

HOMO AQUATICUS by Poul Anderson

SEPTEMBER

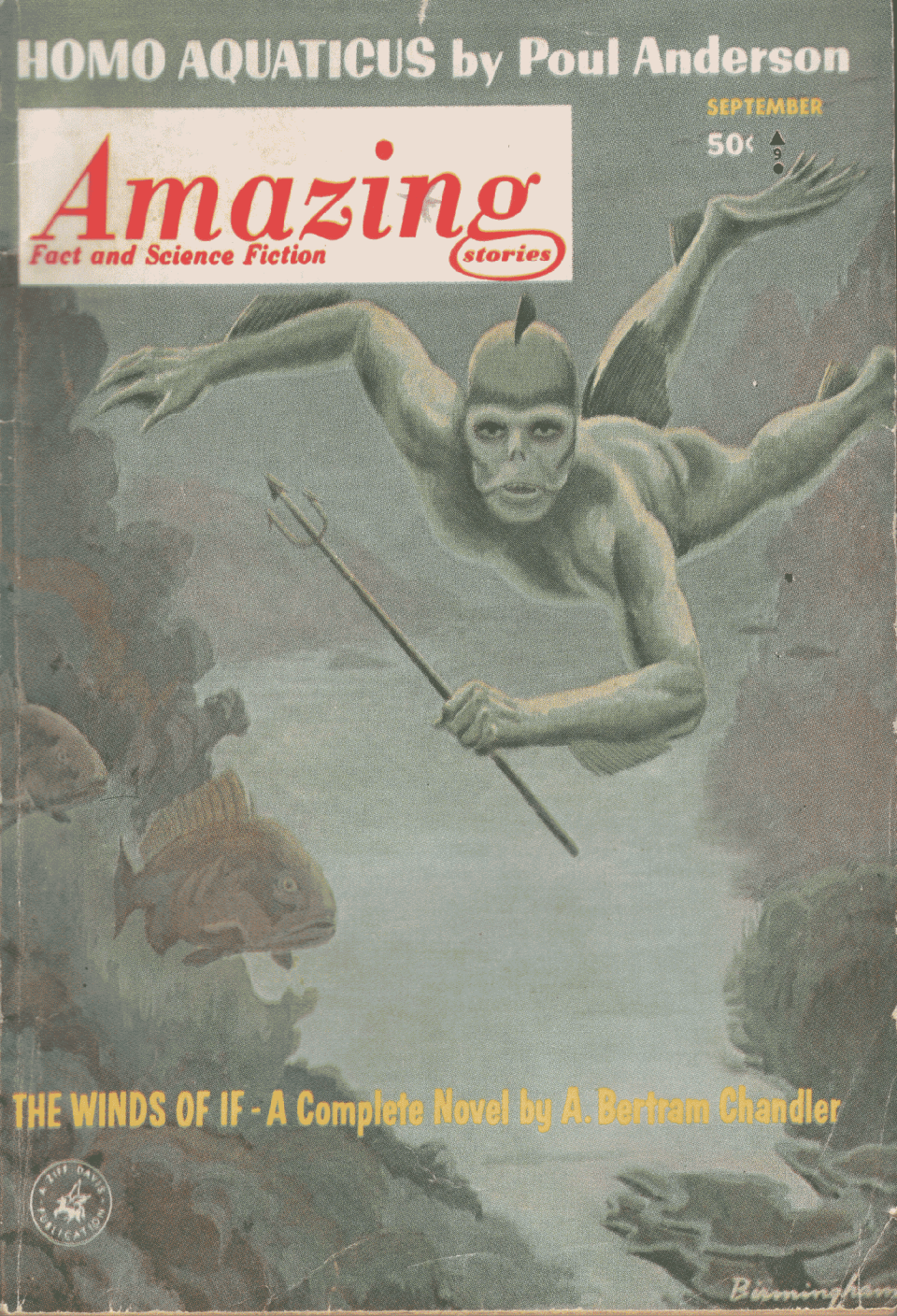
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# Amazing

Fact and Science Fiction Stories

September, 1963 Vol. 37, No. 9

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# EDITORIAL

**N**OW that oysters R in season again with the return of September, we feel some confidence in emphasizing the marine aspects of life in this issue. Birmingham's cover—nor Poul Anderson's stirring *Homo Aquaticus* (see page 6)—may not be what evolutionists have in mind from a technical standpoint; but we think that they superbly point up man's ancient heritage from the sea, and the very real possibility of his future place there.

Long after we had scheduled this story and cover, there were signs that we had not, really, gone far enough in our extrapolation. The fact is that research and engineering for deep-water cultures has progressed far beyond our realization. For example, major oil companies on the West Coast are already using electronically controlled, TV-eye-equipped, fin-stabilized robots to explore the sea bottom for oil-deposit formations. It is expected that other robots can drill and maintain deep-underwater wells; and that, eventually, undersea robots will be routinely used to "prospect" for the billions of tons of precious minerals which accrete on the ocean floor.

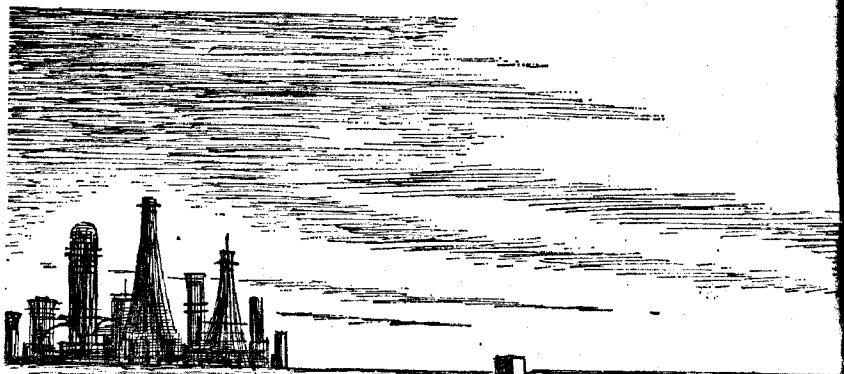
Westinghouse scientists reported recently the practicability

of undersea atomic power plants. An undersea reactor is already in the preliminary design stages; it would be able to generate 3,000 kw—enough electricity for a community of 6,000 people. So it is no longer entirely visionary to contemplate cities under the sea. Another job for underwater atomic reactors would be to heat sea-bottom water, causing it to rise and carry with it from the depths a rich flow of nutrients—remains of eons-dead plants and animals. Where these nutrients flow, marine life prospers. So it is conceivable that atomic-powered "fertilizer plants" could enrich the potential harvests of oceanic "farms."

But even all of this is routine compared to the vision of the famed undersea explorer Jacques-Yves Cousteau, inventor of the Aqua-Lung. Cousteau foresees men living in the sea—at first artificially-equipped for a hostile environment, and then as a natural inhabitant.

Talking of artificial aids, Cousteau points out that space doctors are working on a capsule, surgically linked with the aorta, that would allow an astronaut to regenerate his blood with oxygen without breathing air.

*(Continued on page 121)*



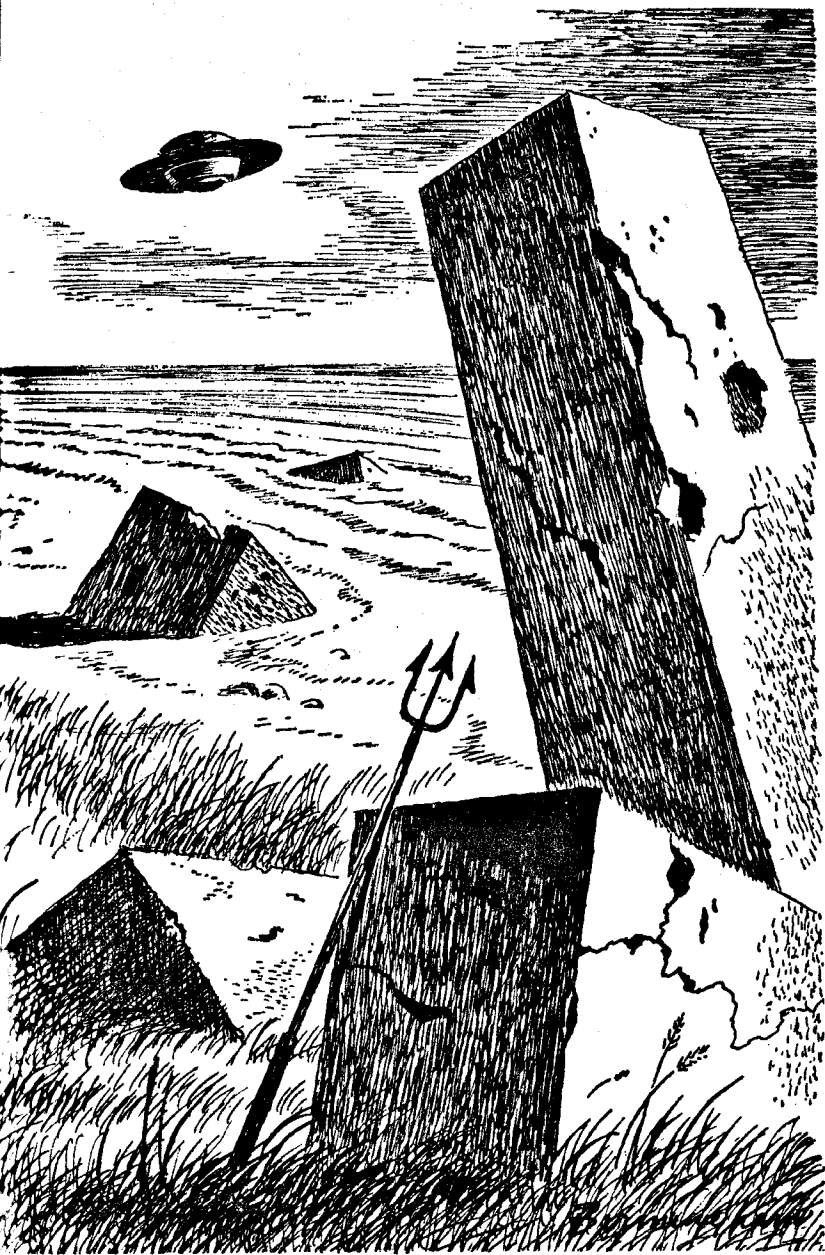
Illustrated by  
BIRMINGHAM

**The Kith ship had traveled to the  
end of the galaxy, to expiate  
a crime. But before penance could  
be done, there must be  
another death—and a new birth.**

# *Homo Aquaticus*

By POUL ANDERSON

NOW and then, on that planet, Jong Errifrans thought he heard the distant blowing of a horn. It would begin low, with a pulse that quickened as the notes waxed, until the snarl broke in a brazen scream and sank sobbing away. The first time he started and asked the others if they heard. But the sound was on the bare edge of audibility for him, whose ears were young and



sharp, and the men said no. "Some trick of the wind, off in the cliffs yonder," Mons Rainart suggested. He shivered. "The damned wind is always hunting here." Jong did not mention it again, but when he heard the noise thereafter a jag of cold went through him.

There was no reason for that. Nothing laired in the city but sea birds, whose wings made a white storm over the tovertops and whose flutings mingled with wind skirl and the drumroll of surf; nothing more sinister had appeared than a great tiger-striped fish which patrolled near the outer reefs. And perhaps that was why Jong feared the horn: it gave the emptiness a voice.

At night, rather than set up their glower, the four would gather wood and give themselves the primitive comfort of a fire. Their camping place was in what might once have been a forum. Blocks of polished stone thrust out of the sand and wiry grass which had occupied all streets; toppled colonnades demarked a square. More shelter was offered by the towers clustered in the city's heart, still piercing the sky, the glazit windows still unbroken. But no, those windows were too much like a dead man's eyes, the rooms within were too hushed, now that the machines which had been the city's life lay corroded beneath the dunes. It

was better to raise a tent under the stars. Those, at least, were much the same, after twenty thousand years.

The men would eat, and then Regor Lannis, the leader, would lift his communicator bracelet near his mouth and report their day's ransacking. The spaceboat's radio caught the message and relayed it to the *Golden Flyer*, which orbited with the same period as the planet's twenty-one-hour rotation, so that she was always above this island. "Very little new," Regor typically said. "Remnants of tools and so on. We haven't found any bones yet for a radioactivity dating. I don't think we will, either. They probably cremated their dead, to the very end. Mons has estimated that engine block we found began rusting some ten thousand years ago. He's only guessing, though. It wouldn't have lasted at all if the sand hadn't buried it, and we don't know when that happened."

"But you say the furnishings inside the towers are mostly intact, age-proof alloys and synthetics," answered Captain Ilmaray's voice. "Can't you deduce anything from their, well, their arrangement or disarrangement? If the city was plundered—"

"No, sir, the signs are too hard to read. A lot of rooms have obviously been stripped. But we



don't know whether that happened in one day or over a period maybe of centuries, as the last colonists mined their own homes for stuff they could no longer make. We can only be sure, from the dust, that no one's been inside for longer than I like to think about."

WHEN Regor had signed off, Jong would usually take out his guitar and chord the songs they sang, the immemorial songs of the Kith, many translated from languages spoken before ever men left Earth. It helped drown out the wind and the surf, booming down on the beach where once a harbor had stood. The fire flared high, picking their faces out of night, tinging plain work clothes with unrestful red and then guttering down so that shadows swallowed the bodies. They looked much alike, those four men, small, lithe, with dark sharp features; for the Kith were a folk apart, marrying between their own ships, that carried nearly all traffic among the stars. Since a vessel might be gone from Earth for a century or more, the planetbound civilizations, flaring and dying and re-born like the flames that warmed them now, could not be theirs. The men differed chiefly in age, from the sixty years that furrowed Regor Lannis' skin to the twenty of Jong Errifrans.

Ship's years, mostly, Jong remembered, and looked up to the Milky Way with a shudder. When you fled at almost the speed of light, time shrank for you, and in his own life he had seen the flower and the fall of an empire. He had not thought much about it then—it was the way of things, that the Kith should be quasi-immortal and the planetarians alien, transitory, not quite real. But a voyage of ten thousand light-years toward Galactic center, and back, was more than anyone had ventured before; more than anyone would ever have done, save to expiate the crime of crimes. Did the Kith still exist? Did Earth?

After some days, Regor decided: "We'd better take a look at the hinterland. We may improve our luck."

"Nothing in the interior but forest and savannah," Neri Avelair objected. "We saw that from above."

"On foot, though, you see things you miss from a boat," Regor said. "The colonists can't have lived exclusively in places like this. They'd need farms, mines, extractor plants, outlying settlements. If we could examine one of those, we might find clearer indications than in this damned huge warren."

"How much chance would we have, hacking our way through the brush?" Neri argued. "I say

let's investigate some of those other towns we spotted."

"They're more ruinous than this one," Mons Rainart reminded him. "Largely submerged." He need not have spoken; how could they forget? Land does not sink fast. The fact that the sea was eating the cities gave some idea of how long they had been abandoned.

"Just so," Regor nodded. "I don't propose plunging into the woods, either. That'd need more men and more time than we can spare. But there's an outsize beach about a hundred kilometers north of here, fronting on a narrow-mouthed bay, with fertile hills just behind—hills that look as if they ought to contain ores. I'd be surprised if the colonists did not exploit the area."

Neri's mouth twitched downward. His voice was not quite steady: "How long do we have to stay on this ghost planet, before we admit we'll never know what happened?"

"Not too much longer," Regor said. "But we've got to try our best before we do leave."

**H**E jerked a thumb at the city. Its towers soared above fallen walls and marching dunes, into a sky full of birds. The bright yellow sun had bleached out their pastel colors, leaving them bone-white. And yet the view behind them was beautiful,

forest that stretched inland a hundred shades of shadow-rippled green, while in the opposite direction the land sloped down to a sea that glittered like emerald strewn with diamond dust, moving and shouting and hurling itself in foam against the reefs. The first generations here must have been very happy, Jong thought.

"Something destroyed them, and it wasn't simply a war," Regor said. "We need to know what. It may not have affected any other planet. But maybe it did."

Maybe Earth lay as empty, Jong thought, not for the first time.

The *Golden Flyer* had paused here to refit before venturing back into man's old domain. Captain Ilmaray had chosen a F9 star arbitrarily, three hundred light-years from Sol's calculated present position. They detected no whisper of the energies used by civilized races, who might have posed a threat. The planet seemed a paradise, Earth-mass but with its land scattered in islands around a worldwide ocean, warm from pole to pole. Mons Rainart was surprised that the carbon dioxide equilibrium was maintained with so little exposed rock. Then he observed weed mats everywhere on the water, many of them hundreds of square kilometers in area, and decided that their photosynthesis

was active enough to produce a Terrestrial-type atmosphere.

The real and terrible shock had been to observe from orbit the ruined cities. Not that colonization could not have reached this far, and beyond, during twenty thousand years. But the venture had been terminated; why?

That evening it was Jong's turn to hold a personal conversation with those in the mother ship. He got his parents, via intercom, to tell them how he fared. The heart jumped in his breast when Sorya Rainart's voice joined theirs. "Oh, yes," the girl said, with an uneven little laugh, "I'm right here in the apartment. Dropped in for a visit, by chance."

Her brother chuckled at Jong's back. The young man flushed and wished hotly for privacy. But of course Sorya would have known he'd call tonight. . . . If the Kith still lived, there could be nothing between him and her. You brought your wife home from another ship. It was space-man's law, exogamy aiding a survival that was precarious at best. If, though, the last Kith ship but theirs drifted dead among the stars; or the few hundred aboard the *Golden Flyer* and the four on this world whose name was lost were the final remnants of the human race—she was bright and gentle and swayed sweetly when she walked.

"I—" He untangled his tongue. "I'm glad you did. How are you?"

"Lonely and frightened," she confided. Cosmic interference seethed around her words. The fire spat sparks, loudly, into the darkness overhead. "If you don't learn what happened here . . . I don't know if I can stand wondering, the rest of my life."

