but* the scan lines. Again, that sounds silly, but in fact it is a very useful technique. Suppose you have a clear, high quality picture of a tank. From this you make a band-pass filter which will let through only space frequencies corresponding to this picture of a tank. If then you use this on a picture of the same tank under camouflage, it conveniently removes everything corresponding to camouflage and shows you a picture of the tank. Such a technique is highly useful in reconnaissance work. Unfortunately, this particular one has its problems, but they can be solved by another optical technique.

The tank in the picture used to make the mask must be in the same *position* in the picture you are

trying to analyze. If the tank in the picture is to the left of center, while the tank in the mask was above center, you don't get anything out. This requires you to move the picture around in the Fourier transforming apparatus to be sure you aren't missing anything. So you are back to checking things one after the other, which is a serial technique and therefore unoptical.

This problem can be neatly avoided by using a mask made slightly differently. Instead of a positive print of the Fourier transform of the target object, the tank, you use a *hologram* made from that transform. This is called a van der Lugt filter, after A. van der Lugt of the University of Michigan, where a great deal of optical processing was first done during the Sixties. Such a filter fiddles around with the Fourier transform components in such a way that it produces a bright spot wherever the target object *correlates* well with something in the image. It no longer matters where the object is. All you get is a black field with a bright spot wherever there is something that looks like a tank to the filtering system. Such a thing has all kinds of uses: aerial reconnaissance is only one.

Machine reading can be neatly performed by marrying a correlation filter to a computer. You have a series of filter holograms corresponding to each letter in the alphabet. These are used in turn to filter the information on a transparency made from a page such as this one. For each letter one gets a spot on the filtered version of the page wherever that letter occurs. It is a simple matter to detect the positions of these spots with photodiodes and feed them into the computer. Then it is up to the programmers what the machine makes of it all. If, however, you didn't have an optical correlation filter, you would have to scan each letter and use the computer to figure out what it was as well as what it all might mean.

It has even been suggested that such a system might form a basis for an associative memory system for a machine. You put something in and see how well it correlates to other things contained in the machine. The memory contents of the computer would be represented optically by black and clear checkerboard arrays where each square, being black or not, would represent the 1 and 0 of the binary number system which the machine uses.

An interesting sidelight on this system is given by this quote from a paper by Gabor, the inventor of Holography.

> "The power of this system for recognizing short fragments of coded sequences can not only be good, but it can be too good. One may have to take precautions lest a large parallel store, on being offered *one* word, offer the user *all* the long

sentences that contain that word—like the *Thesaurus Linguae Latinae** for example."

[Gabor's footnote] *"*Thesaurus Linguae Latinae,* B. G. Tuebner Verlagsgesellschaft, Leipzig (1900-1963; in progress); the publishers of this dictionary, in Latin, plan to record, with representative quotations from each author, every word in the text of each Latin author down to the Antonines with a selection of important passages from the works of all writers to the seventh century."[2]

Using these holographic filters it is possible to do another useful kind of optical filtering. Correlation of two things can be expressed mathematically in a certain way, and this mathematical procedure has a twin brother called "convolution." The convolution of two things is not intuitively graspable the way correlation is, but it is nevertheless useful. Since it is so similar to correlation, it is performed optically just as the correlation is. In fact it is performed automatically when correlation filtering is done. The field of bright spots showing where the object correlates with the mask appears on one side of the optical axis, and the convolution of the object and the mask on the other.

In a sense, convolution is the reverse of correlation. Suppose that instead of using a van der Lugt hologram filter made from some target object which you wish to locate, as was done with the machine reading system, you make the filter from an array of bright spots. Then when some image is passed through this system the result of *convolution* is an array of images at the positions of these spots. This is potentially of great use in the manufacture of solid state devices. These are made by photographic techniques on wafers of silicon. The wafers are around two inches across, while the devices themselves are only a few thousandths of an inch square. Therefore they are made thousands at a time in arrays on the wafer and cut apart later. One thus needs thousands of repetitions of the same image to contact print on this wafer. Present technique is to make thousands of successive exposures (a serial technique again), moving the plate slightly between each one, to generate the array. A convolution filter could perform this operation in one exposure, saving hours of time.

A potential use of optical filters which is now being studied is in aiding computers to perform mathematical operations much faster. It appears that it may be possible to perform such huge operations as multiplication of arrays of numbers optically, all at once. Presently computers do it serially, and use very large amounts of expensive computer time, as *each* number in one array has to be multiplied by

all the numbers in the other, one after another. If you can somehow represent each array of numbers as a field of dots, say, then the multiplication might be carried out instantaneously by optical techniques. This is rather new work.

So far we have discussed only spatial filtering, the Fourier transform of the space frequencies being doctored by some masking arrangements, and then reformed into an image. It is also possible to derive useful information about an image by looking at its Fourier transform, without reforming the image.

This technique has been used to classify aerial photographs. The problem is simple—you have a huge pile of aerial shots, most of which show nothing of interest—just natural terrain. You would like to have a computer select the ones which you should examine—that is, the ones which show man-made objects. One characteristic of man-made objects in general is that they tend to be regular—rows of houses, plow furrows in a field, patterns of trees in an orchard, even the regular spacing of the four engines on the wings of a parked aircraft. Natural terrain, on the other hand, is generally very irregular. Nothing repeats every few feet or yards, so there are no well-defined space-frequency components, just a random jumble of space frequencies that will produce a fairly uniform glow without any particular bright spots when Fourier analyzed. The regularities in man-made objects, on the other hand, produce patterns of bright spots in the transform. It is fairly easy to get a computer to recognize this situation and set a picture with such a transform aside for human examination.

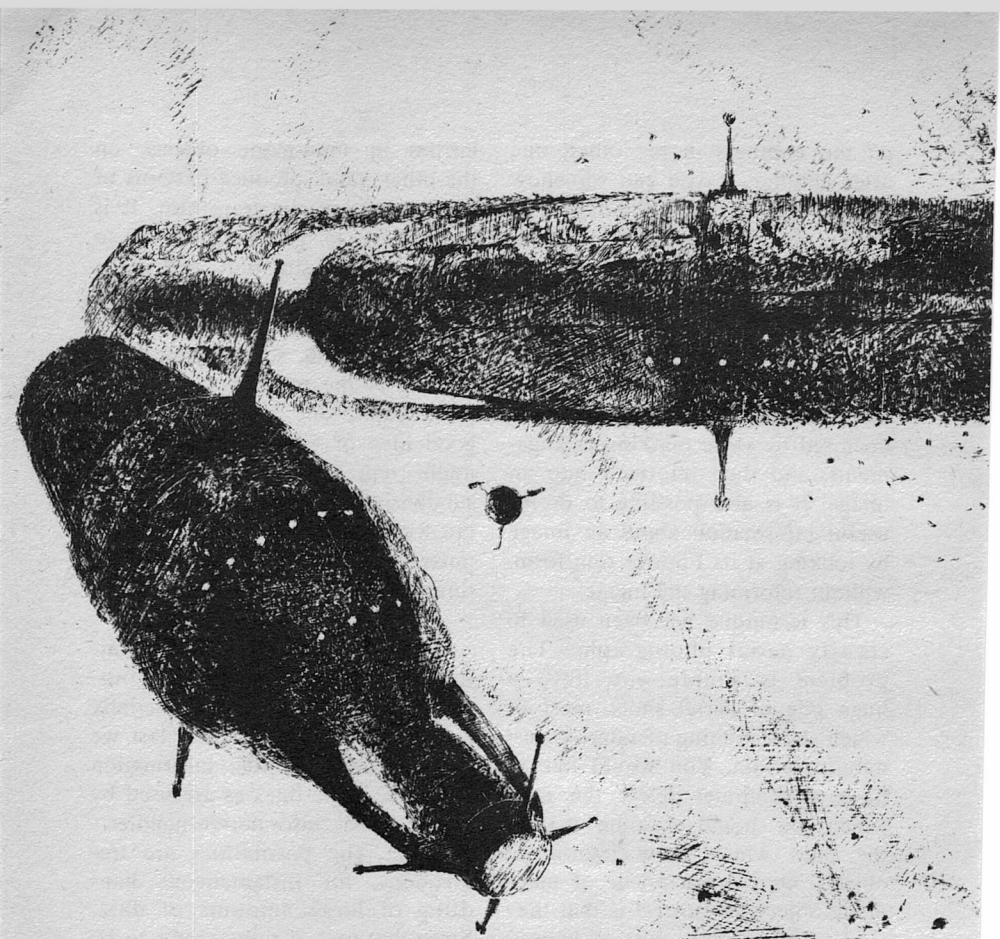
In fact, with some practice at looking at the transform of such a photograph, one can even get a good idea of what sort of thing it might represent—an orchard or a subdivision of a city, or waves in the wake of a ship. Thus the computer can even subclassify the pictures of interest to some extent.

The whole idea of processing information in this instantaneous, parallel fashion, rather than serially is really rather new. But at last we have begun to handle information along the same lines as are used by nature's best information-handler—the eye. The possibilities are tremendous, for instantaneous handling of large amounts of data. Since that sort of thing seems to be the coming problem, one can expect to see more of optical processors in the near future. ■

NOTES

[1] It is quite common to refer to what we have called "space frequencies" here, as "spatial frequencies." In the interests of clarity I have avoided that term. Unfortunately "spatial filtering" is always called by that name, barbaric as it is.

[2] D. Gabor, IBM Journal of Research and Development, March, 1969.



he fell into a dark hole

A little knowledge is a dangerous thing, but it's better than no knowledge at all.

JERRY POURNELLE


JOHN SCHOENHERR

CDSN Captain Bartholomew Ramsey watched his men check out, each man leaving the oval entry port under the satanic gaze of the master-at-arms. After nearly two years in space the men deserved something more exciting than twenty hours dirtside at Ceres Base, but they were eager for even that much. CDSS *Daniel Webster* got all the long patrols and dirty outsystem jobs in the Navy because her captain didn't protest. Now, when these men got to Luna Base and Navy Town, Lord help the local girls . . .

Well, they'd be all right here, Ramsey thought. The really expensive pleasures were reserved for Belt prospectors and the crews of Westinghouse mining ships. Bart glanced at the screens displaying ships docked at Ceres. None of the big ore-processing ships were in Thorstown. Things should be pretty quiet. Nothing Base Marines couldn't handle, even if *Daniel Webster*'s crew hadn't been on a good drunker for twenty months. Ramsey turned away from the entry port to go back to his cabin.

It was difficult to walk in the low gravity of Ceres. Very inconvenient place, he thought. But of course low gravity was a main reason for putting a Navy yard there. That and the asteroid mines . . .

He walked carefully through gray steel bulkheads to the central corridor. Just outside the bridge entrance he met Dave Trevor, the first lieutenant.

"Not going ashore?" Ramsey asked.

"No, sir." Trevor's boyish grin was infectious. Ramsey had once described it as the best crew morale booster in the Navy. And at age twenty-four Dave Trevor had been in space eleven years, as ship's boy, midshipman, and officer. He would know every pub in the Solar System and a lot outside it . . . "Never cared much for the girls on Ceres," he said. "Too businesslike."

Captain Ramsey nodded sagely. With Trevor's looks he wouldn't have to shell out money for an evening's fun anywhere near civilization. Ceres was another matter. "I'd appreciate it if you'd make a call on the provost's office, Mr. Trevor. We might need a friend there by morning."

The lieutenant grinned again. "Aye, aye, Captain."

Bart nodded and climbed down the ladder to his cabin. Trevor's merry whistling followed him until he closed the door. Once Ramsey was inside he punched a four-digit code on the intercom console.

"Surgeon's office, Surgeon's Mate Hartley, sir."

"Captain here. Make sure we have access to a good dental repair unit in the morning, Hartley. Even if we have to use Base facilities."

"Aye, aye, sir."

Ramsey switched the unit off and permitted himself a thin smile. The regeneration stimulators aboard *Daniel Webster* worked but there

was something wrong with the coding information in the dental unit. It produced buck teeth, not enormous but quite noticeable, and when his men were out drinking and some dirtpounder made a few funny remarks . . .

The smile faded as Ramsey sat carefully in the regulation chair. He glanced around the sterile cabin. There were none of the comforts other captains provided themselves. Screens, charts, built-in cabinets and tables, his desk, everything needed to run his ship, but no photographs and solidos, no paintings and rugs. Just Ramsey and his ship, his wife with the masculine name. He took a glass of whiskey from the arm of the chair. It was Scotch and the taste of burnt malt was very strong. Bart tossed it off and replaced it to be refilled. The intercom buzzed.

"Captain here."

"Bridge, sir. Call from Base Commandant Torrin."

"Put him on."

"Aye, aye, sir." The watch midshipman's face vanished and Rap Torrin's broad features filled the screen. The rear admiral looked at the bare cabin, grimaced, then smiled at Ramsey.

"I'm going to pull rank on you, Bart," Torrin said. "Expect that courtesy call in an hour. You can plan on having dinner with me, too."

Ramsey forced a smile. "Very good, sir. My pleasure. In an hour, then."

"Right." The screen went blank and Ramsey cursed. He drank the second whiskey and cursed again, this time at himself.

What's wrong with you? he thought. *Rap Torrin is as good a friend as you have in the Navy. Shipmate way back in* Ajax *under Sergei Lermontov. Now Rap has a star, well, that was expected. And Lermontov is Vice Admiral Commanding, the number two man in the whole CoDominium Space Navy.*

And so what? I could have had stars. As many as I wanted. I'm that good, or I was. And with Martin Grant's influence in the Grand Senate and Martin's brother John in charge of United States security, Senator Martin Grant's son-in-law could have had any post no matter how good . . .

Ramsey took another whiskey from the chair and looked at it for a long time. He'd once had his star, polished and waiting, nothing but formalities to go, while Rap and Sergei grinned at his good luck. Sergei Lermontov had just made junior vice admiral then. Five years ago.

Five years. Five years ago Barbara Jean Ramsey and their son Harold were due back from Meiji. Superstitiously, Bart had waited for them before accepting his promotion. When he took it he'd have to leave *Daniel Webster* for something dirtside and wait until a spacing admiral was needed. That wouldn't have been long. The Danube situation was heating up back then. Ramsey could have commanded the first punitive expedition, but it

had gone out under an admiral who botched the job. Barbara Jean had never come home from Meiji.

Her ship had taken a new direct route along an Alderson path just discovered. It never came out into normal space. A scoutcraft was sent to search for the liner, and Senator Grant had enough influence to send a frigate after that. Both vanished, and there weren't any more ships to send. Bartholomew Ramsey stayed a captain. He couldn't leave his ship because he couldn't face the empty house in Luna Base compound.

He sighed, then laughed cynically at himself. Time to get dressed. Rap wanted to show off his star, and it would be cruel to keep him waiting.

The reunion was neither more nor less than he'd expected, but Admiral Torrin cut short the time in his office. "Got to get you home, Bart. Surprise for you there. Come along, man, come along."

Bart followed woodenly. *Something really wrong with me,* he thought. *Man doesn't go on like this for five years. I'm all right aboard Old Danny Boy. It's only when I leave my ship, now why should that be?* But a man can marry a ship, even a slim steel whiskey bottle four hundred meters long and sixty across; he wouldn't be the first captain married to a cruiser.

Most of Ceres Base was underground, and Bart was lost in the endless rock corridors. Finally they reached a guarded area. They returned the Marines' salutes and went through to broader hallways lined with carpets. There were battle paintings on the walls. Some reached back to wet navy days and every CD base, insystem or out, had them. There were scenes from all the great navies of the world, Russian, Soviet, U.S., British, Japanese . . . there weren't any of Togo at Tshushima, though. Or Pearl Harbor. Or Bengal Bay.

Rap kept up his hearty chatter until they got inside his apartment. The admiral's quarters were what Bart had visualized before he entered, richly furnished, filled with the gifts and mementos that a successful independent command captain could collect on a dozen worlds after more than twenty years in service. Shells and stuffed exotic fauna, a cabinet made of the delicately veined snakewood of Tanith, a table of priceless Spartan roseteak. There was a house on Luna Base that had been furnished like this . . .

Bart caught sight of the man who entered the room and snapped to attention in surprise. Automatically he saluted.

Vice Admiral Lermontov returned the salute. The admiral was a tall, slim man who wore rimless spectacles which made his gray eyes look large and round as they bored through his subordinates. Men who served under Lermontov either loved him or hated him. Now his thin features distorted in genuine

pleasure. "Bartholomew, I am sorry to surprise you like this."

Lermontov inspected Ramsey critically. The smile faded slightly. "You have not taken proper care of yourself, my friend. Not enough exercise."

"I can still beat you. Arm wrestling, anything you name—uh, sir."

Lermontov's smile broadened again. "That is better. But you need not call me 'sir'. You would say 'sir' only to Vice Admiral Lermontov, and it is quite obvious that the Vice Admiral Commanding cannot possibly be on Ceres. So, since you have not seen me . . ."

"I see," Ramsey said.

Lermontov nodded. "It is rather important. You will know why in a few moments. Rap, can you bring us something to drink?"

Torrin nodded and fussed with drinks from the snakewood cabinet. The ringing tone of a crystal glass was very loud in the quiet apartment. Ramsey was vaguely amused as he took a seat at the roseteak table in the center of the lush room. A rear admiral waiting on a captain, and no enlisted spacers to serve the Vice Admiral Commanding, who, after all, wasn't really there in the first place . . . the whiskey was from Inverarry and was very good.

"You have been in space nearly two years," Lermontov said. "You have not seen your father-in-law in that time?"

"More like three since Martin and I really talked about anything," Ramsey said. "We—we remind each other too much of Barbara Jean and Harold."

The pain in Ramsey's face was reflected as a pale shadow in Lermontov's eyes. "But you knew he had become chairman of the appropriations committee."

"Yes."

"The Navy's friend, Grand Senator Grant. Without him these last years would have been disaster for us all. For the Navy, and for Earth as well if those politicians could only see it." Lermontov cut himself off with an angry snap. The big eyes matching his steel gray hair focused on Bart. "The new appropriations are worse," the admiral growled. "While you have been away, everything has become worse. Millington, Harmon, Bertram, they all squeeze President Lipscomb's Unity Party in your country, and Kaslov gains influence every day in mine. I think it will not be long before one or the other of the CoDominium sponsors withdraws from the treaties, Bart. And after that, war."

"War." Ramsey said it slowly, not believing. After a hundred and fifty years of uneasy peace between the United States and the Soviets, war again, and with the weapons they had . . .

"Any spark might set it off," Lermontov was saying. "We must be ready to step in. The fleet must be strong, strong enough to cope with the national forces and do whatever we must do."

Ramsey felt as if the admiral had struck him. War? Fleet intervention? "What about the Commanding Admiral? The Grand Senate?"

Lermontov shrugged. "You know who are the good men, who are not. But so long as the fleet is strong, something perhaps can be done to save Earth from the idiocy of the politicians. Not that the masses are better, screaming for a war they can never understand." Lermontov drank quietly, obviously searching for words, before he turned back to Ramsey. "I have to tell you something painful, my friend. Your father-in-law is missing."

"Missing—where? I told Martin to be careful, that Millington's Liberation Army people . . ."

"No. Not on Earth. Outsystem. Senator Grant went to Meiji to visit relatives there . . ."

"Yes." Ramsey felt the memory like a knife in his vitals. "His nephew, Barbara Jean's cousin, an officer in the Diplomatic Corps on Meiji. Grew up in the senator's home. Barbara Jean was visiting him when . . ."

"Yes." Lermontov leaned closer to Ramsey so that he could touch his shoulder for a moment. Then he took his hand away. "I do not remind you of these things because I am cruel, my friend. I must know—would the senator have tried to find his daughter? After all these years?"

Bart nodded. "She was his only child. As Harold was mine. If I thought there was any chance I'd look myself. You think he tried it?"

"We do." Lermontov signaled Torrin to bring him another drink. "Senator Grant went to Meiji with the visit to his relatives as cover. With the Japanese representation question to come up soon, and the budget after that, Meiji is important. The Navy provided a frigate for transportation. It took the usual route through Colby and around, and was supposed to return the same way. But we have confirmed reports that Senator Grant's ship went instead to the jumpoff point for the direct route."

"What captain in his right mind would let him get away with that?"

"His name was Commander John Grant, Jr. The senator's nephew."

"Oh." Bart nodded again, exaggerating the gesture as he realized the full situation. "Yeah. Johnny would do it if the old man asked. So you came all the way out here for my opinion, Sergei? I can give it quick. Senator Grant was looking for Barbara Jean. So you can write him off and whatever other plans you've got for the goddam Navy you can write off too. Learn to live without him, Sergei. The goddam jinx has another good ship and another good man. Now if you'll excuse me I want to get back to my ship and get drunk."

Captain Ramsey strode angrily toward the door. Before he reached it the vice admiral's voice crackled through the room. "Captain, you are not excused."

"Sir." Ramsey whirled automati-

cally. "Very well, sir. Your orders?"

"My orders are for you to sit down and finish your drink, Captain." There was a long silence as they faced each other. Finally Ramsey sat at the expensive table.

"Do you think so badly of me, Bart, that you believe I would come all the way out here, meet you secretly, for as little as this?"

Bart looked up in surprise. Emotions welled up inside him, emotions he hadn't felt in years, and he fought desperately to force them back. *No, God, don't let me hope again. Not that agony. Not hope . . .* But Lermontov was still speaking.

"I will let Professor Stirner explain it to you, since I am not sure any of us understand him. But he has a theory, Bart. He believes that the senator may be alive, and that there may be a chance to bring him home before the Senate knows he is missing. For years the Navy has preserved the peace, now a strong fleet is needed more than ever. We have no choice, Bart. If there is any chance at all, we must take it."

Professor Hermann Stirner was a short Viennese with thinning red hair, improbable red freckles, and a neat round belly. Ramsey thought him about fifty, but the man's age was indeterminate. It was unlikely that he was younger, but with regeneration therapy he could be half that again. Rap Torrin brought the professor in through a back entrance.

"Dr. Stirner is an intelligence adviser to the fleet," Lermontov said. "He is not a physicist."

"No, no physicist," Stirner agreed quickly. "Who would want to live under the restrictions of a licensed physicist? CoDominium intelligence officers watching every move, suppressing most of your discoveries . . ." He spoke intently giving the impression of great emotion no matter what he said. "And most physicists I have met are not seeing beyond the end of their long noses. Me, I worry mostly about politics, Captain. But when the Navy loses ships, I want to know what happened to them. I have a theory about those ships, for years."

Ramsey gripped the arms of his chair until his knuckles were white, but his voice was deadly calm. "Why didn't you bring up your theory before now?"

Stirner eyed him critically. Then he shrugged. "As I said, I am no physicist. Who would listen to me? But now, with the senator gone . . ."

"We need your father-in-law badly," Lermontov interrupted. "I do not really believe Professor Stirner's theories, but the fleet needs Senator Grant so desperately we will try anything. Let Dr. Stirner explain."

"Ja. You are a bright young CoDominium Navy captain, I am going to tell you things you know already, maybe. But I do not myself understand everything I should know, so you let me explain my own way, ja?" Stirner paced briskly for a moment,

then sat restlessly at the table. He gave no chance to answer his question, but spoke rapidly, so that he gave the impression of interrupting himself.

"You got five forces in this universe we know about, ja? Only one of them maybe really isn't in this universe, we do not quibble about that, let the cosmologists worry. Now we look at two of those forces, we can forget the atomics and electromagnetics. Gravity and the Alderson force, these we look at. Now you think about the universe as flat like this table, eh?" He swept a pudgy hand across the roseteak surface. "And wherever you got a star, you got a hill that rises slowly, gets all the time steeper until you get near the star when it's so steep you got a cliff. And you think of your ships like roller coasters. You get up on the hill, aim where you want to go, and pop on the hyperspace drivers. Bang, you are in a universe where the Alderson effect acts like gravity. You are rolling downhill, across the table, and up the side of the next hill, not using up much potential energy, so you are ready to go again somewhere else if you can get lined up right, O.K.?"

Ramsey frowned. "It's not quite what we learned as middies—you've got ships repelled from a star rather than—"

"Ja, ja, plenty of quibble we can make if we want to. Now, Captain, how is it you get out of hyperspace when you want to?"

"We don't," Ramsey said. "When we get close enough to a gravity source, the ship comes out into normal space whether we want it to or not."

Stirner nodded. "Ja. And you use your photon drivers to run around in normal space where the stars is like wells, not hills, at least thinking about gravities. Now, suppose you try to shoot past one star to another, all in one jump?"

"It doesn't work," Ramsey said. "You'd get caught in the gravity field of the in-between star. Besides, the Alderson paths don't cross each other. They're generated by stellar nuclear activities, and you can only travel along lines of equal flux. In practice that means almost line of sight, with range limits, but they aren't really straight lines . . ."

"Ja. O.K. That's what I think is happening to them. I think there is a star between A-7820 and 82 Eridani, which is the improbable name Meiji's sun is stuck with."

"Now wait a minute," Admiral Torrin protested. "There can't be a star there, Professor. There's no question of missing it, not with our observations. Man, do you think the Navy didn't look for it? A liner and an explorer class frigate vanished on that route. We looked, first thing we thought of."

"Suppose there is a star there but you are not seeing it?"

"How could that be?" Torrin asked.

"A Black Hole, Admiral. Ja," Stirner continued triumphantly, "I think Senator Grant fell into a Black Hole."

Ramsey looked puzzled. "I seem to remember hearing something about Black Holes, but I don't remember what."

"Theoretical concept," Stirner said. "Hundred, hundred and fifty years ago, before the CoDominium Treaty puts a stop to scientific research. Nobody ever finds any Black Holes, so no appropriations for licensed physicists to work on them. But way back then a man named Schwarzschild, Viennese perhaps, thinks of them." Stirner puffed with evident pride. "A Black Hole is like a neutron star that goes all the way. Collapsed down so far, down to maybe two, three kilometers, that nothing gets out of the gravity well. Infinite red shift of light. Some ways a Black Hole isn't even theoretically inside the universe."

The others looked incredulous and Stirner laughed. "You think that is strange? There was even talk once about whole galaxies collapsed to less than a tenth AU in size. They wouldn't be in the universe for real either."

"Then how would Black Holes interact with—oh," Rap Torrin said, "gravity. It still has that."

Stirner's round face bobbed in agreement. "Ja, ja, which is how we know is no black galaxy out there. Would be too much gravity, but there is plenty room for a star. Now one thing I do not understand though, why the survey ship gets through, others do not. Maybe gravity changes for one of those things, ja?"

"No, look, the Alderson path really isn't a line of sight, it can shift slightly—maybe just enough!" Torrin spoke rapidly. "If the geometry were just right, then sometimes the Hole wouldn't be in the way . . ."

"O.K.," Stirner said. "I leave that up to you Navy boys. But you see what happens, the ship is taking sights or whatever you do when you are making a jump, the captain pushes the button, and maybe you come out in normal space near this Black Hole. Nothing to see anywhere around you. *And no way to get back home.*"

"Of course." Ramsey stood, twisted his fingers excitedly. "The Alderson effect is generated by nuclear reactions. And the dark holes—"

"Either got none of those, or the Alderson force stuffs is caught inside the Black Hole like light and everything else. So you are coming home in normal space or you don't come home at all."

"Which is light-years. You'd never make it." Ramsey found himself near the bar. Absently he poured a drink. "But in that case—the ships can sustain themselves a long time on their fuel!"

"Yes." Lermontov said it carefully. "It is at least possible that Senator Grant is alive. If his frigate

dropped into normal space at a sufficient distance from the Black Hole so that it did not vanish down it."

"Not only Martin," Bart Ramsey said wonderingly. His heart pounded. "Barbara Jean. And Harold. They were on a Norden Lines luxury cruiser, only half the passenger berths taken. There should have been enough supplies and hydrogen to keep them going five years, Sergei. More than enough!"

Vice Admiral Lermontov nodded slowly. "That is why we thought you should go. But you realize that . . ."

"I haven't dared hope. I've wanted to die for five years, Sergei. Found that out about myself, had to be careful. Not fair to my crew to be so reckless. I'll go after Martin and—I'll go. But what does that do for us? If I do find them, I'll be as trapped as they are."