"Cut that!" he said sharply. The rusting of morale had destroyed more than one ship in the past. Although—"No, I'm sorry." He knew she did not lack courage. The fear was alive in him too, that he would be haunted forever by what he had seen here. Death in itself was an old familiar of the Kith. But this time they were returning from a past more ancient than the glaciers and the mammoths had been on Earth when they left. They needed knowledge as much as they needed air, to make sense of the universe. And their first stop in that spiral arm of the Galaxy which had once been home, had confronted them with a riddle that looked unanswerable. So deep in history were the roots of the Kith that Jong could recall the symbol of the Sphinx; and suddenly he saw how gruesome it was.

"We'll find out," he promised her. "If not here, then when we arrive at Earth." Inwardly, he was unsure. He made small talk

and even achieved a joke or two. But afterward, laid out in his sleeping bag, he thought he heard the horn winding in the north.

THE expedition rose at dawn, bolted breakfast, and stowed their gear in the spaceboat. It purred from the city on grav drive, leveled off, flew at low speed not far above ground. The sea tumbled and flashed on the right, the land climbed steeply on the left. No herds of large animals could be seen there. Probably none existed, with such scant space to develop in. But the ocean swarmed. From above Jong could look down into transparent waters, see shadows that were schools of fish numbering in the hundreds of thousands. Further off he observed a herd of grazers, piscine but big as whales, plowing slowly through a weed mat. The colonists must have gotten most of their living from the sea, he thought.

Regor set the boat down on a cliff overlooking the bay he had described. The escarpment ringed a curved beach of enormous length and breadth, its sands strewn with rocks and boulders. Kilometers away, the arc closed in on itself, leaving only a strait passage to the ocean. The bay was placid, clear bluish-green beneath the early sun, but not stagnant. The tides of the

one big moon must raise and lower it two or three meters in a day, and a river ran into it from the southern highlands. Afar, Jong could see how shells littered the sand below high-water mark, proof of abundant life. It seemed bitterly unfair to him that the colonists had had to trade so much beauty for darkness.

Regor's gaunt face turned from one man to the next. "Equipment check," he said, and went down the list: fulgurator, communication bracelet, energy compass, medikit—"My God," said Neri, "you think we were going on a year's trek and separately at that."

"We'll disperse, looking for traces," Regor said, "and those rocks will often hide us from each other." He left the rest unspoken: that that which had been the death of the colony might still exist.

They emerged into cool, flowing air with the salt and iodine and clean decay smell of coasts on every Earthlike world, and made a slow way down the scarp. "Let's radiate from this point," Regor said, "and if nobody has found anything, we'll meet back here in four hours for lunch."

JONG'S path slanted farthest north. He walked briskly at first, his body enjoying the motion, scrunch of sand and rattle of pebbles beneath his boots,

whistle of the many birds overhead. But presently he must pick his way across drifts of stone and among dark boulders, some as big as houses, that cut him off from the wind and his fellows; and he remembered Sorya's aloneness.

*Oh, not that. Haven't we paid enough?* he thought. And, for a moment's defiance: *We didn't do the thing. We condemned the traitors ourselves, and threw them into space, as soon as we learned. Why should we be punished?*

But the Kith had been too long isolated, themselves against the universe, not to hold that the sin and sorrow of one belonged to all. And Tomakan and his fellow conspirators had done what they did unselfishly, to save the ship. In those last vicious years of the Star Empire, when Earthmen made the Kithfolk scapegoats for their freedom by betraying to the crew fled to await better times, the *Golden Flyer's* captured people would have died rather horribly—had Tomakan not bought their freedom by betraying to the persecutors that asteroid where two other Kith vessels lay, readying to leave the Solar System. How could they afterward meet the eyes of their kindred, in the Council that met at Tau Ceit?

The sentence was just: to go exploring to the fringes of the Galactic nucleus. Perhaps they

would find the Elder Races who must dwell somewhere, perhaps they would bring back the knowledge and wisdom that could heal man's inborn lunacies. Well, they hadn't; but that was something in itself, enough to give the *Golden Flyer* back her honor. No doubt everyone who had sat in Council was long dead now. Still, their descendants—

Jong stopped in midstride. His shout went ringing among the rocks.

"What is it? Who called? Anything wrong?" The questions flew from his bracelet like anxious bees.

He stooped over the little heap and touched it with fingers that wouldn't hold steady. "Worked flints," he breathed. "Flakes, broken spearheads . . . shaped wood . . . something—" He scabbled wildly in the sand. Sunlight struck off a piece of metal, rudely hammered into a dagger. It has been, it must have been fashioned from some of the ageless alloy in the city—long ago, for the blade was worn so thin that it had snapped across—He crouched over the shards and babbled.

And shortly Mons' deep tones cut through: "Here's another site! An animal skull, could only have been split with a sharp rock, a thong—wait, wait, there's something carved in this block, maybe a symbol—"

Then suddenly he roared, and made a queer choked gurgle, and his voice came to an end.

Jong leaped erect. The communicator jabbered with calls from Neri and Regor. He ignored them. There was no time for dismay, he was busy tuning his energy compass. Each bracelet emitted a characteristic frequency besides its carrier wave, for location purposes, and—The needle swung about. His free hand unholstered his fulgurator and he went bounding over the rocks.

As he broke out onto the open stretch of sand, the wind hit him full in the face. Momentarily through its shrillness he heard the horn, louder than before, off beyond the cliffs. A part of him remembered fleetingly how one day on a frontier world he had seen a band of huntsmen gallop in pursuit of a wounded animal that wept as it ran, and how the chief had raised a crooked bugle to his lips and blown just such a call.

**T**HE note died away. Jong's eyes swept the beach. Far down its length he saw several figures emerge from a huddle of boulders. Two of them carried a human shape. He yelled and sprinted to intercept them. The compass dropped from his grasp.

They saw him and paused. When he neared, Jong made out that the form they bore was

Mons Rainart's. He swung ghastly limp between his carriers. Blood dripped from his back and over his breast.

Jong's stare went to the six murderers. They were chillingly manlike, half a meter taller than him, superbly muscled beneath the naked white skin, but altogether hairless, with long webbed feet and fingers, a high dorsal fin and smaller fins at heels and elbows and on the domed heads. The features were bony, with great sunken eyes and no external ears. A cap of skin drooped from pinched nose to wide mouth. Two carried flint-tipped wooden spears, two had tridents hammered from metal—the tines of one were luridly red and wet—and those who bore the body had knives slung at their waists.

"Stop!" Jong shrieked. "Let him go!"

He plowed to a halt, a few meters off, and menaced them with his gun. The biggest uttered a gruff bark and advanced, trident poised. Jong retreated a step. Whatever they had done, he hated to—

An energy beam winked, followed by its thunderclap. The one that carried Mons' shoulders crumpled, first at the knees, then down into the sand. The blood from the hole burned through him mingled with the spaceman's, equally crimson.

They whirled. Neri Avelair pounded down the beach from the opposite side. His fulgurator spoke again. The shimmering wet sand reflected the blast. It missed, but quartz fused where it struck near the feet of the creatures and hot droplets spattered them.

The leader waved his trident and shouted. They ran toward the water. The one who had Mons' ankles did not let go. The body flapped arms and head as it dragged. Neri shot a third time. Jolted by his own speed, he missed anew. Jong's finger remained frozen on the trigger.

The five giants entered the bay. Its floor shelved rapidly. In a minute they were able to dive below the surface. Neri reached Jong's side and fired, bolt after bolt, till a steam cloud rose into the wind. Tears whipped down his cheeks. "Why didn't you kill them?" he screamed. "You could have gunned them down where you were!"

"I don't know." Jong stared at his weapon. It felt oddly heavy.

"They drowned Mons!"

"No . . . he was dead already. I could see. Must have been pierced through the heart. I suppose they ambushed him in those rocks—"

"M-m-maybe. But his body, damn you, we could've saved that at least!" Senselessly, Neri put a blast through the finned corpse.

"Stop that!" commanded Regor. He threw himself down and gasped for breath. Dimly, Jong noticed that there were gray streaks in the leader's hair. It seemed a matter of pity and terror that Regor Lannis the unbendable should be whittled away by the years.

*What am I thinking? Mons is killed—Sorya's brother!*

Neri holstered his fulgurator, covered his face with both hands, and sobbed.

AFTER a long while Regor shook himself, rose, knelt again to examine the dead swimmer. "So there were natives here," he muttered tonelessly. "The colonists must not have known. Or maybe they underestimated what savages could do."

His hands ran over the glabrous hide. "Still warm," he said, mostly to himself. "Air-breathing; a true mammal, no doubt, though this male lacks vestigial nipples; real nails on the digits, even if they have grown as thick and sharp as claws." He peeled back the lips and examined the teeth. "Omnivore evolving toward carnivore, I'd guess. The molars are bigger than ours, and rather are still pretty flat, but the rest pointed." He peered into the dimmed eyes. "Human type vision, probably less acute. You can't see so far under water. We'll need extensive study to de-

termine what kind of color sensitivity there is—was—if any. Not to mention the other adaptations. I daresay they can stay below for many minutes at a stretch. Doubtless not as long as cetaceans, however. They haven't evolved that far from their land ancestors. You can tell by the fins. Of some use in swimming, but not really an efficient size or shape as yet."

"You can wonder about that, while Mons is being carried away?" Neri choked.

Regor got up and tried in a bemused fashion to brush the sand off. "Oh, no," he said. His face worked, and he blinked several times. "We've got to do something about that, of course." He glanced skyward. The air was full of wings, as the sea birds sensed meat and wheeled insolently close. Their piping overrode the wind. "Let's get back to the boat. We'll take this carcass along for the scientists."

Neri cursed at the delay, but took one end of the object. Jong had the other. The weight felt monstrous, and seemed to grow as they stumbled towards the cliffs. Breath rasped in their throats. Their shirts clung to the sweat on them, which they could smell through every sea odor.

Jong looked down at the ugly face beneath his hands. In spite of everything, in spite of Mons being dead—oh, never to hear his

big laugh again, never to move a chessman or hoist a glass or stand on the thrumming decks with him!—he wondered if there was a female somewhere out in the ocean who had thought the face beautiful.

"We weren't doing them any harm," said Neri between wheezes.

"You can't . . . blame a poison snake . . . or a carnivore . . . if you come too near," Jong said.

"But these aren't dumb animals! Look at that brain case. At that knife." Neri needed a space of time before he had the lungful to continue his fury: "We've dealt with nonhumans often enough. Fought them once in a while. But they had a reason to fight . . . mistaken or not, they did. I never saw or heard of anyone striking down utter strangers at first sight."

"We may not have been strangers," Regor said.

"What?" Neri's head twisted around to stare at the older man.

Regor shrugged. "There was a human colony here. The natives seem to have wiped it out. I imagine they had reasons then. And the tradition may have survived."

*For ten thousand years or more?* Jong thought, shocked. *What horror did our race visit on theirs, that they haven't been able to forget in so long?*



HE tried to picture what might have happened, but there was no reality to it, only a dry and somehow thin logic. Presumably this colony was planted by some civilization that followed the Star Empire. Presumably that civilization had crumbled in its turn. The settlers had most likely possessed no spaceships of their own; outposts worlds found it easiest to rely on the Kith for what few trade goods they wanted. Often their libraries did not even include the technical data for building a ship, and they lacked the economic surplus necessary to do that research over again.

So—the colony was orphaned. Later, if a period of especially virulent anti-Kithism had occurred here, the traders might have stopped coming; might even have lost any record of this world's existence. *Or the Kith might have become extinct, but that is not a possibility we will admit.* The planet was left isolated.

Without much dry land, it couldn't support a very big population, even if most of the food and industrial resources had been drawn from the sea. However, the people should have been able to maintain a machine culture. No doubt their society would ossify, but static civilizations can last indefinitely.

Unless they are faced by vigor-

ous barbarians, organized into million-man hordes under the lash of outrage. . . . But was that the answer? Given atomic energy, how could a single city be overrun by any number of neolithic hunters?

Attack from within? A simultaneous revolt of every autochthonous slave? Jong looked back to the dead face. The teeth glinted at him. *Maybe I'm softheaded. Maybe these creatures simply take a weasel's pleasure in killing.*

They struggled up the scarp and into the boat. Jong was relieved to get the thing hidden in a cold storage locker. But then there came the moment when they called the *Golden Flyer* to report.

"I'll tell his family," said Captain Ilmaray, most quietly.

*But still I'll have to tell Sorya how he looked,* Jong thought. The resolution stiffened in him: *We're going to recover the body. Mons is going to have a Kithman's funeral; hands that loved him will start him on his orbit into the sun.*

He had no reason to voice it, even to himself. The oneness of the Kith reached beyond death. Ilmaray asked only if Regor believed there was a chance.

"Yes, provided we start soon," the leader replied. "The bottom slopes quickly here, but only to about thirty meters. Then it's al-

most flat to some distance beyond the gate, further than our sonoprobes reached when we flew over. I doubt the swimmers are fast enough to evade us till they reach too great a depth for a nucleoscope to detect Mons' electronic gear."

"Good. Don't take risks, though." Grimly: "We're short enough on future heredity as is." After a pause, Ilmaray added, "I'll order a boat with a high-powered magnascreen to the stratosphere, to keep your general area under observation. Luck ride with you."

"And with every ship of ours," Regor finished the formula.

As his hands moved across the pilot board, raising the vessel, he said over his shoulder, "One of you two get into a spacesuit and be prepared to go down. The other watch the 'scope, and lower him when we find what we're after."

"I'll go," said Jong and Neri into each other's mouths. They exchanged a look. Neri's glared.

"Please," Jong begged. "Maybe I ought to have shot them down, when I saw what they'd done to Mons. I don't know. But anyhow, I didn't. So let me bring him back, will you?"

Neri regarded him for nearly a minute more before he nodded.

**T**HE boat cruised in slow zig-zags, out across the bay, while

Jong climbed into his spacesuit. It would serve as well under water as in the void. He knotted a line about his waist, adjusted the other end to the little winch by the main personnel lock. The metallic strand woven into its plastic would conduct phone messages. He draped a sack over one arm for that which he would find, and hoped there would be no call to use the slugthrower at his hip.

"There!"

Jong jerked at Neri's shout. Regor brought the craft to a halt, a couple of meters above the surface and three kilometers from shore. "You certain?" he asked.

"Absolutely. Not moving, either. I suppose they abandoned him so as to make a faster escape when they saw us coming through the air."

Jong clamped his helmet shut. External noises ceased. The stillness made him aware of his own breath and pulse and—some inner sound, a stray nerve current or mere imagination—the hunter's horn, remote and triumphant.

The lock opened, filling with sky. Jong walked to the rim and was nearly blinded by the sunlight off the wavelets. Radiance ran to the horizon. He eased himself over the lip. The rope payed out and the surface shut over him. He sank.

A cool green roofed with sun-blaze enclosed him. Even through the amor, he felt multitudinous vibrations, the sea lived and moved, everywhere around. A pair of fish streaked by, unbelievably graceful. For a heretical instant he wondered if Mons would not rather stay here, lulled till the end of the world.

*Cut that!* he told himself, and peered downward. Darkness lurked below. He switched on the powerful flash at his belt, probing after his goal.

Particles in the water scattered the light, so that he fell as if through an illuminated cave. More fish passed near. Their scales reflected like jewels. He thought he could make out the bottom now, white sand and uplifted ranges of rock on which clustered many-colored coraloids, growing toward the sun. And then the swimmer appeared.

He moved slowly to the fringe of light and poised there. In his left hand he bore a trident, perhaps the one which had killed Mons. At first he squinted against the dazzle, then looked steadily at the radiant metal man. As Jong continued to descend, he followed, propelling himself with easy gestures of feet and free hand, a motion as lovely as a snake's.

Jong gasped and yanked out his slugthrower.

"What's the matter?" Neri's

voice rattled in his earplugs.

He gulped. "Nothing," he said, without knowing why. "Lower away."

The swimmer came a little closer. His muscles were tense, mouth open as if to bite; but the deep-set eyes remained unwavering. Jong returned the gaze. They went down together, still considering each the other.

*He's not afraid of me,* Jong thought, *though he saw on the beach what we can do.*

Impact jarred through his soles. "I'm there," he called mechanically. "Give me a little slack and—Oh!"

The blood drained from his head as if an ax had split it. He swayed, supported only by the water. Thunders and winds went through him, and the roar of the horn.

"Jong!" Neri called, infinitely distant. "Something's the matter, I know there is, gimme an answer, for the love of Kith say something!"

THE swimmer touched bottom too. He stood across from that which had belonged to Mons Rainart, the trident upright in his hand.

Jong lifted the gun. "I can fill you with metal," he heard himself groan. "I can cut you to pieces, the way you—you—"

The swimmer shuddered, as if he had understood, but stayed

where he was. Slowly, he raised the trident toward the unseen sun. With a single gesture, he reversed it, thrust it into the sand, let go, and turned his back. A thrust of the great legs sent him arrowing off.

The knowledge exploded in Jong. For a century of seconds he stood alone with it.

Regor's voice pierced through: "Get my suit, I'm going after him."

"I'm all right," he managed to say. "I found Mons."

He gathered what he could. There wasn't much. "Bring me up," he said.

When he was lifted from the bay and climbed through the airlock, he felt how heavy was the weight upon him. He let fall the sack and trident and crouched beside them. Water ran off his gear.

The doors closed. The boat climbed. A kilometer high, Regor locked the controls and came aft to join the others. Jong bestirred himself enough to remove his helmet, just as Neri opened the sack.

Mons' head rolled out and bounced dreadfully across the deck. Neri strangled a yell.

Regor lurched back. "They ate him," he croaked. "They cut him to pieces for food."

He gathered his will, strode to the port and peered out. "I saw one of them break the surface, a

short while before you came up," he said between his teeth. Sweat—or was it tears?—coursed down the gullies in his cheeks. "We can catch him. The boat has a gun turret."

"No—" Jong tried to rise, but hadn't the strength.

The radio buzzed. Regor ran to the pilot's chair forward, threw himself into it and slapped the receiver switch. Neri set lips together, picked up the head and laid it on the sack. "Mons, Mons, but they'll pay," he said.