"Maybe. Maybe not." Stirner snorted. "Why you think we came out here, just to shake up a captain and maybe lose the Navy a cruiser? What made me think about this Black Hole business, I am questioning a transportee. Sentence to the labor market on Tanith, the charge is unauthorized scientific research. I look into all those crazies, might be something the Navy can use, ja? This one was fooling around with gravity waves, theories about Black Holes. Hard to see how the Navy could use it. I was for letting them take this one to Tanith when I start to think, we are losing those ships coming from Meiji, and click! So I pulled the prisoner off the colony ship."

"And he says he can get us home from a dark hole in blank space?" Ramsey asked. He tried to suppress the wave of excitement that began in his bowels and crept upward until he could hardly speak. Not hope! Hope was an agony, something to be dreaded. It was much easier to live with resignation . . .

"Ja. Only is not a him. Is a her. Not very attractive her. She *says* she can do this." Stirner paused significantly.

"Miss Ward hates the CoDominium, Bart," Lermontov said carefully. "With what she thinks is good reason. She won't tell us how she plans to get the ship home."

"By God, she'll tell me!" *Why can't anything be simple? To know Barbara Jean is dead, or to know what mountain to climb to save her . . .* "If I can't think of something we can borrow a State Security man from the—"

"No." Lermontov's voice was a flat refusal. "Leave aside the ethics of the situation, we need this girl's creative energies. You can't get that with brainscrubs."

"Maybe." *And maybe I'll try it anyway if nothing else works. Barbara Jean, Barbara Jean . . .* "Where is this uncooperative scientist?"

"On Ceres." Vice Admiral Lermontov stretched a long arm toward the bar and poured for everyone. Stirner swished his brandy appreciatively in a crystal snifter. "Under-

stand something, Bart," the Admiral said. "Miss Ward may not know a thing. She may hate us enough to destroy a CD ship even at the cost of her life. You're gambling on a theory we don't know exists and could be wrong even if she has one."

"So I'm gambling. My God, Sergei, do you know what I've been through these last years? It isn't normal for a man to brood like I do, you think I don't know that? That I don't know you whisper about it when I'm not around? Now you say there's a chance but it might cost my life. *You're* gambling a cruiser you can't spare, my ship is worth more to the Navy than I am."

Lermontov ignored Ramsey's evaluation, and Bart wished it had been challenged. But it was probably true, although the old Bart Ramsey was something else again, a man headed for the job Sergei held now . . .

"I am gambling a ship because if we do not get Martin Grant back in time for the appropriations hearings, I will lose more than a ship. We might lose half the fleet."

"Ja, ja," Stirner sighed. He shook his round head sadly, slowly, a big gesture. "It is not usual that one man may be so important, I do not believe in the indispensable-man theory myself. Yet, without Senator Grant I do not see how we are getting the ships in time or even keeping what we have, and without those ships . . . but maybe it is too late anyway, maybe even with the senator we cannot get the ships, or with the ships we can still do nothing when a planet full of people are determined to kill themselves."

"That's as it may be," Lermontov said. "But for now we need Senator Grant. I'll have the prisoner aboard *Daniel Webster* in four hours, Bart. You'll want to fill the tanks. Trim the crew down to minimum also. We must try this, but I do not really give very good odds on your coming home."

"STAND BY FOR JUMPOFF. Jump stations, man your jump stations." The unemotional voice of the officer of the watch monotoned through steel corridors, showing no more excitement than he would have used to announce an off-watch solido show. It took years to train that voice into Navy officers, but it made them easier to understand in battle. "Man your jump stations."

Bart Ramsey looked up from his screens as First Lieutenant Trevor ushered Marie Ward onto the bridge. She was a round, dumpy woman, her skin a faint red color. Shoulder length hair fell almost straight down to frame her face, but dark brown wisps poked out at improbable angles despite combings and hair ribbons. Her hands were big, as powerful as a man's, and the nails, chewed to the quick, were colorless. When he met her Ramsey had estimated her age in the mid-thirties and was surprised to learn she was only twenty-six.

"You may take the assistant helmsman's acceleration chair," Ramsey told her. He forced a smile. "We're about to make the jump to Meiji." In his lonely ship. She'd been stripped down, empty stations all through her.

"Thank you, Captain." Marie sat and allowed Trevor to strap her in. The routine for jumpoff went on. As he listened to the reports, Ramsey realized Marie Ward was humming.

"What is that?" he asked. "Catchy tune . . ."

"Sorry. It's an old nursery thing. 'The bear went over the mountain, the bear went over the mountain, the bear went over the mountain, to see what he could see.' "

"Oh. Well, we haven't seen anything yet."

" 'The other side of the mountain, was all that he could see.' But it's the third verse that's interesting. 'He fell into a dark hole, and covered himself over with charcoal—' "

"Warning, warning, take your posts for jumpoff."

Ramsey examined his screens. His chair was surrounded by them. "All right, Trevor, make your search."

"Aye, aye, sir."

Lieutenant Trevor would be busy for a while. He had been assigned the job of looking after Marie Ward, but for the moment Ramsey would have to be polite to her. "You haven't told us much about what we're going to see on the other side of that mountain. Why?"

"Captain, if you knew everything I did, you wouldn't need to take me along," she said. "I wish they'd hurry up. I *don't like* starjumps."

"It won't be long now—" Just what do you say to a convict genius? The whole trip out she'd been in everybody's hair, seldom talking about anything but physics. She'd asked the ship's officers about the drive, astrogation, instruments, the guns, nearly everything. Sometimes she was humorous, but more often scathingly sarcastic. And she wouldn't say a word about Black Holes, except to smile knowingly. More and more Ramsey wished he'd borrowed a KGB man from the Soviets . . .

"WARNING, WARNING. Jumpoff in one minute," the watch officer announced. Alarm bells sounded through the ship.

"Lined up, Captain," Trevor said. "For all I can tell, we're going straight through to 81 Eridani. If there's anything out there, I can't see it."

"Humph," Marie Ward snorted. "Why should you?"

"Yes, but if the Alderson path's intact, the Hole won't have any effect on us," Trevor protested. "And to the best we can measure, that path is there."

"No, no," Marie insisted. "You don't measure the Alderson path at all! You only measure the force, Lieutenant. Then your computer deduces the existence of the path from the stellar geometry. I'd have thought they'd teach you that much

anyway. And that you could remember it."

"FINAL WARNING. Ten seconds to jump." A series of chimes, descending in pitch. Marie grimaced. Her mannish hands clutched the chair arms as she braced herself. At the tenth tone everything blurred for an instant that stretched to a million years.

There is no way to record the time a jump takes. The best chronological instruments record nothing whatever. Ships vanish into the state of nonbeing conveniently called "hyperspace" and reappear somewhere else. Yet it always *seems* to take forever, and while it happens everything in the universe is wrong, *wrong,* WRONG . . .

Ramsey shook his head. The screens around his command seat remained blurred. "Jump completed. Check ship," he ordered.

Crewmen moved fuzzily to obey despite the protests of tortured nerves. Electronic equipment, computers, nearly everything complex suffers from jump induced transients although there is no known permanent effect.

"Captain, we're nowhere near Meiji!" the astrogator exclaimed. "I don't know *where* we are . . ."

"Stand by to make orbit," Ramsey ordered.

"Around *what?*" Lieutenant Trevor asked. "There's no star out there, Captain. There's nothing!"

"Then we'll orbit nothing." Ramsey turned to Marie Ward. "Well, we've found the damn thing. You got any suggestions about locating it? I'd as soon not fall into it."

"Why not?" she asked. Ramsey was about to smile politely when he realized she was speaking seriously. "According to some theories, a Black Hole is a time/space gate. You could go into it and come out—somewhere else. In another century. Or another universe."

"Is that why the hell you brought us out here? To kill yourself testing some theory about Black Holes and space/time?"

"I am here because the CoDominium Marines put me aboard," she said. Her voice was carefully controlled. "And I have no desire to test any theory. Yet." She turned to Lieutenant Trevor. "Dave, is it really true? There's no star out there at all?"

"It's true enough."

She smiled. A broad, face-cracking smile that, with the thousand meter stare in her eyes, made her look strangely happy. Insanely happy, in fact. "My God, it worked! There really is a Black Hole . . ."

"Which we haven't found yet," Trevor reminded her.

"Oh. Yes. Let's see—it should have started as about five stellar masses in size. That's my favorite theory, anyway. When it began to collapse it would have radiated over eighty percent of its mass away. X rays, mostly. Lots of them. And if it had planets, they might still be here . . . Anyway,

it should be about as massive as Sol. There won't be any radiation coming out. X rays, light, nothing can climb out of that gravity well . . . just think of it, infinite red shift! It really happens!"

"Infinite red shift," Ramsey repeated carefully. "Yes, ma'm. Now, just how do we find this source of tired light?"

"It isn't tired light! That's a very obsolete theory. Next I suppose you'll tell me you think photons slow down when they lose energy."

"No, I—"

"Because they don't. They wouldn't *be* photons if they *could* slow down. They just lose energy until they vanish."

"Fine, but *how do we find it?*"

"It can't reach out and grab you, Captain," she said. The grin wasn't as wide as before, but still she smiled softly to herself. It made her look much better, although the mocking tone didn't help Ramsey's appreciation. "It's just a star, Captain. A very small star, very dense, as heavy as most other stars, but it doesn't have any more gravity than Sol. You could get quite close and still pull away—"

"If we knew which direction was away."

"Yes. Hm-m-m. It will bend light rays, but you'd have to be pretty close to see any effect at all from that . . ."

"Astrogation!" Ramsey ordered crisply. "How do we find a star we can't see?"

"We're about dead in space relative to whatever stopped us," the astrogator told him. "We can wait until we accelerate toward it and get a vector from observation of other stars. That will take a while. Or we can see if it's left any planets, but with nothing to illuminate them they'll be hard to find—"

"Yeah. Do the best you can, Mister." Marie Ward was still looking happily at the screens. They showed absolutely nothing. Ramsey punched another button in the arm of his command chair.

"Comm room, sir."

"Eyes, there are ships out there somewhere." *God, I hope there are. Or one ship.* "Find them and get me communications."

"Aye, aye, sir. I'll use the distress frequencies. They might be monitoring those."

"Right. And Eyes, see if your bright electronics and physics boys can think of a way to detect gravity. So far as I can make out that's the only effect that Black Hole has on the real universe."

"On *our* real universe, Captain," Marie Ward said.

"Huh?"

"On *our* real universe. Imagine a universe in which there are particles with non-zero rest masses able to move faster than light. Where you get rid of energy to go faster. Sentient beings in that universe would think of it as real. It might even be where our ships go when they make an Alderson jump. And the Black

Holes could be gates to get you there."

"Yes, Miss Ward," Ramsey said carefully. Two enlisted spacers on the other side of the bridge grinned knowingly at each other and waited for the explosion. They'd been waiting ever since Marie Ward came aboard, and it ought to be pretty interesting. But Ramsey's voice became even softer and more controlled. "Meanwhile, have you any useful suggestions on what we should do now?"

"Find the Hole, of course. Your astrogator seems quite competent. His approach is very reasonable. Yes, quite competent. For a Navy man."

Carefully, his hands moving very slowly, Captain Bartholomew Ramsey unstrapped himself from his command chair and launched himself across the bridge to the exit port. "Take the con, Mr. Trevor," he said. And left.

For fifty hours *Daniel Webster* searched for the other ships. Then, with no warning at all, Ramsey was caught in the grip of a giant vise.

For long seconds he felt as if titanic hands were squeezing him. They relaxed, ending the agony for a brief moment. And tried to pull him apart. The screens blurred, and he heard the sound of rending metal as the hands alternately crushed, then pulled.

Somehow the watch officer sounded General Quarters. Klaxons blared through the ship as she struggled with her invisible enemy. Ramsey screamed, as much in rage and frustration as pain, hardly knowing he had made a sound. He had to take control of his ship before she died, but there were no orders to give. This was no attack by an enemy, but what, what?

The battle damage screen flared red. Ramsey was barely able to see as it showed a whole section of the ship's outer corridors evacuated to space. How many men were in there? Most wouldn't be in armor. *My God!* Daniel Webster *too? My wife and now my ship?*

Slowly it faded away. Ramsey pulled himself erect. Around him on the bridge the watch crew slumped at their stations. The klaxons continued, adding their confusion, until Ramsey shut them off.

"What—what was it?" Lieutenant Trevor gasped. His usually handsome features were contorted with remembered pain, and he looked afraid.

"All stations report damage," Ramsey ordered. "I don't know what it was, Lieutenant."

"I do!" Marie Ward gasped excitedly. Her eyes darted about in wonder. "I know! Gravity waves from the Black Hole! A tensor field! And these were tensor, not scalar—"

"Gravity waves?" Ramsey asked stupidly. "But gravity waves are weak things, only barely detectable."

Marie Ward snorted. "In your experience, Captain. And in mine. But

according to one Twentieth Century theory—they had lots of theories then, when intellectuals were free, Captain—according to one theory if a Black Hole is rotating and a mass enters the Schwarzschild Limit, part of the mass will be converted to gravity waves. *They* can escape from the Hole and affect objects outside it. So can Alderson forces, I think. But they didn't know about the Alderson force then . . ."

"But—is that going to happen again?" Ramsey demanded. Battle damage reports appeared on his screens. "We can't live through much of that."

"I really don't know how often it will happen," Marie answered. She chewed nervously on her right thumbnail. "I do know one thing. We have a chance to get home again."

"Home?" Ramsey took a deep breath. That depended on what had been done to Danny Boy. A runner brought him another report. Much of the ship's internal communications were out, but the chief engineer was working with a damage-control party. Another screen came on, and Ramsey heard the bridge speaker squawk.

"Repairable damage to normal space drive in main engine room," the toneless voice said. "Alderson drive appears unaffected."

"Gunnery reports damage to laser lenses in number one battery. No estimate of time to repair."

Big rigid objects had broken. Ramsey later calculated the actual displacement at less than a millimeter/meter; not very much, but enough to damage the ship and kill half a dozen crewmen unable to get into battle armor. Explosive decompression wasn't a pretty death, but it was quick.

With all her damage, *Daniel Webster* was only hurt. She could sail, his ship wasn't dead. Not yet. Ramsey gave orders to the damage control parties. When he was sure they were doing everything they could he turned back to the dumpy girl in the assistant helmsman's seat.

"How do we get home?"

She had been scribbling on a pad of paper, but her pencil got away from her when she tried to set it down without using the clips set into the arm of the seat. Now she stared absently at her notes, a thin smile on her lips. "I'm sorry, Captain. What did you say?"

"I asked, how do we get home?"

"Oh." She tried to look serious but only succeeded in appearing sly. "I was hasty in saying that. I don't know."

"Sure. Don't you want to get home?"

"Of course, Captain. I'd just love to get back on a colony ship. I understand Tanith has such a wonderful climate."

"Come off it. The Navy doesn't forget people who've helped us. You aren't going to Tanith." He took a deep breath. "We have a rescue mission, Miss Ward. Some of those

people have been out here for five years." Five years of that? Nobody could live through five years of that. *O God, where is she? Crushed, torn apart, again and again, her body drifting out there in black space without even a star? Rest eternal grant them, O Lord, and let light perpetual shine upon them . . .*

"How do we get home?"

"I told you, I don't know."

But you do. And come to think of it, so do I. "Miss Ward, you implied that if we knew when a mass would enter the Black Hole, we could use the resulting Alderson forces to get us out of here."

"I'll be damned." She looked at Ramsey as if seeing him for the first time. "The man can actually—yes, of course." She smiled faintly. "I *thought* so before we left Ceres. Theory said that would work . . ."

"But we'd have to know the timing rather precisely, wouldn't we?"

"Yes. Depending on the size of the mass. The larger it is, the longer the effect would last. I think. Maybe not, though."

Ramsey nodded to himself. There was only one possible mass whose entry into the Hole they could predict. "Trevor."

"Sir?"

"One way you might amuse yourself is in thinking of ways to make a ship impact a solar mass not much more than two kilometers in diameter; a star you can't see and whose location you can't know precisely."

"Aye, aye, skipper." Dave Trevor frowned. He didn't often do that and it distorted his features. "Impact, Captain? But unless you were making corrections all the way in, you'd probably miss—as it is, the ship would pick up so much velocity that it's more likely to whip right around—"

"Exactly, Lieutenant. But it's the only way home."

One hundred and eight hours after breakout Chief Yeoman Karabian located the other ships. *Daniel Webster*'s call was answered by the first frigate sent out to find the Norton liner:

"DANIEL WEBSTER THIS IS HENRY HUDSON BREAK BREAK WE ARE IN ORBIT ELEVEN ASTRONOMICAL UNITS FROM WHATEVER THAT THING DOWN THERE IS STOP WE WILL SEND A CW SIGNAL TO GIVE YOU A BEARING STOP

"THE NORTON LINER LORELEI AND CDSN CONSTELLATION ARE WITH US STOP YOUR SIGNAL INDICATES THAT YOU ARE LESS THAN ONE AU FROM THE DARK STAR STOP YOU ARE IN EXTREME DANGER REPEAT EXTREME DANGER STOP ADVISE YOU MOVE AWAY FROM DARK STAR IMMEDIATELY STOP THERE ARE STRONG GRAVITY FLUXES NEAR THE DARK STAR STOP THEY CAN TEAR YOU APART STOP ONE SCOUTSHIP ALREADY DESTROYED BY GRAVITY WAVES STOP REPEAT ADVISE YOU MOVE AWAY FROM DARK STAR IMMEDIATELY AND HOME ON OUR CW SIGNAL STOP

"REQUEST FOLLOWING INFORMATION COLON WHO IS MASTER ABOARD DANIEL WEBSTER INTERROGATIVE BREAK BREAK MESSAGE ENDS."

Ramsey read the message on his central display screen, then punched the intercom buttons. "Chief, get this out:

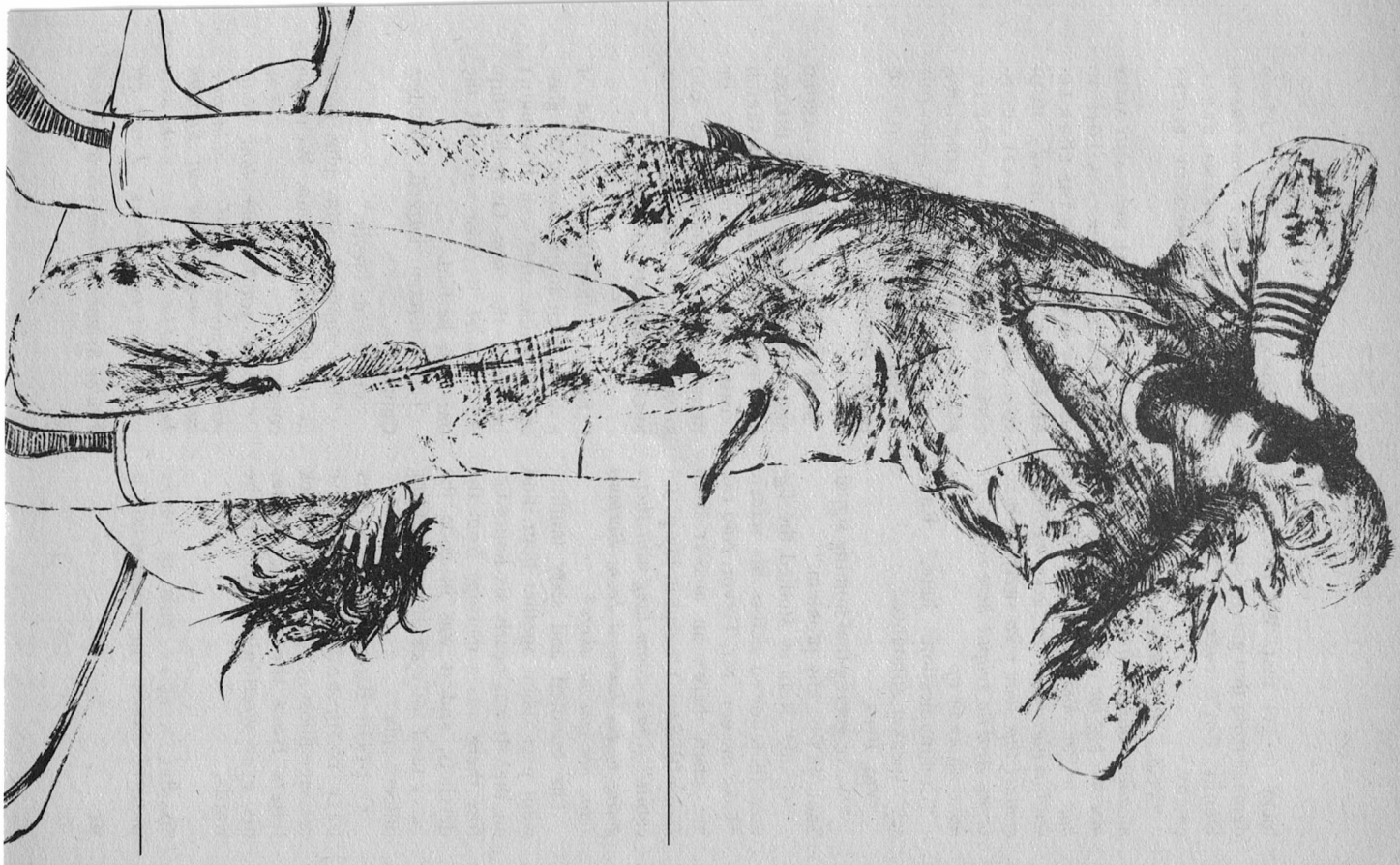
"HENRY HUDSON THIS IS DANIEL WEBSTER BREAK BREAK CAPTAIN BARTHOLOMEW RAMSEY COMMANDING STOP WE WILL HOME ON YOUR BEACON STOP HAVE EXPERIENCED GRAVITY STORM ALREADY STOP SHIP DAMAGED BUT SPACEWORTHY STOP

"IS SENATOR MARTIN GRANT ABOARD CONSTELLATION INTERROGATIVE IS MRS RAMSEY THERE INTERROGATIVE BREAK MESSAGE ENDS."

The hundred-and-sixty-minute round trip for message and reply would be a lifetime.

"Trevor, get us moving when you've got that beacon," Ramsey ordered. "Pity he couldn't tell us about the gravity waves before we found out the hard way."

"Yes, sir." The acceleration alarm rang through the ship as Trevor prepared the new course. "We can only make about a half G, Captain. We're



lucky to get that. We took more damage from that gravity storm than Danny Boy's ever got from an enemy."

"Yeah." *Pity indeed. But communications did all they could. Space is just too big for omni signals, and we had maser damage to boot. Had to send in narrow cones, lucky we made contact this soon even sweeping messages. And no ecliptic here either. Or none we know of.*

"Communications here," Ramsey's speaker announced.

"Yes, Eyes."

"We're getting that homing signal. Shouldn't be any problem."

"Good." Ramsey studied the figures that flowed across his screen. "Take the con, Mr. Trevor. And call me when there's an answer from *Henry Hudson.* I'll wait in my patrol cabin." *And a damn long wait that's going to be. Barbara Jean, Barbara Jean, are you out there?*

The hundred and sixty minutes went past. Then another hour, and another. It was nearly six hours before there was a message from the derelicts; and it was in code the Navy used for eyes of commanding officers only.

Captain Ramsey sat in his bare room and stared at the message flimsy. In spite of the block letters from the coding printer his eyes wouldn't focus on the words.

"DANIEL WEBSTER THIS IS HENRY HUDSON BREAK THE FOLLOWING IS PERSONAL MESSAGE FOR CAPTAIN BARTHOLOMEW RAMSEY FROM GRAND SENATOR MARTIN GRANT BREAK BREAK PERSONAL MESSAGE BEGINS

"BART WE ARE ALL HERE AND ALIVE STOP THE SCOUTSHIP WAS LOST TO GRAVITY WAVES STOP THE LINER LORELEI THE FRIGATE HENRY HUDSON AND THE FRIGATE CONSTELLATION ARE DAMAGED STOP LORELEI IN SPACEWORTHY CONDITION WITH MOST OF CREW SURVIVING DUE TO HEROIC EFFORTS OF MASTER OF HENRY HUDSON STOP

"BOTH BARBARA JEAN AND HAROLD ARE WELL STOP REGRET TO INFORM YOU THAT BARBARA JEAN MARRIED COMMANDER JAMES HARRIMAN OF HENRY HUDSON THREE YEARS AGO STOP BREAK END PERSONAL MESSAGE BREAK BREAK MESSAGE ENDS."

Ramsey automatically reached for a drink, then angrily tossed the glass against a bare steel wall. It wouldn't be fair to the crew. Or to his ship. And *Daniel Webster* was still the only wife he had.

The intercom buzzed. "Bridge, Captain."

"Go ahead, Trevor."

"Two hundred eighty plus hours to rendezvous, Captain. We're on course."

"Thank you." *Damn long hours those are going to be. How could she—but that's simple. For all Barbara Jean could know she and the boy were trapped out here forever. I can bet*

there were plenty of suicides on those ships. And the boy would be growing up without a father.

Not that I was so much of one. Half the time I was out on patrol anyway. But I was home when he caught pneumonia from going with us to Ogden Base. Harold just had to play in that snow . . .

He smiled in remembrance. They'd built a snowman together. But Harold wasn't used to Earth gravity, and that more than the cold weakened him. The boy never did put in enough time in the centrifuge on Luna Base. Navy kids grew up on the Moon because the Navy was safe only among its own . . .

Ramsey made a wry face. Hundreds of Navy kids crowding into the big centrifuge . . . they were hard to control, and Barbara Jean like most mothers hated to take her turn minding them. She needed a hairdo. Or had to go shopping. Or something . . .

She should have remarried. Of course she should. He pictured Barbara Jean with another man. *What did she say to him when they made love? Did she use the same words? Like our first time, when we—oh, damn.*

He fought against the black mood. *Harriman. James Harriman. Fleet spatball champ seven years ago. A good man. Tough. Younger than Barbara Jean. Harriman used to be a real comer before he vanished. Never married and the girls at Luna Base forever trying to get—never married until now.*

Stop it! Would you rather she was dead? The thought crept through unwanted. *If you would, you'll godammit not admit it, you swine. Not now and not ever.*

She's alive! Bart Ramsey, you remember that and forget the rest of it. Barbara Jean is alive!

Savagely he punched the intercom buttons.

"Bridge. Aye, aye, Captain."

"We on course, Mister?"

"Yes, sir."

"Damage control parties working?"

"Yes, sir." Trevor's voice was puzzled. He was a good first lieutenant, and it wasn't like Ramsey to ride him . . .

"Excellent." Ramsey slapped the off button, waited a moment, and reached for another whiskey. This time he drank it. And waited.

There was little communication as *Daniel Webster* accelerated, turned over, and slowed again to approach the derelicts. Messages took energy, and they'd need it all. To get out, or to survive if Marie Ward proved wrong with her theories. Someday there'd be a better theory. Lermontov might come up with something, and even now old Stirner would be examining ancient records at Stanford and Harvard. If Ward was wrong, they still had to survive . . .

"Getting them on visual now," the comm officer reported. The unemotional voice broke. "Good God, Captain!"

Ramsey stared at the screens. The derelicts were worse than he could have imagined. *Lorelei* was battered, although she seemed intact, but the other ships seemed *bent.* The frigate *Constellation* was a wreck, with gaping holes in her hull structure. *Henry Hudson* was crumpled, almost unrecognizable. The survivors must all be on the Norton liner.

Ramsey watched in horror as the images grew on the screens. *Five years, with all hope going, gone. Harriman must be one hell of a man to keep anyone alive through that.*

When they were alongside Navy routine carried Ramsey through hours that were lifetimes. Like one long continuous Jump. Everything *wrong.*

Spacers took *Daniel Webster*'s cutter across to *Lorelei* and docked. After another eternity she lifted away with passengers. CDSN officers, one of the merchant service survivors from *Lorelei*—and the others. Senator Grant. Johnny Grant. Commander Harriman. Barbara Jean, Harold—and Jeanette Harriman, age three.

"I'll be in my cabin, Trevor."

"Yes, sir."

"And get some spin on the ship as soon as that boat's fast aboard."

"Aye, aye, sir."

Ramsey waited. Who would come? It was his ship, he could send for anyone he liked. Instead he waited. Let Barbara Jean make up her own mind. Would she come? And would Harriman be with her?

Five years. Too long, he's had her for five years. But we had ten years together before that. Damned if I don't feel like a Middie on his first prom.

He was almost able to laugh at that.

The door opened and she came in. There was no one with her, but he heard voices in the corridor outside. She stood nervously at the bulkhead, staring around the bare cabin, at the empty desk and blank steel walls.

Her hair's gone. The lovely black hair that she never cut, whacked off short and tangled—God, you're beautiful. Why can't I say that? Why can't I say anything?

She wore shapeless coveralls, once white, but now grimy, and her hands showed ground-in dirt and grease. They'd had to conserve water, and there was little soap. Five years is a long time to maintain a closed ecology.

"No pictures, Bart? Not even one of me?"

"I—I thought you were dead." He stood, and in the small cabin they were very close. "There wasn't anybody else to keep a picture of."

Her tightly kept smile faded. "I—I would have waited, Bart. But we were dead. I don't even know why we tried to stay alive. Jim drove everybody, he kept us going, and then—he needed help."

Ramsey nodded. It was going to be all right. Wasn't it? He moved closer and put his hands on her shoulders, pulling her to him. She responded woodenly, then broke away.

"Give me—give me a little time to get used to it, Bart."

He backed away from her. "Yeah. The rest of you can come in now," he called.

"Bart, I didn't mean—"

"It's all right, Barbara Jean. We'll work it out." Somehow.

The boy came in first. He was very hesitant. Harold didn't look so very different. He still had a round face, a bit too plump. But he was *big.* And he was leading a little girl, a girl with dark hair and big round eyes, her mother's eyes.

Harold stood for a long moment. "Sir—ah," he began formally, but then he let go of the girl and rushed to his father. "Daddy! I knew you'd come get us, I told them you'd come!" He was tall enough that his head reached Bart's shoulder, and his arms went all the way around him.

Finally he broke away. "Dad, this is my little sister." He said it defiantly, searchingly, watching his father's face. Finally he smiled. "She's a nuisance sometimes, but she grows on you."

"I'm sure she does," Ramsey said. It was very still in the bare cabin. Ramsey wanted to say something else, but he had trouble with his voice.

Daniel Webster's wardroom was crowded. There was barely room at the long steel table for all the surviving astrogation officers to sit with Ramsey, Senator Grant, and Marie Ward. They waited tensely.

The senator was thinner than Ramsey had ever seen him despite the short time he'd been marooned. *Constellation* had been hit hard by a gravity storm—it was easier to think of them that way, although the term was a little silly. Now the senator's hands rested lightly on the wardroom table, the tips of the fingers just interlocked, motionless. Like everyone else Senator Grant watched Commander Harriman.

Harriman paced nervously. He had grown a neatly trimmed beard, brown, with both silver and red hairs woven through it. His uniform had been patched a dozen times, but it was still the uniform of the Service, and Harriman wore it proudly. There was no doubt of who had been in command.

"The only ship spaceworthy is *Lorelei,*" Harriman reported. "*Henry Hudson* was gutted to keep *Lorelei* livable, and Johnny Grant's *Constellation* took it hard in the gravity storms before we could get him out far enough from that thing."

Senator Grant sighed loudly. "I hope never to have to live through anything like that again. Even out this far you can feel the gravity waves, although it's not dangerous. But in close, before we knew where to go . . ."

"But *Lorelei* can space?" Ramsey asked. Harriman nodded. "Then *Lorelei* it'll have to be. Miss Ward, explain what it takes to get home again."

"Well, I'm not *sure,* Captain. I think we should wait."

"We can't wait. I realize you want to stay out here and look at the Black Hole until doomsday, but these people want to go home. Not to mention my orders from Lermontov."

Reluctantly she explained her theory, protesting all the while that they really ought to make a better study. "And the timing will have to be perfect," she finished. "The ship must be at the jumpoff point and turn on the drive at just the right time."

"Throw a big mass down the hole," Harriman said. "Well, there's only the one mass to throw. *Lorelei.*" He stopped pacing for a moment and looked thoughtful. "And that means somebody has to ride her in."

"Gentlemen?" Ramsey looked around the table. One by one the astrogation officers nodded mutely. Trevor, seeing his captain's face, paused for a long second before he also nodded agreement.

"There's no way to be sure of a hit if we send her in on automatic," Trevor said. "We can't locate the thing close enough from out here. We can't send *Lorelei* on remote, either. The time lag's too long."

"Couldn't you build some kind of homing device?" Senator Grant asked. His voice was carefully controlled, and it compelled attention. In the Grand Senate, Martin Grant's speeches were worth listening to, although senators usually voted from politics anyway.

"What would you home on?" Marie asked caustically. "There's nothing to detect. In close enough you should see bending light rays, but I'm not sure. I'm just not sure of anything, but I know we couldn't build a homing device."

"Could we wait for a gravity storm and fly out on that?" Trevor asked. "If we were ready for it, we could make the jump . . ."

"Nonsense," Harriman snapped. "Give me credit for a little sense, Lieutenant. We tried that. I didn't know what we were up against, but I figured those were gravity waves after they'd nearly wrecked my ships. Where there's gravity there may be Alderson forces. But you can't predict the damn gravity storms. We get one every thousand hours, sometimes close together, sometimes a long time apart, but about a thousand-hour average. How can you be in position for a jump when you don't know it's coming? And the damn gravity waves do things to the drives."

"Every thousand hours!" Marie demanded excitedly. "But that's impossible! What could cause that—so much matter! Commander Harriman, have you observed asteroids in this system?"

"Yeah. There's a whole beehive of them, all in close to the dark star. Thousands and thousands of them, it looks like. But they're *really* close, it's a swarm in a thick plane, a ring about ten kilometers thick. It's hard to observe anything, though. They

move so fast, and if you get in close the gravity storms kill you. From out here we don't see much."

"A ring—are they large bodies?" Marie asked. Her eyes shone.

Harriman shrugged. "We've bounced radar off them and we deduce they're anywhere from a few millimeters to maybe a full kilometer in diameter, but it's hard to tell. There's nothing stable about the system, either."

Marie chewed both thumbnails. "There wouldn't be," she said. She began so softly that it was difficult to hear her. "There wouldn't be if chunks keep falling into the Hole. Ha! We won't be able to use the asteroids to give a position on the Black Hole. Even if you had better observations, the Hole is rotating. There must be enormous gravitational anomalies."

Harriman shrugged again, this time helplessly. "You understand, all we ever really observed was some bending light and a fuzzy occultation of stars. We deduced there was a dark star, but there was nothing in our data banks about them. Even if we'd known what a Black Hole was, I don't know how much good it would have done. I burned out the last of the Alderson drives three years ago trying to ride out. We were never in the right position . . . I was going to patch up *Constellation* and have another stab at it."

Just like that, Ramsey thought. *Just go out and patch up that wreck of a ship.* How many people would even try, much less be sure they could . . . so three years ago they'd lost their last hope of getting out of there. And after that, Barbara Jean had . . .

"Did you ever try throwing something down the Hole yourself?" Trevor asked.

"No. Until today we had no idea what we were up against. I still don't, but I'll take your word for it." Harriman drew in a deep breath and stopped pacing. "I'll take *Lorelei* down."

Bart looked past Harriman to a painting on the wardroom bulkhead. Trevor had liked it and hung it there long ago. John Paul Jones strode across the blazing decks of his flagship. Tattered banners blew through sagging rigging, blood ran in the scuppers, but Jones held his old cutlass aloft.

Well, why not? Somebody's got to do it, why not Harriman? But—but what will Barbara Jean think?

"I want to go too." Marie Ward spoke softly, but everyone turned to look at her. "I'll come with you, Commander Harriman."

"Don't be ridiculous," Harriman snapped.

"Ridiculous? What's ridiculous about it? This is an irreplaceable opportunity. We can't leave the only chance we'll ever have to study Black Holes for an amateur. There is certainly nothing ridiculous about a trained observer going." Her voice softened. "Besides, you'll be too

busy with the ship to take decent observations."

"Miss Ward." Harriman compelled attention although it was difficult to say exactly why. Even though Ramsey was senior officer present, Harriman seemed to dominate the meeting. "Miss Ward, we practically rebuilt *Lorelei* over the past five years. I doubt if anyone else could handle her, so I've *got* to go. But just why do you want to?"

"Oh—" the arrogant tone left her voice. "Because this is my one chance to do something important. Just what am I? I'm not pretty." She paused, as if she hoped someone would disagree, but there was only silence.

"And no one ever took me seriously as an intellectual. I've no accomplishments at all. No publications. Nothing. But as the only person ever to study a Black Hole, I'll be recognized!"

"You've missed a point." Ramsey spoke quickly before anyone else could jump in. His voice was sympathetic and concerned. "We take you seriously. Admiral Lermontov took you so seriously he sent this cruiser out here. And you're our only expert on Black Holes. If Commander Harriman's attempt fails or for any other reason we don't get out of this system on this try, you'll have to think of something else for us."

"But—"

Harriman clucked his tongue impatiently. "Will *Lorelei* be mass enough, Miss Ward?"

"I don't know." She'd answered softly, but when they all stared at her she pouted defensively. "Well, I don't! How could I! There should be more than enough energy but I don't *know*!" Her voice rose higher. "If you people hadn't suppressed everything we'd have more information. But I've had to work all by myself, and I—"

Dave Trevor put his hand gently on her arm. "It'll be all right. You haven't been wrong yet."

"Haven't I?"

Senator Grant cleared his throat. "This isn't getting us anywhere at all. We have only one ship capable of sailing down to that Hole and only one theory of how to get away from here. We'll just have to try it."

There was a long silence before Bart spoke. "You sure you want to do this, Commander?" Ramsey cursed himself for the relief he felt, knowing what Harriman's answer would be.

"I'll do it, Captain. Who else could? Let's get started."

Ramsey nodded. *If 'twere done, 'twere best done quickly . . . what was that from? Shakespeare?* "Mr. Trevor, take an engineering crew over to *Lorelei* and start making her ready. Get all the ships' logs too."

"Logs!" Marie smiled excitedly. "Dave, I want to see those as soon as possible."

As Trevor nodded agreement, Ramsey waved dismissal to the officers. "Commander Harriman, if you'd stay just a moment . . ."

The wardroom emptied. There was a burst of chatter as the others left. Their talk was too spirited, betraying their relief. *They* didn't have to take *Lorelei* into a Black Hole. Ramsey and Harriman sat for what seemed like a long time.

"Is there something I can say?" Ramsey asked.

"No. I'd fight you for her if there wasn't a way home. But if there's any chance at all—you'll take care of Jeanette, of course." Harriman looked at the battered mug on the table, then reached for the coffee pot. After years in space he didn't notice the strange angle the liquid made as it flowed into the cup under spin gravity. "That's fine coffee, Captain. We ran out, must be three, four years ago. You get to miss coffee after a while."

"Yeah." *What the Hell can I say to him? Do I thank him for not making me order him to take that ship in? He really is the only one who could do it, and we both knew that.* Unwanted, the image of Barbara Jean in this man's arms came to him. Ramsey grimaced savagely. "Look, Harriman, there's got to be some way we can—"

"There isn't and we both know it. Sir. Even if there were, what good would it do? We can't both go back with her."

And I'm glad it's me who's going home, Ramsey thought. *Hah. The first time in five years I've cared about staying alive. But will she ever* really *be mine again?*

Was that all that was wrong with me?

"Your inertial navigation gear working all right?" Harriman asked. "Got an intact telescope?"

"Eh? Yeah, sure."

"You shouldn't have too much trouble finding the Jumpoff point, then."

"I don't expect any." Marie Ward's ridiculous song came back to him. 'He fell into a dark hole, and covered himself over with charcoal, he went back over the mountain—' But Harriman wouldn't be going back over the mountain. Or would he? What was a Black Hole, anyway? Could it really be a time tunnel?

Harriman poured more coffee. "I better get over to *Lorelei* myself. Can you spare a pound of coffee?"

"Sure."

Harriman stood. He drained the mug. "Don't see much point in coming back to *Daniel Webster* in that case. Your people can plot me a course and send it aboard *Lorelei.*" He flexed his fingers as if seeing them for the first time, then brushed imaginary lint from his patched uniform. "Yeah. I'll go with the cutter. Now."

"Now? But don't you want to—"

"No, I think not. What would I say?" Harriman very carefully put the coffee mug into the table rack. "Tell her I loved her, will you? And be sure to send that coffee over. Funny the things you can get to miss in five years."

"DANIEL WEBSTER THIS IS LORELEI BREAK BREAK TELL TREVOR HIS COURSE WAS FINE STOP I APPEAR TO BE ONE HALF MILLION KILOMETERS FROM THE BLACK HOLE WITH NO OBSERVABLE ORBITAL VELOCITY STOP WILL PROCEED AT POINT 1G FROM HERE STOP STILL CANNOT SEE THAT BEEHIVE AT ALL WELL STOP NOTHING TO OBSERVE IN BEST CALCULATED POSITION OF BLACK HOLE STOP TELL MARIE WARD SHE IS NOT MISSING A THING STOP BREAK MESSAGE ENDS."

Barbara Jean and her father sat in Captain Ramsey's cabin. Despite the luxury of a shower she didn't feel clean. She read the message flimsy her father handed her.

"I ought to say something to him, hadn't I? Shouldn't I? Dad, I can't just let him die like this."

"Leave him alone, kitten," Senator Grant told her. "He's got enough to do, working that half-dead ship by himself. And he has to work fast. One of those gravity storms while he's this close and—" Grant shuddered involuntarily.

"But—God, I've made a mess of things, haven't I?"

"How? Would you rather it was Bart taking that ship in there?"

"No. No, no, no! But I still—wasn't there any other way, Daddy? Did somebody *really* have to do it?"

"As far as I can tell, Barbara Jean. I was there when Jim volunteered. Bart tried to talk him out of it, you know."

She didn't say anything.

"You're right, of course," Grant sighed. "He didn't try very hard. There wasn't any point in it anyway. Commander Harriman was the obvious man to do it. You didn't enter the decision at all."

"I wish I could believe that."

"Yes. So does your husband. But it's still true. Are you coming down to the bridge? I don't think it's a good idea, but you can."

"No. You go on, though. I have to take care of Jeanette. Bill Hartley has her in the sick bay. Daddy, what am I going to do?"

"You're going to go home with your husband and be an admiral's lady. For a while, anyway. And when there aren't any admirals because there isn't any fleet, God knows what you'll do. Make the best of it like all the rest of us, I guess."

The bridge was a blur of activity as they waited for *Lorelei* to approach the Black Hole. As the minutes ticked off, tension grew. A gravity storm just now would wipe out their only chance.

Finally Ramsey spoke. "You can get the spin off the ship, Mr. Trevor. Put the crew to jump stations."

"Aye, aye, sir."

"Can we talk to Harriman still?" Senator Grant asked.

Ramsey's eyes flicked to the screens, past the predicted time of impact to the others, taking in every detail. "No." He continued to look at the data pouring across the screens. Their position had to be right. Ev-

erything had to be right, they'd get only the one chance at best . . . "Not to get an answer. You could get a message to *Lorelei* but before we'd hear a reply it'll be all over."

Grant looked relieved. "I guess not, then."

"Damnedest thing." Harriman's voice was loud over the bridge speaker. "Star was occulted by the Hole. Made a bright ring in space. Real bright. Just hanging there, never saw anything like it."

"Nobody else ever will," Marie Ward said quietly. "Or will they? Can the Navy send more ships out here to study it? Oh, I wish I could *see*!"

They waited forever until Harriman spoke again. "Got a good position fix," they heard. "Looks good, Ramsey, damn good."

"Stand by for jumpoff," Bart ordered. Alarm bells rang through *Daniel Webster.*

"Another bright ring. Must be getting close."

"What's happening to his voice?" Senator Grant demanded.

"Time differential," Marie Ward answered. "His ship is accelerating to a significant fraction of light velocity. Time is slowing down for him relative to us."

"Looks good for jump here, skipper," Trevor announced.

"Right." Bart inspected his screens again. The predicted time to impact ticked off inexorably, but it was only a prediction. Without a more exact

in times to come

Earthquakes are more than a scientific curiosity to Californians, and Californian William E. Cochrane has written next month's lead novelette, "Earthquake," in which the skill and courage of a team of seismologists is pitted against the planet-rattling fury of a major temblor. The scene is a raw new planet, just opened for colonization and development. The seismology team has established their base at the most likely spot on this active world to produce a major quake. Their goal is to learn the what, why and how of earthquakes. But there are other people at work on the planet with different goals. To them, a team of crazy scientists is at best a nuisance, often a curse. The battle between the scientists and their fellow humans is almost as tough as the battle against the tectonic forces that threaten to kill them all. Almost. The cover is by Kelly Freas.

The science fact article for the April issue is by James B. Beal, "Parapsychology and Parapsychology," in which recent studies on the effects of bioelectrical fields are examined.

The concluding installment of Poul Anderson's "People of the Wind" will also grace our April issue, together with as many short stories as we can find room for, plus the usual Brass Tacks and Reference Library features.

location of the Hole it couldn't be perfect. As Ramsey watched, the ship's computers updated the prediction from Harriman's signals.

Ramsey fingered the keys on his console. The Alderson drive generators could be kept on for less than a minute in normal space, but if they weren't on when *Lorelei* hit. . . . he pressed the key. *Daniel Webster* shuddered as the ship's fusion engines went to full power, consuming hydrogen and thorium catalyst at a prodigal rate, pouring out energy into the drive where it–vanished.

Into hyperspace, if that was a real place. Or on the other side of the Lepton Barrier. Maybe to where you went when you fell through a Black Hole if there was anything to that theory. Marie Ward had been fascinated by it and had seen nothing to make her give it up.

Wherever the energy went, it left the measurable universe. But not all of it. The efficiency wasn't that good. The drive generators screamed . . .

"There's another bright ring. Quite a sight. Best damn view in the universe." The time distortion was quite noticeable now. Time to impact loomed big on Ramsey's screens, seconds to go.

Marie Ward hummed her nursery rhyme. Unwanted, the words rang through Ramsey's head. 'He fell into a dark hole–' The time to impact clicked off to zero. Nothing happened.

"Ramsey, you lucky bastard," the speaker said. "Did you know she kept your damned picture the whole time? The whole bloody time, Ramsey. Tell her–"

The bridge blurred. There was a twisted, intolerable, eternal instant of agony. And confusion. Ramsey shook his head. The screens remained blurred.

"We–we're in the 81 Eridani system, skipper!" Trevor shouted. "We–hot damn, we made it!"

Ramsey cut him off. "Jump completed. Check ship."

"It worked," Marie Ward said. Her voice was low, quiet, almost dazed. "It really worked." She grinned at Dave Trevor, who grinned back. "Dave, it worked! There *are* Black Holes, and they *do* bend light, and they *can* generate Alderson forces, and I'm the first person to ever study one! Oh!" Her face fell.

"What's wrong?" Trevor asked quickly.

"I can't publish." She pouted. That was what had got her in trouble in the first place. The CoDominium couldn't keep people from thinking. *Die Gedanken, Sie sind frei.* But CDI could ruthlessly suppress books and letters and arrest everyone who tried to tell others about their unlicensed speculations.

"I can arrange something," Senator Grant told her. "After all, you're *the* expert on Black Holes. We'll see that you get a chance to study them for the fleet." He sighed and tapped the arm of his acceleration chair, then whacked it hard with his open

palm. "I don't know. Maybe the Co-Dominium Treaty wasn't such a good idea. We got peace, but—you know, all we ever wanted to do was keep national forces from getting new weapons. Just suppress *military* technology. But that turned out to be nearly everything. And did we really get peace?"

"We'll need a course, Mr. Trevor," Ramsey growled. "This is still a Navy ship. I want the fastest route home."

Home. Sol System, and the house in Luna Base compound. It's still there. And I'll leave you, Daniel Webster, but I'll miss you, old girl, old boy, whatever you are. I'll miss you, but I can leave you.

Or can I? Barbara Jean, are you mine now? Some of you will always belong to Jim Harriman. Five goddam years that man kept his crew and passengers alive, five years when there wasn't a shred of hope they'd get home again. She'll never forget him.

And that's unworthy, Bart Ramsey. Neither one of us ought to forget him.

"But I still wonder," Marie Ward said. Her voice was very low and quiet, plaintive in tone. "I don't suppose I'll ever know."

"Know what?" Ramsey asked. It wasn't hard to be polite to her now.

"It's the song." She hummed her nursery rhyme. "What did he really see on the other side of the mountain?" ■

hard workers only

Finding a job
isn't always easy;
sometimes you have to travel
far from home.

MARK K. ROBERTS

45 April 2058

Dear Marci,

I suppose by now you are wondering why it is I am not there with you at St. Ignatius to get married like we planned to do. It is a long and involved story and I will tell it to you now so that you will not feel as if I left you at the altar (ha-ha). Also I know your Momma will be disappointed as well as your Uncle Mario and Uncle Pietro and your big brothers: Luigi, Roberto and Carmine. So anyway, here is how it is.

You know I have strong feelings about the responsibilities of a married man. I do not feel that the Guaranteed Annual Income is anything to be making a family on. We discussed that before as you know. Even with us both earning it, bringing kids up on the dole is no way to live, I think. After all, what do the little tykes got to look forward to?

So. I decided to go out and look for a real job. It is hard, with all the jobs being automated and all that, so I went to a Job Counselor. He steered me to this newspaper ad. Like that. Right in the paper, yet. I hope your eyes are not filled with tears as this is a long letter and you have several pages to read.

As I was saying, there was this ad in the paper. I saved it to show to you in case everything went all right and I'll enclose it now.

HARD WORKERS ONLY
NEED APPLY

Government Work!
Immediate Openings!
Low Pressure Welders
$25,000.00
Steel Erectors
$23,000.00
Gen. Construction Workers
$15=20 M
Long term contracts. NO TAXES. Exciting work for physically fit. Apply in writing: Times, Box 31M.

So you see how it was. All that money and no taxes. I applied. And would you believe it? I got a reply to my letter. They sent a bunch of papers, even a Security Clearance form. So I didn't want to upset you by getting your hopes up too soon and I didn't tell you about it right then. I filled out all that stuff and sent it off. All a guy can do is try, right?

Anyway, they wrote back in a couple of days and said I was selected for advanced training. I was supposed to report to this doctor for a physical. I did and I passed.

Next thing they send me this big envelope with a lot of papers in it. One was a file thingy that looked like this:

ROSELLI, VITO S.
Cvn. Emp. Gr. 11 L.O. Weld.
1. Top Secret Granted 25 Mar. 58, Limited Access, Project Horizon.

They said I was to bring all my papers and report for orientation and training on the first April. Remember? That was when I told you I had to go out of town on family business. Well, it was *family* business in a way . . . our family.

Anyhow, we all got there and they clamped down a big Security Thing. No calls, no leaving the area, no letters. Then they started the training. Boy, and I thought I was some hot-shot welder!

Santa Maria! They took us through every kind of welding there is. We did Oxy cutting and welding, heliarc, jig work, silver solder, high pressure, low pressure and under water, yet! They even stuffed the seven of us who lasted out the first week—there were over twenty guys started there for welding—into a centrifuge and a vacuum chamber and made us weld in them. They taught us a lot of new stuff I never heard of and can't talk about—secret, you know.

And they made us all the time do all this crazy gym stuff. You know; push-ups, sit-ups, running like the devil himself was after us everywhere we went. And climbing things, ropes and stuff. Oh, yeah, and the deep breathing exercises. We were going around blue in the face or red all the time.

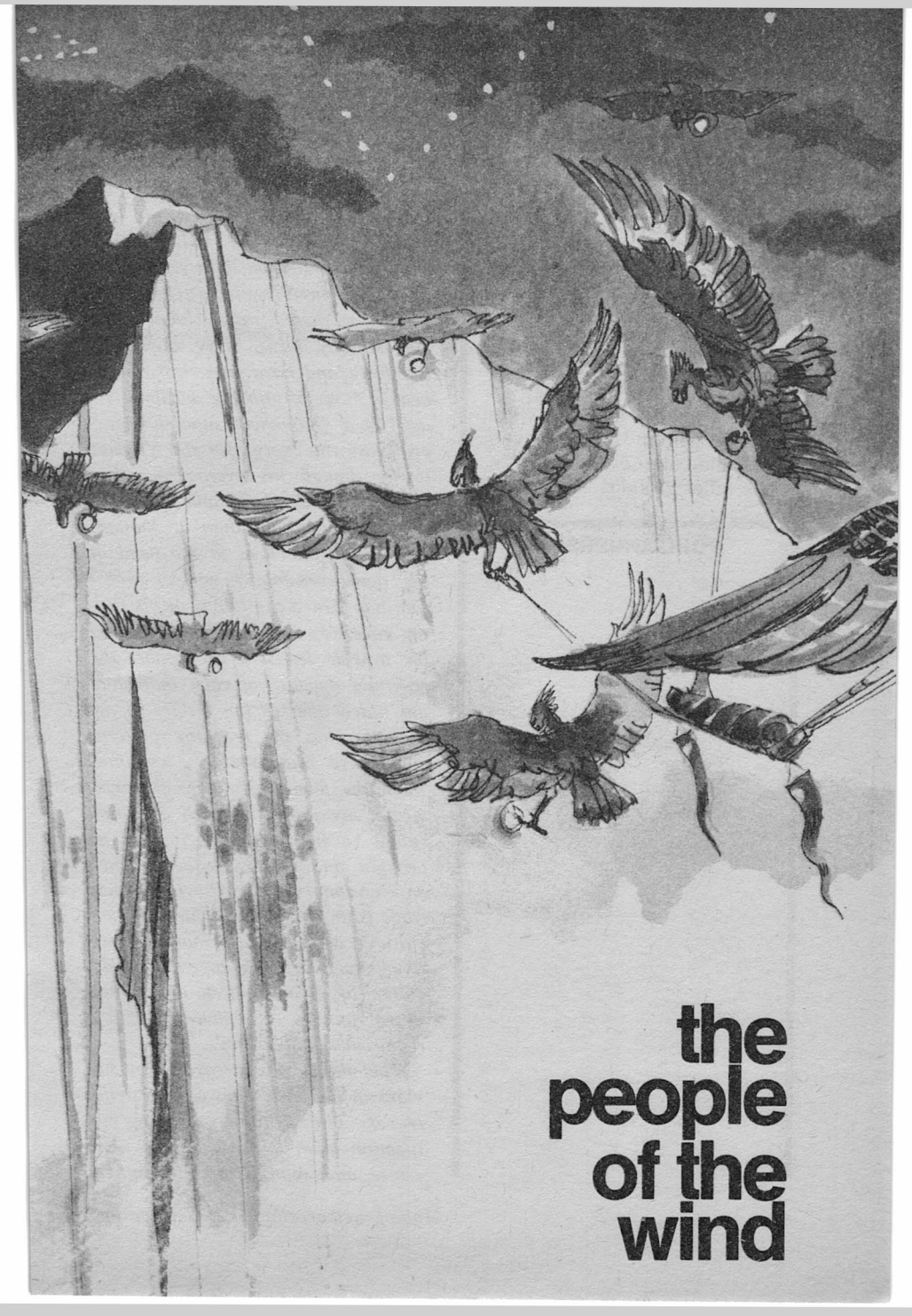
Every day they were giving us written tests and inspecting our welding work like crazy. The other guys had it just as rough. They had to build things and tear them right down and build them again. And driving some kind of looney trucks around with big bags of air instead of caterpillar treads. We all had a turn at that and I found out why my Pa always said never be a truck driver. Hey! That's hard work.

So the last week we all worked together and built this big dome and the boss man said it was good and right and we all did darn good work. So it was time to leave.

They took us to the spaceport of all places. I figured right then we'd be on the Deimos project, you know, building the new low grav bio-lab and all. But no such luck. So, sweetheart, that's why I can't be there today. They say that if we work it right the job will be over and we'll be back in about eight years. So if you don't find some other guy and settle down on the dole, I'll be back with all that tax-free money and we can settle down to a good life. But don't be mad at me, *cara mia,* it wasn't my fault.

How was I to know the job I signed up for was gonna be on Earth? ■

LEO SUMMERS



the people of the wind

Part Two of Three Parts.