Captain Ilmaray's tones filled the hull: "We just got word from the observer boat. It isn't there yet, but the magnascreen's already spotted a horde of swimmers . . . no, several different flocks, huge, must total tens of thousands . . . converging on the island where you are. At the rate they're going, they should arrive in a couple of days."

Regor shook his head, as if stunned. "How did they know?"

"They didn't," Jong mumbled.

"No matter." Neri leaped to his feet, a tiger movement. "That's exactly what we want. A couple of bombs dropped in the middle of 'em."

"You mustn't!" Jong cried. He became able to rise too. The trident was gripped in his hand. "He gave me this."

"What?" Regor swiveled around. Neri stiffened where he stood.

"Down below," Jong told them. "He saw me and followed me to the bottom. Realized what I was doing. Gave me this. His weapon."

"Whatever for?"

"A peace offering. What else?"

Neri spat on the deck. "Peace, with those filthy cannibals?"

**J**ONG squared his shoulders. The armor enclosing him no longer seemed an insupportable burden. "You wouldn't be a cannibal if you ate a monkey, would you?"

Neri said an obscene word, but Regor suppressed him with a gesture. "Well, different species," the pilot admitted coldly. "By the dictionary you're right. But these killers are sentient. You don't eat another thinking being."

"It's been done," Jong answered. "By humans too. More often than not, as an act of respect or love, taking some of the person's mana into yourself. Anyway, how could they know what we were? When he saw I'd come to gather our dead, he gave me his weapon. How else could he say he was sorry, and that we're brothers? Maybe he even realized that's literally true, after he'd had a little while to think the matter over. But I don't imagine their traditions are that old. It's enough, it's even better, that he simply confessed we were his kin

because we also care for our dead."

"What are you getting at?" Neri snapped.

"Yes, what the destruction's going on down there?" Ilmaray demanded through the radio.

"Wait." Regor gripped the arms of his chair. His voice fell low. "You don't mean they're—"

"Yes, I do," Jong said. "What else could they be? How could a mammal that big, with hands and brain, evolve on these few islands? How could any natives have wiped out a colony that had atomic weapons? I thought about a slave revolt, but that doesn't make sense either. Who'd bother with so many slaves, when they had cybernetic machines? No, the swimmers are the colonists. They can't be anything else."

"Huh?" grunted Neri.

Ilmaray said across hollow space: "It could be. If I remember rightly, Homo Sapiens is supposed to have evolved from the, uh, Neanderthal, type, in something like ten or twenty thousand years. Given a small population, genetic drift, yes, a group might need even less time to degenerate."

"Who says they're degenerate?" Jong retorted.

Neri pointed to the staring-eyed head on the deck. "That does."

"That was an accident, I tell

you, a misunderstanding," Jong said. "We had it coming, blundering in blind the way we did. They aren't degenerate, they're just adapted. As the colony got more and more dependent on the sea, and there were mutations, those who could best take that sort of environment had the most children. A static civilization wouldn't notice what was happening till too late, and wouldn't be able to do anything about it if they did. Because the new people had the freedom of the whole planet. The future was theirs."

"Yeh, a future of being savages."

"They couldn't use our kind of civilization. It's wrong for this world. If you're going to spend most of your life in salt water, you can't very well keep your electric machines; and flint you can pick up almost anywhere is an improvement over metal that has to be mined and smelted.

"Oh, maybe they have lost some intelligence. I doubt even that, but if they have what of it? We never did find the Elder Race. Maybe intelligence really isn't the goal of the universe. I believe, myself, these people are coming back up the ladder, in their own way. But that's none of our business." Jong knelt and closed Mons' eyes. "We were allowed to atone for our crime," he said very softly. "The least we can do is forgive them in our

turn. Isn't it? And . . . we don't know if any other humans are left, anywhere in all the worlds, except us and these."

"Why did they kill Mons?"

"They're air breathers," Jong said, "and doubtless they have to learn swimming, as pinnipeds do, instead of having an instinct. So they need breeding grounds. That beach, yes, that must be where the tribes are headed. A party of males went in advance to make sure the place was in order. They saw something strange and terrible walking on the ground where their children were to be born, and they felt compelled to attack it."

Neri slumped down on a bench. The silence came back.

Until Ilmaray said: "I think you have the answer. We can't stay here, then. Return immediately and we'll get under weigh."

Regor nodded and touched the controls. The engine hummed into life. Jong got up, walked to a port, and watched the sea beneath him dwindle as the sky darkened and the stars trod froth.

*I wonder what that sound was, he thought vaguely. A wind noise, no doubt, as Mons said. But I'll never be sure.* For a moment it seemed to him that he heard it again, in the thrum of energy and metal, in the beat of his own blood, the horn of a hunter pursuing a quarry that wept as it ran.

**THE END**

**The fey Mr. Young continues his scholarly researches  
in the scientific origins of our myth and legend  
with this tale of an agile—and avaricious—one-man**

# BOARDING PARTY

By **ROBERT F. YOUNG**

Illustrated by **FINLAY**

(Translator's note: *The original of the following report was recently acquired by the Terran Industrial Library through the Interstellar Historical Exchange Society, into whose illustrious fold the member nations of the Terran Economic Bloc have at last been admitted. The narrative is of primary interest to the library officials because it provides unequivocal proof that, long before the Interstellar Economic Community took official cognizance of our existence, several articles of Community Commerce found their way into our culture. To the layman, however, the narrative is of primary interest because it provides an intriguing parallel to a narrative of an altogether different nature.*)

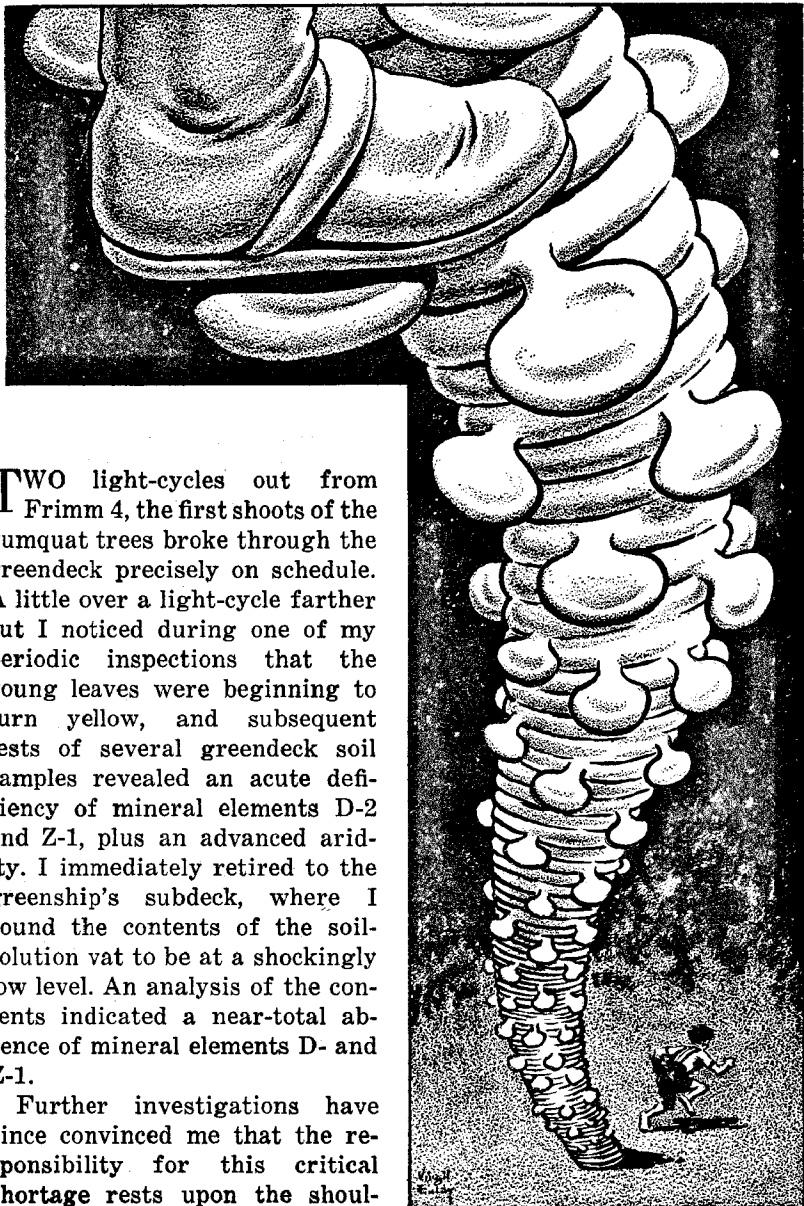
TO: Interstellar Nurseries,  
Frimm 4

FROM: Captain of the Greenship  
*Uxurient*,  
Urtz 2

SUBJECT(S): (1) Why the *Uxurient* put in to an out-of-bounds system during the Frimm 4-Urtz 2 run; (2) how a boarding party of one gained the green-deck and made off with a Uterium 5 snirk bird, a toy friddlefork, and two containers of yellow trading disks; (3) why the *Uxurient's* flexible ship-to-ground capillary tube is ten exids shorter than it used to be.

(1)

*Why the Uxurient put in to  
an Out-of-Bounds System  
during the Frimm 4-Urtz  
2 Run*



**T**WO light-cycles out from Frimm 4, the first shoots of the yumquat trees broke through the greendeck precisely on schedule. A little over a light-cycle farther out I noticed during one of my periodic inspections that the young leaves were beginning to turn yellow, and subsequent tests of several greendeck soil samples revealed an acute deficiency of mineral elements D-2 and Z-1, plus an advanced aridity. I immediately retired to the greenship's subdeck, where I found the contents of the soil-solution vat to be at a shockingly low level. An analysis of the contents indicated a near-total absence of mineral elements D- and Z-1.

Further investigations have since convinced me that the responsibility for this critical shortage rests upon the shoul-



ders of none other than Ur-Lon-Ho-Lee, Interstellar Nurseries' senior shipping clerk, but at the time, the yumquat-tree shipment pre-empted my attention to the exclusion of all other matters. If the trees were to be allowed to shoot up at the usual accelerated growth rate and were to be delivered in satisfactory sapling stage to the Urtz 2 customer who had ordered them, I had but one course of action open to me: to put in to the nearest system, find a planet with a soil rich in moisture and rich in mineral elements D-2 and Z-1, and replenish the soil-solution vat by means of the *Uxurient's* ship-to-ground capillary tube. Fortunately, there happened to be a system in the vicinity of the *Uxurient's* present position, but unfortunately it happened to be one of the many systems that are out-of-bounds to Interstellar Economic Community ships. Before coming to a decision, then, I had to weigh the importance of my mission against the risk of causing "a substantial interference in the normal evolution of an extra-Community culture"—a possibility that is always present when a Community ship is forced to enter an out-of-bounds system. I decided that it was my responsibility both to the customer and to the company to run this risk, and proceeded to put in to the system at once.

I wasted no time on the outer worlds, knowing from experience that such worlds rarely yield anything in the way of flora and hence could not possibly possess the kind of soil I needed, but arrowed in to the orbital regions of the first four. Perceiving at once that Four would not serve my purpose, I continued on to Three. Three turned out to be a Frimm 4-type planet in all respects save its slightly smaller size; it also turned out to be the reason for the system's having been placed out of bounds. I was not surprised: One seldom finds soil of the type employed by Frimm 4 nurseries without finding intelligent life in the immediate vicinity. In this instance, I used the term "intelligent life" in its broadest sense, for the several civilizations I transchecked at random revealed technologies not far removed from the paleolithic stage, and in one case, in the very midst of it.

ON several of the land masses I detected scattered deposits of the soil-type I needed, and I could have replenished the *Uxurient's* soil-solution vat from any of them. However, I chose an unusually rich one on a large island near the major land mass, reasoning that the less time I consumed in the operation, the less chance there would be of my occasioning "a substantial in-

terference in the normal evolution of an extra-Community culture". This particular deposit bordered a small community of scattered, thatch-roofed dwellings, and abounded in trees similar to the yumquat species. After activating the *Uxurient's* ventral camouflage-unit, I brought the greenship down to about two hundred mirids, gravved it into position above the edge of the forest, and opened the capillary-tube lock. I timed my maneuver to coincide with the passing of the dusk belt, but, reluctant to attract any more attention than was absolutely necessary, I waited through most of the ensuing night phase before lowering the capillary tube. Unfortunately, I erred somewhat in my calculations, and the tube's rhizomorphous feeding system, owing partially to the rather strong wind that had sprung up during the night phase, entered the soil much closer to one of the native dwellings than I had intended should be the case; however, dawn being near at hand, I lacked sufficient time to recoil and relocate the device, so I left it where it was. I was not particularly worried: the natives' superstitious fear of the tube would probably preclude their approaching it closely enough for them to be able to damage it, and if their superstitious fear of

the tube itself was not strong enough to make them keep their distance, their fear of the "low-lying cloud" from which the tube depended should be.

My mind at ease in this respect then, I reduced the opacity of the hull's upper hemisphere to complete transparency so that the greendeck would benefit from the rays of the system's sun, after which I retired to the sub-deck to check on the first influx of nutrients into the soil-solution vat. The length of the capillary tube prohibited any immediate change in the solution-level, so while I waited, I busied myself checking the tubes that run down to the vat from the section of the greendeck where the upper extremities of the capillary tube are affixed. Next, I checked the outgoing tubes that feed the greendeck soil. By the time I finished, the level had begun to rise.

I waited till it rose above the halfway mark, then I took a sample and ran an analysis. The result delighted me: the D-2 and Z-1 mineral element content had quadrupled! If the rapidity with which the vat was filling continued, I would be able to disengage the capillary tube, recoil it, and be on my way before the next night phase.

I lingered for a while longer, watching the level climb. Finally, remembering that I had

not eaten since before my discovery of the soil deficiency, I left the vat-room, picked up three lliaka hind quarters in the meat-compartment, attached them to my belt, and proceeded up the ramp to the greendeck. The thought of the fine steaks which the quarters would yield made me realize how truly hungry I was, and I set off across the greendeck toward my distant living quarters with quickened steps. As I walked, the sight of the arid soil stretching away in every direction afflicted me with melancholy, even though I knew that the deplorable condition was well on its way toward being corrected. The leaves of the baby yumquat trees, I saw to my dismay, had more than merely yellowed: they had shriveled too. And so scrawny were the little shoots that, had I not known that they were there, I might very well have walked in their midst and have been unaware of their existence. Indeed, the greendeck, awash now with bright morning sunlight, had more of the aspect of a desert than it did an aspect of a thriving oasis where plants are grown during shipment. I submit that my bringing the *Uxurient* in to an out-of-bounds system was more than merely justified: it was in keeping with the highest ideals that govern man in his relationship to plant-life.

## BOARDING PARTY

(2)

*How a Boarding Party of One gained the Greendeck and made off with a Uterium 5 Snirk Bird, a Toy Friddlefork, and Two Containers of Yellow Trading Disks.*

ARRIVING at my living quarters, I removed my greendeck fatigues and laid them upon the arms of the rack beside the entrance, wondering as I always do on such occasions how Ho-Hat-Li-Tum, the company's morale manager, could have fallen for so blatantly whimsical an appointment as a clothes rack in the form of a life-size woman. Granted, greenship pilots lead lonely lives, but tell me this: how can the mere act of their laying their outer garments upon the outstretched arms of a brainless, speechless, feelingless mannequin in the least alleviate their loneliness? If Ho-Hat-Li-Tum were really concerned about the morale of the greenship pilots, he would spurn such half-way measures and concentrate his energies on getting the regulation that forbids pilots to take their wives into space with them rescinded.

To continue: Once in my living quarters, I proceeded directly to the galley where I cut two large steaks from one of the lliaka hindquarters. Placing the steaks upon the grill to sear, I

got a loaf of bread and decanter of wine out of the provision closet, after which I set the table. When the steaks were done, I placed them on a large platter and sat down to eat. It was at this point that I received a very definite impression that I was being watched.

I looked around the galley. Other than myself, of course, no one was there, and certainly the various cupboards were much too small to harbor a secret onlooker. A secret onlooker indeed! Angry with myself, I put the matter from my mind, concluding that the condition of the yumquat trees had depressed me to a greater extent than I had realized, and that I had fallen prey to preposterous imaginings. I wish now that I had been less eager to ascribe what proved to be a perfectly valid psychosensory perception to my emotional letdown.

I ate ravenously, devouring both of the steaks and the entire loaf of bread. Afterward, a feeling of peace and good will stole over me, and on an impulse I called the Uterium 5 snirk bird down from its perch above the galley doorway and persuaded it by means of a crust of bread to perch upon my forefinger. Despite the large and ovoid xanthous droppings which these birds sporadically deposit on chairs, tables and floors, they

make wonderful pets, and I envied the particular customer who was to receive this one—a tiny, bright-eyed female—as a partial bonus for his yumquat-tree order. The other components of his bonus—the toy friddlefork and the two containers of yellow trading disks—stood on a shelf just behind me, and reaching around and procuring them, I set them on the table before me. Such evidence of largess invariably renews my faith in the company, and on long runs I often get out customer bonuses and speculate on the munificence of a concern such as ours. Thus I speculated now—but not for long. I had not slept for nearly two zodal periods and was far more tired than I realized, and to complicate matters, the heavy meal which I had just consumed had had a soporific effect upon me. Almost before I knew it, I dozed off.

I believe that my first appraisal that the previously mentioned psychosensory perception had not been illusory after all was the creak of one of the cupboard doors. Unfortunately, this appraisal was on the unconscious, rather than the conscious, level, and failed to arouse me from my stupor. It took the hysterical cackling of the Uterium 5 snirk bird, a few moments later, to bring me back to true awareness,

and by that time, it was too late. The tiny man who had shinned up the table leg and seized the snirk bird, the two containers of yellow trading disks, and the toy friddlefork had already regained the deck and was running toward the doorway. In the process of climbing back down, he must have bumped the toy friddlefork and accidentally activated its tonal unit, for it was bleating away insistently as he bore it away. Indeed, so insistent were its cries that one would have thought that it expected me to come after it and succor it.

Incredulously, I got to my feet. I saw then that the thief was not a man, but a boy—the tiniest boy that I have ever seen in my whole life. Assuming his stature to be average, it is unlikely that even a full-grown adult of his species would come any higher than a Frimm 4's citizen's kneecap!

I called after him, uttering my name in as gentle a tone of voice as I could manage and assuring him that if he would return the articles he had stolen no harm would come to him. He only ran the faster, and fairly streaked through the galley doorway, down the entrance corridor, and out onto the green-deck. I had no choice but to set off in pursuit, and this I did, naively believing that I could overtake him easily. In this I

erred indeed. Never have I ever seen anyone run so fast. Why, there were times when I could have sworn that his feet weren't even touching the deck!

As I lumbered along in his wake, I wondered how he could conceivably have gotten on board. Had he climbed the capillary tube? This didn't seem possible in view of the *Uxurient's* altitude and in view of his diminutiveness, but I could think of no other answer. There was no need for me to, I saw presently: that he had climbed up the tube was unequivocally demonstrated by the ease and the celerity with which he now began to climb down it.

(3)

*Why the Uxurient's Flexible Ship-to-Ground Capillary Tube is now Ten Exids Shorter than It used to be*

**L**OATH to give up the chase, I started climbing down the tube myself. This is not as difficult as one would at first imagine—as I myself had imagined, in fact, prior to making the attempt. The branch-like protuberances that absorb the sunlight and transmute it into the energy required for the capillary-action provide numerous hand- and footholds, and had it not been for the almost gale-force wind that had developed, my descent would

have been relatively easy. Even with the wind, I found myself in no great danger, and I have no doubt but what I would have reached the ground in due course had I not underestimated the resourcefulness—and the blood-thirstiness—of my youthful quarry. He kept calling out repeatedly at the top of his voice, but I did not suspect what he was up to until, halfway down, I paused and looked below me. I was just in time to see a woman run out of the thatch-roofed dwelling near which the tube had rooted itself and hand him a small object the very moment his feet touched the ground.

I deduced from the shards of sunlight that the object threw off that it was a cutting tool of some kind. I was not long left in doubt in any event, for no sooner did the boy have it in his possession than he began to wield it. A series of thuds was borne upward by the wind, and with each thud, the tube gave a convulsive shudder. I had seen unattached ship-to-ground capillary tubes at the mercy of the wind before, and I knew the danger that confronted me. Consequently I began climbing back up toward the *Uxurient* at once. While I will not attempt to deny that I was frightened, I would like to point out that it wasn't so much my predicament that frightened me, but the cold-blooded attitude of

the young savage below me. He thought that by severing the tube he could bring it crashing to the ground, and the ferocity and the frequency of his blows testified to the eagerness with which he awaited my destruction.

It was his very attitude, I believe, that gave me the strength and the determination to gain the *Uxurient* after the tube broke free and began lashing wildly back and forth. For a long while I lay gasping on the green-deck; then, when my breath came back, I recoiled the tube, secured the tube-lock, and lifted into space. The soil-solution vat was not as full as I would have wished, but by careful rationing I knew that I could make its contents suffice. Whether I could or not, I wanted no more part of the world I had just left. I never want to see the place again.

\* \* \*

I WOULD like to append a word in my defense. While it is true that I was instrumental in exposing an extra-Community culture to a technology far beyond its ken, it must be remembered that all such cultures are flexible in nature and can absorb the seemingly inexplicable with the utmost equanimity. They achieve this quite simply by identifying the unfamiliar with the familiar, and by ascribing those phenomena which happen

to be beyond their experience to the workings of magic. Far from having an adverse effect, the present instance will, I am sure, provide the basis for a colorful legend. No doubt the legend will acquire a more satisfying ending, and unquestionably the boy's exploits will be exaggerated. As regards the Uterium 5 snirk bird, the toy friddlefork, and the two containers of yellow trading disks, you may be sure that the young rascal had already identified them with objects with which he was familiar

(and which he coveted) before he left the galley cupboard in which he was hiding. If he had not done so, he would not have stolen them. In any case, I am not unduly bitter about their loss, even though I must make that loss good. The measure of a Frimm 4 citizen's true worth is the quantity of his magnanimity; hence I hope that both the boy and the woman—probably his mother—live happily ever after.

(signed)

Fee-Fi-Fo-Fum

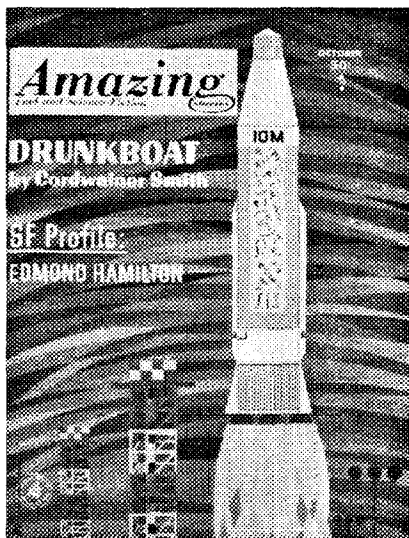
THE END

## COMING NEXT MONTH

**Cordwainer Smith** headlines the October issue of **AMAZING** with *Drunkboat*, a driving novelet of one man's tortured plunge through a new dimension of space in the quest for his galaxy-tossed love.

In answer to many requests, Sam Moskowitz will profile **Edmond Hamilton**, whose career covers almost the entire history and range of science fiction.

And, also in the October **AMAZING**, a truly Classic Reprint—the unforgettable *Prince of Liars*, a double-length novelet by **L. Taylor Hansen**.



Plus other stories and all our regular features. October **AMAZING** goes on sale at newsstands September 10.

# NEUTRINO ASTRONOMY

By BEN BOVA

*A smaller sun, visible day and night . . . a heaven deprived of some of its most familiar constellations . . . an early-warning system to detect supernovae in their birth throes . . . this is the way the cosmos looks to scientists on a new astronomical frontier.*

**I**N a salt mine near Cleveland, 2300 feet underground, where the only light comes from the fluorescent lamps on the gallery ceiling, a group of scientists are conducting an experiment.

They are astronomers. They are studying the Sun and stars.

They are "looking" at the Sun through nearly half a mile of solid Earth. Not only that. They "see" not merely the surface of the Sun, but directly into the depths of the solar core.

Obviously, these astronomers are not observing visible light. Nor are they interested in radio waves. They are studying one of the rarest, most elusive particles in all the strange lexicon of nuclear physics—the neutrino.

#### **How Does the Energy Get Away?**

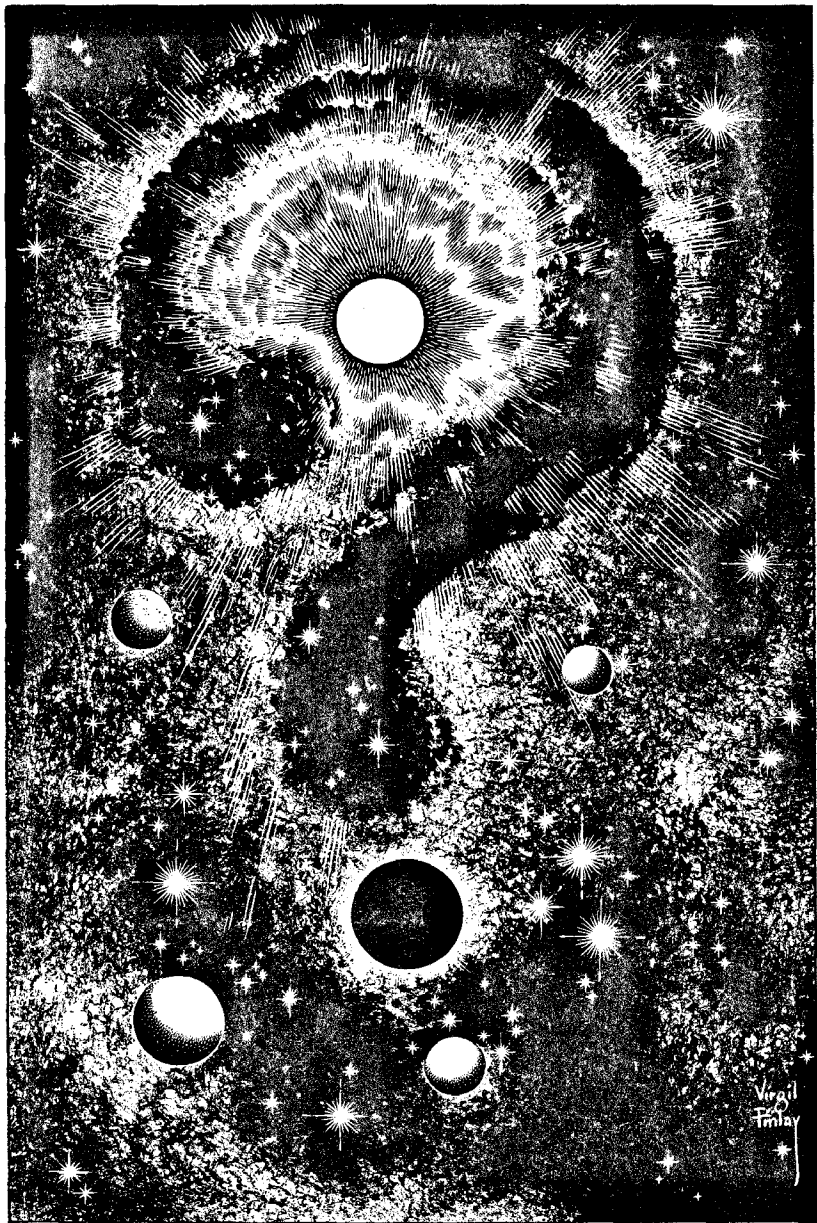
One of the many paradoxes of

modern astronomy is that, to study the infinite universe, astronomers must consider the infinitesimal atomic nucleus. The birth and death of the stars depend on nuclear processes taking place at their core.

It was in 1938 that Hans Bethe began unravelling the Sun's nuclear energy reactions. Suddenly astronomy became astrophysics, and the relatively new discipline of nuclear physics was applied to the oldest of man's sciences to explain how the stars could produce such prodigious amounts of energy.

The astrophysicists discovered that the Sun, and all the stars, were nuclear furnaces converting hydrogen into helium and radiating away energy. The Sun is a controlled fusion reactor about five billion years old, with





Virgil  
Timlay

another five or six billion years of stable life-span ahead.

Bethe (and Carl von Weizsacker, working independently) elaborated the now famous *carbon chain* (see Table 1). The net result of this nuclear roundelay is that four hydrogen nuclei (protons) are converted into a helium nucleus. Later it was discovered that the simpler *proton-proton* reaction yields the same effect (also in Table 1).

Both these fusion reactions produce the energy that we eventually receive as sunlight. What was not immediately realized was that these reactions also produce neutrinos.

**B**OTH the proton-proton and carbon-chain reactions take place in the Sun, with the proton-proton process contributing most of the energy output. It is believed that the carbon chain becomes increasingly important in stars hotter than the Sun.

Astrophysicists have come to the conclusion that as a star ages and uses up most of its hydrogen fuel, its central temperatures increase markedly. At these higher temperatures, helium nuclei begin to fuse into heavier elements. As the star continues to age and to heat up, constantly-heavier elements are produced in its core. But in some stars (per-

TABLE 1

<u>Carbon Chain</u>	<u>Key</u>
$H^1 + C^{12} \rightarrow N^{13} + \nu$	$H^1 =$ Hydrogen (proton)
$N^{13} \rightarrow C^{13} + e^+ + \nu$	$H^2 =$ Deuterium, deuteron)
$C^{13} + H^1 \rightarrow N^{14} + \gamma$	$He^3, He^4 =$ Helium isotopes
$N^{14} + H^1 \rightarrow O^{15} + \gamma$	$C^{12}, C^{13} =$ Carbon isotopes
$O^{15} \rightarrow N^{15} + e^+ + \nu$	$N^{13}, N^{14} =$ Nitrogen isotopes
$N^{15} + H^1 \rightarrow C^{12} + He^4$	$O^{15} =$ Oxygen isotope
	$e^+ =$ positron (positive electron)
	$\gamma =$ gamma ray
	$\nu =$ neutrino
<u>Proton-Proton Reaction</u>	
$H^1 + H^1 \rightarrow H^2 + e^+ + \nu$	
$H^2 + H^1 \rightarrow He^3 + \gamma$	
$He^3 + He^3 \rightarrow He^4 + 2H^1$	

Two nuclear fusion processes for converting hydrogen to helium, releasing energy in the form of gamma rays and neutrinos. Note that in the Carbon Chain, only four hydrogen nuclei (protons) and one carbon nucleus are required as input; the carbon nucleus, after several transmutations, returns to its original form at the chain's end.

haps in all) this cycle is suddenly interrupted by a cosmic cataclysm. The star explodes. Not in the relatively gentle gas-puff of an ordinary nova. That type of event can be considered a mild burp; hardly more than 0.01 percent of the star's mass is blown away. Some stars go into a nova phase every few weeks. What we are speaking of here is a really violent stellar explosion—a *supernova*. This catastrophe virtually destroys the star. A supernova might release as much energy in 24 hours as the Sun does in a million years!

The Chinese observed a supernova on July 4 (!) 1054 A.D. It was bright enough to be seen in full daylight. Modern astronomers, using the Chinese annals have found the site of the cataclysm—the wildly-distorted cloud of incandescent gases called the Crab Nebula. Even today, 900 years after the explosion, those gases are hurtling outward through space at nearly a thousand miles per *second*!

Impressive as a supernova might be, it is even more puzzling to astronomers and astrophysicists. Why does a star explode? What mechanism can possibly exist that could permit a star to expel so much energy so quickly? How does the energy get away from the star? Until recently, these questions remained stubbornly unanswered.

#### The Particle That Had To Be

While the astrophysicists were puzzled by the supernova problem, the nuclear physicists had a much more serious matter on their hands. They were faced with a full-scale revolution that threatened to wreck the entire structure of modern physics. The furor was over a seemingly-simple nuclear reaction, the *beta decay* of neutrons. Some time ago physicists realized that the neutron is not a fully stable particle. It spontaneously decays into a proton and electron (which is also called a beta particle). The neutron's half-life is 12 minutes—a very long time, in nuclear physics, where billionths of a second are ordinary. If 1000 neutrons are left to themselves, within 12 minutes, 500 will decay to protons and electrons. In another 12 minutes, 250 more will undergo beta decay. And so on. There is nothing unusual about beta decay; it is one of the fundamental radioactive processes. Or so physicists thought, until they took a deeper look.

When a neutron undergoes beta decay, the energy of motion of the resulting proton and electron should be exactly equal to the mass-energy of the original neutron. This is the foundation of physics: energy and mass are interchangeable, but in any given reaction, you must end with exactly the same total

amount of mass and energy that you started with. Mass and energy must be conserved; they can neither be created out of nothing, nor disappear into nothingness. Without this concept of conservation, the whole structure of physics collapses. And the beta decay of neutrons seemed to show that this conservation concept was wrong.

The energy of motion of the electron and proton should equal the mass-energy of the original neutron. But when the energy was measured, there was no equality at all. Most of the motion-energy goes to the very light electron. Measurement of the electron's motion (or *kinetic*) energy showed that in different instances of beta decay, its energy ranged from almost the right amount all the way down to zero. The electron did not exhibit the proper kinetic energy! Worse yet, it might fly off with almost any amount of energy. Where was the missing energy?

There were two possible answers: (1) The conservation of mass and energy was not a general principle of the physical world. (2) There was another particle, undetected so far, involved in the beta decay process. The first alternative would have meant that the world's physicists might as well start collecting bats' wings and bongo drums

and become witch doctors. So they chose the second, and prayed hard that it was right. Wolfgang Pauli and Enrico Fermi worked out the theoretical requirements for the missing particle in the 1930's. It would have to be a neutral particle, no electric charge. It would have no mass (just as photons, particles of light, have no mass). And, again like the photon, it would travel at the speed of light.

Fermi gave the new particle an Italian name meaning, "little neutral one": *Neutrino*.

A skeptic might have pointed out that the neutrino had been invented by the physicists merely to avoid the ruination of the conservation principles. And on looking at the theoretical description of the neutrino, the skeptic might have thought the physicists were safeguarding their ruse by making it impossible to ever find the particle.

A particle of no mass and no electrical charge, moving at light-speed. How do you detect it? Other nuclear particles can be trapped in a few feet of lead, or made to leave tracks in a cloud, bubble, or spark chamber. The neutrino would leave no track whatsoever. And as for stopping it with lead—the neutrino can penetrate 50 *lightyears* of lead without interacting with a single atom! The neutrino is so aloof that it can pass through

stars and planets as though they were empty space.

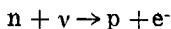
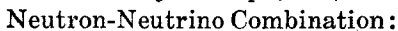
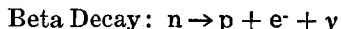
#### Neutrinos and Antineutrinos

If a skeptic would have been uneasy about accepting the validity of the neutrino, he was no more worried than the physicists themselves. They knew that they were treading on thin ice, but they had no alternative. All that stood between them and the downfall of physical science was the undetectable neutrino. But although the neutrino could not be detected, clues to its existence could be gathered.

The physicists returned to the beta decay process. They noted that if the neutron decayed into a proton and electron, and no other particle, then the proton and electron should fly away from each other on a straight line. This is not what happens. The proton and electron leave tracks in a cloud chamber that form a V, with the apex at the location of the original neutron. The V-shaped track leads one to suspect that a third particle participated in the decay of the neutron. A third particle that leaves no track.

The theoreticians began to define the neutrino's traits more exactly, and to fit it in with the rest of the growing family of sub-atomic particles—mesons, hyperons, anti-particles. They learned that the particle postu-

ated in beta decay is actually an anti-neutrino, an anti-matter form of the neutrino proper. They predicted that neutrinos proper would combine with a neutron to form a proton and electron. The two reactions are written:



Key

$n$  = neutron       $\nu$  = neutrino

$p$  = proton       $\bar{\nu}$  = antineutrino

$e^-$  = electron

Other neutrino reactions were predicted, too. But the fact remained that the neutrino itself had not been predicted, but invented. As the years went by, the theoreticians' invention remained unseen and unconfirmed.