The ritual of war is played out until one side concedes defeat—usually long before the "loser" has been seriously hurt. But the people of Avalon—Human and Ythrian—were engaged not in a ritual of battle, but in a struggle for the survival of their society. The rules of war that they followed were different from those of the Terrans, and even those of the other Ythrians.

POUL ANDERSON

SYNOPSIS

Ythri is a planet, somewhat smaller than Earth but basically terrestroid, orbiting the sun Quetlan about three hundred light-years from Sol. The intelligent natives are winged, feathered, warm-blooded, but not actually birds, since they give live birth and have jaws rather than beaks. A set of gill-like antlibranchs acts as a "biological supercharger," providing the energy for the Ythrian to fly though his average mass is some twenty-five kilos and he stands not much shorter than a human. (He stands on claws at the bend of his downward-folded wings; evolution has turned the talons of his raptor ancestors into hands.) The need for a wide territory to support the resulting appetite of each individual has much affected the history of the race. So has the breeding pattern: compulsive eroticism at "lovetime" when the female ovulates, otherwise virtual asexuality. Though ovulation tends to be periodic, it can be brought on by outside factors such as emotional stress. However, marriage is an institution, which in most cultures even includes marital fidelity; couples are held together by devotion to their children, by mutual liking, and by the conveniences and requirements of society.

The planet was discovered by humans in the early days of interstellar travel. The Planha-speaking civilization upon it was quick to modernize and soon assimilated others.

This happened rather easily because the basic unit of that civilization is the choth*—more than a clan, less than a nation, free to organize itself in practically any way, on any basis, that the members wish. Thus the larger framework can contain an infinite variety of life styles. To be sure, the fierce independence of the choths makes central government in the usual human sense impossible. There are Wyvans, leaders and speakers on different levels; there are meetings (Khruaths) of varying size to try cases, consider law and common policy; but everything is a matter of delicately balancing interests. Nevertheless, it works, since Ythrians lack such human traits as readiness to follow a glorified ruler.*

They expanded into space, though on a much smaller scale than man was doing. In human-dominated regions, the raw capitalism of the Polesotechnic League ended in chaos and violence. David Falkayn saw this coming, and led a group of humans into the uncorrupted Ythrian sphere. He proposed forming a joint colony on Avalon, a planet of the sun Laura, hospitable to both races, not too far from Quetlan. This was done—under Ythrian suzerainty.

In the course of centuries, mutual influence between the two races on Avalon grew until, in effect, a new, hybrid civilization was gestating. As the process accelerated, older, conservative members of either species often felt that their children were discarding a whole racial heritage. Undeniably, psychological problems did arise.

Meanwhile the Time of Troubles, when freebooters, barbarians, and war lords ran rampant through known space, was ridden out. Ythri restored order by tightening control over its sphere to a degree, expanding to a degree, and thus developing the Domain. From the ruins of the League came the Terran Empire, whose vigorous Caesarism made it enormously larger and stronger than the Ythrian polity, and eventually brought its boundary up against the less well-defined one of the latter. Disputes led to increasingly destructive incidents, until war looked all too likely.

The First Marchwarden—roughly corresponding to "chief of armed services"—of Avalon was FERUNE, *an Ythrian. The Second Marchwarden was a human,* DANIEL HOLM. *Those two had, over the years, nagged and maneuvered Avalon into a program of military preparedness. The other Ythrian colonies, and the mother planet, had done less; the Domain as a whole had done very little, since by its nature it left almost everything up to member societies to do for themselves.*

HOLM *was also worried about his son* CHRISTOPHER, *who had "gone bird"—adopted Ythrian ways to the extent that he was even received into a choth. (In his case it was Stormgate, whose territory was in those mountains, east of the capital city Gray, which humans had called the*

Andromedas and Ythrians, Weathermother.) Though he still spent time in Gray to continue his studies, CHRIS *was ever more often at Stormgate, especially with his closest friend, the female Ythrian* EYATH. *To her and his other chothmates, he was known as* ARINNIAN.

However, he was still sufficiently close to his father to share the latter's conviction that trouble lay ahead. To help organize civil defense, he traveled widely as a representative of Stormgate. This included trips to the island of St. Li, in that part of the Oronesian archipelago held by the Highsky choth. There dwelt TABITHA FALKAYN, *a young woman, a "bird" like him but much better adjusted to it. In Highsky she was called* HRILL.

CHRIS/ARINNIAN *was surprised at how taken aback he was when* EYATH *told him of her betrothal to a male of her race,* VODAN.

Meanwhile EKREM SARACOGLU *was busy. He was the Terran Empire's governor of the border sector, his seat the human-colonized planet Esperance. Under Admiral* JUAN CAJAL, *the Terran Navy was marshaling strength in the region. This distressed the admiral's daughter* LUISA. *Being attracted to her,* SARACOGLU *made soothing noises and omitted to say that he had already gotten an Imperial rescript declaring war on Ythri, to be made public when he saw fit. He did not intend to incorporate the whole Domain in the Empire, but he did intend to defeat it and acquire certain of its holdings—including Avalon—in order to rectify this troublesome frontier.*

Among Navy personnel was Lt. PHILIPPE ROCHEFORT, *commander of a Meteor-class fighter. His crew consisted of* ABDULLAH HELU *and the (nonhuman) Cynthian* WA CHAOU. *While on leave,* ROCHEFORT *was sharply reminded of how many Imperial citizens opposed the idea of war.*

Nor was Avalon united. In particular, MATTHEW VICKERY, *President of its Parliament of Man, spoke against the "militarism" of* FERUNE *and* DANIEL HOLM. *They could only break down his resistance to mobilization with the help of* LIAW *of The Tarns, High Wyvan and thus the most influential Ythrian on the planet.*

CHRIS/ARINNIAN *and* TABITHA/HRILL *attended a conference on defense in Centauri, the second city of Avalon. Out for relaxation afterward, they chanced upon* VODAN. *He was spending the last few hours before he reported to his space-navy unit in company with a shabby female named* QUENNA. *She was one of the rare Ythrians who could ovulate at will, a despised abnormality which usually left the sufferers no recourse but to use it as an irresistible lure in a career of prostitution.* CHRIS *expressed his disgust to* TABITHA. *She warned him that he was coming to see the females of his own race in the same light, as mere sex machines. Greatly though one*

could learn from aliens, it was wrong and harmful to deny one's fundamental heritage. CHRIS *resented her remarks and they parted coolly. In the morning, he heard the news: Terra had served notice of war.*

Part 2

VII

"Our basic strategy is simple," Admiral Cajal had explained. "I would prefer a simpler one yet: pitched battle between massed fleets, winner takes all."

"But the Ythrians will scarcely be that obliging," Governor Saracoglu remarked.

"No. They aren't well organized for it, in the first place. Not in character for them to centralize operations. Besides, they must know they're foredoomed to lose any stand-up fight. They lack the sheer numerical strength. I expect they'll try to maintain hedgehog positions. From those they'd make sallies, harass, annihilate what smaller units of ours they found, prey on our supply lines. We can't drive straight into the Domain with that sort of menace at our rear. Prohibitively costly. We could suffer actual disaster if we let ourselves get caught between their inner and outer forces."

"Ergo, we start by capturing their advanced bases."

"The major ones. We needn't worry about tiny new colonies or backward allies, keeping a few ships per planet." Cajal gestured with a flashbeam. It probed into the darkness of a display tank, wherein gleamed points of luminance that represented the stars of this region. They crowded by thousands across those few scaled-down parsecs, a fire-swarm out of which not many men could have picked an individual. Cajal realized his talent for doing this had small intrinsic value. The storage and processing of such data were for computers. But it was an outward sign of an inner gift.

"Laura the nearest," he said. "Hru and Khrau further on, forming a triangle with it. Give me those, and I'll undertake to proceed directly against Quetlan. That should force them to call in everything they have, to protect the home star! And, since my rear and my lines will then be reasonably secure, I'll get the decisive battle I want."

"Hm-m-m." Saracoglu rubbed his massive chin. Bristles made a scratchy sound; as hard as he had been at work, he kept forgetting to put on fresh inhibitor after a depilation. "You'll hit Laura first?"

"Yes, of course. Not with the whole armada. We'll split, approximately into thirds. The detached sections will proceed slowly toward Hru and Khrau, but not attack until Laura has been reduced. The force should be ample in all three systems, but I want to get the feel

of Ythrian tactics—and, too, make sure they haven't some unpleasant surprise tucked under their tail-feathers."

"They might," Saracoglu said. "You know our intelligence on them leaves much to be desired. The problems of spying on nonhumans . . . and Ythrian traitors are almost impossible to find, competent ones completely impossible."

"I still don't see why you couldn't get agents into that mostly human settlement at Laura."

"We did, Admiral, we did. But in a set of small, close-knit communities they could accomplish nothing except report what was publicly available to see. You must realize, Avalonian humans no longer think, talk, even walk quite like any Imperial humans. Imitating them isn't feasible. And, again, deplorably few can be bought. Furthermore, the Avalonian Admiralty is excellent on security measures. The second in command, chap named Holm, seems to have made several extended trips through the Empire, official and unofficial, in earlier days. I understand he did advanced study at one of our academies. He knows our methods."

"*I* understand he's caused not just the Lauran fleet but the planetary defenses to be enormously increased, these past years," Cajal said. "Yes, we must certainly take care of him first."

That had been weeks ago. On this day (clock concept in unending starry night) the Terrans neared their enemy.

Cajal sat alone in the middle of the superdreadnaught *Valenderay.* Communication screens surrounded him, and humming silence, and radial kilometers of metal, machinery, weapons, armor, energies, through which passed several thousand living beings. But he was, for this moment, conscious only of what lay outside. A viewscreen showed him: darkness, diamond hordes, and Laura, tiny at nineteen astronomical units' remove but gold and shining, shining.

The ships had gone out of hyperdrive and were accelerating sunward on gravity thrust. Most were far ahead of the flag vessel. A meeting with the defenders could be looked for at any minute.

Cajal's mouth tightened downward at the right corner. He was a tall man, gaunt, blade-nosed, his widow's peak hair and pointed beard black though he neared his sixties. His uniform was as plain as his rank allowed.

He had been chain-smoking. Now he pulled the latest cigarette from a scorched mouth and ground it out as if it were vermin. *Why can't I endure these final waits?* he thought. *Because I will be safe while I send men to war?*

His glance turned to a picture of his dead wife, standing before their house among the high trees of Vera Fé. He moved to animate but, instead, switched on a recorder.

Music awoke, a piece he and she had loved, well-nigh forgotten on Terra but ageless in its triumphant serenity, Bach's *Passacaglia*. He leaned back, closed his eyes and let it heal him. *Man's duty in this life,* he thought, *is to choose the lesser evil.*

A buzz snapped him to alertness. The features of his chief executive captain filled a screen and stated, "Sir, we have received and confirmed a report of initial hostilities from Vanguard Squadron Three."

"Very good, Citizen Feinberg," Cajal said, "Let me have any hard information immediately."

It would soon come flooding in, beyond the capacity of a live brain. Then it must be filtered through an intricate complex of subordinates and their computers, and he could merely hope the digests which reached him bore some significant relationship to reality. But those earliest direct accounts were always subtly helpful, as if the tone of a battle were set at its beginning.

"Aye, sir." The screen blanked.

Cajal turned off the music. "Farewell for now," he whispered, and rose. There was one other personal item in the room, a crucifix. He removed his bonnet, knelt, and signed himself, "Father, forgive us what we are about to do," he begged. "Father, have mercy on all who die. All."

"Word received, Marchwarden," the Ythrian voice announced. "Contact with Terrans, about twelve astronomical units out, direction of the Spears. Firing commenced on both sides, but seemingly no losses yet."

"My thanks. Please keep me informed." Daniel Holm turned off the intercom.

"As if it were any use for me to know!" he groaned.

His mind ran through the calculation. Light, radio, neutrinos take about eight minutes to cross an astronomical unit. The news was more than an hour and a half old. That initial, exploratory fire-touch of a few small craft might well be ended already, the fragments of the vanquished whirling away on crazy orbits while the victors burned fuel as if their engines held miniature suns, trying to regain a kinetic velocity that would let them regroup. Or if other units on either side were not too distant, they might have joined in, sowing warheads in wider and wider circles across space.

He spoke an obscenity and beat fist on palm. "If we could hypercommunicate—" But that wasn't practical. The "instantaneous" pulses of a vessel quantum-jumping around nature's speed limit could be modulated to send a message a light-year or so—however, not this deep in a star's distorting gravitational field, where you risked annihilation if you tried to travel nonrelativistically. Of course, you could get away with it if you were

absolutely sure of your tuning, but nobody was in wartime—and anyhow, given that capability, the Terrans would be a still worse foe, fighting them would be hopeless rather than half hopeless. *Why am I rehearsing this muck?*

"And Ferune's there and I'm here!"

He sprang from his desk, stamped to the window and stood staring. A cigar fumed volcanic between his teeth. The day beyond was insultingly beautiful. An autumn breeze carried odors of salt up from the bay, which glittered and danced under Laura and heaven; and it bore scents from the gardens it passed, brilliant around their houses. North shore hills lay in a blue haze of distance. Overhead skimmed wings. He didn't notice.

Rowena came to him. "You knew you had to stay, dear," she said. She was still auburn-maned, still very slim and erect in her cover-all.

"Yeh. Backup. Logistic, computer, communications support. And maybe Ferune understands space warfare better, but I'm the one who really built the planetary defense. We agreed, months back. No dishonor to me, that I do the sensible thing." Holm swung toward his wife. He caught her around the waist. "But oh, God, Ro, I didn't think it'd be this hard!"

She drew his head down onto her shoulder and stroked the grizzled hair.

Ferune of Mistwood had planned to bring his own mate along. Wharr had traveled beside him throughout a long naval career, birthed and raised their children on the homeships that accompanied every Ythrian fleet, drilled and led gun crews. But she fell sick and the medics weren't quite able to ram her through to recovery before the onslaught came. You grow old, puzzlingly so. He missed her sternness.

But he was too busy to dwell on their good-byes. More and more reports were arriving at his flagship. A pattern was beginning to emerge.

"Observe," he said. The computers had just corrected the display tank according to the latest data. It indicated sun, planets, and color-coded sparks which stood for ships. "Combats here, here, here. Elsewhere, neutrino emissions reaching our detectors, cross-correlations getting made, fixes being obtained."

"Foully thin information," said the feathers and attitude of his aide.

"Thus far, aye, across interplanetary distances. However, we can fill in certain gaps with reason, if we assume their admiral is competent. I feel moderately sure that his pincer has but two claws, coming in almost diametrically opposite, from well north and south of

the ecliptic plane . . . so." Ferune pointed. "Now he must have reserves further out. To avoid making a wide circuit with consequent risk of premature detection, these must have run fairly straight from the general direction of Pax. And were I in charge, I would have them near the ecliptic. Hence we look for their assault, as the pincers close, from here." He indicated the region.

They stood alone in the command bridge, broad though the chamber was. Ythrians wanted room to stretch their wings. Yet they were wholly linked to the ship by her intercoms, calculators, officers, crewfolk, more tenuously linked to that magnificence which darkened and bejeweled a viewscreen, where the killing had begun. Clangor and clatter of activity came faint to them, through a deep susurrus of power. The air blew warm, ruffling their plumes a little, scented with perfume of cinnamon bush and amberdragon. Blood odors would not be ordered unless and until the vessel got into actual combat; the crew would soon be worn out if stimulated too intensely.

Ferune's plan did not call for hazarding the superdreadnaught this early. Her power belonged in his end game. At that time he intended to show the Terrans why she was called after the site of an ancient battle on Ythri. He had had the Anglic translation of the name painted broad on the sides: *Hell Rock.*

A new cluster of motes appeared in the tank. Their brightnesses indicated ship types, as accurately as analysis of their neutrino emanations could suggest. The aide started. His crest bristled. "That many more hostiles, so soon? Uncle, the odds look bad."

"We knew they would. Don't let this toy hypnotize you. I've been through worse. Half of me is regenerated tissue after combat wounds. And I'm still skyborne."

"Forgive me, Uncle, but most of your fights were police actions inside the Domain. This is the *Empire* coming."

Ferune expressed: "I am not unaware of that. And I too have studied advanced militechnics, both practical and theoretical." Aloud he said, "Computers, robots, machines are only half the makers of a warweird. There are also brains and hearts."

Claws clacked on the deck as he walked to the viewscreen and peered forth. His experienced eye picked out a glint among the stars, one ship. Otherwise his fleet was lost to vision in the immensity through which it fanned.

"A new engagement commencing," said the intercom.

Ferune waited motionless for details. Through his mind passed words from one of the old Terran books it pleasured him to read. *The fear of a king is as the roaring of a*

lion: whoso provoketh him to anger sinneth against his own soul.

Hours built into days while the fleets, in their hugely scattered divisions, felt for and sought each other's throats.

Consider: at a linear acceleration of one Terran gravity, a vessel can, from a "standing start," cover one astronomical unit—about a hundred and forty-nine million kilometers—in a bit under fifty hours. At the end of that period, she has gained one thousand and sixty kilometers per second of velocity. In twice the time, she will move at twice the speed and will have spanned four times the distance. No matter what power is conferred by thermonuclear engines, no matter what maneuverability comes from a gravity thrust which reacts directly against that fabric of relationships we call space, one does not quickly alter quantities on this order of magnitude.

Then, too, there is the sheer vastness of even interplanetary reaches. A sphere one astronomical unit in radius has the volume of some thirteen million Terras; to multiply this radius by ten is to multiply the volume by a thousand. No matter how sensitive the instruments, one does not quickly scan those deeps, nor ever do it with much accuracy beyond one's immediate neighborhood, nor know where a detached object is *now* if signals are limited to light speed. As the maddeningly incomplete hoard of data grows, not just the parameters of battle calculations change; the equations do. One discovers he has lost hours in travel which has turned out to be useless or worse, and must lose hours or days more in trying to remedy matters.

But then, explosively fast, will come a near enough approach at nearly enough matched velocities for a combat which may well be finished in seconds.

"Number Seven, launch!" warned the dispatcher robot, and flung *Hooting Star* out to battle.

Her engines took hold. A thrum went through the bones of Philippe Rochefort where he sat harnessed in the pilot chair. Above his instrument panel, over his helmet and past either shoulder, viewscreens filled a quarter globe with suns. Laura, radiance stopped down lest it blind him, shone among them as a minikin disc between two nacreous wings of zodiacal light.

His radar alarm whistled and lit up, swiveling an arrow inside a clear ball. His heart sprang. He couldn't help glancing that way. And he caught a glimpse of the cylinder which hurtled toward *Ansa*'s great flank.

During a launch, the negagrav screen in that area of the mother vessel is necessarily turned off. Nothing is there to repulse a tor-

pedo. If the thing makes contact and detonates. . . In vacuum, several kilotons are not quite so appallingly destructive as in air or water; and a capital ship is armored and compartmented against concussion and heat, thickly shielded to cut down what hard radiation gets inside. Nevertheless she will be badly hurt, perhaps crippled, and men will be blown apart, cooked alive, shrieking their wish to die.

An energy beam flashed. An instant's incandescence followed. Sensors gave their findings to the appropriate computer. Within a millisecond of the burst, a "Cleared" note warbled. One of Wa Chaou's guns had caught the torpedo square on.

"Well done!" Rochefort cried over the intercom. "Good show, Watch Out!" He rotated his detectors in search of the boat which must have been sufficiently close to loose that missile.

Registry. Lockon. *Hooting Star* surged forward. *Ansa* dwindled among the constellations. "Give me an estimated time to come in range, Abdullah," Rochefort said.

"He seems aware of us," Helu's voice answered, stone-calm. "Depends on whether he'll try to get away or close in . . . Hm-m-m, yes, he's skiting for cover." (*I would too, for fair,* Rochefort thought, *when a heavy cruiser's spitting boats. That's a brave skipper who sneaked this near.*) "We can intercept in about ten minutes, assuming he's at his top acceleration. But I don't think anybody else will be able to help us, and if we wait for them, he'll escape."

"We're not waiting," Rochefort decided. He lasered his intentions back to the squadron control office aboard ship and got an O.K. Meanwhile he wished his sweat were not breaking out wet and sour. He wasn't afraid, though; his pulse beat high but steady and never before had he seen the stars with such clarity and exactness. It was good to know he had the inborn courage for Academy psychtraining to develop.

"If you win," Squadron Control said, "make for—" a string of numbers which the machines memorized—"and act at discretion. We've identified a light battleship there. We and *Ganymede* between us will try saturating its defenses. Good luck."

The voice clipped off. The boat ran, faster every second until the ballistics meters advised deceleration. Rochefort heeded and tapped out the needful orders. Utterly irrelevant passed through his head the memory of an instructor's lecture. "Living pilots, gunners, all personnel, are meant to make decisions. Machines execute most of those decisions, set and steer courses, lay and fire guns, faster and more precisely than nerve or muscle. Machines, consciousness-level computers, could also be built

to decide. They have been, in the past. But while their logical abilities might be far in excess of yours and mine, they always lacked a certain totality, call it intuition or insight or what you will. Furthermore, they were too expensive to use in war in any numbers. You, gentlemen, are multipurpose computers who have a *reason* to fight and survive. Your kind is abundantly available and, apart from programming, can be produced in nine months by unskilled labor." Rochefort remembered telling lower classmen that it was three demerits if you didn't laugh at the hoary joke.

"Range," Helu said.

Energy beams stabbed. The scattered, wasted photons which burned along their paths were the barest fraction of the power within.

One touched *Hooting Star.* The boat's automata veered her before it could penetrate her thin plating. That was a roar of sidewise thrust. The interior fields couldn't entirely compensate for the sudden high acceleration. Rochefort was crammed back against his harness till it creaked, while weight underfoot shifted dizzyingly.

It passed. Normal one-gee-down returned. They were alive. They didn't even seem to need a patch-plate; if they had been pierced, the hole was small enough for self-sealing. And yonder in naked-eye sight was the enemy!

With hands and voice, Rochefort told his boat to drive straight at that shark shape. It swelled monstrously fast. Two beams lanced from it and struck. Rochefort held his vector constant. He was hoping Wa Chaou would thus be able to get a fix on their sources and knock them out before they could do serious damage. *Flash! Flash!* Brightness blanked. "Oh, glorious! Ready torps."

The Ythrian drew nearer till the human could see a painted insigne, a wheel whose spokes were flower petals. *That's right, they put personal badges on their lesser craft, same as we give unofficial names. Wonder what that'n means.* He'd been told that some of their speedsters carried ball guns. But hard objects cast in your path weren't too dangerous till relative velocities got into the tens of KPS.

She fired a torpedo. Wa Chaou wrecked it almost in its tube. *Hooting Star*'s slammed home.

The explosion was at such close quarters that its fiery gases filled the Terran's screen. A fragment struck her. She shivered and belled. Then she was past, alone in clean space. Her opponent was a cloud which puffed outward till it grew invisible, a few seared chunks of metal and possibly bone cooling off to become meteoroids, falling away aft, gone from sight in seconds.

"If you will pardon the expression," Rochefort said shakily, "yahoo!"

"That was a near one," Helu

said. "We'd better ask for antirad boosters when we get back."

"Uh-huh. Right now, though, we've some unfinished business." Rochefort instructed the boat to change vectors. "No fears, after the way you chaps conducted yourselves."

They were not yet at the scene when joyful broadcasts and another brief blossoming told them that a hornet swarm of boats and missiles had stung the enemy battleship to death.

VIII

Slowly those volumes of space wherein the war was being fought contracted and neared each other. At no time were vessels ranked. Besides being unfeasible to maintain, formations tight and rigid would have invited a nuclear barrage. At most, a squadron of small craft might travel in loose echelon for a while. If two major units of a flotilla came within a hundred kilometers, it was reckoned close. However, the time lag of communication dropped toward zero, the reliability of detection swooped upward, deadly encounters grew ever more frequent.

It became possible to know fairly well what the opponent had in play and where. It became possible to devise and guide a campaign.

Cajal remarked in a tape report to Saracoglu: "If every Ythrian system were as strong as Laura, we might need the whole Imperial Navy to break them. Here they possess, or did possess, approximately half the number of hulls that I do—which is to say, a sixth the number we deemed adequate for handling the entire Domain. Of course, that doesn't mean their actual strength is in proportion. By our standards, they are weak in heavy craft. But their destroyers, still more their corvettes and torpedo boats, make an astonishing total. I am very glad that no other enemy sun, besides Quetlan itself, remotely compares with Laura!

"Nevertheless, we are making satisfactory progress. In groundling language—a technical summary will be appended for you—we can say that about half of what remains to them is falling back on Avalon. We intend to follow them there, dispose of them, and thus have the planet at our mercy.

"The rest of their fleet is disengaging, piecemeal, and retreating spaceward. Doubtless they mean to scatter themselves throughout the uninhabitable planets, moons, and asteroids of the system, where they must have bases, and carry on hit-and-run war. This should prove more nuisance than menace, and once we are in occupation their government will recall them. Probably larger vessels, which have hyperdrive, will seek to go reinforce elsewhere: again, not unduly important.

"I am not underestimating these

people. They fight skillfully and doggedly. They must expect to use planetary defenses in conjunction with those ships moving toward the home world. God grant, more for their sakes than ours, most especially for the sakes of innocent females and children of both races, God grant their leaders see reason and capitulate before we hurt them too badly."

The half disc of Avalon shone sapphire swirled with silver, small and dear among the stars. Morgana was coming around the dark side. Ferune remembered night flights beneath it with Wharr, and murmured, *"O moon of my delight that knows no wane—"*

"Hoy?" said Daniel Holm's face in the screen.

"Nothing. My mind drifted." Ferune drew breath. "We've skimpy time. They're coming in fast. I want to make certain you've found no serious objection to the battle plan as detailed."

The laser beam took a few seconds to flicker between flagship and headquarters. Ferune went back to his memories.

"I bugger well do!" Holm growled. "I already told you. You've brought *Hell Rock* too close in. Prime target."

"And I told you," Ferune answered, "we no longer need her command capabilities." *I wish we did, but our losses have been too cruel.* "We do need her firepower and, yes, her attraction for the enemy. That's why I never counted on getting her away to Quetlan. There she'd be just one more unit. Here she's the keystone of our configuration. If things break well, she will survive. I know the scheme is not guaranteed, but it was the best my staff, computers, and self could produce on what you also knew beforehand would be short notice. To argue, or modify much, at this late hour is to deserve disaster."

Silence. Morgana rose further from Avalon as the ship moved.

"Well . . ." Holm slumped. He had lost weight till his cheekbones stood forth like ridges in upland desert. "I s'pose."

"Uncle, a report of initial contact," Ferune's aide said.

"Already?" The First Marchwarden of Avalon turned to the comscreen. "You heard, Daniel Holm? Fair winds forever." He cut the circuit before the man could reply. "Now," he told the aide, "I want a recomputation of the optimum orbit for this ship. Project the Terran's best moves . . . from their viewpoint, in the light of what information we have . . . and adjust ours accordingly."

Space sparkled with fireworks. Not every explosion, nor most, signified a hit; but they were thickening.

Three Stars slammed from her cruiser. At once her detectors reported an object. Analysis followed

within seconds—a Terran Meteor, possible to intercept, no nearby companions. "Quarry!" Vodan sang out. "Five minutes to range."

A yell went through the hull. Two weeks and worse of maneuver, cooped in metal save for rare, short hours when the flotilla dipped into combat, had been heavy chains to lift.

His new vector pointed straight at Avalon. The planet waxed; he flew toward Eyath. He had no doubts about his victory. *Three Stars* was well blooded. She was necessarily larger than her Imperial counterpart—Ythrian requirements for room—and therefore had a trifle less acceleration. But her firepower could on that account be made a great deal greater, and had been.

Vodan took feet off perch and hung in his harness. He spread his wings. Slowly he beat them, pumping his blood full of oxygen, his body full of strength and swiftness. It tingled, it sang. He heard a rustling aft as his four crewfolk did likewise. Stars gleamed above and around him.

Three representations occupied Daniel Holm's office and, now, his mind. A map of Avalon indicated the ground installations. The majority were camouflaged and, he hoped, he would have prayed if he believed, were unknown to the enemy. Around a holographic world globe, variegated motes swung in multitudinous orbits. Many stations had been established a few days ago, after being transported to their launch sites from underground automated factories which were also supposed to be secret. Finally a display tank indicated what was known of the shifting ships out yonder.