#### Water, Water Everywhere . . .

For a number of years, the neutrino theory lived in an uneasy state of apprehension. But the experimental tools of nuclear physics were steadily becoming bigger and more powerful. Enormous nuclear reactors and giant particle accelerators, "atom-smashers" such as the 30-billion-volt alternating gradient synchrotron at Brookhaven National Laboratory, became available to bring even the superelusive neutrino within the threshold of detection. How can you detect a particle that can travel through the entire Earth in about a quar-

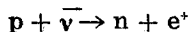
ter of a second, just as though it was not there at all?

First, the physicists realized it would be impossible to see the neutrino itself, or its track. So they would try to observe reactions in which neutrinos took part—watch the crime, so to speak, even though the criminal remained invisible. But the devilish part was to make the neutrino *do something!* They pass through matter as though it did not exist. The physicists were in the position of the Ancient Mariner, with neutrinos everywhere, but no way to get one to stop long enough to register on a detector.

However, the laws of chance held out a slim promise. If the physicists could monitor the passage of a large-enough number of neutrinos, sooner or later one of them would cause a reaction that could be detected. It was a slim promise—but no other was in sight. What was needed was size: big detecting equipment and huge numbers of neutrinos. In 1953, Frederick Reines and Clyde L. Cowan, Jr., of Los Alamos Scientific Laboratory, hopefully set up detecting equipment at the Atomic Energy Commission's gigantic production nuclear reactor at Savannah River, Ga. One of the world's largest reactors, the Savannah River pile produced an avalanche of anti-neutrinos some 30 times

larger than the neutrino stream coming in from the Sun and stars. Theoretically.

The Savannah River reactor like all fission reactors, produced neutron-rich products. The neutrons, through the beta decay process, yielded protons, electrons and antineutrinos. Again . . . theoretically. Reines and Cowan set up a detector that consisted mainly of water—1000 pounds of water. Water contains hydrogen, and hydrogen nuclei are simply protons. Anti-neutrinos would react with protons, the theoreticians claimed, to yield neutrons and positrons (the positively-charged anti-matter equivalent of the electron):



The water was doped with cadmium, which would capture the neutrons produced by the reaction. When a neutron is absorbed by a cadmium atom, gamma rays are produced. Also, when the positrons produced by the reaction meet electrons in the water, they annihilate each other and produce another set of gamma rays. Both the gamma rays produced by the neutron-cadmium and positron-electron reactions have characteristic energy levels.

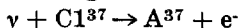
Reines and Cowan set up electronic equipment—and shielding devices—that would register only gamma rays of the proper

energy levels. The electronics showed that such gamma rays did indeed occur; therefore, neutrons and positrons were being produced in the cadmium-laced water; therefore anti-neutrinos were reacting with protons.

The anti-neutrino was found! The neutrino theory was verified.

With six years' hindsight, the experiment sounds easy. But out of a flow of some  $10^{17}$  anti-neutrinos passing through the detecting equipment each *second*, Reines and Cowan were able to register about three reactions per hour. The anti-neutrino finally did something—but just barely.

The neutrino itself was finally captured some while later by Brookhaven's Raymond Davis, following a suggestion by Bruno Pontecorvo of the Soviet Union's Joint Institute for Research Studies. Davis' experiment was based on the fact that the nuclei of chlorine-37 atoms can absorb a neutrino and become transformed to argon-37 nuclei:



Argon-37 is radioactive and can be detected, even in very minute amounts, by conventional radiation counters. Again, the experiment had to be on a large scale, because the neutrinos react so very rarely. Thousands of gallons of carbon tetrachloride, helium flushing systems, radia-

tion counters, and much patience were required. But the neutrino was found.

Within the past year, a new type of neutrino-antineutrino pair has been found. These two new particles are associated with mu and pi meson—unstable, short-lived particles produced in cyclotrons and other accelerators. Not much is known about the meson-type of neutrino, except that it is evidently a different species from the original electron-associated neutrino and antineutrino. They seem to have the same physical attributes—no charge, and no mass, down to the limit that can be measured. But neutrinos coming from mesons do not engage in any of the reactions that electron-neutrinos take part in. Hence the suspicion that they are different species. Some physicists have suggested calling the new particle the "neutretto."

The meson-neutrino, or neutretto, is still too new to be understood well. Fortunately, it is the familiar old electron-associated neutrino that we are concerned with.

#### Today's Energy Today

We saw a few pages ago that the Sun and the stars are producing neutrinos. Detecting equipment similar to that used by Reines, Cowan and Davis is now being put into operation in

a salt mine near Cleveland. The reason that the astronomers went underground, of course, was to screen out as much as possible the effects of cosmic rays and other spurious radiation that might trigger their detectors erroneously and confuse their work. The neutrino, of course, is blithely unhampered by half a mile of solid Earth. In fact, the detectors should pick up just as many neutrinos at midnight, when they must come up through the whole planet, as they would at noon, when they shine down from the sky!

What will the astronomers learn from solar neutrinos? No one is certain, at present. But scientists always welcome a new tool for investigating the physical world, and the neutrino will show the Sun as it has never been seen before. With an optical telescope, you can see the shining photosphere of the Sun. You are looking at photons of light that left the Sun's surface eight minutes earlier. But these photons represent energy that was released in nuclear reactions deep in the Sun's core *a million years ago*.

The Sun's energy is derived from the proton-proton and carbon-chain fusion reactions within its core. These reactions yield energy in the form of neutrinos and gamma ray photons. Now, at its core, the Sun's gases are

75 times denser than water (the solid Earth is about five times denser than water). The particles in the solar core are packed so densely that the gamma radiation produced by a fusion reaction is almost immediately absorbed by a nearby particle. The radiation energy is ultimately released by the particle, but at a longer wavelength. This "hand-over-hand" process is repeated countless trillions of times. The original gamma rays become X-rays, then ultra-violet . . . after perhaps a million-year-long odyssey through the Sun's immense bulk, the energy finally reaches the surface and is radiated into space as the yellowish visible light we are familiar with.

The neutrinos, on the other hand, have no such ordeal. Once created in the solar furnace, they head straight out, at light-speed, as though there were nothing at all in their way. When some of these neutrinos are trapped in Earthly detectors, we shall be observing energy that was released by the Sun little more than eight minutes ago. For the first time, we shall be seeing the Sun's current energy-output, instead of the tail-end of a million-year-long journey.

More yet. When solar neutrinos are identified, it will be the first experimental proof that



the Sun is indeed a nuclear furnace. No one doubts that it is, but experimental proof would ice the theoreticians' cake nicely. What the neutrino-astronomers shall "see" is not the million-mile-wide ball of glowing gases that our eyes show us, but a smaller sphere that gives off neutrinos. If the size of this sphere—the solar core—can be measured, it may be possible to get some real idea of the Sun's age and probably life expectancy.

This inner core of the Sun is our star's real furnace. The nuclear fusion reactions take place there—not *in* the core, however; on its surface. The core itself is believed to be primarily helium "ash" produced by the nuclear furnace. Along the spherical surface of the core, fresh hydrogen is being converted into helium, and giving off gamma and neutrino energy. Therefore, the size of the core is indicative of the age of the Sun—the length of time it has been fusing hydrogen to helium. Only a qualitative estimate can be made, probably; but a large core would certainly be older than a small one. If the size of the core can be measured, and compared to the total diameter of the Sun, estimates of the Sun's life expectancy might take on a solidity that is not now possible.

#### The Stellar Pituitary Gland

Not only might neutrinos allow us to estimate the Sun's age and life-span more closely. Neutrinos might well control the aging process in the Sun, much as the pituitary gland is suspected to regulate aging in human beings. We saw that the proton-proton fusion reaction is responsible for most of the sun's energy output. Strictly speaking, the term *proton-proton* is a misnomer. Two protons cannot combine, their mutual positive electric charges repel each other. However, under the proper circumstances, a proton can emit a neutrino and a positron, and change into a neutron. A proton and neutron *can* combine to form a deuteron (the  $H^2$  of Table 1). Once a deuteron has been formed, the rest of the so-called proton-proton reaction can take place.

It has been estimated that on the average, a proton in the Sun's core gets only one chance every few thousand years to penetrate the electrostatic barrier of fellow proton deeply enough to have a chance to form a deuteron. And of these rare occasions, only once in 10 million times will one of the protons happen to emit a neutrino at the propitious time and allow a deuteron actually to be formed. Thus, for the Sun, the emission of neutrinos determines the rate

at which deuterons are formed. The rate of deuteron formation determines the rate at which fusion reactions can take place. The fusion reaction rate determines how quickly the Sun is consuming its hydrogen fuel—how fast it is aging. So the neutrinos determine the pace of the Sun's evolution. They also carry off some 10 percent of the Sun's energy outright, flying straight out from the solar core with it, as soon as they are produced.

#### "Neutrino Stars" and Supernovae

As a star ages it becomes hotter, not cooler. At some time in the future, the helium "ash" at the Sun's core will become dense enough and (because of the pressure) hot enough to begin fusing into heavier elements, such as carbon, oxygen and neon. Later still, these elements will transmute themselves at even-higher temperatures into even-heavier elements. Many stars in the Milky Way galaxy have gone through this evolution and have passed along the road to extinction. The Crab Nebula, with a feeble white-dwarf star at its center, is a spectacular example. Less dramatic, but nearer at hand are the white-dwarf companions of Sirius and Procyon. Other stars are in the midst of this evolution; these are the red giant stars—Capella, Aldebaran, and Arcturus are three easily-observed examples.

As a star gets older and hotter, its neutrino emission increases. When a critical temperature is reached, a new process for creating neutrinos comes into play, and the star begins to lose even more of its energy to neutrinos. This new process does not require atomic nuclei. All that is needed is electrons and their anti-matter equivalents, positrons. Under ordinary conditions, when an electron and positron meet, they annihilate each other and yield a pair of gamma ray photons—pure electromagnetic energy. But in the core of a hot star, electron-positron annihilation can sometimes result in the production of a neutrino and anti-neutrino, instead of gamma rays.

This is a critical factor. If an electron-positron meeting produces gamma rays, it is quite likely that somewhere else in the star, a pair of gamma photons are colliding to produce an electron-positron pair. The two processes are in balance. The star loses no energy. But on the rare occasion when an electron-positron collision produces a neutrino and anti-neutrino, these two particles fly straight out of the star. The energy is gone forever.

Neutrino-antineutrino production by this method is very rare, even at temperatures of 600 million degrees Kelvin. Cal-

culations show that only once in  $10^{20}$  electron-positron collisions will a neutrino-antineutrino pair be formed. But astrophysics is filled with large numbers. Aged, hot stars produce neutrinos and antineutrinos at a pace brisk enough to seal their own fate. At high-enough temperatures, a star can produce so many neutrino-antineutrino pairs that these particles will carry off all the star's energy in a little more than 24 hours!

When that happens, the star has no recourse but to collapse violently. This collapse heats up the star to the point where its core literally explodes—a titanic nuclear bomb. The star is torn apart by the blast wave of the explosion. This is the answer to the puzzling question of the supernovae. Ironically, the explosion produces still more neutrinos, of the highest energy of all. Supernova explosions might also be the source of cosmic rays, many astronomers believe.

#### The Neutrino Universe

The age of neutrino astronomy is apparently close at hand. What would the universe look like, if we could really see neutrinos, instead of visible light?

The Sun, of course, would be a much smaller disk. And it would be visible regardless of the time

of day, because we could see it shining through the Earth. The heavens would be greatly altered. Most of the constellations would disappear, since their stars are only dim emitters of neutrinos. But perhaps familiar Orion would not suffer too much, since that constellation is composed mainly of very hot stars that should be beaming neutrinos at a prodigious rate. (The Orion stars are young, but for the most part very large and hot bluish giants and supergiants.)

If we were capable of watching the stars for millions of years, we would notice the neutrino-brightness of some of them steadily increasing. And where we saw a steady increase in antineutrinos as well, we would know that a supernova is on the way. In fact, one of the first tasks the neutrino-astronomers have set themselves is to monitor the occurrence of anti-neutrinos, in an effort to create a supernova early-warning system.

Neutrino astronomy is still too new and untried to have had any effect on astronomy as yet. Still, 20 years ago, radio telescopes were in the same condition. Radio astronomy has since added a new dimension to the old science of star-gazing. Will neutrino astronomy have as great an impact? It seems very likely.

# *the Winds of If*

By A. BERTRAM CHANDLER

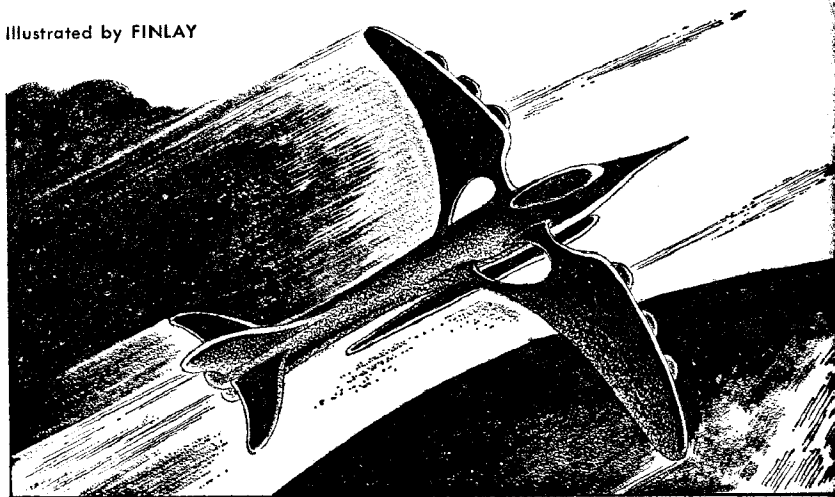
**Things are bleak enough at the Edge of Darkness without looking for trouble. But this ship found trouble time and time again. And not the least of the problems was: which Time was it in? Another provocative saga of the men and women of The Rim Worlds.**

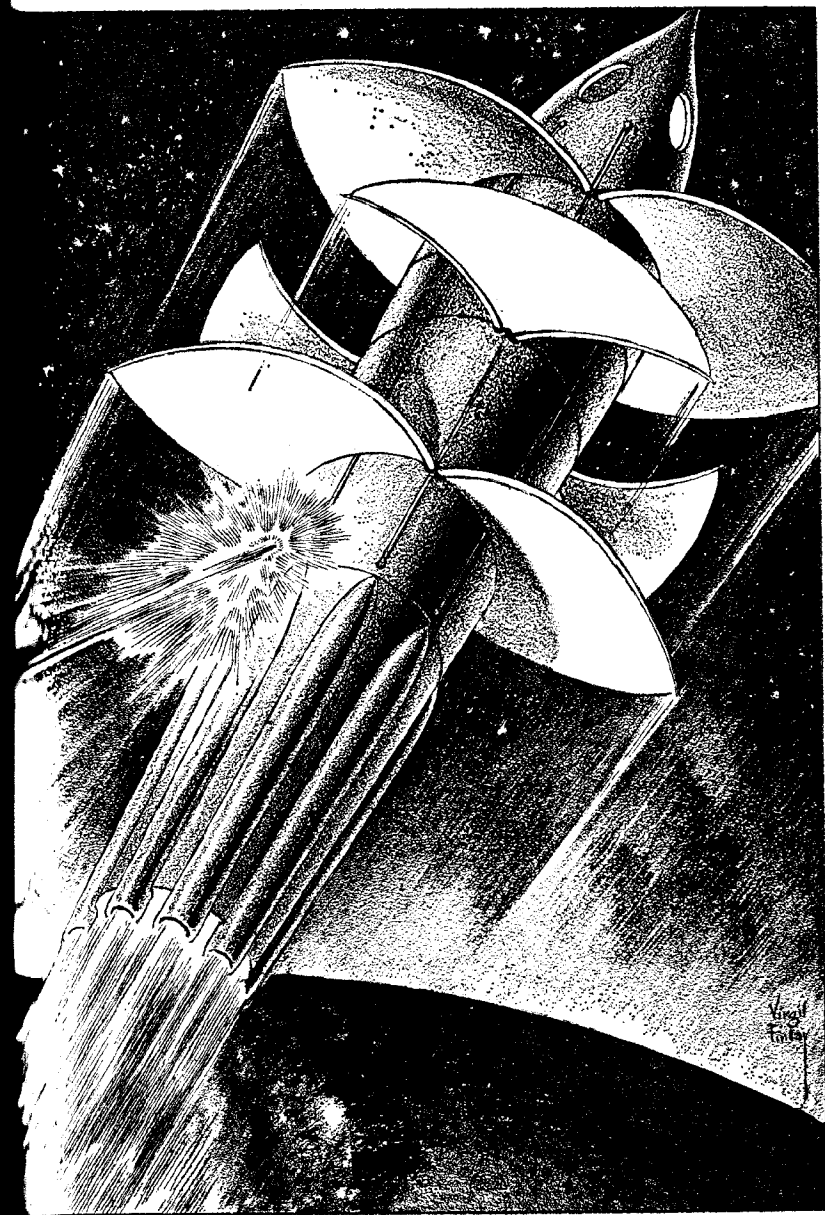
## CHAPTER 1

SHE was old and tired, was *Rim Dragon*—and after this, her final voyage, we were feeling just that way ourselves. It was as though she had known, some-

how, that a drab and miserable end awaited her in the ungentle hands of the breakers, as though she had been determined to forestall the inevitable, to go out in a blaze of glory—or as much glory

Illustrated by FINLAY





as would have been possible for a decrepit *Epsilon* Class tramp finishing her career, after many changes of ownership, at the very rim of the Galaxy, the edge of night.

Fortunately for us, she had overdone things.

Off Groller, for example, a malfunctioning of the control room computer had coincided with a breakdown of the main propellant pump. If the Second Mate hadn't got his sums wrong we should have been trapped in a series of grazing ellipses, with no alternative but to take to the boats in a hurry before too deep a descent into the atmosphere rendered this impossible. As things worked out, however, the mistakes made by our navigator (and his pet computer) resulted in our falling into a nice, stable orbit, with ample time at our disposal in which to make repairs.

Then there had been Pile trouble, and Mannschenn Drive trouble—and for the benefit of those of you who have never experienced this latter, all I can say is that it is somewhat hard to carry out normal shipboard duties when you're not certain if it's High Noon or last Thursday. It was during the Mannschenn Drive trouble that Cassidy, our Reaction Drive Chief Engineer, briefly lost control of his temperamental fissioning furnace. By some miracle the resultant flood

of radiation seemed to miss all human personnel. It was the algae tanks that caught it—and this was all to the good, as a mutated virus had been running riot among the algae, throwing our air conditioning and sewage disposal entirely out of kilter. The virus died, and most of the algae died—but enough of the organisms survived to be the parents of a new and flourishing population.

There had been the occasions when she had not overdone things, but when her timing had been just a little out. There had been, for example, the tube lining that had cracked just a second or so too late (fortunately, from our viewpoint) but, nonetheless, had resulted in our sitting down on the concrete apron of Port Grimes, on Tharn, hard enough to buckle a vane.

There had been another propellant pump failure—this time on Mellise—that caused us to be grounded on that world for repairs at just the right time to be subjected to the full fury of a tropical hurricane. Luckily, the procedure for riding out such atmospheric disturbances is laid down in Rim Runners' Standing Orders and Regulations.

Anyhow, the voyage was now over—almost over, that is.

**WE** were dropping down to Port Forlorn, on Lorn, falling slowly down the column of in-

candescence that was our Reaction Drive, drifting cautiously down to the circle of drab grey concrete that was the spaceport apron, to the grey concrete that was hardly distinguishable from the grey landscape, from the dreary flatlands over which drifted the thin rain and the grey smoke and the dirty fumes streaming from the stacks of the refineries.

We were glad to be back—but, even so . . .

Ralph Listowel, the Mate, put into words the feeling that was, I think, in the minds of all but one of us. He quoted sardonically,

*"Lives there a man with soul  
so dead*

*Who never to himself hath said  
When returning from some  
foreign strand*

*This is my own, my native  
land?"* . . .

The only genuine, native-born Rim Worlder among us was the Old Man. He looked up from his console to scowl at his Chief Officer. And then I, of course, had to make matters worse by throwing in my own two bits' worth of archaic verse. I remarked, "The trouble with you, Ralph, is that you aren't romantic. Try to see things this way . . .

*"Saw the heavens fill with  
commerce, argosies with  
magic sails,*

*Pilots of the purple twilight*

*dropping down with costly  
bales . . ."*

"What the hell's the bloody Purser doing in here?" roared the Captain, turning his glare on me. "Mr. Malcolm, will you please get the hell out of my control room? And you, Mr. Listowel, please attend to your duties."

I unstrapped myself from my chair and left, hastily. We carried no Third Mate, and I had been helping out at landings and blast-offs by looking after the R/T. Besides, I liked to be on top to see everything that was happening. Sulkily, I made my way down to the officers' flat, staggering a little as the ship lurched, let myself into the wardroom.

The other two "idlers" were there—Sandra and Doc Jenkins. They were sprawled at ease in their acceleration chairs, each of them sipping a drink from a tall glass, dewy with condensation.

"So this is how the poor live," I remarked sourly.

"The way that the old bitch has been carrying on," said the Doc affably, "we have to assume that any given drink may be our last. But how come you're not in the greenhouse?"

"They gave me the bum's rush," I admitted, dropping into the nearest chair, strapping myself in. I was feeling extremely disgruntled. In well manned, well found ships Pursers are brought

up to regard the control room as forbidden ground but, over the past few months, I had become used to playing my part in blastings-off and landings, had come to appreciate the risks that we were running all the time. If anything catastrophic happened I'd be dead, no matter where I was. But when I die I'd like to know the reason.

"So they gave you the bum's rush," said Sandra, not at all sympathetically. (She had been heard to complain that if the Purser was privileged to see all that was going on, a like privilege should be extended to the Catering Officer.) "Might I inquire why?"

"You might," I told her absently, listening to the thunder of the rocket drive, muffled by the insulation but still loud in the confined space. It sounded healthy enough. They seemed to be getting along without me up there. But we weren't down yet.

"Why?" she asked bluntly.

"Give me a drink, and I'll tell you."

She did not unstrap herself but extended a long, shapely arm, managed to shove the heavy decanter and a glass across the table so that they were within my reach.

"All right. If you must know, I was quoting poetry. Ralph started it. The Master did not, repeat not, approve . . ."

"Poetry," said Sandra flatly, "and ship handling just don't mix. Especially at a time like this."

"She was riding down," I said, "sweetly and gently, on full automatic."

"And all of us," she pointed out, "at the mercy of a single fuse. I may be only the cook and bottle washer aboard this wagon, but even I know that it is essential for the officers in Control to be fully alert at all times."

"All right," I said. "All right."

I glared at her, and she glared at me. She was always handsome—but she was almost beautiful when she was in a bad temper. I wondered (as I had often wondered) what she would be like when the rather harsh planes and angles of her face were softened by some gentler passion. But she did her job well, and kept herself to herself—as I had learned, the hard way.

MEANWHILE, we were still falling, still dropping, the muffled thunder of our reaction drive steady and unfaltering. In view of the past events and near disasters of the voyage it was almost too good to be true. It was, I decided, too good to be true—and then, as though in support of my pessimism, the sudden silence gripped the hearts of all of us. Sandra's face was white under her coppery



hair and Jenkins' normally ruddy complexion was a sickly green. We waited speechless for the last, the final crash.

The ship tilted gently, ever so gently, tilted and righted herself, and the stuffy air inside the wardroom was alive with the whispered complaints of the springs and cylinders of her landing gear. The bulkhead speaker crackled and we heard the Old Man's voice: "The set-down has been accomplished. All personnel may proceed on their arrival duties."

## CHAPTER 2

WE all had work to do—but none of us was particularly keen on getting started on it. We were down, and still in one piece, and we were feeling that sense of utter relaxation that comes at the end of a voyage.

Breathing a hearty sigh of unashamed relief, Doc Jenkins unstrapped himself and poured a generous drink from the decanter into each of our glasses. "Journey's end," said Doc, making a toast of it.

"In lovers' meetings," I added, finishing the quotation. "Is there anything left in the bottle?" demanded Ralph Listowel.

We hadn't seen or heard him come into the wardroom. We looked up at him in mild amazement as he stood there, awkward, gangling, his considerable

height diminished (but ever so slightly) by his habitual slouch. There was a worried expression on his lined face. I wondered just what was wrong now.

"Here, Ralph," said Sandra, passing him a drink.

"Thanks." The Mate gulped. "H'm. Not bad." He gulped again. "Any more?"

"Building up your strength, Ralph?" asked Sandra sweetly.

"Could be," he admitted. "Or, perhaps, this is an infusion of Dutch courage."

"What do you want it for?" I asked. "The hazards of the voyage are over and done with."

"Those hazards," he said gloomily. "But there are worse hazards than those in Space. When mere Chief Officers are bidden to report to the Super's office, at once, there's something cooking—and, I shouldn't mind betting you a month's pay, something that stinks."

"Just a routine bawling out," I comforted him. "After all, you can't expect to get away with everything *all* the time."

A wintry grin did nothing to soften his harsh features. "But it's not only *me* he wants. He wants you, Sandra, and you, Doc, and you, Peter. *And* our commissioned clairvoyant. One of you had better go to shake him out of his habitual stupor."

"But what have we done?" asked Doc in a worried voice.

"My conscience is clear," I said. "At least, I think it is . . ."

"My conscience is clear," stated Sandra firmly.

"Mine never is," admitted Doc Jenkins gloomily.

The Mate put his glass down on the table. "All right," he told us brusquely. "Go and get washed behind the ears and brush your hair. One of you drag the crystal gazer away from his dog's brain in aspic and try to get him looking something like an officer and a gentleman."

"Relax, Ralph," said Jenkins, pouring what was left in the decanter into his own glass.

"I wish I could. But it's damned odd the way the Commodore is yelling for all of us. I may not be a psionic radio officer, but I have my hunches."

Jenkins laughed. "One thing is certain, Ralph, he's not sending for us to fire us. Rim Runners are never that well off for officers. And once we've come out to the Rim, we've hit rock bottom." He began to warm up. "We've run away from ourselves as far as we can, to the very edge of night, and we can't run any further . . ."

"Even so . . ." said the Mate.

"Doc's right," said Sandra. "He'll just be handing out new appointments to all of us. With a bit of luck—or bad luck?—we might be shipping out together again."

What about the Old Man?" I asked. "And the engineers? Are they bidden to the Presence?"

"No," said Ralph. "As far as I know, they'll just be going on leave." He added gloomily, "There's something in the wind as far as we're concerned. I wish I knew what it was . . ."

"There's only one way to find out," said Sandra briskly, getting to her feet.

WE left the ship together—Ralph, Doc Jenkins, Sandra, Smethwick and myself. Ralph, who was inclined to take his Naval Reserve commission seriously, tried to make it a march across the dusty, scarred concrete to the low huddle of administration buildings. Both Sandra and I tried to play along with him—but Doc Jenkins and our tame telepath could turn any march into a straggle without even trying. For Smethwick there was, perhaps, some excuse; released from the discipline of watchkeeping he was renewing contact with his telepathic friends all over the planet. He wandered along like a man in a dream, always on the point of falling over his own feet. And Jenkins rolled happily beside him, a somewhat inane grin on his ruddy face. I guessed that in the privacy of his cabin he had depleted his stocks of Jungle Juice still further.

It was a relief to get into the office building, out of the insistent, nagging wind. The air was pleasantly warm, but my eyes were still stinging. I used my handkerchief to try to clear the gritty particles from them, saw, through tears, that the others were doing the same—all save Smethwick who, lost in some private world of his own, was oblivious to discomfort. Ralph in the lead, we started to ascend the stairs, paused to throw a beckoning nod at us. Not without reluctance we followed.

THERE was the familiar door at the end of the passageway, with *Astronautical Superintendent* inscribed on the translucent plastic. The door opened of itself as we approached. Through the doorway we could see the big, cluttered desk and, behind it, the slight, wiry figure of Commodore Grimes. He had risen to his feet, but he still looked small, dwarfed by the furnishings that must have been designed for a much larger man. I was relieved to see that his creased and pitted face was illumined by a genuinely friendly smile, his teeth startlingly white against the dark skin.

"Come in," he boomed. "Come in, all of you." He waved a hand to the chairs that had been set in a rough semi-circle before his desk. "Be seated."

When the handshaking and the exchange of courtesies were over we sat down. There was a period of silence while Miss Hal-lows busied herself with the percolator and the cups. My attention was drawn by an odd looking model on the Commodore's desk, and I saw that the others, too, were looking at it curiously and that old Grimes was watching us with a certain degree of amusement. It was a ship, that was obvious, but it could not possibly be a spaceship. It was, I guessed, some sort of aircraft; there was a cigar-shaped hull and, protruding from it, a fantastically complicated array of spars and vanes. I know even less about aeronautics than I do about astronautics—after all, I'm just the spacefaring office boy—but even I doubted if such a contraption could ever fly. I turned my head to look at Ralph; he was staring at the thing with a sort of amused and amazed contempt.

"Admiring my new toy?" asked the Commodore with a knowing smile.

"It's rather . . . It's rather odd, sir," said Ralph.

"Go on," chuckled Grimes. "Why don't you ask?"

There was an embarrassed silence, broken by Sandra. "All right, Commodore. What is it?"

"That, my dear," he told her, "is your new ship."

### CHAPTER 3

WE looked at the Commodore, and he looked back at us. I tried to read his expression, came to the reluctant conclusion that he wasn't joking. We looked at the weird contraption on his desk. Speaking for myself—the more I stared at it, the less like a ship it seemed. Have you ever seen those fantastic ornamental carp that are bred on Earth, their bodies surrounded by an ornate tracery of filmy fins, utility sacrificed to appearance? That's what the thing reminded me of. It was pretty, beautiful, even, in a baroque kind of way, but quite useless. And Grimes had told us, quite seriously, that it was a model of our new ship.

Ralph cleared his throat. He said, "Excuse me, sir, but I don't quite understand. That . . . that model doesn't seem to represent a conventional vessel. I can't see any signs of a venturi . . ." He was on his feet now, bending over the desk. "And are those propellers? Or should I say airscrews?" He straightened up. "And she's not a gaussjammer, one of the old Ehrenhaft Drive jobs. That's certain."

Old Grimes was smiling again. "Sit down, Captain Listowel. There's no need to get excited."

"*Captain Listowel?*" asked Ralph.

"Yes." The smile vanished as

though switched off. "But only if you agree to sail in command of . . ." he gestured towards the model . . . "*Flying Cloud.*"

"*Flying Cloud?* But that's a Trans-Galactic Clipper name . . ."

Grimes smiled again. "The first *Flying Cloud* was a clipper on Earth's seas, in the days of wooden ships and iron men. This *Flying Cloud* is a clipper, too—but not a Trans-Galactic Clipper. She is the latest addition to Rim Runners' fleet, the first of her kind."

"But . . ." Ralph was looking really worried now. "But, sir, there are many senior Masters in this employ. Come to that, there are quite a few Chief Officers senior to me . . ."

"And all of them," said Grimes, "old and set in their ways, knowing only one way of getting from Point A to Point B, and not wanting to know any other. Lift on Reaction Drive. Aim for the target star. Accelerate. Cut Reaction Drive. Switch on Mannschenn Drive. A child could do it. And while all this is going on you have the ship overmanned with a pack of engineers, eating their heads off and pulling down high salaries, and getting to the stage where they regard the ship merely as a platform upon which to mount their precious machinery . . ."

I couldn't help grinning. It

was common knowledge that Grimes didn't like engineers and was hardly on speaking terms with the Engineer Superintendents.

But Ralph, once he had smelled a rat, was stubborn. And he was frank. He said, "I appreciate the promotion, sir. But there must be a catch in it."

"Of course there is. Life is just one long series of catches.

Ralph was persistent. This . . ." he nodded towards the model . . . "is obviously something new, something highly experimental. As you know, I hold my Master's Certificate—but it's valid in respect of conventional drives only . . ."

"But you, Captain Listowel, are the only officer we have with any qualifications at all in respect of the Erikson Drive." He pulled a folder out of the top drawer of his desk, opened it. "Like most of our personnel, you made your way out to the Rim by easy stages. You were four years on Atlantia. You shipped in tops'l schooners as navigator—it seems that the Atlantian Ministry of Transport recognizes aeronautical certificates of competency insofar as navigation is concerned. You thought of settling permanently on the planet and becoming a professional seaman. You sat for, and obtained, your Second Mate's Certificate in Sail . . ."

"But what connection . . . ?"

"Let me finish. You were in *Rim Leopard* when she had that long spell for repairs on Tharn. You elected to take part of your leave on that world—and you shipped out as a supernumerary officer in one of their trading schooners . . ."

"Even so . . ."

"Take it from me, Captain Listowel, that your fore-and-aft rig Second Mate's ticket, together with your experience, means more than your Master Astronaut's Certificate. Too, you are qualified in one other, very important way." He looked at each of us in turn. "You're all qualified."

"I know nothing about wooden ships, Commodore," said Jenkins, "and I'm not an iron man."

"Too right, Doctor," agreed the Commodore cheerfully. "But you have no close ties on any of the Rim Worlds—neither chick nor child, as the saying goes. And that applies to all of you."

"This new ship is dangerous?" asked Ralph quietly.

"No, Captain Listowel. She's safer than the average spaceship—far safer than *Rim Dragon*. She'll be as easy as an old shoe. And economical to run. She is," he went on, "a prototype. It is our intention, insofar as some trades are concerned, to make her the standard carrier."

"And the catch?"

ALL right. You're entitled to know." He leaned back in his chair, gazed at the ceiling as though in search of inspiration. "You are all of you, I take it, familiar with the principle of the conveyor belt?"

"Of course," Ralph told him.

"Good. You know, then, that as long as the belt is kept loaded, the speed at which it is run is of relatively minor importance. So it is with shipping. Express services are desirable for mails and passengers and perishables—but what does it matter if a slab of zinc is ten years on the way instead of ten weeks?"

"It will matter a lot to the crew of the ship," grumbled Doc.

"I agree. But when the ship is travelling almost at the speed of light, there will not be a lapse of ten years subjective time. To the crew it will be just a normal interstellar voyage."

"But," objected Ralph. "Ten years. Where does the economy come in?"

"In manning, for a start. I have already discussed the matter with the Astronauts' Guild, and they agree that personnel should be paid on the basis of subjective elapsed time . . ."

"What!" exploded Ralph.

"Plus a bonus," added Grimes hastily. "Then there's fuel consumption. There'll be a Pile, of course, but it will be a small one. It will be required only to supply

power for essential services and auxiliary machinery. As you all know, fissionable elements are in short supply and very expensive on the Rim Worlds, so that's a big saving. Then, there'll be no Reaction Drive and Interstellar Drive Engineers to wax fat on their princely salaries. One Donkeyman, on junior officer's pay, will be able to handle the job . . ."

"A Donkeyman?" asked Sandra, her voice puzzled.

"Yes, my dear. In the last days of sail, on Earth, the windjammers used some auxiliary machinery, steam driven. The mechanic who looked after and ran this was rated as Donkeyman."

Then Ralph voiced the thoughts, the objections of all of us. He complained, "You've told us nothing, Commodore. You want us to buy a pig in a poke. You've mentioned something called the Erikson Drive, and you've given us a short lecture on the economics of ship management, but we're spacemen, not accountants. Oh, I know that we're supposed to get our star wagons from Point A to Point B as economically as possible—but getting them there is the prime consideration. And, frankly, I don't see how that contraption could get from one side of the spaceport to the other . . ."