Holm longed for a cigar, but his mouth was too withered by too much smoke in the near past. *Crock, how I could use a drink!* he thought. Neither might that be; the sole allowable drugs were those which kept him alert without exacting too high a price from his metabolism.

He stared at the tank. *Yeh. They're sure anxious to nail our flagship. Really converging on her, now.*

He sought the window. While Gray still lay shadowy, the first dawnlight was picking out houses and making the waters sheen. Above, the sky arched purple, its stars blurred by the negagrav screens. They had to keep changing pattern, to give adequate coverage while allowing air circulation. That stirred up restless little winds, cold and a bit damp. But on the whole the country reached serene. The storms were beyond the sky and inside the flesh.

Holm was alone, more alone than ever in his life, though the forces of a world awaited his bidding. It would have to be his; the computers could merely advise. He

guessed that he felt like an infantryman preparing to charge.

"There!" Rochefort shouted.

He saw a moving point of light in a viewscreen set to top magnification. It grew as he watched, a needle, a spindle, a toy, a lean sharp-snouted hunter on whose flank shone three golden stars.

The vectors were almost identical. The boats neared more slowly than they rushed toward the planet. *Odd,* Rochefort thought, *how close* Ansa*'s come without meeting any opposition. Are they just going to offer token resistance? I'd hate to kill somebody for a token.* Avalon was utterly beautiful. He was approaching in such wise that on his left the great disc had full daylight—azure, turquoise, indigo, a thousand different blues beneath the intercurving purity of cloud, a land mass glimpsed green and brown and tawny. On high right was darkness, but moonlight shimmered mysteriously across oceans and weather.

Wa Chaou sent a probe of lightning. No result showed. The range was extreme. It wouldn't stay thus for long. Now Rochefort needed no magnification to see the hostile hull. In those screens it was as yet a glint. But it slid across the stellar background, and it was more constant than the fireballs twinkling around.

Space blazed for a thousand kilometers around that giant spheroid which was *Hell Rock.* She did not try to dodge; given her mass, that was futile. She orbited her world. The enemy ships plunged in, shot, went by and maneuvered to return. They were many, she was one, save for a cloud of attendant Meteors and Comets. Her firepower, though, was awesome; still more were her instrumental and computer capabilities. She had not been damaged. When a section of screen must be turned off to launch a pack of missiles, auxiliary energy weapons intercepted whatever was directed at the vulnerable spot.

Rays had smitten. But none could be held steady through an interval sufficient to get past those heavy plates. Bombs whose yield was lethal radiation exploded along the limits of her defense. But the gamma quanta and neutrons were drunk down by layer upon layer of interior shielding. The last of them, straggling to those deep inner sections where organic creatures toiled, were so few that ordinary medication nullified their effects.

She had been built in space and would never touch ground. A planetoid in her own right, she blasted ship after ship that dared come against her.

Cajal's Supernova was stronger. But *Valenderay* must not be risked. The whole purpose of all that armament and armor was to protect the command of a fleet. When word reached him, he studied the

display tank. "We're wasting lesser craft. She eats them," he said, chiefly to himself. "I hate to send capital vessels in. The enemy seems to have much more defensive stuff than we looked for, and it's bound to open up on us soon. But that close, speed and maneuverability don't count for what they should. We must have sheer force to take that monster out; and we must do that before we can pose any serious threat to the planet." He tugged his beard. "S-s-so . . . between them, *Persei, Ursa Minor, Regulus, Jupiter,* and attendants should be able to do the job . . . fast enough and at enough of a distance that they can also cope with whatever the planet may throw."

Tactical computers ratified and expanded his decision. He issued the orders.

Vodan saw a torpedo go past. "Hai, good!" he cried. Had he applied a few megadynes less of decelerative force, that warhead would have connected. The missile braked and came about, tracking, but one of his gunners destroyed it.

The Terran boat crawled ahead, off on the left and low. Vodan's instruments reported she was exerting more sideways than forward thrust. The pilot must mean to cross the Ythrian bows, bare kilometers ahead, loose a cloud of radar window, and hope the concerted fire of his beam guns would penetrate before the other could range him. Since Ythrians, unlike Terrans, did not fight wearing spacesuits—how could anybody not go insane after more than a few hours in those vile, confining things?—a large hole in a compartment killed them.

The son-of-a-zirraukh was good, Vodan acknowledged happily. Lumbering and awkward as most space engagements were, this felt almost like being back in air. The duel had lasted until Avalon stood enormous in the bow screens. In fact, they were closer to atmosphere than was prudent at their velocity. They'd better end the affair.

Vodan said how.

He went on slowing at a uniform rate, as if he intended presently to slant off. He thought the Terran would think: *He sees what I plan. When I blind his radar, he will sheer from my fire in an unpredictable direction. Ah, but we're not under hyperdrive. He can't move at anything like the speed of energy beams. Mine can cover the entire cone of his possible instantaneous positions.*

For that, however, the gun platform needed a constant vector. Otherwise too many unknowns entered the equations and the target had an excellent chance of escaping. For part of a minute, if Vodan had guessed right, the Meteor would forego its advantage of superior mobility. And . . . he had superior weapons.

The Terran might well expect a

torpedo and figure he could readily dispose of the thing. He might not appreciate how very great a concentration of energy his opponent could bring to bear for a short while, when all projectors were run at overload.

Vodan made his calculations. The gunners made their settings.

The Meteor passed ahead, dwarfish upon luminous Avalon. A sudden, glittering fog sprang from her. At explosive speed, it spread to make a curtain. And it hid one ship as well as the other.

Rays sliced through, seeking. Vodan knew exactly where to aim his. They raged for thirty seconds.

The metal dust scattered. Avalon again shone enormous and calm. Vodan ceased fire before his projectors should burn out. Nothing came from the Meteor. He used magnification, and saw the hole which gaped astern by her drive cones. Air gushed forth, water condensing ghost-white until it vanished into void. Acceleration had ended entirely.

Joy lofted in Vodan. "We've struck him!" he shouted.

"He could launch his torps in a flock," the engineer worried.

"No. Come look if you wish. His power plant took that hit. He has nothing left except his capacitor bank. If he can use that to full effect, which I doubt, he still can't give any object enough initial velocity to worry us."

"Kh'hng. Shall we finish him off?"

"Let's see if he'll surrender. Standard band. . . Calling Imperial Meteor. Calling Imperial Meteor."

One more trophy for you, Eyath!

Hell Rock shuddered and toned. Roarings rolled inward. Air drifted bitter with smoke, loud with screams and bawled commands, running feet and threshing wings. Compartment after compartment was burst open to space. Bulkheads slid to seal twisted metal and tattered bodies off from the living.

She fought. She could fight on under what was left of her automata, well after the last of the crew were gone whose retreat she was covering.

Those were Ferune, his immediate staff, and a few ratings from Mistwood who had been promised the right to abide by their Wyvan. They made their way down quaking, tolling corridors. Sections lay dark where fluoropanels and facings were peeled back from the mighty skeleton.

"How long till they beat her asunder?" asked one at Ferune's back.

"An hour, maybe," he guessed. "They wrought well who built her. Of course, Avalon will strike before then."

"At what minute?"

"Daniel Holm must gauge that."

They crowded into their lifeboat. Ferune took the controls. The craft

lifted against interior fields; valves swung ponderously aside; she came forth to sight of stars and streaked for home.

He glanced behind. The flagship was ragged, crumpled, cratered. In places metal had run molten till it congealed into ugliness, in other places it glowed. Had the bombardment been able to concentrate on those sites where defenses were down, a megaton warhead or two would have scattered the vessel in gas and ashes. But the likelihood of a precise hit at medium range was too slim to risk a supermissile against her remaining interception capability. Better to hold well off and gnaw with lesser blasts.

"Fare gladly into the winds," Ferune whispered. In this moment he put aside his new ways, his alien ways, and was of Ythri, Mistwood, Wharr, the ancestors and the children.

Avalon struck. The boat reeled. Under an intolerable load of light, viewscreens blanked. Briefly, illumination went out. The flyers crouched, packed together, in bellowing, heat, and blindness.

It passed. The boat had not been severely damaged. Backup systems cut in. Vision returned, inside and outside. Aft, *Hell Rock* was silhouetted against the waning luridness of a fireball that spread across half heaven.

A rating breathed, "How . . . many . . .megatons?"

"I don't know," Ferune said. "Presumably ample to dispose of those Imperials we sucked into attacking us."

"A wonder we came through," said his aide. Every feather stood erect on him and shivered.

"The gases diffused across kilometers," Ferune reminded. "We've no screen field generator here, true. But by the time the front reached us, even a velocity equivalent of several million degrees could not raise our temperature much."

Silence clapped down, while smaller detonations glittered and faded in deeper distances and energy swords lunged. Eyes sought eyes. The brains behind were technically trained.

Ferune spoke it for them. "Ionizing radiation, primary and secondary. I cannot tell how big a dose we got. The meter went off scale. But we can probably report back, at least."

He gave himself to his piloting. Wharr waited.

Rochefort groped through the hull of *Hooting Star.* Interior grav generation had been knocked out; freefalling, they were now weightless. And airless beyond the enclosing armor. Stillness pressed inward till he heard his heart as strongly as he felt it. Beads of sweat broke off brow, nose, cheeks, and danced between eyes and faceplate, catching light in oily gleams. That light fell queerly across vacuum, undiffused, sharp-shadowed.

"Watch Out!" he croaked into his radio. "Watch Out, are you there?"

"I'm afraid not," said Helu's voice in his earplugs, from the engine room.

Rochefort found the little body afloat behind a panel cut half loose from its moorings. The same ray had burned through suit and flesh and out through the suit, cauterizing as it went so that only a few bloodgouts drifted around. "Wa Chaou bought it?" asked Helu.

"Yes." Rochefort hugged the Cynthian to his breast and fought not to weep.

"Any fire control left?"

"No."

"Well, I think I can squeeze capacitor power into the drive units. We can't escape the planet on that, but maybe we can land without vaporizing in transit. It'll take a pretty fabulous pilot. Better get back to your post, skipper."

Rochefort opened the helmet in order to close the bulged-out eyes, but the lids wouldn't go over them. He secured the corpse in a bight of loose wire and returned forward to harness himself in.

The call light was blinking. Mechanically, conscious mainly of grief, he plugged a jack into his suit unit and pressed the Accept button.

Anglic, accented, somehow both guttural and ringing: "Imperial Meteor. Are you alive? This is the Avalonian. Acknowledge or we shoot."

"Ack . . . ack—" Before the noise in his throat could turn to sobbing, Rochefort said, "Yes, captain here."

"We will take you aboard if you wish."

Rochefort clung to the seatback, legs trailing aft. It hummed and crackled in his ears.

"Ythri abides by the conventions of war," said the unhuman voice. "You will be interrogated but not mistreated. If you refuse, we must take the precaution of destroying you."

Kh-h-h-h . . . m-m-m-m. . .

"Answer at once! We are already too nigh Avalon. The danger of being caught in crossfire grows by the minute."

"Yes," Rochefort heard himself say. "Of course. We surrender."

"Good. I observe you have not restarted your engine. Do not. We are matching velocities. Link yourselves and jump off into space. We will lay a tractor beam on you and bring you in as soon as may be. Understood? Repeat."

Rochefort did.

"You fought well," said the Ythrian. "You showed deathpride. I shall be honored to welcome you aboard." And silence.

Rochefort called Helu. The men bent the ends of a cable around their waists, cracked the personnel lock, and prepared to tumble free. Kilometers off they saw the vessel

that bore three stars, coming like an eagle.

The skies erupted in radiance.

When ragged red dazzlement had cleared from their vision, Helu choked, *"Ullah akbar, Ullah akbar. . .* They're gone. What *was* it?"

"Direct hit," Rochefort said. Shock had blown some opening in him for numbness to drain out of. He felt strength rising in its wake. His mind flashed, fast as those war lightnings yonder but altogether cool. "They knew we were helpless and had no friends nearby. But in spite of a remark the captain made, they must've forgotten to look out for their own friends. The planet-based weapons have started shooting. I imagine the missiles include a lot of tracker torpedoes. Our engines were dead. His weren't. A torp homed on the emissions."

"What, no recognition circuits?"

"Evidently not. To lash out on the scale they seem to be doing, the Avalonians would've had to sacrifice quality for quantity, and rely on knowing the dispositions of units. It was not reasonable to expect any this close in. The fighting's further out. I daresay that torp was bound there, against some particular Imperial concentration, when it happened to pass near us."

"Um." They hung between darkness and glitter, breathing. "We've lost our ride," Helu said.

"Got to make do, then," Rochefort answered. "Come."

Beneath his regained calm, he was shaken at what appeared to be the magnitude of the Avalonian response.

IX

When the boat had come to rest, thundering and shuddering ended, only bake-oven heat and scorched smells remaining, Rochefort let go of awareness.

He swam up from the nothing some minutes later. Helu stood over him. "Are you O.K., skipper?" At first the engineer's voice seemed to come across a whining distance, and the sweat and soot on his face blurred into the haze which grayed all vision.

"O.K.," Rochefort mumbled. "Get me . . . 'nother stimpill. . ."

Helu did, with a glass of water that wrought a miracle on wooden tongue and parchment palate. "Hand of Fatima, what a ride!" he said unevenly. "I thought for certain we were finished. How did you ever get us down?"

"I don't remember," Rochefort answered.

The drug took hold, giving him back clarity of mind and senses, plus a measure of energy. He could reconstruct what he must have done in those last wild minutes. The ergs stored in the capacitors had not been adequate to kill the boat's entire velocity relative to the planetary surface. He had used them for control, for keeping the

hull from being boiled off by the atmospheric friction that braked it. *Hooting Star* had skipped halfway around the globe on the tropopause, as a stone may be skipped over a lake, then screamed down on a long slant which would have ended in drowning—for the hole aft could not be patched, and a sealed-off engine room would have weighed too much when flooded—except that somehow he, Philippe Rochefort, had spotted (he recollected now) a chain of islands and achieved a crash landing on one. . .

He spent a while in the awe of being alive. Afterward he unharnessed, and in their separate fashions he and Helu gave thanks; and they added a wish for the soul of Wa Chaou. By that time the hull had cooled to a point where they dared touch the lock. They found its outer valve had been torn loose when the boat plowed across ground.

"Good air," Helu said.

Rochefort inhaled gratefully. It was not just that the cabin was hot and stinking. No regeneration system on any spacecraft could do the entire work of a living world. This atmosphere that streamed to meet him smelled of ozone, iodine, greenery, flower fragrances; it was mild but brisk with breezes.

"Must be about Terran standard pressure," Helu went on. "How does a planet like this keep so much gas?"

"Surely you've met the type before," Rochefort said.

"Yes, but never stopped to wonder. Now that I've had the universe given back to me, I'd, uh, I'd like to know it better."

"Well, magnetism helps," Rochefort explained absently. "The core is small, but on the other hand the rotation is rapid, making for a reasonable value of H. Besides, the field has fewer charged particles to keep off, therefore fewer get by it to bounce off gas molecules. Likewise, the total ultraviolet and X radiation received is less. That sun's fairly close—we're getting about ten percent more illumination than Terra does—but it's cooler than Sol. The energy distribution curve peaks at a lower frequency and the stellar wind is weak."

Meanwhile he sensed the gravity. His weight was four-fifths what it had been when the boat's interior field was set at standard pull. When you dropped sixteen kilos you noticed it at first—a bounciness, an exuberance of the body which the loss of a friend and the likelihood of captivity did not entirely quench—though you soon came to take the feeling for granted.

He stepped forth and looked around. Those viewscreens which remained functional had shown him this area was unpeopled. Inland it rose steeply. On the other side it sloped down to a beach where surf tumbled in a white vio-

lence whose noise reached him across more than a kilometer. Beyond, a syenite sea rolled to a horizon which, in spite of Avalon's radius, did not seem appreciably nearer than on Terra or Esperance. The sky above was a blue more bright and deep than he was used to. The sun was low, sinking twice as fast as on man's home. Its disc showed a bit larger, its hue was tinged golden. A sickle moon trailed, a fourth again the angular diameter of Luna seen from the ground. Rochefort knew it was actually smaller but, being close, raised twice the tides.

Occasional sparks and streaks blinked up there—monstrous explosions in space. Rochefort turned his mind from them. For him the war was presumably over. Let it be over for everybody, soon, before more consciousnesses died.

He gave his attention to the life encircling him. His vessel had gouged and charred through a dense mat of low-growing, beryl-green stuff which covered the island. "I suppose this explains why the planet has no native forests," he murmured, "which may in turn help explain why animal life is underevolved."

"Dinosaur stage?" Helu asked, watching a flock of clumsy winged creatures go by. They each had four legs; the basic vertebrate design on Avalon was hexapodal.

"Well, reptiloid, though some have developed features like hair or an efficient heart. By and large, they don't stand a chance against mammalian or avian life forms. The colonists had to do quite a lot of work to establish a stable mixed colony, and they keep a good deal of land reserved, including the whole equatorial continent."

"You've really studied them up, haven't you?"

"I was interested. And . . . seemed wrong to let them be only my targets. Seemed as if I ought to have some reality on the people I was going to fight."

Helu peered inland. Scattered shrubs and trees did exist. The latter were either low and thick or slim and supple, to survive the high winds that rapid rotation must often create. Autumn or no, many flowers continued in bloom, flamboyant scarlets and yellows and purples. Fruits clustered thick on several other kinds of plant.

"Can we eat local food?" Helu asked.

"Yes, of course," Rochefort said. "They'd never have made the success they did, colonizing, in the time they've had, if they couldn't draw on native resources. Some essentials are missing, assorted vitamins and whatnot. Imported domestic animals had to be revamped genetically on that account. We'd come down with deficiency diseases if we tried to eat Avalonian material exclusively. However, that wouldn't happen fast, and I've read that much of it is tasty. Unfortu-

nately, I've read that much is poisonous, too, and I don't know which is which."

"Hm-m-m." Helu tugged his mustache and scowled. "We'd better call for somebody to come get us."

"No rush," said Rochefort. "Let's first learn what we can. The boat has supplies for weeks, remember. We just might be able to—" He stopped. Knowledge stung him. "Right now we've a duty."

Perforce they began by making a spade and pick out of scrap; and then the plant cover was tough and the soil beneath a stubborn clay. Sunset had perished in flame before they got Wa Chaou buried.

A full moon would have cast ample light; higher albedo as well as angular size and illumination gave it more than thrice the brilliance of Luna. Tonight's thin crescent was soon down. But the service could be read by two lamp-white companion planets and numberless stars. Most of their constellations were the same as those Rochefort had shared with Eve Davisson on Esperance. Three or four parsecs hardly count in the galaxy.

Does a life? I must believe so. "Father, unto You in what form He did dream You, we commit this being our comrade; and we pray that You grant him rest, even as we pray for ourselves. Lord have mercy, Lord have mercy, Lord have mercy. . ."

The gruesome little flashes overhead were dying away.

"Disengage," Cajal said. "Withdraw. Regroup in wide orbits."

"But, but Admiral," protested a captain of his staff, "their ships—they'll use the chance to escape—disappear into deep space."

Cajal's glance traveled from screen to screen on the comboard. Faces looked out, some human, some nonhuman, but each belonging to an officer of Imperial Terra. He found it hard to meet those eyes.

"We shall have to accept that," he told them. "What we cannot accept is our present rate of losses. Laura is only a prologue. If the cost of its capture proves such that we have to wait for reinforcements, giving Ythri time to reorganize, there goes our entire strategy. The whole war will become long and expensive."

He sighed. "Let us be frank, citizens," he said. "Our intelligence about this system was very bad. We had no idea what fortifications had been created for Avalon—"

In orbit, automated stations by the hundreds, whose power plants fed no engines but, exclusively, defensive screens and offensive projectors; thus mortally dangerous to come in range of. Shuttling between them and the planet, hence guarded by them, a host of supply craft, bringing whatever might be

needed to keep the robots shooting.

On the surface, and on the moon, a global grid of detectors, launch tubes, energy weapons too immense for spaceships to carry; some buried deep in rock or on the ocean beds, some aboveground or afloat. The chance of a vessel or missile getting through from space, unintercepted, small indeed; and negafields shielding every vital spot.

In the air, a wasp swarm of pursuit craft on patrol, ready to streak by scores against any who was so rash as to intrude.

"—and the defenders used our ignorance brilliantly. They lured us into configurations that allowed those instrumentalities to inflict staggering damage. We're mousetrapped between the planet and their ships. Inferior though the enemy fleet is, under present circumstances it's disproportionately effective.

"We have no choice. We must change the circumstances, fast. If we pull beyond reach of the defenses, their fleet will again be outmatched and, I'm sure, will withdraw to the outer parts of this system as Captain K'thak has said."

"Then, sir?" asked a man. "What do we do then?"

"We make a reassessment," Cajal told him.

"Can we saturate their capabilities with what we've got on hand?" wondered another.

"I do not know," Cajal admitted.

"How could they do this?" cried a man from behind the bandages that masked him. His ship had been among those smashed. "A wretched colony—what's the population, fourteen million, mostly ranchers?—how was it possible?"

"You should understand that," Cajal reproved, though gently because he knew drugs were dulling brain as well as pain. "Given abundant nuclear energy, ample natural resources, sophisticated automation technology, one needs nothing else except the will. Machines produce machines, exponentially. In a few years one has full production under way, limited only by available minerals; and an underpopulated, largely rural world like Avalon will have a good supply of those.

"I imagine," he mused aloud—because any thought was better than thought of what the Navy had suffered this day, "that same pastoral economy simplified the job of keeping secret how great an effort was being mounted. A more developed society would have called on its existing industry, which is out in the open. The Avalonian leadership, once granted *carte blanche* by the electorate, made most of its facilities from zero, in regions where no one lives." He nodded. "Yes, citizens, let us confess we have been taken." Straightening: "Now we salvage what we can."

Discussion turned to ways and means. Battered, more than decimated, the Terran force was still

gigantic. It was strewn through corresponding volumes of space, its units never motionless. Arranging for an orderly retreat was a major operation in itself. And there would be the uncertainties, imponderables, and inevitable unforeseen catastrophes of battle. And the Avalonian space captains must be presented with obvious chances to quit the fight—not mere tactical openings, but a clear demonstration that their withdrawal would not betray their folk—lest they carry on to the death and bring too many Imperials with them.

But at last the computers and underlings were at work on details, the first moves of disengagement were started. Cajal could be alone.

Or can I be? he thought. *Ever again? The ghosts are crowding around.*

No. This debacle wasn't his fault. He had acted on wrong information. Saracoglu—no, the governor was a civilian who was, at most, peripherally involved in fact-gathering and had worked conscientiously to help prepare. Naval Intelligence itself—but Saracoglu had spoken sooth. Real espionage against Ythri was impossible. Besides, Intelligence . . . the whole Navy, the whole Empire . . . was spread too thin across a reach too vast, inhuman, hostile; in the end, perhaps all striving to keep the Peace of Man was barren.

You did what you could. Cajal realized he had not done badly. These events should not be called a debacle, simply a disappointment. Thanks to discipline and leadership, his fleet had taken far fewer losses than it might have; it remained overwhelmingly powerful; he had learned lessons that he would use later on in the war.

Nevertheless, the ghosts would not go away.

Cajal knelt. *Christ, who forgave the soldiers, help me forgive myself. Saints, stand by me till my work is done.* His look went from crucifix to picture. *Before everyone, you, Elena who in Heaven must love me yet, since none were ever too lowly for your love, Elena, watch over me. Hold my hand.*

Beneath the flyers, the Middle Ocean rolled luminous black. Above them were stars and a Milky Way whose frostiness cut through the air's warmth. Ahead rose the thundercloud mass of an island. Tabitha heard surf on its beaches, a drumfire in the murmur across her face.

"Are they sure the thing landed here?" asked one of the half-dozen Ythrians who followed her and Draun.

"Either here or in the sea," growled her partner. "What's the home guard for if not to check out detector findings? Now be quiet. And wary. If that was an Imperial boat—"

"They're marooned," Tabitha finished for him. "Helpless."

"Then why've they not called to be fetched?"

"Maybe their transmitter is ruined."

"And maybe they have a little scheme. I'd like that. We've many new-made dead this night. The more Terrans for hell-wind to blow ahead of them, the better."

"Follow your own orders and shut up," Tabitha snapped.

Sometimes she seriously considered dissolving her association with Draun. She had come to see over the years that he didn't really believe in the gods of the Old Faith, nor carry out their rites from traditionalism like most Highsky folk; no, he enjoyed those slaughterous sacrifices. And he had killed in duello more than once, on his own challenge, however much trouble he might have afterward in scraping together winner's gild for the bereaved. And while he seldom abused his slaves, he kept some, which she felt was the fundamental abuse.

Still—he was loyal and, in his arrogant way, generous to friends; his seamanship combined superbly with her managerial talents; he could be good company when he chose; his wife was sweet; his youngest cubs were irresistible, and loved their Kin-She Hrill who took them in her arms. . .

I'm perfect? Not by a fertilizing long shot, considering how I let my mind meander!

They winged, she thrust above the strand and high over the island. Photoamplifier goggles showed it silver-gray, here and there speckled with taller growth; on boulders, dew had begun to catch starlight. *(How goes it yonder? The news said the enemy's been thrown back, but—)* She wished she were flying nude in this stroking, giddily perfumed air. But her business demanded coveralls, cuirass, helmet, boots. That which had been detected coming down might be a crippled Avalonian, but might equally well be— *Hoy!*

"Look." She pointed. "A fresh track." They swung about, crossed a ridge, and the wreck lay under them.

"Terran indeed," Draun said. She saw his crest and tailfeathers quiver in eagerness. He wheeled, holding a magnifier to his eyes. "Two outside. Hya-a-a-a-ah!"

"Stop!" Tabitha yelled, but he was already stooping.

She cursed the awkwardness of gravbelts, set controls and flung herself after him. Behind came the other Ythrians, blasters clutched to breasts while wings hastened their bodies. Draun had left his gun sheathed, had taken out instead the half-meter-long, heavy, crooked Fao knife.

"Stop!" Tabitha screamed into the whistle of split air. "Give them a chance to surrender!"

The humans, standing by a patch of freshly turned earth, heard. Their glances lifted. Draun howled

his battle cry. One man yanked at a holstered sidearm. Then the hurricane was on him. Wings snapped around so it roared in the pinions. Two meters from ground, Draun turned his fall into an upward rush. His right arm swept the blade in a short arc; his left hand, on the back of it, urged it along. The Terran's head flew off the neck, hit the susin and horribly bounced. The body stood an instant, geysering blood, before it collapsed like a puppet on which the strings have been slashed.

"Hya-a-a-a-ah!" Draun shrieked. "Hell-winds blow you before my chothmates! Tell Illarian they are coming!"

The other Terran stumbled back. His own sidearm was out. He fired, a flash and boom in blackness.

Before they kill him too— Tabitha had no time for planning. She was in the van of her squad. The man's crazed gaze and snap shot were aimed at Draun, whose broad-winged shadow had not yet come about for a second pass. She dived from the rear, tackled him low, and

rolled over, gripping fast. They tumbled; the belt wasn't able to lift both of them. She felt her brow slammed against a root, her cheek dragged abradingly over the susin.

His threshings stopped. She turned off her unit and crouched beside him. Pain and dizziness and the laboring of her lungs were remote. He wasn't dead, she saw, merely half stunned from his temple striking a rock. Blood oozed in the kinky black hair, but he stirred and his eyeballs were filled with starlight. He was tall, swarthy by Avalonian measure . . . people with such chromosomes generally settled beneath stronger suns than Laura. . .

The Ythrians swooped near. Wind rushed in their quills. Tabitha scrambled to her feet. She bestrode the Terran. Gun in hand, she gasped, "No. Hold back. No more killing. He's mine."

X

Ferune of Mistwood reported in at Gray, arranged his affairs and said his good-byes within a few days.

To Daniel Holm: "Luck be your friend, First Marchwarden."

The man's mouth was stretched and unsteady. "You must have more time than—than—"

Ferune shook his head. The crest drooped ragged; most feathers that remained to him were lusterless white; he spoke in a mutter. His grin had not changed. "No, I'm afraid the medics can't stimulate regeneration in this case. Not when every last cell got blasted. Pity the Imperials didn't try shooting us full of mercury vapor. But you'd find that inconvenient."

Yes, you've more tolerance for heavy metals than humans do, went uselessly through Holm, *but less for hard radiation.* The voice trudged on: "As is, I am held together by drugs and baling wire. Most of those who were with me are already dead, I hear. But I had to get my powers and knowledge transferred to you, didn't I, before I rest?"

"To me?" the man suddenly couldn't hold back. "Me who killed you?"

Ferune stiffened. "Come off that perch, Daniel Holm. If I thought you really blame yourself, I would not have left you in office—probably not alive; anyone that stupid would be dangerous. You were executing my plan, and bloody-gut well it worked too, kh'hng?"

Holm knelt and laid his head on the keelbone. It was sharp, when flesh had melted from above, and the skin was fever-hot and he could feel how the heart stammered. Ferune shifted to handstance. Wings enfolded the man and lips kissed him. "I flew higher because of you," Ferune said. "If war allows, honor us by coming to my rite. Fair winds forever."

He left. An adjutant helped him

into a car and took him northward, to the woodlands of his choth and to Wharr who awaited him.

"Permit me to introduce myself. I am Juan de Jesús Cajal y Palomares of Nuevo México, commanding His Imperial Majesty's naval forces in the present campaign. You have my word as a Terran officer that the beam is tight, the relays are automatic, this conversation will be recorded but not monitored, and the tape will be classified secret."

The two who looked out of the screens were silent, until Cajal grew over-aware of the metal which enclosed him, background pulse of machinery and slight chemical taint in the air blown from ventilators. He wondered what impression he was making on them. There was no way to tell from the old Ythrian—Liaw? Yes, Liaw—who evidently represented civil authority. That being sat like a statue of grimness, except for the smoldering yellow eyes. Daniel Holm kept moving, cigar in and out of his mouth, fingers drumming desktop, tic in the left cheek. He was haggard, unkempt, stubbly, grimy, no hint of Imperial neatness about him. But he scarcely seemed humble.

He it was who asked at length: "Why?"

"Por qué?" responded Cajal in surprise. "Why I had a signal shot down to you proposing a conference? To discuss terms, of course."

"No, this secrecy. Not that I believe you about it, or anything else."

Cajal felt his cheeks redden. *I must not grow angry.* "As you wish, Admiral Holm. However, please credit me with some common sense. Quite apart from the morality of letting the slaughter and waste of wealth proceed, you must see that I would prefer to avoid further losses. That is why we're orbiting Avalon and Morgana at a distance and have made no aggressive move since battle tapered off last week. Now that we've evaluated our options, I am ready to talk; and I hope you've likewise done some hard thinking. I am not interested in pomp or publicity. Such things only get in the way of reaching practical solutions. Therefore the confidential nature of our parley. I hope you'll take the chance to speak as frankly as I mean to, knowing your words need not commit you."

"Our word does," Holm said.

"Please," Cajal urged. "You're angry, you'd kill me were you able, nevertheless you're a fellow professional. We both have our duties, however distasteful certain of them may be."

"Well, get on with it, then. What d'you want?"

"To discuss terms, I said. I realize we three alone can't authorize or arrange the surrender, but—"

"I think you can." Liaw interrupted: a low, dry, harshly ac-

cented Anglic. "If you fear court-martial afterward, we will grant you asylum."

Cajal's mouth fell open. "What are you saying?"

"We must be sure this is no ruse. I suggest you bring your ships one at a time into close orbit, for boarding. Transportation home for the crews will be made available later."

"Do you . . . do you—" Cajal swallowed. "Sir, I'm told your proper title translates more or less into 'Judge' or 'Lawspeaker'. Judge, this is no time for humor."

"If you don't want to give in," Holm said, "what's to discuss?"

"Your capitulation, *por Dios!*" Cajal's fist smote the arm of his chair. "I'm not going to play word games. You've delayed us too long already. But your fleet has been smashed. Its fragments are scattered. A minor detachment from our force can hunt them down at leisure. We control all space around you. You've no possibility of outside help. Whatever might recklessly be sent from other systems would be annihilated in detail; and the admiralties there know it. If they go anywhere with what pitiful strength they have, it'll be to Quetlan." He leaned forward. "We'd hate to bombard your planet. Please don't compel us to."

"Go right ahead," Holm answered. "Our interceptor crews would enjoy the practice."

"But—are you expecting blockade runners to—to— Oh, I know how big a planet is. I know an occasional small craft could sneak past our detector grids, our patrols, and stations. But I also know how very small such craft must be, and how very occasional their success."

Holm drew savagely on his cigar before he stabbed it into its smoke. "Yes, sure," he snapped. "Standard technique. Eliminate a space fleet, and its planet has to yield or you'll pound it into radioactive slag. Nice work for a man, that, hm-m-m? Well, my colleagues and I saw this war coming years back. We knew we'd never have much of a navy by comparison, if only because you bastards have so much more population and area behind you. But defense—Admiral, you're at the end of a long line of communication and supply. The border worlds aren't geared to produce anything like the amount of stuff you require; it has to come from deeper in the Empire. We're *here,* set up to make everything necessary as fast as necessary. We can't come after you. But we can bugger well swamp whatever you throw at us."

"Absolutely?"

"O.K., once in a great while, by sheer luck, you doubtless could land a warhead, and it might be big and dirty. We'd weather that, and the home guard has decontamination teams. Chances of its hitting anything important are about like drawing three for a royal flush. No ship of yours can get close

enough with an energy projector husky enough to pinken a baby's bottom. But there're no size and mass limits on our ground-based photon weapons; we can use whole rivers to cool their generators while their snouts whiff you out of our sky. Now tell me why in flaming chaos we should surrender."

Cajal sat back. He felt as if struck from behind.

"No harm in learning what conditions you meant to offer," Liaw said, toneless.

Face saving? Those Ythrians are supposed to be satanically proud, but not to the point of lunacy. Hope knocked in Cajal. "Honorable terms, of course," he said. "Your ships must be sequestered, but they will not be used against Ythri and personnel may go home, officers to keep their sidearms. Likewise for your defensive facilities. You must accept occupation and cooperate with the military government, but every effort will be made to respect your laws and customs, individuals will have the right to petition for redress of grievances, and Terran violators of the statutes will be punished as severely as Avalonian. Actually, if the population behaves correctly, I doubt if a large percentage will ever even see an Imperial marine."

"And after the war?"

"Why, that's for the Crown to decide, but I presume you'll be included in a reorganized Sector Pacis, and you must know Governor Saracoglu is efficient and humane. Insofar as possible, the Empire allows home rule and the continuation of local ways of life."

"Allows. The operative word. But let it pass. Let us assume a degree of democracy. Could we stop immigrants from coming until they outvoted us?"

"Well . . . well, no. Citizens are guaranteed freedom of movement. That's one of the things the Empire is for. Confound it, you can't selfishly block progress just because you prefer archaism."

"There is no more to discuss. Good day, Admiral."

"No, wait! Wait! You can't—condemn your whole people to war by yourselves!"

"If the Khruaths and the Parliament change their views, you will be informed."

"But listen, you're letting them die for nothing," Cajal said frantically. "This frontier is going to be straightened out. You, the whole Domain of Ythri have no power to stop that. You can only prolong the murderous, maiming farce. And you'll be punished by worse peace terms than you could have had. Listen, it's not one-sided. You're coming into the Empire. You'll get trade, contact, protection. Cooperate now and I swear you'll start out as a chartered client state, with all the privileges that means. Within years, individuals will be getting Terran citizenship. Eventually the whole of Avalon could become

part of Greater Terra. For the love of God, be realistic!"

"We are," said Liaw.

Holm leered. Both screens blanked.

Cajal sat for minutes, staring. *They can't have been serious. They can't.* Twice he reached toward his intercom. Have them called; maybe this was some childish insistence that the Empire beg them to negotiate. . .

His hand drew back. *No. I am responsible for our own dignity.*

Decision came. Let Plan Two be set in train. Leave the calculated strength here to invest Avalon. Comparatively little would be required. The sole real purpose was to keep this world's considerable resources from flowing to Ythri and these bases from menacing Cajal's lines back to the Empire. Siege would tie up more men and vessels than occupation would have done, but he could spare them.

The important thing was not to lose momentum. Rather, his freed ships must be off immediately to help in simultaneous assaults on Khrau and Kru. He'd direct the former himself, his second in command the latter. What they had learned here would be quite helpful.

And he was sure of quick victories yonder. Intelligence had failed to learn the extent of Avalonian arming, but not to discover the fact itself; that could not be concealed. By the same token, he knew that no other planet of the Domain had had a Daniel Holm nagging it over the years to build against this storm. He knew that the other Ythrian colonial fleets were small and poorly coordinated, the worlds unarmed.

Quetlan, the home sun, was more formidable. But let him rip spectacularly enough through the spaces between, and he dared hope his enemies would have the wisdom to capitulate before he stabbed them in the heart.

And afterward a few distorted molecules, recording the armistice, will give us Avalon. Very well. Better than fighting. Do they know this? Do they merely want to keep for a few weeks more, the illusion of freedom? Well, I hope the price they'll be charged for that—levies, restrictions, revisions of their whole society, that might otherwise have been deemed unnecessary—I hope they won't find the price unendurably steep—because endure it they must.

Before sunrise, Ferune departed Mistwood.

That day his home country bore its name well. Fog blew cold, wet, and blinding off the sea. Smokiness prowled the glooms around thick boles of hammerbranch, soaring trunks of lightningrod; moisture dripped from boughs onto fallen leaves, and where it stuck a pool which had formed among the ringed stems of a sword-of-sorrow,

it made a tiny glass chiming. But deeper inland, where Old Avalon remained, a boomer tree frightened beasts that might have grazed on it, and this noise rolled beneath the house of Ferune and echoed off the hanging shields of his ancestors.

Wings gathered. A trumpet sounded through night. Forth came his sons to meet their chothmates. They carried the body on a litter between them. His uhoths fluttered about, puzzled at his quietness. His widow led the way. Flanking were his daughters, their husbands and grown children, who bore lit torches.

Wings beat. The flight cut upward. When it rose past the fog, this was turned to blue-shadowed white under an ice-pale eastern lightening. Westward over sea, the last stars glimmered in royal purple.

Still the folk mounted, until they were near the top of what unaided flesh could reach. Here the airs whittered thin and chill; but on the rim of a twilit world, the snow-peaks of the Weathermother were kindled by a yet hidden sun.

All this while the flight beat north. Daniel Holm and his family, following in heavy garments and breathing masks, saw wings glow across heaven in one tremendous spearhead. They could barely make out the torchflames which streamed at its point, as sparks like the waning stars. More clearly came the throb from under those pinions. Apart from that, silence was total.

They reached wilderness, a land of crags, boulders, and swift-running streams. There the sons of Ferune stopped. Wings outspread, they hovered on the first faint warmth of morning, their mother before them. Around circled their near kin; and in a wheel, the choth surrounded these. And the sun broke over the mountains.

To Ferune came the new Wyvan of Mistwood. Once more he blew the horn, and thrice he called the name of the dead. Wharr swept by, to kiss farewell. Then the Wyvan spoke the words of the New Faith, which was two thousand years old.

"High flew your spirit on many winds; but downward upon you at last came winging God the Hunter. You met Him in pride, you fought Him well, from you He has honor. Go hence now, that which the talons left, be water and leaves, arise in the wind; and spirit, be always remembered."

His sons tilted the litter. The body fell, and after it the torches.

Wharr slanted off in the beginning measures of the sky dance. A hundred followed her.

Hanging afar, between emptiness and immensity, Daniel Holm said to Christopher: "And that Terran thought we'd surrender."

XI

Liaw of The Tarns spoke. "We are met in the Great Khruath of

Avalon, that free folk may choose their way. Our enemy has taken elsewhere most of the might which he brought against us. This is no victory, since those vessels will make war upon the rest of the Domain. Meanwhile he has left sufficient ships to hold us cut off. They are unlikely to attack our world. But they will seek to find and root out our bases among the sister planets and the few warcraft of ours that are left in space. Save for what harrassment our brethren aboard can contrive, we have no means of taking the offensive. Our defenses we can maintain indefinitely. Yet no pledge can be given that great harm will not be wrought on Avalon, should the foe launch a determined effort. He has declared that in the end we are sure to be subjugated. This is possibly true. He has then declared that we can expect better treatment if we yield now than if we fight on, though at best we will come under Imperial law and custom. This is certainly true.

"They who speak for you rejected the demand, as was their duty until you could be summoned to decide. I remind you of the hazards of continued war and the threat of a harsh peace should we lose. I remind you furthermore that if we do resist, the free folk of Avalon must give up many of their rights and submit to their military leaders for as long as the strife lasts.

"What say the choths?"

He and his colleagues stood on the olden site, First Island in the Hesperian Sea. At their backs rose the house of David Falkayn; before them greensward slanted toward beach and surf. But no booths or tents had been raised, no ships lay at anchor, no swarms of delegates flew down to form ranks beneath the trees. Time was lacking for ceremonious assemblies. Those elected at regional meetings, and those individuals who signified a wish to speak, were present electronically.

The computer-equipped staff worked hard inside the house. However taciturn the average Ythrian was, however unwilling to make a fool of himself by declaiming the obvious, still, when some two million enfranchised adults were hooked into a matter of as great moment as this, the questions and comments that arrived must be filtered. Those chosen to be heard must wait their turns.

Arinnian knew he would be called. He sat by Eyath before an outsize screen. They were alone on the front, hence lowest bench. At their backs the tiers rose, the household of Lythran and Blawsa crowded thereon, to the seat of the master and his lady. Liaw's slow words only deepened the quiet in that broad, dark, weapon-hung chamber; and so did the rustle of feathers, the scrape of claws or alatans, when someone shifted a little.

The air was filled with the woodsmoke odor of Ythrian bodies. A breeze, gusting in from a window open on rain, added smells of damp earth and stirred the banners that hung from high rafters.

"–report on facts concerning–"

The image in the screen became that of a rancher. Behind him could be seen the North Coronan prairie, a distant herd, a string of quadrupedal burden-bearing zirraukhs led by a flapping youth, a more up-to-date truck which passed overhead. He stated, "Food production throughout the Plains of Long Reach has been satisfactory this year. The forecasts for next season are optimistic. We have achieved seventy-five percent storage of preserved meat in bunkers proofed against radioactive contamination, and expect to complete this task by midwinter. Details are filed in Library Central. Finished." The scan returned to the High Wyvans, who promptly called on another area representative.

Eyath caught Arinnian's arm. He felt the pulse in her fingers, and the claws on the two encirling thumbs bit him. He looked at her. The bronze-brown crest was stiffly raised, the amber eyes like lanterns. Fangs gleamed between her lips. "Must they drone on till eternity molders?" she breathed.

"They need truth before they decide," he whispered back, and felt the disapproving stares between his shoulderblades.

"What's to decide–when Vodan's in space?"

"You help him best by patience." He wondered who he was to give counsel. Well, Eyath was young *(me too, but this day I feel old)* and it was cruel that she could hope for no word of her betrothed until, probably, war's end. No mothership could venture in beaming range of beleaguered Avalon.

At least it was known that Vodan's ship had been among those which escaped. Too many orbited in wreck. More Terrans had been destroyed, of course, thanks to the trap that Ferune and Holm sprang. But one Ythrian slain was too many, Arinnian thought, and a million Terrans were too few.

"–call on the chief of the West Coronan guard."

He scrambled to his feet, realized that was unnecessary, and opined that he'd better remain standing than compound his gaucherie by sitting down again before he had spoken. "Uh, Arinnian of Stormgate. We're in good shape, equipping, training, and assigning recruits as fast as they come in. But we want more. Uh, since nobody has mentioned it, I'd like to remind people that except for ranking officers, home guard service is part time and the volunteer's schedule can be set to minimize interference with his ordinary work. Our section's cooperation with the North Oronesians is now being extended through the entire archipelago, and

we aim to do likewise in southerly and easterly directions till, uh, we've an integrated command for the Brendan's, Fiery, and Shielding Islands as well, to protect the whole perimeter of Corona.

"Uh, on behalf of my father, the First Marchwarden, I want to point out a considerable hole in Avalon's defense, namely the absence of a guard for Equatoria, nothing there except some projector and missile launching sites. True, the continent's uninhabited, but the Terrans know that, and if they consider an invasion, they aren't likely to care about preserving a piece of native ecology intact. I, uh, will receive suggestions about this and pass them along the proper channels." His tongue was dry. "Finished."

He lowered himself. Eyath took his hand, gentler this time. Thank fortune, no one wanted to question him. He could be crisp in discussing strictly technical problems with a few knowledgeable persons, but two million were a bit much for a man without political instincts.

The talk seemed interminable. And yet, at the end, when the vote was called, when Liaw made his matter-of-fact announcement that the data bank recorded eighty-three percent in favor of continued resistance, scarcely six hours had passed. Humans couldn't have done it.

"Well," Arinnian said into the noise of cramped wings being stretched, "no surprises."

Eyath tugged at him. "Come," she said. "Get your belt. I want to use my muscles before dinner."

Rain beat through dusk, cold and tasting of sky. When they came above the clouds, he and she turned east to get away from their chothmates who also sought exercise. Snowpeaks and glaciers thrust out of whiteness, into a blue-black where gleamed the early stars and a few moving sparks which were orbital fortresses.

They fared awhile in silence, until she said: "I'd like to join the guard."

"Hm-m-m? Ah. Yes; welcome."

"But not fly patrol. That's essential, I know, and pleasant if the weather's halfway good; but I don't want a lot of pleasure. Look, see Camelot rising yonder. Vodan may be huddled inside a dead moon of it, waiting and waiting for a chance to hazard his life."

"What would you prefer?" he asked.

Her wings beat more steadily than her voice. "You must be caught in a hurricane of work, which is bound to stiffen. Surely your staff's too small, else why would you be so tired? Can't I help?"

"Hm-m-m . . . well—"

"Your assistant, your fetch-and-carry lass, even your personal secretary? I can take an electro-cram in the knowledge and skills, and be

ready to start inside a few days."

"No. That's rough."

"I'll survive. Try me. Fire me if I can't grip the task, and we'll stay friends. I believe I can, though. Maybe better than someone who hasn't known you all these years, and who can be given another job. I'm bright and energetic. Am I not? And . . . Arinnian, I so much need to be with you, till this cripplewing time is outlived."

She reached toward him. He caught her hand. "Very well, galemate." In the wan light she flew as beautiful as ever beneath sun or moon.

"Yes, I'll call for a vote tomorrow," Matthew Vickery said.

"How d'you expect it'll go?" Daniel Holm asked.

The President sighed. "How do you think? Oh, the war faction won't bring in quite the majority of Parliament that it did of the Khruath. A few members will vote their convictions rather than their mail. But I've seen the analysis of that mail, and of the phone calls and—yes, you'll get your damned resolution to carry on. You'll get your emergency powers, the virtual suspension of civilian government you've been demanding. I do wish you'd read some of those letters or watch some of those tapes. The fanaticism might frighten you as it does me. I never imagined we had that much latent insanity in our midst."

"It's insane to fight for your home?"

Vickery bit his lip. "Yes, when nothing can be gained."

"I'd say we gain quite a chunk. We kicked a sizable hole in the Terran armada. We're tying up a still bigger part, that was originally supposed to be off to Ythri."

"Do you actually believe the Domain can beat the Empire? Holm, the Empire can't *afford* to compromise. Take its viewpoint for a minute if you can. The solitary keeper of the peace among thousands of wildly diverse peoples; the solitary guardian of the borders against the barbarian and the civilized predatory alien, who carry nuclear weapons. The Empire has to be more than almighty. It must maintain credibility, universal belief that it's irresistible, or hell's kettle boils over."

"My nose bleeds for the Empire," Holm said, "but His Majesty will have to solve his problems at somebody else's expense. He gets no free rides from us. Besides, you'll note the Terrans didn't keep throwing themselves at Avalon."

"They had no need to," Vickery replied. "If the need does arise, they'll be back in force. Meanwhile we're contained." He filled his lungs. "I admit your gamble paid off extraordinarily—"

"Please. 'Investment.' And not mine. Ours."

"But don't you see, now there's nothing further we can use it for

except a bargaining counter? We can get excellent terms, and I've dealt with Governor Saracoglu, I know he'll see to it that agreements are honored. Rationally considered, what's so dreadful about coming under the Empire?"

"Well, we'd begin by breaking our oath to Ythri. Sorry, chum. Deathpride doesn't allow."

"You sit here mouthing obsolete words, but I tell you, the winds of change are blowing."

"I understand that's a mighty old phrase too," Holm said. "Ferune had one still older that he liked to quote. How'd it go? '–their finest hour–' "

Tabitha Falkayn shoved off from the dock and hauled on two lines in quick succession. Jib and mainsail crackled, caught the breeze, and bellied taut. The light, open boat heeled till foam hissed along the starboard rail, and accelerated outward. Once past the breakwater, on open sea, she began to ride waves.

"We're planing!" Philippe Rochefort cried.

"Of course," Tabitha answered. "This is a hydrofoil. 'Ware boom." She put the helm down. The yard swung, the hull skipped onto the other tack.

"No keel? What do you do for lateral resistance?"

She gestured at the oddly curved boards which lifted above either rail, pivoting in response to vanes upon them. "Those. The design's Ythrian. They know more about the ways of wind than men and men's computers can imagine."

Rochefort settled down to admire the view. It was superb. Billows marched as far as he could see, blue streaked with violet and green, strewn with sun-glitter, intricately white-foamed. They rumbled and whooshed. Fine spindrift blew off them, salty on the lips, spurring the blood where it struck bare skin. The air was cool, not cold, and singingly alive. Aft, the emerald heights of St. Li dwindled at an astonishing speed.

He had to admit the best part was the big, tawny girl who stood, pipe in teeth, hawklike pet on shoulder, bleached locks flying, at the tiller. She wore nothing but a kilt, which the wind molded to her loins, and–to be sure–her knife and blaster.

"How far did you say?" he asked.

"'Bout thirty-five kilometers. A couple of hours at this rate. We needn't start back till sundown, plenty of starlight to steer by, so you'll have time for poking around."

"You're too kind, Donna," he said carefully.

She laughed. "No, I'm grateful for an excuse to take an outing. Especially since those patches of atlantis weed fascinate me. Entire ecologies, in areas that may get bigger'n the average island. And

the fisher scout told me he'd seen a kraken grazing the fringes of this one. Hope we find him. They're a rare sight. Peaceful, though we dare not come too near something that huge."

"I meant more than this excursion," Rochefort said. "You receive me, a prisoner of war, as your house guest."

Tabitha shrugged. "Why not? We don't bother stockading what few people we've taken. They aren't going anywhere." Her eyes rested candidly on him. "Besides, I want to know you."

He wondered, with an inward thump, how well.

Somberness crossed her. "And," she said, "I hope to . . . make up for what happened. You've got to see that Draun didn't wantonly murder your friend. He's, well, impetuous; and a gun was being pulled; and it *is* wartime."

He ventured a smile. "Won't always be, Donna."

"Tabitha's the name, Philippe; or Hrill when I talk Planha. You don't, of course . . . That's right. When you go home, I'd like you to realize we Ythrians aren't monsters."

"Ythrians? You?" He raised his brows.

"What else? Avalon belongs to the Domain."

"It won't for much longer," Rochefort said. In haste: "Against that day, I'll do what I can to show you we Terrans aren't monsters either."

He could not understand how she was able to grin so lightheartedly. "If it amuses you to think that, you're welcome. I'm afraid you'll find amusement in rather short supply here. Swimming, fishing, boating, hiking . . . and, yes, reading; I'm addicted to mystery stories and have a hefty supply, some straight from Terra. But that's just about the list. I'm the sole human permanently resident on St. Li, and between them, my business and my duties as a home guard officer will keep me away a lot."

"I'll manage," he said.

"Sure, for a while," she replied. "The true Ythrians aren't hostile to you. They mostly look on war as an impersonal thing, like a famine where you might have to kill somebody to feed him to your young but don't hate him on that account. They don't go in for chitchat, but if you play chess you'll find several opponents."

Tabitha shortened the mainsheet and left it in a snap cleat. "Still," she said, "Avalonians of either kind don't mass-produce entertainment, the way I hear people do in the Empire. You won't find much on the screens except news, sleepifyingly earnest educational programs, and classic dramas which probably won't mean a thing to you. So . . . when you get bored, tell me and I'll arrange for your

quartering in a town like Gray or Centauri."

"I don't expect to be," he said, and added in measured softness, "Tabitha." Nonetheless he spoke honestly when he shook his head, stared over the waters, and continued: "No, I feel guilty at not grieving more, at being as conscious as I am of my fantastic good luck."

"Ha!" she chuckled. "Someday I'll count up the different ways you were lucky. That was an unconverted island you were on, lad, pure Old Avalonian, including a fair sample of the nastier species."

"Need an armed man, who stays alert, fear any animals here?"

"Well, no doubt you could shoot a spathodont dead before it fanged you, though reptiloids don't kill easy. I wouldn't give odds on you against a pack of lycosauroids, however; and if a kakkelak swarm started running up your trousers—" Tabitha grimaced. "But those're tropical mainland beasties. You'd have had your troubles from the plants, which're wider distributed. Suppose a gust stirred the limbs of a surgeon tree as you walked by. Or . . . right across the ridge from where you were, I noticed a hollow full of hell shrub. You're no Ythrian, to breathe those vapors and live."

"Brrr!" he said. "What incurable romantic named this planet?"

"David Falkayn's granddaughter, when he'd decided this was the place to go," she answered, grave again. "And they were right, both of them. If anything, the problem was to give native life its chance. Like the centaurs, who're a main reason for declaring Equatoria off limits, because they use bits of stone and bone in tool fashion and maybe in a million years they could become intelligent. And by the way, their protection was something Ythri insisted on, hunter Ythri, not the human pioneers."

She gestured. "Look around you," she said. "This is our world. It's going to stay ours."

No, he thought, and the day was dulled for him, *you are wrong, Tabitha-Hrill. My admiral's going to hammer your Ythrians until they have no choice but to hand you over to my Emperor.*

XII

Week after fire-filled week, the Terran armada advanced.

Cajal realized that despite its inauspicious start, his campaign would become a textbook classic. In fact, his decision about Avalon typified it. Any fool could smash through with power like his. As predicted, no other colonial system possessed armament remotely comparable to what he had encountered around Laura. What existed was handled with acceptable skill, but simply had no possibility of winning.

So any butcher could have spent lives and ships, and milled his op-

position to dust in the course of months. Intelligence data and Cajal's own estimate had shown that this was the approach his enemies expected him to take. They in their turn would fight delaying actions, send raiders into the Empire, seek to stir up third parties such as Merseia, and in general make the war sufficiently costly for Terra that a negotiated peace would become preferable.

Cajal doubted this would work, even under the most favorable circumstances. He knew the men who sat on the Policy Board. Nevertheless he felt his duty was to avoid victory by attrition—his duty to both realms. Thus he had planned, not a cautious advance where every gain was consolidated before the next was made, but a swordstroke.

Khrau and Hru fell within days of the Terrans' crossing their outermost planetary orbits. Cajal left a few ships in either system and a few occupation troops, mostly technicians, on the habitable worlds.

These forces looked ludicrously small. Marchwarden Rusa collected a superior one and sought to recapture Khrau. The Terrans sent word and hung on. A detachment of the main fleet came back, bewilderingly soon, and annihilated Rusa's command.

On Hru III the choths rose in revolt. They massacred part of the garrison. Then the missiles struck from space. Not many were needed before the siege of the Imperials was called off. The Wyvans were rounded up and shot. This was done with proper respect for their dignity. Some of them, in final statements, urged their people to cooperate with relief teams being rushed from Esperance to the smitten areas.

Meanwhile the invaders advanced on Quetlan. From their main body, tentacles reached out to grab system after system in passing. Most of these Cajal did not bother to occupy. He was content to shatter their navies and go on. After six weeks, the sun of Ythri was englobed by lost positions.

Now the armada was deep into the Domain, more than fifty light-years from the nearest old-established Imperial base. The ornithoids would never have a better chance of cutting it off. If they gathered everything they had for a decisive combat—not a standup slugging match, of course; a running fight that might last weeks—they would still be somewhat outmatched in numbers. But they would have a continuing supply of munitions, which the Imperials would not.