Grimes looked down at the cold coffee in his cup with distaste. He got up, went to his fil-

ing cabinet and pulled out the "W" drawer, taking from it a bottle of whisky and glasses. He said, "It's rather a long story, but you're entitled to hear it. I suggest that we all make ourselves comfortable."

We settled down with our drinks to listen.

#### CHAPTER 4

YOU will recall (he said) that, some few years ago, I commissioned *Faraway Quest* to carry out a survey of this sector of the Galaxy. To the Galactic East I made contact with Tharn and Grollor, Mellise and Stree, but you are all familiar with the planets of the Eastern Circuit. My first sweep, however, was to the West . . . Yes, there are worlds to the West, populous planets whose peoples have followed a course of evolution parallel to our own. They're more than merely humanoid, some of these people. They're human. But—and it's one helluva big "but"—their worlds are anti-matter worlds. We didn't realize this until an attempt was made to establish contact with an alien ship. Luckily only two people were directly involved—our own Psionic Radio Officer and a woman, who seemed to hold the same rank, from the other vessel. The idea was that they should meet and rub noses and so on in one of *Faraway Quest's* boats; mid-

way between the two ships; both I and the other Captain were worried about the possibility of the exchange of viruses, bacteria and whatever, and this boat of mine was supposed to be a sort of quarantine station. But we need not have worried. Our two pet guinea pigs went up and out in a flare of energy that would have made a fusion bomb look silly.

So that was it, I thought at the time. The Psionic Radio Officers had had it, in a big way, so communications had broken down. And it was quite obvious that any contact between ourselves and the people of the anti-matter worlds was definitely impossible. I got the hell out and ran to the Galactic East. I made landings on Tharn and Grollor and Mellise and Stree and dickered with the aborigines and laid the foundations of our Eastern Circuit trade. But there was that nagging doubt at the back of my mind; there was that unfinished business to the West. Cutting a long story short, after things were nicely sewn up on the Eastern Circuit worlds I went back. I managed to establish contact—but not physical contact!—with the dominant race. I'd replaced my Psionic Radio Officer, of course, but it was still a long job. I'm sure that Mr. Smethwick won't mind if I say that the average professional telepath just hasn't got the right kind of

mind to cope with technicalities. But we worked out a code to use with buzzer and flashing lamp and, eventually, we were even able to talk directly on the RT without too many misunderstandings.

We traded ideas. Oddly enough—or not so oddly—there wasn't much to trade. Their technology was about on the same level as our own. They had atomic power (but who hasn't?) and interstellar travel, and their ships used a version of the Mannschenn Drive, precessing gyroscopes and all. It was all very interesting, academically speaking, but it got neither party anywhere. Anything we knew and used, they knew and used. Anything they knew and used, we knew and used. It was like having a heart to heart talk with one's reflection in a mirror.

Oh, there were a few minor differences. That new system of governor controls for the Mannschenn Drive, for example—we got that from the anti-matter people. And they'd never dreamed of keeping fish in their hydroponics tanks, but they're doing it now. But there was nothing really important.

But I had to bring *something* back. And I did. No doubt you've often wondered just what *is* going on inside Satellite XIV. It's been there for years, hanging in its equatorial orbit, plastered

with KEEP OFF notices. It's still there—but the reason for its construction has been removed.

I BROUGHT something back. I brought back a large hunk of anti-matter. It's iron—or should I say “anti-iron”? But, iron or anti-iron, it still behaves as iron in a magnetic field. It's hanging in its casing, making no contact with the walls—and it had better not!—held in place by the powerful magnets. It'd be safe in a hard vacuum, but it's safer still suspended in the neutronium that the University boys were able to cook up for me.

Well, I had this hunk of anti-matter. I still have. The problem was—what was it good for? Power? Yes—but how could it be used? No doubt some genius will come up with the answer eventually, but, so far, nobody has. In the laboratory built around it—Satellite XIV—techniques were developed for carving off small pieces of it, using laser, and these tiny portions were subjected to experiment. One of the experiments—bombardment with neutrinos—yielded useful results. After such a bombardment anti-matter acquires the property of anti-gravity. It's analogous to permanent magnetism in many ways—but, as far as the scientists have been able to determine *really* permanent.



But how to use it? The answer is obvious, you'll say. Use it in spaceships. That's what I came up with myself. I passed the problem on to Dr. Kramer at the University. I don't profess to be able to make head or tail of his math—but it boils down to this: Anti-matter and the temporal precession field of the Mannschenn Drive just don't mix. Or they do mix—too well. This is the way that I understand it. You use anti-matter, and anti-gravity, to get upstairs. Well and good. You use your gyroscopes to get lined up on the target star, then you accelerate. You build up velocity, and then you cut the Reaction Drive. Well and good. Then you switch on the Mannschenn Drive . . .

You switch on the Mannschenn Drive—and as your ship consists of both normal matter and anti-matter she'll behave—abnormally. Oh, there'll be temporal precession all right. *But* . . . The ship, herself, will go astern in Time, as she should—and that hunk of anti-matter will precess in the opposite temporal direction. The result, of course, will be catastrophic.

Even so—if I may borrow one of your pet expressions, Captain Listowel—even so, I was sure that anti-matter, with its property of induced anti-gravity, would be of great value in space travel. There was this lump of

iron that I had dragged all the way back from the Galactic West, encased in aluminum and neutronium and alnico magnets, hanging there in its orbit, quite useless, so far, but potentially extremely useful. There *must* be a way to use it.

But what was the way?

*(He looked at us, as though waiting for intelligent suggestions. None were forthcoming. He drained his glass. He refilled it. He waited until we had refilled ours.)*

I kept thinking of what Julius Caesar said when he landed in England, *Veni, vedi, vici*. I came, I saw, I conquered.

Well, insofar as the anti-matter worlds were concerned, I came, I saw—and I didn't conquer. All I had to show for my trouble was this damned great hunk of anti-iron, and I just couldn't figure out a use for it. It irked me more than somewhat. So, after worrying about it all rather too much, I retired from the field and left it all to my Subconscious.

I had a fairly large library at home including many books on the history of transport. In my leisure I found them fascinating reading. Galleys, with sweating slaves manning the sweeps. Galileons—with wind power replacing muscle power. The clipper ships—acres of canvas spread to the gales of the Roaring Forties.

The first steamships. The motor ships. The nuclear powered ships. And, in the air, the airships—dirigible balloons. The aeroplanes. The jets. The rockets—and the first spaceships.

And with the spaceships sail came back, but briefly. There was the Erikson Drive. There were the ships that spread their great plastic sails and drifted out from the orbit of Earth to that of Mars, but slowly, slowly. It was a good idea—but as long as those ships had mass it was impracticable. Even so, had there then been any means of nullifying gravity they would have superseded the rockets.

Then the penny dropped. The oldtimers didn't have anti-gravity. I *do* have anti-gravity. I can build a real sailing ship—a vessel to run before the photon gale, a ship that can be handled just as the old windjammers on Earth's seas were handled. A ship, come to that, Captain Listowel, that can be handled just as the tops'l schooners on Atlantia's seas are handled . . .

(He waved a hand towards the model on his desk.)

There she is. There's *Flying Cloud*. The first of the real lightjammers. And she's yours.

#### CHAPTER 5

**E**VEN so . . ." murmured Ralph, breaking the silence, "I don't think that I'm qualified.

I doubt if any of us are qualified."

"You *are* qualified," stated Grimes flatly. "You've experience in sail, which is more than any other Master or officer in this employ can boast. Oh, there was Calver. He was in sail, too, before he joined us, but he's no longer with us. So you're the only possible choice."

"But . . . I've no *real* qualifications."

Grimes laughed. "Who has? There *was* a Certificate of Competency, Erikson Drive, issued on Earth a few centuries ago. But don't let that bother you. The Rim Confederacy will issue Certificates of Competency for the Improved Erikson Drive."

"And the examiner?" asked Ralph.

"For a start, you," stated Grimes.

"But, damn it all, sir, there aren't any text books, manuals . . ."

"You will write them when you get around to it."

"Even so, sir," protested Ralph, "this is rather much. Don't think that I'm not appreciative of the promotion, but . . ."

Grimes grinned happily. He said, "In my own bumbling way—after all, I'm a spaceman, neither a seaman nor an airman—I've worked out some rough and ready methods for handling this brute." His hand went out to

the beautiful model on his desk with a possessive, caressing gesture. "If it were not for the fact that I have a wife and family I'd be sailing as her first Master. As things are, although not without reluctance, I've had to waive that privilege. But I can give you a rough idea of what's required . . ."

He took from the top drawer of his desk a little control panel, set it down before himself. He pressed a stud and we watched, fascinated, as the spars rotated on their long axes and then, when the sails were furled, folded back into slots in the shell plating.

"As you see," he told us, "there are now only the atmospheric control surfaces left exposed—including, of course, the airscrews. In appearance the ship is not unlike one of the dirigible airships of the early days of aviation. A lighter-than-air ship, in fact. But she's not lighter than air. Not yet.

"This model, as you've all probably guessed by this time, is a working model—insofar as her handling inside atmospheric limits is concerned. She has within her a tiny fragment of the anti-iron, a miniscule sphere of anti-matter complete with induced anti-gravity . . ." He looked at Ralph. "Now, I'd like you to get the feel of her, Captain Listowel. Go on, she won't

bite you. Take hold of her. Lift her off the desk."

Ralph got slowly to his feet, extended two cautious hands, got his fingers around the cylindrical hull. He said, accusingly, "But she's heavy . . ."

"Of course she's heavy. When the real ship is berthed on a planetary surface to discharge and load cargo we don't want her at the mercy of every puff of wind. All right, put her down again. And now stand back."

RALPH stood back, without reluctance. Grimes pressed another stud on his control panel. None of us was expecting what happened next—the stream of water that poured from vents on the underside of the model, flooding the desk top, dripping onto the carpet. Miss Hallows clucked annoyance, we just watched, fascinated. The Commodore smiled happily, his hands busy at the miniature controls. There was the whine of a motor inside the model ship and the two airscrews at the after end started to turn. Before they had picked up speed, while the separate blades were still clearly visible, *Flying Cloud* began to move, sliding slowly over the smooth surface of the desk. (I noticed that she barely disturbed the film of moisture.) She reached the edge and she dropped—but slowly, slowly, and then

the control surfaces, elevators and rudder, twitched nervously, and her screws were a translucent blur, and her fall was checked and she was rising, obedient to her helm, making a circuit of the desk and gaining altitude with every lap. There was still a dribble of water from her outlets that fell, shockingly cold, on our upturned faces.

"You see," said Grimes. "In an atmosphere you have no worries at all. Drive her down on negative dynamic lift, start the compressors if you have to to give her a little extra mass with compressed air." (A faint throb was audible above the whine of the motors.) "Open your valves if you think that she's getting too heavy." (We heard the thin, high whistle.) "I'm sorry that I can't give a real demonstration of how she'll handle in Deep Space, but I can give you some sort of an idea." (He jockeyed the model almost to ceiling level, manipulated the controls so that she was hanging stern on to the big overhead light globe.) "There's the Sun," he said. "The Sun, or any other source of photons. You spread your sails . . ." (The spars extended from the hull, the complexity of plastic vanes unfurled.) "And off you go. Mind you, I'm cheating. I'm using the air screws. And now, watch carefully. One surface of each sail is silvered, the other

surface is black. By use of the reflecting and absorbing surfaces I can steer the ship, I can even exercise control over her speed . . . Any questions, Captain Listowel?"

"Not yet," said Ralph cautiously.

"I've told you all I know," Grimes told him cheerfully. "I admit that this handling of her in Deep Space, under sail, is all theory and guesswork. You'll have to make up the rule as you go along. But the atmospheric handling is pretty well worked out. Landing, for example." He looked at his secretary. "Miss Hallows, is the spaceport open for traffic?"

She sighed, then said, "Yes, Commodore."

"But it's not," he said.

She sighed again, got to her feet and went to a door, her manner displaying a certain embarrassment. Behind the door was Commodore Grimes' private lavatory.

"And that," said Grimes, "is a working model of the spaceport of the near future. A lake, natural or artificial. Or a wide river. Or a sheltered bay. Maintenance costs cut to a bare minimum . . ."

I got to my feet, saw that the tub was full.

The model *Flying Cloud* droned slowly over our heads, her suit of sails once again withdrawn, steered through the open

door of the bathroom, her air-screws and elevators driving her down in a long slant towards the surface of the water in the tub. While she was still all of three feet above it a tendril snaked from her underbelly, a long tube that extended itself until its end was submerged. Once again there was the throbbing of a tiny pump and the model settled, gradually at first, then faster, then dropping with a startlingly loud splash.

"A clumsy landing," admitted Grimes, "but I'm sure that you'll do better, Captain."

"I hope so," said Ralph gloomily.

#### CHAPTER 6

**E**VEN so, Ralph, I think, thoroughly enjoyed himself in the few weeks that followed. I doubt if any of the rest of us did. I know that I didn't. Sailing as a sport is all very well on a planet like Caribbea, but it has little to recommend it on a bleak slag heap such as Lorn. Oh, there's always a wind—but that wind is always bitter and, as often as not, opaque with gritty dust.

I don't think that anybody had ever sailed on Lorn until we, the future personnel of *Flying Cloud* cast off our sleek, smart catamaran from the rickety jetty on the shore of Lake Misere, under the derisive stares of the local

fishermen in their shabby, power-driven craft, to put in hour after hour, day after day of tacking and wearing, running free, sailing close hauled and all the rest of it.

But Ralph was good. I have to admit that. I was amazed to learn that so much control of the flimsy, complicated, wind-driven contraption was possible. In my innocence I had always assumed that a sailing vessel could proceed only in a direction exactly opposite to that from which the wind was blowing. I learned better. We all learned better. But I still think that there are easier ways of under sail.

Yes, we all of us had to get a grounding in sail seamanship—Sandra, Doc Jenkins and Smethwick as well as myself. We gathered that Commodore Grimes wasn't finding it easy to find officers for his new, new ship.

When we had all become more or less competent sailormen—Ralph called it Part A of our certificates—we thought that the worst was over. How wrong we were! The next stage of our training was to bumble around in yet another archaic contraption, a clumsy, lighter-than-air monstrosity called a blimp. (Like the catamaran, it had been built merely for instructional purposes.) I don't profess to know the origin of the name, but it looked like a blimp. One just

couldn't imagine it's being called anything else. There was a flacid bag of gas—helium—shaped like a fat cigar, and from this depended a streamlined cabin that was control room, living quarters and engine room. There was a propeller driven by a small diesel motor, that drove us through the air at a maximum speed of 50 knots. (Our speed over the ground was, of course, governed by wind direction and velocity.) There was a lot of complicated juggling with gas and ballast. There was the occasion when we were blown off course, drifting helplessly over Port Forlorn just as *Rim Hound* was coming in. Ralph told us afterwards that had the blimp been hydrogen filled it would have been our finish—as it was, with our gasbag all but burst by the searing heat of *Rim Hound's* exhaust, leaking from every seam, we made an ignominious crash landing in Lake Misere, from which dismal puddle we were rescued by the fishermen—who were, of course, highly amused to see us again, and in even more ludicrous circumstances than before.

But the blimp was patched up and made airworthy—as airworthy as she ever would be, and we carried on with our training. And we got the feel of the brute. We neither respected nor loved her, but we came to under-

stand what she could and could not do and, when Ralph had decided that we all (including himself) had passed for Part B of our certificates we proceeded, in the little airship, to Port Erikson on the southern shore of Coldharbor Bay.

THERE'S one thing you can say in favor of the Survey Service boys who first made landings on the Rim Worlds, and you can say the same thing in favor of the first colonists. When it came to dishing out names they were realistic. Lorn . . . Port Forlorn . . . Lake Misere . . . The Great Barrens . . . Mount Desolation . . . Coldharbor Bay . . .

The trip was not a happy one. In spite of the heat from the single diesel the cabin was bitterly cold as we threaded our way over and through the Great Barrens, skirting the jagged, snow-covered peaks, fighting for altitude in the higher passes, jettisoning ballast when dynamic lift proved insufficient and then, perforce, being obliged to valve gas for the long slant down over the dreary tundra that somebody in the First Expedition had named the Nullarbor Plain.

And there was Coldharbor Bay ahead, a sliver of dull lead inset in the dun rim of the horizon. There was Coldharbor Bay, leaden water under a leaden sky, and

a huddle of rawly new buildings along its southern shore, and something else, something big and silvery, somehow graceful, that looked out of place in these drab surroundings.

"The ship," I said unnecessarily. "*Flying Cloud.*"

"*Flying Crud!*" sneered Doc Jenkins. He was not in a good mood. His normally ruddy face was blue with cold, and a violent pitch and yaw of the ship, a few minutes since, had upset a cup of scalding coffee in his lap. "And what ruddy genius was it," he demanded, "who decided to establish a spaceport in these godforsaken latitudes? Damn it all, it isn't as though we had the Ehrenhaft Drive to contend with and lines of magnetic force to worry about. And both old Grimes and you, Ralph, have been harping on the fact—or is it only a theory?—that these fancy lightjammers will be far easier to handle in an atmosphere than a conventional spaceship."

"True," admitted Ralph. "True. But, even so . . . Just remember that on Lorn every major center of population is on or near the equator. And there's a certain amount of risk in having conventional spaceports near cities—and the conventional spaceship isn't one per cent as potentially dangerous as a light-jammer."

"I don't see it," insisted Doc. "To begin with, there's a much smaller Pile. A lightjammer is far less dangerous."

"Don't forget what's in the heart of her," said Ralph quietly. "That core of anti-iron. Should the casing be breached, should the anti-matter come into contact with normal matter . . ."

He lifted his gloved hands from the wheel in an expressive, explosive gesture. The ship swung off course, dipped and rolled. It was my turn to get a lapful of hot coffee. I decided that there was a lot to be said in favor of the despised drinking bulbs used in Deep Space.

"Any more questions," asked Ralph, "before we make it landing stations?"

"If you insist on answering with your hands," I said, "no."