Cajal gave them every opportunity. They obliged.

The Battle of Yarro Cluster took eight standard days, from the first engagement to the escape of the last lonely Ythrian survivors. But the first two of these days were preliminary and the final three were scarcely more than a mopping

up. Details are for the texts. In essence, Cajal made use of two basic advantages. The first was surprise; he had taken pains to keep secret the large number of ammunition carriers with him. The second was organization; he could play his fleet like an instrument, luring and jockeying the ill-coordinated enemy units into death after death.

Perhaps he also possessed a third advantage, genius. When that thought crossed his mind, he set himself a penance.

The remnants of Domain power reeled back toward Quetlan. Cajal followed leisurely.

Ythri was somewhat smaller than Avalon, somewhat drier, the cloud cover more thin and hence the land masses showing more clearly from space, tawny and rusty in hue, under the light of a sun more cool and yellow than Laura. Yet it was very lovely, floating among the stars. Cajal left that viewscreen on and from time to time glanced thither, away from the face in his comboard.

The High Wyvan Trauvay said, "You are bold to enter our home." His Anglic was fluent, and he employed a vocalizer for total clarity of pronunciation.

Cajal met the unblinking yellow eyes and answered, "You agreed to a parley. I trust your honor." *I put faith in my Supernova and her escort, too. Better remind him.* "This war is a sorrow to me. I would hate to blacken any part of your world or take any further lives of your gallant folk."

"That might not be simple to do, Admiral," Trauvay said slowly. "We have defenses."

"Observed. Wyvan, may I employ blunt speech?"

"Yes. Particularly since this is, you understand, not a binding discussion."

No, but half a billion Ythrians are tuned in, Cajal thought. *I wish they weren't. It's as if I could feel them.*

What kind of government is this? Not exactly democratic—you can't hang any Terran label on it, not even "government," really. Might we humans have something to learn here? Everything we try seems to break down at last, and the only answer to that which we ever seem to find is the brute simplicity of Caesar.

Stop, Juan! You're an officer of the Imperium.

"I thank the Wyvan," Cajal said, "and request him and his people to believe we will not attack them further unless forced or ordered to do so. At present we have no reason for it. Our objectives have been achieved. We can now make good our rightful claims along the border. Any resistance must be sporadic and, if you will pardon the word, pathetic. A comparatively minor force can blockade Quetlan. Yes, naturally individual ships can steal past now and then. But to all intents and purposes, you will be

isolated from your extrasystemic possessions, allies, and associates. Please consider how long the Domain can survive as a political entity under such conditions.

"Please consider, likewise, how your holding out will be an endless expense, an endless irritation to the Imperium. Sooner or later, it will decide to eliminate the nuisance. I do not say this is just, I say merely it is true. I myself would appeal an order to open fire. Were it too draconian, I would resign. But His Majesty has many admirals."

Stillness murmured around crucified Christ. Finally Trauvay asked, "Do you call for our surrender?"

"For an armistice," Cajal said.

"On what conditions?"

"A mutual cease-fire, of course . . . by definition! Captured ships and other military facilities will be retained by Terra, but prisoners will be repatriated on both sides. We will remain in occupation of systems we have entered, and will occupy those worlds claimed by the Imperium which have not already been taken. Local authorities and populaces will submit to the military officers stationed among them. For our part, we pledge respect for law and custom, rights of nonseditious free speech and petition, interim economic assistance, resumption of normal trade as soon as possible, and the freedom of any individual who so desires to sell his property on the open market and leave. Certain units of this fleet will stay near Quetlan and frequently pass through the system on surveillance; but they will not land unless invited, nor interfere with commerce, except that they reserve the right of inspection to verify that no troops or munitions are being sent."

Waves passed over the feathers. Cajal wished he knew how to read them. The tone stayed flat: "You do demand surrender."

The man shook his head. "No, sir, I do not, and in fact that would exceed my orders. The eventual terms of peace are a matter for diplomacy."

"What hope have we if defeat be admitted beforehand?"

"Much." Cajal made ready his lungs. "I respectfully suggest you consult your students of human sociodynamics. To put it crudely, you have two influences to exert, one negative, one positive. The negative one is your potentiality of renewing the fight. Recall that most of your industry remains intact in your hands, that you have ships left which are bravely and ably manned, and that your home star is heavily defended and would cost us dearly to reduce.

"Wyvan, people of Ythri, I give you my most solemn assurance the Empire does not want to overrun you. Why should we take on the burden? Worse than the direct expense and danger would be the loss of a high civilization. We desire, we need your friendship. If any-

thing, this war has been fought to remove certain causes of friction. Now let us go on together.

"True, I cannot predict the form of the eventual peace treaty. But I call your attention to numerous public statements by the Imperium. They are quite explicit. And they are quite sincere, for it is obviously to the best interest of the Imperium that its word be kept credible.

"The Domain must yield various territories. But compensations can be agreed on. And, after all, everywhere that your borders do not march with ours, there is waiting for you a whole universe."

Cajal prayed he was reciting well. His speeches had been composed by specialists, and he had spent hours in rehearsal. But if the experts had misjudged or he had bungled—

O God, let the slaughter end . . . and forgive me that the back of my mind is fascinated by the technical problem of capturing that planet.

Trauvay sat moveless for minutes before he said, "This shall be considered. Please hold yourself in the vicinity for consultations." Elsewhere in the ship, a xenologist who had made Ythrians his lifetime work leaped out of his chair, laughing and weeping, to shout, "The war's over! The war's over!"

Bells rang through Fleurville, from the cathedral a great bronze striding, from lesser steeples a frolic. Rockets cataracted upward to explode softly against the stars of summer. Crowds roiled in the streets, drunk more on happiness than on any liquor; they blew horns, they shouted, and every woman was kissed by a hundred strange men who suddenly loved her. In daylight, Imperial marines paraded to trumpets and squadrons of aircraft or small spacecraft roared recklessly low. But to the capital of Esperance and Sector Pacis, joy had come by night.

High on a hill, in the conservatory of the gubernatorial palace, Ekrem Saracoglu looked out over the galaxy of the city. He knew why it surged so mightily—the noise reached him as a distant wavebeat—and shone so brilliantly. The pacifist heritage of the colonists was a partial cause; now they could stop hating those brothers who wore the Emperor's uniform. *Although,* his mind murmured, *I suspect plain animal relief speaks louder. The smell of fear has been on this planet since the first border incidents, thick since war officially began. An Ythrian raid, breaking through our surprised cordons—a sky momentarily incandescent—*

"Peace," Luisa said. "I have trouble believing."

Saracoglu glanced at the petite shape beside him. Luisa Carmen Cajal y Gomez had not dressed gaily after accepting his invitation to dinner. Her gown was correct as to length and pattern, but plain gray velvyl. Apart from a tiny gold

cross between the breasts, her jewelry was a few synthetic diamonds in her hair. They glistened among high-piled black tresses like the night suns shining through the transparency overhead, or like the tears that stood on her lashes.

The governor, who had covered his portliness with lace, ruffles, tiger-patterned arcton waistcoat, green iridon culottes, snowy shimmerlyn stockings, and gems wherever he could find a place, ventured to pat her hand. "You are afraid the fighting may resume? No. Impossible. The Ythrians are not insane. By taking our armistice terms, they acknowledged defeat to themselves even more than to us. Your father should be home soon. His work is done." He sighed, trusting it wasn't too theatrically. "Mine, of course, will get rougher."

"Because of the negotiations?" she asked.

"Yes. Not that I'll have plenipotentiary status. However, I will be a ranking Terran representative, and the Imperium will rely heavily on the advice of my staff and myself. After all, this sector will continue to border on the Domain, and will incorporate the new worlds."

Her look was disconcertingly weighing from eyes that young. "You'll become quite an important man, won't you, Your Excellency?" Her tone was, if not chilly, cool.

Saracoglu got busy pinching superfluous buds off a fuchsia. Beside it a cinnamon bush—Ythrian plant—filled the air with fragrance. "Well, yes," he said. "I would not be false to you, Donna, including false modesty."

"The sector expanded and reorganized. You will probably get an elevation in the peerage, maybe a knighthood. At last, pretty likely, called Home and offered a Lord Advisorship."

"One is permitted to daydream."

"You promoted this war, Governor."

Saracoglu ran a palm over his base scalp. *All right,* he decided. *If she can't see or doesn't care that it was on her account I sent Helga and Georgette packing (surely, by now, the gossip about that has reached her, though she's said no word, given no sign), well, I can probably get them back; or if they won't, there's no dearth of others. No doubt this particular daydream of mine is simply man's eternal silly refusal to admit he's growing old and fat. I've learned what the best condiments are when one must eat disappointment.*

But how vivid she is among the flowers.

"I promoted action to end a bad state of affairs before it got worse," he told her. "The Ythrians are no martyred saints. They advanced their interests every bit as ruthlessly as their resources allowed. Human beings were killed. Donna, my oath is to Terra."

Still her eyes dwelt on him. "Nevertheless you must have known what this would do for your career," she said, still quiet.

He nodded. "Certainly. Will you believe that that did not simplify, it vastly complicated things for me? I *thought* I thought this border rectification would be for the best. And, yes, I think I can do a better than average job, first in rebuilding out here, not least in building a reconciliation with Ythri; later, if I'm lucky, on the Policy Board, where I can instigate a number of reforms. Ought I to lay down this work in order that my conscience may feel smug? Am I wicked to enjoy the work?"

Saracoglu reached in a pocket for his cigarette case. "Perhaps the answer to those questions is yes," he finished. "How can a mortal man be sure?"

Luisa took a pair of steps in his direction. Amidst the skips of his heart he remembered to maintain his rueful half-smile. "Oh, Ekrem—" She stopped. "I'm sorry, Your Excellency."

"No, I am honored, Donna," he said.

She didn't invite him to use her given name, but she did say, smiling through tears, "I'm sorry, too, for what I hinted. I didn't mean it. I'd never have come tonight if I hadn't gotten to know you for a . . . a decent man."

"I hardly dared hope you would accept," he told her, reasonably truthfully. "You could be celebrating with people your age."

The diamonds threw scintillations when she shook her head. "No, not for something like this. Have you heard I was engaged to be married once? He was killed in action two years ago. Preventive action, it was called—putting down some tribes that had refused to follow the 'advice' of an Imperial resident. Well." She drew breath. "Tonight I couldn't find words to thank God. Peace was too big a gift for words."

"You're the admiral's daughter," he said. "You know peace is never a free gift."

"Do wars come undeserved?"

A discreet cough interrupted. Saracoglu turned. He was expecting his butler to announce cocktails, and the sight of a naval uniform annoyed him. "Yes?" he snapped.

"If you please, sir," the officer said nervously.

"Pray excuse me, Donna." Saracoglu bowed over Luisa's wonderfully slim hand and followed the man out into the hall.

"Well?" he demanded.

"Courier from our forces at Laura, sir." The officer shivered and was pale. "You know, that border planet Avalon."

"I do know." Saracoglu braced himself.

"Well, sir, they got word of the armistice all right. Only they reject it. They insist they'll keep on fighting."

XIII

The bony, bearded face in the screen said, on a note close to desperation, "Sirs, you are . . . are behaving as if you were mad."

"We've got company," Daniel Holm replied.

"Do you then propose to secede from the Domain?" Admiral Cajal exclaimed.

"No. The idea is to stay in it. We're happy there. No Imperial bureaucrats need apply."

"But the armistice agreement—"

"Sure, let's keep the present cease-fire. Avalon doesn't want to hurt anybody."

Cajal's mouth stiffened. "You cannot pick and choose among clauses. Your government has declared the Empire may occupy this system pending the final peace settlement."

Liaw of The Tarns thrust his frosty head toward the scanner that sent his image to Holm's office and Cajal's orbiting warcraft. "Ythrian practice is not Terran," he said. "The worlds of the Domain are tied to each other principally by vows of mutual fidelity. That our fellows are no longer able to help us does not give them the right to order that we cease defending ourselves. If anything, deathpride requires that we continue the fight for what help it may afford them."

Cajal lifted a fist into view. "Sirs," he rasped, "you seem to think this is the era of the Troubles and your opponents are barbarians who'll lose purpose and organization and go away if they're stalled for a while. The truth is, you're up against Imperial Terra, which thinks in terms of centuries and reigns over thousands of planets. Not that any such time or power must be spent on you. Practically the entire force that broke the Domain can now be brought to bear on your single globe. And it will be, sirs. If you compel the outcome, it will be."

His gaze smoldered upon them. "You have strong defenses," he said, "but you must understand how they can be swamped. Resistance will buy you nothing except the devastation of your homes, the death of thousands or millions. Have *they* been consulted?"

"Yes," Liaw replied. "Between the news of Ythri's capitulation and your own arrival, Khruath and Parliament voted again. A majority favors holding on."

"How big a majority this time?" Cajal asked shrewdly. He saw feathers stir and facial muscles twitch, and nodded. "I do not like the idea of making war on potentially valuable subjects of His Majesty," he said, "most especially not on women and children."

Holm swallowed. "Uh, Admiral. How about . . . evacuating everybody that shouldn't stay or doesn't want to . . . before we start fighting again?"

Cajal sat motionless. His features

congealed. When he spoke, it was as if his throat pained him. "No. I may not help an enemy rid himself of his liabilities."

"Are you bound to wage war?" Liaw inquired. "Cannot the cease-fire continue until a peace treaty has been signed?"

"If that treaty gives Avalon to the Empire, will you obey?" Cajal retorted.

"Perhaps."

"Unacceptable. Best to end this affair at once." Cajal hesitated. "Of course, it will take time to set things in order everywhere else and marshal the armada here. The *de jure* cease-fire ends when my ship has returned to the agreed-on distance. But obviously the war will remain in *status quo*, including the *de facto* cease-fire with respect to Avalon and Morgana, for a short period. I shall confer with Governor Saracoglu. I beseech you and all Avalonians to confer likewise with each other and use this respite to reach the only wise decision. Should you have any word for us, you need but broadcast a request for a parley. The sooner we hear, the milder—the more honorable—treatment you can expect."

"Observed," Liaw said. There followed ritual courtesies, and the screen blanked which had shown Cajal.

Holm and Liaw traded a look across the kilometers between them. At the rear of the man's office, Arinnian stirred uneasily.

"He means it," Holm said.

"How correct is his assessment of relative capabilities?" the Wyvan asked.

"Fairly good. We couldn't block a full-out move to wreck us. Given as many ships as he can whistle up, bombarding, ample stuff would be sure to get past our interception. We depend on the Empire's reluctance to ruin a lot of first-class real estate . . . and, yes, on that man's personal distaste for megadeaths."

"You told me earlier that you had a scheme."

"My son and I are working on it. If it shows any promise, you and the other appropriate people will hear. Meanwhile, I imagine you're as busy as I am. Fair winds, Liaw."

"Fly high, Daniel Holm." And that screen blanked.

The Marchwarden kindled a cigar and sat scowling, until he rose and went to the window. Outside was a clear winter's day. Gray did not get the snowfall of the mountains or the northern territories, and the susin stayed green on its hills the year around. But wind whooped, cold and exultant, whitecaps danced on a gunmetal bay, cloaks streamed and fluttered about walking humans, Ythrians overhead swooped through changeable torrents of air.

Arinnian joined him, but had to wet his lips before he could speak. "Dad, do we have a chance?"

"Well, we don't have a choice," Holm said.

"We do. We can swallow our damned pride and tell the people the war's lost."

"They'd replace us, Chris. You know that. Ythri could surrender because Ythri isn't being given away. The other colonies can accept occupation because it's unmistakable to everybody that they couldn't now lick a sick kitten. We're different on both counts." Holm squinted at his son through rank blue clouds of smoke. "You're not scared, are you?"

"Not for myself, I hope. For Avalon—all that rhetoric you hear about staying free. How free are corpses in a charred desert?"

"We're not preparing for destruction," Holm said. "We're preparing to risk destruction, which is something else again. The idea is to make ourselves too expensive an acquisition."

"If Avalon went to the Empire, and we didn't like the conditions, we could emigrate to the Domain."

The Marchwarden's finger traced an arc before the window. "Where would we find a mate to that? And what'd be left of this special society we, our ancestors and us, we built?"

He puffed for a minute before musing aloud: "I read a book once, on the history of colonization. The author made an interesting point. He said you've got to leave most of the surface under plant cover, rooted vegetation and phytoplankton and whatever else there may be. You need it to maintain the atmosphere. And these plants are part of an ecology, so you have to keep many animals too, and soil bacteria and so forth. Well, as long as you must have a biosphere, it's cheaper—easier, more productive—to make it supply most of your food and such, than to synthesize. That's why colonists on terrestroid worlds are nearly always farmers, ranchers, foresters, et cetera, as well as miners and manufacturers."

"So?" his son asked.

"So you grow into your world, generation by generation. It's not walls and machinery, it's a live nature, it's this tree you climbed when you were little and that field your grandfather cleared and yonder hilltop where you kissed your first girl. Your poets have sung it, your artists have drawn it, your history has happened on it, your forebears returned their bones to its earth and you will too, you will too. It is you and you are it. You can no more give it away, freely, than you could cut the heart out of your breast."

Again Holm regarded his son. "I should think you'd feel this stronger than me, Arinnian," he said. "What's got into you?"

"That man," the other mumbled. "He didn't threaten terrible things, he warned, he pleaded. That brought them home to me. I saw . . . Mother, the kids, you, my chothmates—"

Eyath. Hrill. Hrill who is Tabitha. In these weeks we have worked together, she and Eyath and I. . . . Three days ago I flew between them, off to inspect that submarine missile base. Shining bronze wings, blowing fair hair; eyes golden, eyes green; austere jut of keelbone, heavy curve of breasts . . . she is pure. I know she is. I make too many excuses to see her, be with her. But that damned glib Terran she keeps in her house, his tinsel cosmopolitan glamour, he *hears her husky-voiced merriment oftener than I do.*

"Grant them their deathpride," Holm said.

Eyath will die before she yields. Arinnian straightened his shoulders. "Yes. Of course, Dad."

Holm smiled the least bit. "After all," he pointed out, "you got the first germ of this ver-r-ry intriguing notion we have to discuss."

"Actually, it . . . wasn't entirely original with me. I got talking to, uh, Tabitha Falkayn, you know her? She dropped the remark, half joking. Thinking about it later, I wondered if—well, anyhow."

"Hm-m-m. Quite a girl, seems. Especially if she can stay cheerful these days." Holm appeared to have noticed the intensity of his stare, because he turned his head quickly and said, "Let's get to work. We'll project a map first, hm-m-m?"

His thoughts could be guessed. The lift in his tone, the crinkles around his eyes betrayed them. *Well, well. Chris has finally met a woman who's not just a sex machine or a she-Ythrian to him. Dare I tell Ro, yet?—I do dare tell her that our son and I are back together.*

Around St. Li, winter meant rains. They rushed, they shouted, they washed and caressed, it was good to be out in them unclad, and when for a while they sparkled away, they left rainbows behind them.

Still, one did spend a lot of time indoors, talking or sharing music. A clear evening was not to be wasted.

Tabitha and Rochefort walked along the beach. Their fingers were linked. The air being soft, he wore simply the kilt and dagger she had given him, which matched hers.

A full Morgana lifted from eastward waters. Its almost unblemished shield dazzled the vision with whiteness, so that what stars could be seen shone small and tender. That light ran in a quaking glade from horizon to outermost breakers, whose heads it turned into van fire; the dunes glowed beneath it, the tops of the trees which made a shadow-wall to left became hoar. There was no wind and the surf boomed steadily and inwardly, like a heartbeat. Odors of leaf and soil overlay a breath of sea. The sands gave back the day's warmth and gritted a little as they molded themselves sensuously to the bare foot.

Rochefort said in anguish, "This to be destroyed? Burned, poisoned, ripped to flinders? And you!"

"We suppose it won't happen," Tabitha replied.

"I tell you, I *know* what's to come."

"Is the enemy certain to bombard?"

"Not willingly. But if you Avalonians, in your insane arrogance, leave no alternative—" Rochefort broke off. "Forgive me. I shouldn't have said that. It's just that the news cuts too close."

Her hand tightened on his. "I understand, Phil. You're not the enemy."

"What's bad about joining the Empire?" He waved at the sky. "Look. Sun after sun after sun. They could be yours."

She sighed. "I wish—"

She had listened in utter bewitchment to his tales of those myriad worlds.

Abruptly she smiled, a flash in the moonglow that clad her. "No, I won't wish," she said. "I'll hold you to your promise to show me Terra, Ansa, Hopewell, Cynthia, Woden, Diomedes, Vixen, every last marvel you've been regaling me with, once peace has come."

"If we're still able."

"We will be. This night's too lovely for believing anything else."

"I'm afraid I can't share your Ythrian attitude," he said slowly. "And yes . . . that hurts also."

"Can't you? I mean, you're brave, I know you are, and I know you can enjoy life as it happens." Her voice and her lashes dropped. "How much you can."

He halted his stride, swung about, and caught her other hand. They stood wordlessly looking.

"I'll try," he said, "because of you. Will you help me?"

"I'll help you with anything, Phil," she answered.

They had kissed before, at first playfully as they came to feel at ease beside each other, of late more intensely. Tonight she did not stop his hands, nor her own.

"Phil and Hrill," she whispered at last, against him. "Phil and Hrill. Darling, I know a headland, a couple of kilometers further on. The trees shelter it, but you can see moon and water between them and the grass is thick and soft, the Terran grass—"

He followed her lead, hardly able to comprehend his fortune.

She laughed, a catch deep in her breast. "Yes, I planned this," she sang. "I've watched my chance for days. Mind being seduced? We may have little time in fact."

"A lifetime with you is too little," he faltered.

"Now you'll have to help me, my love, my love," she told him. "You're my first. I was always waiting for you."

TO BE CONTINUED

Magazines are uniquely designed to provide the American people with information essential to living today. Their pages reflect the cultural and technological advances occurring in our society. Out of the articles that appear, readers can sift ideas that make them better educated, healthier, more productive, more secure. And what is more important, because of their deliberate selectivity, magazines are able to perform at an optimum service level whether their readers' focus of interest is fashion or the home, religion or the arts, the life-styles of the young or the problems of the aged.

In light of this, it is regrettable that many publications in this country are being placed in jeopardy by the action of the recently reorganized U.S. Postal Service. During a period when the President has instituted a freeze on prices in an effort to slow the inflationary spiral, the U.S. Postal Service has announced an increase in the cost of delivering magazines and newspapers amounting to 127% over the next 5 years. It is especially ironic that this action being taken by a quasi-public corporation is being directed against an industry dedicated to the widest possible dissemination of information and ideas to the public.

When the new Postal Act was passed in 1970, it was with the hope that the restructuring of the Postal Service would make it more efficient and bring into better balance its expenditures and income. Publishers expected magazine mailing costs to increase. What they were not prepared for was an increase that could prove ruinous to many of the finest and most respected magazines in this country. Furthermore, to contend that what the Postal Service is doing is wiping out massive hidden subsidies is to infer that publications are being given illicit privileges that should be done away with.

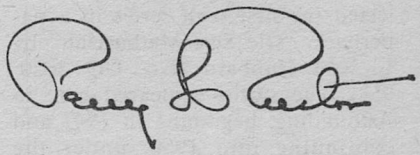
In point of fact, when two centuries ago Congress set up special second-class rates, it was with the intent that these be considered a

OPEN LETTER TO THE READERS OF analog

public subsidy to extend the areas of education and cultural development throughout the country. In the years that have passed, the need to perform these services has not diminished. Rather, it has increased constantly as our society has grown ever more complex and demanded more responsible guidance and clarification.

To maintain the flow of magazine service to the American public, we, along with other publishers in this country, have little alternative except to absorb the rising mailing costs for as long as is economically possible. However, we will continue to mount an opposition to the increase via an appeal to Congress for a review of the Postal Reorganization Act of 1970. What we ask is that the 127% increase be replaced by a more realistic and reasonable schedule of second-class rate increases until the Postal Service solves its reorganization problems and is able to advance toward its promised level of operating efficiency. A bill to this effect was introduced by Congressman Morris K. Udall in the House of Representatives and by Senator Edward M. Kennedy in the Senate in the last session of Congress and is scheduled to be re-introduced early in 1973.

Since ultimately this increase in cost is directed against you, the reader, won't you join us in urging Congress to review the Postal Act of 1970. For without this review, many of the magazines you, your family and your friends value may have to reduce the scope of their services. Some may not survive at all. A note to your Representative and Senators stating your opinion, your support of this bill, or an endorsement on this very page, would be of immeasurable assistance.



Perry L. Ruston, Chairman

The Condé Nast Publications Inc.
Publishers of Analog

the reference library

P. Schuyler Miller

MATERIA MEDICA

Doctors have dabbled in science fiction since its early days. Two regulars in the old *Amazing Stories* were Dr. David H. Keller and Dr. Miles J. Breuer, and there was, of course, a Dr. Conan Doyle. However, the doctors have not, on the whole, written medical science fiction; at least, not until recently, when Michael Crichton's medical background has had a good deal to do with the success of "The Andromeda Strain" and "The Terminal Man."

In spite of this neglect, science fiction has had its medical stories, and good ones. With a notable exception that I'll note in a moment, they have been written by non-medical men.

Donald Wollheim, under his DAW Books imprint, has just collected the first such series in a paperback, "Ole Doc Methuselah" by L. Ron Hubbard (No. UQ 1020; 95¢). The stories appeared here in Astounding, beginning in 1947 and continuing into 1950, under the pseudonym "Rene Lafayette." All seven of them are in this collection, and it's amazing that they haven't been assembled before.

Hubbard, before he found the pot of gold in Dianetics and Scientology, was a good writer of lively fiction. Seen from a modern perspective, most of these stories are really conventional action yarns dressed up in exotic trappings. "Doc Methuselah" is one Dr. Stephen Thomas Metheridge, graduate of Johns Hopkins in the Class of 1946. We meet him seven hundred years later as one of the Soldiers of Light, the six hundred space-roving members of the Universal Medical Society, and follow him through a couple of centuries. Accompanied by his extraterrestrial memory-bank, Hippocrates, he takes on a variety of con-men and nogoodniks in the name of medicine. Actually, the medical problems on which the seven stories are hung are largely cosmetic—an excuse for Doc Methuselah to wade in, a chip on his shoulder and the right in his hypodermic, with Hippocrates to back him up. The exception, and the best story in the book, is the one called "Plague."

I doubt that Hubbard has bothered to revise the stories to any extent, though Wollheim may have, but they read very well and date very little. Doc uses log tables in-

stead of a computer, and when he does get one it is mechanical—not electronic—but the present fourth-generation micro-circuit computers were not predictable in 1947, even by John Campbell. The uninflated dollars of those long-gone days also seem faintly ridiculous when projected into the far future.

Murray Leinster's Med Ship series started here in 1957, after it was clear that Doc Methuselah had vanished for good. Some of them are in a paperback, Pyramid's "Doctor to the Stars," if you can find it. This time the medical puzzles are real, though like Methuselah the Med Ship man meddled where he shouldn't and found medical solutions to social and criminal problems. His ET aide and all-purpose lab animal, Murgotroyd, is far more believable than Hippocrates.

At the same time that the Med Ship stories were appearing in Astounding, James White's Sector General series was coming out in the English *New Worlds.* I believe White has had medical training; at any rate, his stories about a galactic hospital and physicians who cope with the medical problems of scores of nonhuman sapients bring us a big step along toward real medical SF. Ballantine has two paperback collections of the stories allegedly still in print: "Star Surgeon" and "Major Operation." I've recommended them here. I still do.

While all this was going on, a young medical student in Philadelphia was earning his way through medical school by writing medical science fiction. He kept at least two series going, the General Practice Patrol (GPP) series about medical teams tackling problems much like those faced by Hubbard's, Leinster's and White's heroes, and another series about the Hoffman Medical Center. Happily, many of these stories were published as juvenile hardbacks by McKay, and they've been kept in print. "Mercy Men" is about the medical mercenaries of the Hoffman Center; "Star Surgeon" is about the team of GPP Ship *Lancet* ($3.95 each), and more stories in both series are in a new collection, "Rx for Tomorrow" by Alan E. Nourse (David McKay Co., New York; 216 pp; $4.95).

There are two Hoffman and two GPP stories in the collection. The title story, "Rx," sends GPP Ship *Lancet* to a planet which resents and resists any contact with Hospital Earth and its space-roving physicians, and whose own doctors are sorcerers. But their ruler is dying, and the *Lancet* is suckered in on an "or else" basis. "Contamination Crew" is trickier. Dr. Sam Jenkins of the *Lancet* is up before the Medical Disciplinary Board on assorted charges. Loki IV is a planet with a mass illusion: the people think their world is being eaten by something called a *hlorg.* They are "cured"—and Jenkins carries the *hlorg* aboard the *Mercy,* which it begins happily to devour.

The Hoffman Medical Center is somewhere in the future megalopolis of Boswash. In "Free Agent," Dan Griffin finds himself in a brand new body with an unlimited expense account, for a year. There's

a reason. A tricky one. In "Bramble Bush," one of the best in the collection, the center is involved with psionic research. (Incidentally, Alan Nourse's translation of ESP is "extrasensory *potential.*" It's a subtle difference from the usual "perception" or "power," but an important one.

I have my favorites, of course. One of them is "Last Home Call," about the crusty old doctor who feels that the new automated diagnosis and treatment isn't giving patients a fair shake. He still makes house calls. Another is "In Sheep's Clothing," about a terribly strange patient, which in nineteen pages gives us a "quantitative" treatment of the gimmick in "Midwich Cuckoos." Then there's "Heir Apparent," the story of a dedicated space engineer and a doctor whose prescription destroys two lives. Or does it make them?

"Symptomaticus Medicus" is an alternate continuum story, about a doctor from a 1970 Philadelphia whose physicians use sorcery, and who witches himself into our universe, to learn—and teach. "Grand Rounds" is the *Unknown* type of fantasy: Old Scratch sends an imp to destroy the career of a troublesome doctor—who finds a medical way out. "Plague," which like "Last House Call" was written for the book, describes a plague of the future which drives out reason. And "A Gift for Numbers" is a kind of psychosomatic fantasy about supratentorial juxtaposition. Don't look in the dictionary . . . look in Nourse.

TORCON II

Since I failed to give you proper notification of the 1972 World Science Fiction Convention in Los Angeles, let me be on time for 1973. I've already cost you a dollar.

The 1973 Convention will be held in Toronto, as far as I know over the usual Labor Day weekend, August 31-September 3, 1973. (The Canadians are polite and obliging folk, and after all, they do hope for a big attendance from the States, so they honor our three-day holiday.) Robert Bloch is Guest of Honor. Bill Rotsler, fantoonist extraordinary, is Fan Guest of Honor. Convention hotel is the Royal York, Toronto's biggest and best, located where all the action is.

If you can't attend, but want the various progress reports, program, et cetera, you can take out a supporting membership. It would have cost only $3 if I'd gotten this to you before December 1, 1972; as it is, you pay $4 up to August 1, 1973. After that, no further reductions. If you do plan to attend, attending membership was $5 until December 1, and is now $7 until next August 1. Thereafter, and at the door, you pay $10.

Checks go to: Torcon 2, P.O. Box 4, Station K, Toronto 12, Ontario, Canada. If you're living anywhere in the United Kingdom, you have a special contact: Peter Weston, 31 Pinewall Avenue, Birmingham B38 9AE, England. Australians: Robin Johnson, GPO Box 4039, Melbourne, Victoria 30001, Australia. (Australia is bidding for the World Con for 1975.)

I can say from experience that

Toronto has everything. (There is some disagreement in Canada whether it has more than Montreal.) It has a major science fiction reference library, the Spaced-Out Library, which the Toronto Public Library is building up around Judith Merril's personal collection. It has a science fiction book shop, Bakka, at 286 Queen Street West, Toronto 2B. I haven't seen it, but I hope to. It has some outstanding museums, a subway that New Yorkers will never believe, a lake that is partially shared with New York, and a vast number of things the Con committee hasn't mentioned yet.

Try it. You'll like it. You may even like the Con.

THE FLESH IN THE FURNACE
by Dean R. Koontz • Bantam Books, New York • No. S6977 • 132 pp. • 75¢

Dean Koontz is one of the "new generation" of science fiction and fantasy writers, to whom the distinction between the two fields is blurred and rather unimportant. Their background is in the humanities instead of in science or technology, and they use the phenomena they create as a cosmetic rather than as plausible extrapolation. For all that, and other minor faults, he has a fascinating and intense story here.

It is a future in which Man has escaped to the stars and Earth is a decaying sort of ghost world of people and institutions too conservative or lethargic to leave. One of the wonders brought back from the stars is the Furnace from which its operator, Portos Godelhausser, can draw a host of miniature androids, living puppets programmed to play out their entertainments for the yokels, then be dissolved again into the common pool of flesh.

Portos' assistant is the idiot, Sebastian, who is fascinated with the little creatures, and especially with their ingenue, Bitty Belina. He is a fugitive from his own half understood dreams and memories, barely understanding what he sees and what he does. When he kills Portos and drives off into the North American hinterland with the Furnace and its little people, the story is only just beginning.

But if Portos, the Creator of the puppets, is dead, they have a new creator and master in Sebastian, too dull and confused to be tricked. They plot to kill him, and do, cruelly and inhumanly.

Underlying the obvious story is a play of symbolism on the "God is dead" concept. I would like to see a psychiatrist's evaluation of the ideas woven into the plot. Is Sebastian's nightmare the memory of a murder or a rape? Is it mankind's lot to destroy his Maker? Are we the puppets of another Vonopoean creation?

Dean Koontz gets better, book by book (there are a number that I haven't read yet), but I wish he were more careful about trivia. The logs of a cabin aren't glued together. The grain of wood isn't on the surface of a log; it's in the sawed section. And I don't think Sebastian is an "idiot" by a psychologist's criteria . . . just a low-grade moron. The author could

probably care less, but it may irk you.

NEW DIMENSIONS 1

edited by Robert Silverberg • Doubleday & Co., Garden City, New York • 1971 • 246 pp. • $5.95

The 1970's are evidently going to be the decade of original SF anthologies. Damon Knight's "Orbit" series for Putnam has been going since 1966, with one to three books a year, and several paperback anthologies are out or coming out. Now Robert Silverberg puts Doubleday into the hardback anthology race with a selection that is less *avant garde* than the usual "Orbit." You may like it better.

My favorite is a quite straightforward story, Harry Harrison's "The Wicked Flee," in which an emissary of the Vatican pursues a heretic through time to an Italian village. But the plot has more surprises in it than you'd believe. Philip José Farmer outdoes himself by hitching a story you'll remember to a title you can't possibly forget, "The Sliced-Crosswise Only-on-Tuesday World." A Tuesday man falls in love with a Wednesday girl, and shakes the social structure in his efforts to have his day switched.

But how can you put any of these stories ahead of Ursula K. LeGuin's "Vaster Than Empires and More Slow," another of the stories set in her consistent future universe ("Rocannon's World," et cetera.)? The dominant race on a world under study by a team of literally mad scientists is sentience without senses. Or Gardner R. Dozois' "A Special Kind of Morning," in which an old man remembers total war? Or Josephine Saxton's little arrangement on the theme of London's lost bridge (rebuilt in Arizona), "The Power of Time," in which Great Wealth can switch New York and London around like mobile homes? Or Doris Pitkin Buck's disturbing little story of mutation, called "The Giberel"?

These and other more or less tangible stories don't mean the book is hopelessly square. Harlan Ellison's "At the Mouse Circus" is utter surrealism. Ed Bryant's "Love Song of Herself" baffles me completely. Robert C. Malstrom's "The Great A" is a surreal comment on the meaning of art—I guess. R.A. Lafferty's "Sky" is—maybe—a tangiblization of a drug dream. Thomas M. Disch's "Emancipation: A Romance of the Times to Come" carries us beyond Women's Lib in something of the manner of H.G. Wells, but in purely Dischean terms.

What have I left out? "The Trouble with the Past" by Alex and Phyllis Eisenstein is a deft and annoying time paradox story. Barry N. Malzberg's "Conquest" is a tricky little lady-or-the-tiger story (how do you know when you've passed a test?). And in "A Plague of Cars" by Leonard Tushnet, a pressing problem of every present city is handled in a way that recalls an old fairy tale of unpaid rewards and broken bargains.

Watch out, Editor Knight . . . that's Silverberg you feel breathing on your neck-hair.

BRASS TACKS

Dear Mr. Bova:

I have always found Analog editorials interesting and provocative, but this is the first time I have felt sufficiently "provoked" to write a reply to one. I feel your August editorial, "The Disasters that Weren't," misses the point in several important respects.

As a resident of Kitimat, British Columbia, Canada, an aluminum smelter town just south of the Alaska Panhandle, I was quite directly aware of the Amchitka commotion. Although there were a few frightened children who feared the earth might open and swallow them up, few, if any, responsible adults believed that anything would happen and life carried on quite normally. Why, then, the public outcry—which I supported? Simply because the American Government proved once again that the risk, however small, of large-scale devastation to whole communities of innocent bystanders was less important than a *minor* military objective. Surely after twenty years they know whether a hydrogen warhead works or not; besides, as you yourself admitted, the delivery system itself is much more in doubt. Military expediency is a higher priority than public welfare. I wonder if the test would have gone ahead if Washington, D.C., specifically the Pentagon, had been at risk. Actually, I don't wonder—the answer is, certainly not.

While the military is theoretically part of the public service, one wonders who is the servant and who is the master. The military swallows up more public money than all other government services combined. It operates out of a virtually impregnable fortress—physically in Colorado, politically in Washington—and to a large extent dictates American policy. (We all knew there was no way civilians could stop the test after the military had decided to go ahead with it.) When military leaders discuss "national security," they mean their own security. How many nonmilitary targets will be protected by ABM systems . . . ?

Also, what about the energy crisis? We would probably have plenty of energy were it once again not for the ever-present military consideration. Despite their inherently greater instability, "breeder" reactors have received the bulk of research money, rather than more stable fusion types, mainly because "breeder" byproducts have military application. The "eggheads"—who are treated disparagingly, but from whom are expected miracles on a regular basis—have not been able to solve the instability problem, with the result that desperately needed atomic power is years be-

hind schedule, and falling further behind all the time. Military requirements? Right on, brother? We can boast proudly that we have enough bomb power for a 25,000-ton powder keg under every man, woman and child on the face of the earth. With achievements like this, what matter if our great cities have regular brown-outs, with no relief in sight. Good ol' Uncle Sam has more important things to worry about first!

DAVID CONRAD
69 Kechika Street
Kitimat, B.C., Canada

To view everything military as Evil is as bad as viewing everything communist (or capitalist, or Buddhist) as Evil. An effective ABM system is a life-and-death matter to the entire world, so important that heads of the most powerful nations in the world have made it the number one topic of current disarmament treaties. The military's job is to make an ABM system work, and realistic testing is part of that job. As for the energy crisis, it's the unwarranted protests of the environmentalists that is preventing the construction of new power generation plants. The nuclear plants that have been blocked are not breeders, but simple uranium teakettles. Nobody's started building a working breeder reactor, because the breeder is indeed still very much a laboratory problem. But the econuts have stopped construction and/or operation of many nuclear and *fossil-fuel generators. Thus blackouts, brownouts, and—worst of all—a cloud of charges and countercharges that mask the real responsibility.*

Dear Mr. Bova:

In your editorial, "The Disasters that Weren't," from the August issue, you state that mankind has three choices: 1) worldwide disaster; 2) worldwide stability; and 3) expansion into the solar system. Obviously, the only acceptable and open-end choice, at least to a race with any guts left at all, is number three. I agree, for different reasons.

Expansion outside planet Earth may solve the resources problem as far as energy supplies go for conceivably hundreds or even thousands of years. But where are the iron, copper, and nonmetallic resources with which to make *things* going to come from? Try hauling that around in spaceships and see how much a BB costs! Now, I don't rule out teleportation eventually, but I don't see teleportation of these resources from far places to Mother Earth within my lifetime, and it will have to be within my lifetime to do the Earth any good.

But let's go one step further. Grant the miracle of teleportation. Anyone who thinks all of these mining colonies are going to do nothing but feed good old Mother Earth goodies forever has got an unpleasant surprise coming! They may start out as most other colonization ventures on Earth have—namely, the glorification and enrichment of the colonizing body—but they certainly will be no less independent than any other group of men and women with enough guts to do what nobody else has done before. They will get independent fast or go somewhere else. Then they will need all those re-

sources they have been sending Earth for their own use. So you see, colonization is only another stopgap measure as far as the Earth is concerned, with only more catastrophic collapse of Earth's civilization and industry when this source of supplies ceases.

Now let's try shipping all these excess people off the planet to control the population growth. The U.S. alone grew by 24 million people in the last ten years. That's an average of 2.4 million per year. Taking 60 days a year off for Sundays and holidays, we would have to ship 8,000 people a day to *somewhere* just from America. And we have the most advanced technology in the world and one of the lower rates of population growth of all the technologically advanced nations.

Forget it. Humanity on Earth *must* stabilize itself, or else. But not *all* humanity. Too many people are still making the understandable mistake of thinking of the Earth as the hub of mankind, the focal point to which all resources and trade are directed. That is soon to be a no-longer-viable means of thinking.

I hope you keep up the stimulating articles and good stories.

ROBERT A. LOEST
2045 Jammes Road, #297
Jacksonville, Florida 32210

All through history, colonies have become independent when they became self-sufficient. But it's rare for a colony to stop all commerce with its original mother country. Just the opposite occurs, in fact. So when we have colonies in space, they will probably draw a good deal of their wealth—and perhaps their population—from Mother Earth. Assuming suitable transportation, of course.

Dear Sir:

On the left side of your body, you will find your left hand. On the right side of your body, you will find your right hand. May I suggest that you introduce the former to the latter? It is obvious that your left hand doesn't know what your right hand is doing!

In the August 1972 issue of Analog, page 175, you answer A. Doodes' letter by saying, "If we had the resources to go star-roving, would we need another planet's minerals?"; three pages later, you inform us that we can forestall the depletion of Earth's resources indefinitely by "utilizing the resources of other worlds." Now really, sir! Make up your mind!

A more serious quibble with your editorial exists, however. I recall seeing published statistics, although I can't recall the source, which vividly showed the impracticality of solving Earth's population problems by exporting people to other worlds; there couldn't be enough ships, not to mention the fuels, metals, et cetera, necessary to even keep up with the rate of growth. Wouldn't a similar argument, in terms of cost per pound or ton, be applicable to the question of importing raw materials? If finished metals, et cetera, were to be imported, what would be the costs of getting the necessary equipment up there to do the processing?

Putting it simply, do we have enough resources *right now* to go to Mars, dig up and process enough ore to bring back a ton of uranium, and return it to Earth, without a net loss in resources? Now make the same calculations again, starting with the assumption that another twenty years of exploitation of resources have intervened before the first ship takes off. I fear that we cannot count on other planets to replenish what we should be conserving now.

NORMAN E. NELSON
1111 Ninth Street
Rapid City, South Dakota

There's a vast difference between the technology capabilities of a star-roving race and that of a race bound inside the solar system. I presume that by the time we develop an interstellar technology, we'll be using the resources of our solar system and won't need or want resources from other solar systems.

True enough, to propose large-scale emigration of Earth's excess population is technologically infeasible—for the foreseeable future. But the real issue is transportation cost; if the cost can be made low enough, large numbers of people can go off-planet. I doubt that the cost can be made low enough in time to solve the population problems we face today. But bringing raw materials back to Earth . . . that's a different matter. It wouldn't take much energy to push a rather tiny nickel-iron planetoid into Earth orbit. And a ten-mile-wide planetoid would probably contain more iron than the human race has used in the Twentieth Century!

Dear Mr. Bova:

About your editorial, "The Disasters that Weren't"—it all depends on your point of view, and the

quality of the information on which you base your opinions. "Cannikin" wasn't a disaster if one was worried that the "Ring of Fire" around the Pacific might somehow have been so upturned that Alaska would sink into the sea, for instance. But I would consider the wholesale slaughter of eleven hundred sea otters in a National Sea Otter Sanctuary a disaster of sorts. Not that I feel that the sea otter, per se, is all important.

The really tragic disaster, as I see it, is the gross, callous arrogation of the power to conceive and carry out this test by the Administration and the Atomic Energy Commission in the face of such a body of sincere, informed, serious and conscientious opponents to the test. Why Amchitka? Why the most active tectonic area on Earth? Why in a National Wildlife Refuge? Because Jackass Flats would have been bad publicity for the Administration if radioactivity had killed a few thousand herd of livestock?

FRED W. DAVIS
1427 45th Avenue
San Francisco, California 94122

Why anyplace? Because the test was important for our national defense. Not a very pretty answer, perhaps, but the real one. And killing sea otters is *less of a danger than killing livestock and maybe people. Since environmentalists agree that even if the highest claims of otter deaths are true, the otter population hasn't been seriously affected, perhaps the Government took the best available course, after all.*

Dear Mr. Bova:

Clancy O'Brien misclassified psychoactive drugs in his story (Generation Gaps, September 1972). He divided them into those that (guessing from his name) he uses, namely alcohol, tobacco, and caffeine; and all others, which he listed in the story. Actually, each drug has unique effects, and each should have its own legal position. Also, the effects depend on the dose, and the alcoholic and the pothead are very different from the person who has an occasional beer or joint. These differences are well understood by at least college-level users—in the Great Stony Brook Bust of 1968 (I was there), the contraband seized included large quantities of marijuana and hashish, a small amount of amphetamines (there were four or five known speed freaks out of about five hundred people in the quadrangle where I lived), two aspirins and a sugar cube (which turned out to be aspirin and sugar), a bottle of antibiotics with an expired prescription, and no opiate drugs. O'Brien satirically exaggerates that all of *them* frequently use large doses of every kind of drug; if one compensates for his exaggeration he still overestimates the "drug problem," besides wrongly lumping together all drugs. Perhaps the reason is that the press (from which he gets information) emphasizes "newsworthy" occurrences, that is, unusual or bizarre ones.

So, what is to be done? As an individual, I don't use psychoactive drugs (except wine with meals). I suggest that Mr. O'Brien would be

happier, healthier, and on much better ground for argument if he would adopt the same policy. More important is the policy of government, which is ineffective and extremely unwise in its methods.

Many of today's laws, if obeyed, protect a person from his own folly; the drug laws are in this class. The Constitution does not give government the right to make such laws, and they are in any case unwise because they lead people to depend on government to make personal judgments for them. I find it more valuable to keep independent the people who can be so, and to let the foolish ones kill themselves. So I think drugs should not be regulated through criminal law.

It is indeed true that there is a sucker born every minute; witness the large sales of cigarettes and caffeine. It would be nice if they did not get ensnared by drugs. If you make the drugs illegal, you produce the following bad effects: First, it is important to a child to assert his independence, which today he often does by using drugs. Thus the law becomes a recruiting agent for drug users. Second, illegal goods and services have a high profit-potential, and so drug dealers will have plenty of money for bribes to corrupt the police force. Third, pushers will actively recruit users, again because of profits. Fourth, in the case of addictive drugs, addicts will turn to crime to finance their habit. Fifth, when many people do not support the drug law, they get out of the habit of obeying any law and disapproving of lawbreakers.

In short, those people who support strong criminal drug laws are actively supporting organized crime of the worst sort, and are swelling the ranks of drug users.

To reduce drug use, take the following steps: First, abandon criminal laws against possessing and using the drug. You thereby make drug use a much less independence-showing act, and you remove an opportunity for people to not support the law. Second, glut the market with cheap drugs. You thereby keep distributors from making any profit, you remove a corrupting influence on your police, you take away the financial gain from recruiting drug users, and you undercut the mystique of drugs that comes from being hard to get. Third, make it hard for independent dealers to sell, and particularly, advertise. You thereby block ideological recruiting (á la Timothy Leary), but it is very dangerous to censor communications, and I don't recommend it. Fourth, issue low-key and *accurate* propaganda . . .

JAMES F. CARTER
249 Mantua Road
Pacific Palisades, California 90272

In other words, treat narcotics the way we do (cough!) cigarettes?

Dear Mr. Bova:

I seldom write letters to editors, but the September 1972 story by O'Brien, "Generation Gaps," was too good to simply pass by. I do think that when it does come to the final battle between us straights and the far left, we will clobber them. We are mature, organized, accustomed to discipline, and many

of us have had experience with weapons in one war or another.

In any case I would be quite willing to move to one of the Jerry Farms right now—if I only knew that one existed. In case some wealthy reader cares to start such a community I can offer to teach engineering, do plumbing and electrical work or demonstrate the use of all infantry weapons.

STUART A. HOENIG
882 East Glenn Street
Tucson, Arizona 85719

Try your nearest downtown ghetto!

Dear Sir:

I was personally grieved at the death of John W. Campbell as a great pioneering editor and a man who was willing to give at least some new ideas and new technology a hearing. I had hoped that when Analog passed from the domination of his strong personality, the ideological trend of the past few years would be halted or reversed. However, it has intensified instead, and I must register my disappointment. The Astounding/Analog tradition has always favored technological progress and the "manly arts" of war and espionage, but in its better days the contents were somewhat more varied and tolerant, with touches of genuine humor. Recently Analog has boxed itself so severely into its conservative, technology-first corner that fewer and fewer prominent or skilled writers are able to meet your ideological standards, and instead you fill your pages with drivel such as O'Brien's "Generation Gaps," (September 1972) a disorganized mass of hatred and fear with not a touch of talent to redeem itself.

The disintegration of Analog, if such is in store, has barely begun; the generation of writers that includes Anvil, Anderson, Heinlein, and Harrison will be capable of supporting Analog for years to come. But when they are gone, what then? Most of the more talented young writers are being trained up in the New Wave, not because of its leftward leanings (there are some frightening anti-hippy stories in that corner, too), but because of the growing realization that science fiction, as an art form, must be concerned with style as well as content. By your apparent policy of putting ideological correctness before style, you are condemning Analog to a long, slow degeneration into the kind of stilted, graceless prose one finds in propaganda sheets such as the *Guardian* and *Liberty Letter.* I was brought up on a diet of Astounding/Analog during my formative years as a fan, and I respect what Campbell achieved and what his magazine stood for. Please don't let that die in an avalanche of partisan trash.

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It's a rare day when the Editor isn't accused of being Communist, Fascist, Atheist, Clerical and anti-Italian—simultaneously. The stories in Analog are published because they are good science fiction stories, not because of their political slant. Most of our stories have a strong point of view—but not the same *viewpoint!*

later. They are pinpoint weapons, not mass-destruction type. And in space, most of the limitations placed on lasers by atmospheric distortions of the beam and absorption of the beam's power will be completely removed. Space is *the* domain for laser weapons.

The real reason why international law prevails in orbit is that both of the competing nations have found it more to their advantage to obey the law, such as it is, than to violate it. When the time comes that they think it's to their advantage to flaunt the law, they will. Because there is no way for international law to be enforced in orbit (or on Earth, for that matter) except by the direct conflict of one nation against another. And that's not law enforcement. That's war.

The "freedom of space" sounds much like an older and more honored tradition, "freedom of the seas."

For more than a century, the nations of the world have operated under the tacit agreement that the oceans are open to travel and exploitation by anyone. The right to engage in commerce and to reap the resources of the sea (mostly fish, up until recently) has been open to all nations.

Of course, all nations have insisted on keeping their national sovereignty rights over the waters immediately adjacent to their shores. Territorial waters are controlled by the individual nations, and different nations define the limits of territoriality in different ways. To some nations it's three miles off their coasts, to others it's two hundred kilometers. The current trend is to extend the claim to territoriality toward the limits of the continental shelves, and this trend is causing international conflicts and headaches for the World Court, which is the only international arbiter that has a chance of settling such disputes.

Let's back up a bit. Early in the Nineteenth Century, the United States fought with both France and Britain over the right to freedom of the seas. Engaged in a bitter, centuries-long struggle against each other, both France and Britain stopped, searched and seized any ships that they thought might give aid or trade to the enemy. American ships were stopped. American sailors were forced to join the crews of foreign ships.

We exchanged shots with the French, but eventually settled the affair with diplomats—international lawyers. But with the British we engaged in the fiasco called the War of 1812: the first war that America didn't win.

When the shooting stopped, Britain was absolute master of the high seas. An English-led coalition had finally subdued Napoleon, and a Pax Britannica settled over Europe

and North America. The British wisely decided to make a stalemate peace with the stubborn "Colonials," who capped the whole miserable affair by decimating a British army attacking New Orleans two days after the peace treaty had been signed in Belgium.

When you're Number One, you may not try harder, but things tend to go your way anyhow. The British quickly realized that their island nation depended on seaborne commerce. So they grandly fostered the concept of freedom of the seas. To the victorious English, this meant that they had a right to sail wherever they pleased and trade with whomever they desired. International law is always written by the winners, like all law. This time the winner created a situation that benefited just about everybody—but especially themselves. That's called wisdom.

For more than a century, freedom of the seas was assured by the ascendancy of the British fleet. By Teddy Roosevelt's time, the U.S. Navy was strong enough to help bolster the British.

Then came World War II.

At the end of that war, the entire world's seas were literally *mare nostrum.* There was no naval power on Earth, nor any combination of fleets, that could dare to challenge the U.S. Navy. Freedom of the seas was ours, and we generously continued the earlier tradition and shared this freedom with the world, under the knowledge that this freedom wouldn't work unless everyone had a share of it. (All freedoms tend to be that way.)

But over the past few years, this grand concept has started to fold up like a prizefighter who's taken too many punches on the chin.

What has happened is like something out of a science fiction story. The world's nations have discovered that there's wealth in "them thar oceans": food, oil, natural gas, minerals. Pushed by the pressures of exploding populations, many nations have hugely expanded, nationalized, and modernized their fishing fleets. The Grand Banks off Newfoundland are now the scene of a not-always-quiet competition among the fishermen of a dozen nations, some of them from as far away as Russia and Japan. The Americans and Canadians, who've long considered the Banks as virtually their private domain, are now being muscled around by the newcomers in their shiny, efficient factory ships. The World Court is listening to case after case of alleged interference, damages, actual fights.

Meanwhile, nations such as Peru are extending their claims to territorial rights for hundreds of kilometers from their shores. This is to "capture" the rich fishing grounds off their coasts and drive away the gringo fishermen. Then there's the discovery of rich oil and natural gas deposits in ocean areas that

were open to all nations—until the discoveries. Right now, the North Sea is being carved up into spheres of influence by the British, Dutch, West Germans, *et al.*, much in the way Africa and the Orient were dissected by the European empire builders of earlier centuries.

There is no British fleet capable of guaranteeing freedom of the seas anymore. And Britain's not much interested in the idea at present. The American Navy is being challenged by the new and fast-growing power of the Soviet fleet. And the days of battleship diplomacy are long gone, in a world where a confrontation anywhere can result in nuclear hell half an hour later.

So the fond old order of freedom of the seas is going the way all laws go when no one enforces them. Just as the concept of freedom of space will disappear as soon as space-faring nations decide it's in their best interests to ignore the law.

The basic point is simple.

Law and order are lovely concepts, but they work only when *all* the parties involved get something out of the arrangement. Of course, a vastly superior force can impress its will for a while on a smaller, fragmented, or unprepared opponent. But that's not law and order. That's military occupation of a conquered territory. Sooner or later the occupation must end; often it ends in bloodshed.

To make law and order work, to make law and order mean something more than mere words—whether it's in orbit or on the high seas or in your favorite downtown ghetto—then all the parties to the situation must derive some benefits from the system. The law must be enforced, fairly and without favor. But all parties involved must have a stake in maintaining the order.

Without law and order, human beings are much like those missiles waiting in their silos for The Button to be pushed. And law and order cannot be one-way, conqueror to slave. Not for long. To make a legal system work, all the parties involved must work at it. When a nation decides to claim extra offshore territory, or to deny the freedom of space to another nation, the international system of law and order breaks down. War is on the way. Those nations have decided that they stand to gain more by asserting their individual rights, than by observing the rights of other nations.

And when people ignore the law to incite riots, to bug telephones, to beat up kids and then charge them with resisting arrest, to pelt firemen with stones, they're creating anarchy and tearing down the protections of a legal and orderly society.

Many people utter the words "Law and Order" as if they were sacred. Damned few people live up to them.

THE EDITOR

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