He grinned ever so slightly. "All right, then. Now remember, all of you, that this won't be the real thing—but it'll be as near to real as we can make it. To begin with—an upwind approach . . ."

"I can see the windsock," said Sandra, who was using the binoculars.

"Where away?"

"A degree or so to starboard of the stern of the ship. On that tower."

"And wind direction?"

"As near south as dammit. A following wind."

"Good. Now, Peter, you're in charge of the gas valves, and you, Doc, can handle the ballast . . ."

"The tank's dry," grumbled Jenkins.

"Anything with mass is ballast. *Anything*. Open a port and have a pile of odds and ends ready to dump. And you, Mr. Smethwick, stand by the hose and pump . . ."

We were over the spaceport now. We could see the administration buildings and the warehouses, the long wharf alongside which lay *Flying Cloud*. We could see the little, waving figures of people. And we could hear, from our telephone, the voice of Commodore Grimes speaking from Spaceport Control: "What are your intentions, Captain Listowel? The ground crew is standing by for your lines."

"I intend to land on the Bay, sir, to make this a rehearsal of landing the big ship."

"A good idea, Captain. Berth ahead of *Flying Cloud*."

Ralph brought the blimp round in a long curve, lined her up for the beacon at the end of the wharf. He said sharply, "Don't valve any gas unless I tell you, Peter. That's one thing we shan't be able to do in the real ship." I saw that he was using the control surfaces to drive us down, heard the complaining

of structural members. But the surface of the water was close now, closer with every second.

"Mr. Smethwick, the hose!"

I couldn't see what was happening, but I could visualize that long tube of plastic snaking down towards the sea. I felt the blimp jump and lift as contact was made and, at Ralph's barked order, valved a cubic centimetre or so of helium. I heard the throbbing whine as the ballast pump started.

We were down then, the boat bottom of the cabin slapping (or being slapped by) the crests of the little waves, and then, a little heavier, we were properly water-borne and taxi-ing in towards the raw concrete of the new wharf.

It was a good landing—and if good landings could be made in a misshapen little brute like the blimp, then equally good ones should be made in the proud, shining ship that we were approaching.

I thought, with a strong feeling of relief, *There's nothing to worry about after all.*

I don't know if that sentence is included in any collection of Famous Last Words. If it's not, it should be.

## CHAPTER 7

WE made fast to a couple of bollards at the foot of the steps at the end of the wharf. The blimp lay there quietly



enough, her wrinkled hide twitching in the light, eddying breeze; the high warehouse inshore from the quay gave us a good lee. The linesmen ran out a light gangway and we maneuvered the end of it through the cabin door. Smethwick, who had suffered from airsickness during our northward flight, started to hurry ashore. Ralph halted him with a sharp order. Then he said, in a gentler voice, "We all of us still have a lot to learn about the handling of lighter-than-air ships. One thing always to bear in mind is that any weight discharged has to be compensated for." He turned to me, saying, "Peter, stand by the ballast valve. We shouldn't require the pump."

I opened the valve, allowing the water to run into the tank below the cabin deck. I shut it when the water outside was lapping the sill of the open door. Smethwick scrambled out and the ship lurched and lifted. I opened the valve again, then it was Sandra's turn to disembark. Doc Jenkins followed her. Ralph took my place at the valve and I followed the Doctor. Finally Ralph, having satisfied himself that the blimp wasn't liable to take off unmanned, joined us on the wharf.

Commodore Grimes was there, muffled in a heavy synthefur coat. With him were two women,

similarly clad. The Super greeted us, then said to Ralph, "A nice landing, Captain Listowel. I hope you do as well with *Flying Cloud*."

"So do I, sir."

Grimes laughed. "You'd better." He gestured towards the slender, gleaming length of the big ship. "She cost a little more than your little gasbag."

We all stared at her. Yes, she did look expensive. I suppose that it was because she was *new*. The ships to which we had become used out on the Rim were all second- and even third-hand tonnage, obsolescent *Epsilon* Class tramps auctioned off by the Interstellar Transport Commission.

Yes, she looked expensive, and she looked new, and she looked *odd*. She didn't look like a spaceship—or, if she did look like a spaceship she looked like one that, toppling on its vaned landing gear, had crashed on to its side. And yet we felt that this was the way that she should be lying. She reminded me, I decided, of the big commercial submarines used by the Llarsii on their stormy, watery world.

Grimes was still talking. "Captain, I'd like you to meet your new shipmates for the maiden voyage. This is Miss Wayne, of the *Port Forlorn Chronicle*. And, over here, Miss Simmons, your Donkeyman . . ."

I looked at the girls curiously and, I must confess, hopefully. Perhaps the voyage would be even more interesting than anticipated.

Martha Wayne was a tall, slim, sleek brunette—and how she managed to look sleek and slim in her shaggy and bulky furs was something of a mystery. I had read some of her articles in the *Chronicle*—usually towards the end of a voyage, during that period when any and every scrap of hitherto unread printed matter is seized upon avidly. They'd been just the Woman's Page slush. Anyhow, she extended her hand to Ralph as though she expected him to make a low bow and kiss it. He shook it, however, although without much warmth.

Then there was Miss Simmons. ("Call me Peggy," she said at once.) She was short, dumpy in her cold weather clothing. She had thrown back the hood of her parka, revealing a head of tousled sandy hair. Her face was pretty enough, in an obvious sort of way, and the smudge of dark grease on her right cheek somehow enhanced the prettiness.

"Commodore," said Ralph slowly, "did I understand you to say that Miss Simmons is to be our Donkeyman?"

"Yes, Captain." Grimes looked slightly embarrassed. "A little trouble with the Institute . . ."

I could guess what the trouble was. (I found later that my guess was right.) The Institute of Spatial Engineers would be taking a dim view of the Improved Erikson Drive, the system of propulsion that would rob its members of their hard-won status. They would refuse to allow even a junior member to sign as Donkeyman—and, no doubt, they had been able to bring pressure to bear on other engineering guilds and unions, making sure that no qualified engineer would be available.

But a woman . . .

"It's quite all right, Captain," the girl assured him brightly. I had an oil can for a feeding bottle, and when other kids were playing with dolls I was amusing myself with nuts and bolts and spanners."

"Miss Simmons," explained Grimes, "is the daughter of an old friend of mine. Simmons, of Simmons' Air Car Repair Shop in Port Forlorn. Her father assures me that Peggy is the best mechanic he has working for him."

"Even so . . ." said Ralph.

"There'll be no more discussions," said the Super briskly. "That's that. Now, if you feel up to it after your flight in that makeshift contraption, I suggest that we make an inspection of the ship."

"Even so . . ." began Ralph.

"Even so," flared Grimes, "I've got you a Donkeyman, and a damned good one. And Miss Wayne has been commissioned to write the journal—a human journal—of the maiden voyage, but she's willing to make herself useful. She'll be signing as Assistant Purser."

"All right, Commodore," said Ralph coldly. "You can hand over the ship."

### CHAPTER 8

**N**ORMALLY, handing over a spaceship is a lengthy business.

But these, we learned, were not normal circumstances. Lloyd's of London had issued a Provisional Certificate of Spaceworthiness—but this, Grimes told us, was liable to be cancelled at the drop of a hat. The big majority of Lloyd's Surveyors are engineers, and *Flying Cloud* was an affront to those arrogant mechanics. She, as far as they were concerned, was an impudent putting back of the clock, an insolent attempt to return to those good old days when the Master, in Lloyd's own words, was "Master under God" and, in effect, did as he damn' well pleased. The speed of a windjammer was in direct ratio to the skill of her Master. The speed of a lightjammer would be in direct ratio to the skill of her Master. The Donkeyman of a windjam-

mer held Petty Officer's rank only, messing with the Bo's'n, Carpenter and Sailmaker. The Donkeyman of a lightjammer would be a Junior Officer only because the Merchant Navy doesn't run to Petty Officers. So the Institute of Spatial Engineers didn't like lightjammers. So they had run, squealing piteously, to Lloyd's. So the heirs and successors to that Pommy coffee house proprietor, acting on the advice of their prejudiced Surveyors, would, sooner or later—and, quite probably, sooner—get around to revoking that Provisional Spaceworthiness Certificate.

*Flying Cloud* was Grimes' baby. He had brought back the anti-matter from the anti-matter systems. He had worked out a way in which it might be used. He had succeeded in convincing his employers that a lightjammer would be the most economical form of interstellar transport. Now it was up to us to prove him right. Once the maiden voyage was completed successfully, Lloyd's would have no excuse for not granting a Certificate.

So we joined a ship already spaceworthy in all respects. While we had been playing around in the catamaran and the blimp Grimes had achieved wonders. *Flying Cloud* was fully stored and provisioned. Algae,

yeast and tissue cultures were flourishing. The hydroponic tanks would have been a credit to an Empress Class liner. The last of the cargo—an unromantic consignment of zinc ingots for Grollor—was streaming into the ship by way of the main conveyor belt.

We had to take Grimes' word for it that everything was working as it should. Grimes' word, and the word of the Simmons girl, who assured us that she, personally, had checked every piece of machinery. We hoped that they were right, especially since there was some equipment, notably the spars and sails, that could not be actually tested inside an atmosphere, in a heavy gravitational field.

Anyhow, that was the way of it. Ralph affixed his autograph to the Handing Over Form and I, as Mate (Acting, probably Temporary, but not Unpaid) witnessed it. And Martha Wayne, as representative of the *Port Forlorn Chronicle*, made a sound and vision recording of the historic moment. And Doc Jenkins suggested that the occasion called for a drink. Sandra brought out two bottles of champagne. Grimes opened them himself, laughing wryly as the violently expanding carbon dioxide shot the corks up to the deckhead. "And this," he chuckled, "will be the only Reaction Drive as far as

this ship's concerned!" And then, when the glasses were filled, he raised his in a toast. "To *Flying Cloud*," he said solemnly, "and to all who sail in her." He repeated this, emphasizing the word *sail*. "To *Flying Cloud*," we repeated.

The Commodore drained his glass, set it down on the table. There was a sudden sadness in his manner. He said quietly, "Captain Listowel, I'm an outsider here. This is *your* ship. I'll leave you with your officers to get the hang of her. If you want to know anything, I shall be in my office ashore . . ."

He got slowly to his feet.

"Even so, sir . . ." began Ralph.

"This is *your* ship, Listowel. Your Donkeyman knows as much about the auxiliary machinery as I do; probably more. And as far as the handling of the sails is concerned, you'll have to make up the rules as you go along." He paused, then said, "But I shall be aboard in the morning to see you off."

He left us then.

"He should have sailed as her first Master," said Ralph.

"Returning, still a relatively young man, to find his wife an old woman and his son his senior," said Jenkins. "I can see why we were the mugs. We have no ties."

"Even so . . ." said Ralph doubtfully.

"Come off it, Skipper. There's nobody to miss *us* if this scow comes a gutser. We're expendable, even more so than the average Rim Runner officer. And that's saying plenty."

Ralph grinned reluctantly, and gestured to Sandra to refill the glasses. He admitted, "I do believe you're right, Doc. I really do . . ." But the moment of relaxation didn't last long. His manner stiffened again. "All right. Finish your drinks, and then we'll get busy. I'd like you and the Doc, Sandra, to make sure that all's well as far as the farm's concerned. I could be wrong, but I didn't think that the yeasts looked too healthy. And you're the Mate, Peter; ballast and cargo are your worry. Just make sure that everything's going as it should."

"Ay, ay, sir," I replied in what I hoped was a seamanlike manner.

He scowled at me, then turned to the Donkeyman. "And you, Miss Simmons, can give me another run through on the various auxiliaries."

"And what can I do, Captain?" asked the journalist.

"Just keep out of the way, Miss Wayne," he told her, but not unkindly.

**S**HE attached herself to me and followed as I made my way to the Supercargo's Office. It was

already occupied; Trantor, one of the Company's Wharf Superintendents, was there, sitting well back in the swivel chair, his feet on the desk, watching a blonde disrobing on the tiny screen of the portable TV set that he had hung on the bulkhead.

He started to take his feet off the desk slowly when he saw me—and with more haste when he saw Martha Wayne. He reached out to switch off his TV.

"Don't bother," said Martha Wayne. "I've often wondered just who does watch that program. Nobody will admit it."

Nevertheless, he switched off. He saved face by sneering at the new braid on my epaulettes. "Ah," he said, "the Chief Officer. In person. From office boy to bucko mate in one easy lesson."

"There was more than one lesson, Trantor," I told him. "And they weren't all that easy."

Ignoring Trantor, I inspected the gauges. Numbers 1 and 7 ballast tanks were out; 2, 3, 4, 5 and 6 were still in. There was no way of ascertaining the dead-weight tonnage of cargo loaded save by tally and draught—and the columns of mercury in the Draught Indicator told me that if steps were not taken, and soon, *Flying Cloud* would shortly look even more like a submarine than she already did.

I went to the control panel,

opened the exhaust valves to Numbers 2 and 6 tanks, pressed the button that started the pump. I heard the throbbing whine of it as it went into action, saw the mercury columns begin to fall in their graduated tubes.

"What the hell do you think you're doing?" demanded Trantor.

"I'm the Mate," I told him. "You said so. Remember?"

"If you're taking over," he said huffily, "I might as well get ashore."

"You might as well," I agreed. "But, first of all, I want you to come with me to make sure that the cargo is properly stowed and secured."

"Fussy, aren't you?" he growled.

"That's what I'm paid for," I said.

"But what is all this about stowage?" asked Martha Wayne.

"We have to watch it here," I told her. "Even more so than in a conventional ship. In the normal spaceship, *down* is always towards the stern, *always*—no matter if you're sitting on your backside on a planetary surface or accelerating in Deep Space. But here, when you're on the surface or navigating in a planetary atmosphere, *down* is at right angles to the long axis. Once we're up and out, however, accelerating, *down* will be towards the stern."

"I see," she said, in that tone of voice that conveys the impression that its user doesn't.

"I suppose you know that your pump is still running," said Trantor.

"Yes. I know. It should be. It'll run till the tanks are out, and then it'll shut itself off."

"All right. It's your worry," he said.

"It's my worry," I agreed. "And now we'll look at the stowage."

With Trantor in the lead, we made our way along the alleyway to the hold and then, when we were through the airtight door, along the tunnel through the cargo bins. There was nothing to worry about—but that was due more to Grimes' foresight than to Trantor's efficiency. As each bin had been filled the locking bars—stout metal rods padded with resilient plastic—had slid into place.

As we walked between the bins, the words of that ancient poem chased through my mind. *Argosies with magic sails, pilots of the purple twilight dropping down with costly bales . . .* But there weren't any costly bales here. There were drab, prosaic ingots of lead and zinc and cadmium, cargo for which there was a steady demand but no mad rush. Oh, well, we still had the magic sails.

The stevedore foreman, who

had been juggling another set of locking bars into position, looked up from his work. He said cheerfully, "She'll be right, Mister."

"I hope so," I said.

"Just another twenty tons of zinc," he said, "an' that's it. You can have her then. An' welcome to her. I've loaded some rum ships in my time, but this'n's the rummest . . ."

"She'll be right," I told him.

"That's your worry, Mister," he said. "Can't say that I'd like to be away on a voyage for all of twenty years." He gave Martha Wayne an appraising stare. "Although I allow that it might have its compensations."

"Or complications," I said.

#### CHAPTER 9

WE finally got to our bunks that night, staggering to our cabins after a scratch meal of coffee and sandwiches in the wardroom. Ralph had driven us hard, and he had driven himself hard. He had insisted on testing everything that could be tested, had made his personal inspection of everything capable of being inspected. Ballast tanks had been flooded and then pumped out. The ingenious machinery that swivelled furniture and fittings through an arc of 90° when transition was made from atmospheric to spatial flight was operated. The motors driving the airscrews were tested.

At the finish of it all, Doc and Smethwick were on the verge of mutiny, Sandra was finding it imperative to do things in her galley by herself, and Martha Wayne was looking as though she were already regretting having accepted this assignment. Only Peggy Simmons seemed to be enjoying herself. As well as being obviously in love with her machinery, she appeared to have gotten a crush on Ralph.

I was just about to switch off the light at the head of my bunk when there was a gentle tapping at my door. My first thought was that it was Ralph, that the Master had thought of something else that might go wrong and had come to worry his Mate about it. Then, hopefully I thought it might be Sandra.

"Come in," I called softly.

It was Peggy Simmons, dressed in a bulky, unglamorous robe. She looked like a little girl—and not one of the nymphette variety either.

She said, "I hope you weren't asleep, Peter."

"Not quite."

She said, "I just had to talk to somebody. This is all so strange. And tomorrow, after we get away, it will be even stranger."

"What *isn't* strange?" I countered. "Come to think of it, it's the normal that's really strange."

"You're too deep for me," she

laughed ruefully. "But I came to talk to *you* because you're not clever . . ."

"Thank you," I said coldly.

"No. That wasn't quite what I meant, Peter. You *are* clever—you must be, to be Chief Officer of a ship like this. And I'm clever too—but with machinery. But the others—Sandra and Martha Wayne and Doc—are so . . ."

"Sophisticated," I supplied.

"Yes. That's the word. Sophisticated. And poor Claude is the reverse. So unworldly. So weird, even . . ."

"And Ralph?" I prodded.

Her face seemed to light up and to cloud simultaneously. "Oh, he's . . . exceptional? Yes. Exceptional. But I could hardly expect a man like him to want to talk to a girl like me. Could I?"

*And why the hell not? I thought. Put on some make-up, and throw something seductively translucent over the body beautiful instead of that padded tent, and you might get somewhere. But not with me, and not tonight.*

"I haven't known many spacemen," she went on. "Only the Commodore, really, and he's so much one of the family that he hardly counts. But there's always been *something* about you all, those few of you whom I have met. I think I know what it is. You all have *pasts* . . ."

*And how! I thought at once.*

"Like Ralph. Like the Captain, I mean. You and he have been shipmates for a long time, Peter, haven't you? I can't help wondering why such a capable man should come out to the Rim."

"Women," I said.

"Women?"

"Yeah. That's the usual reason why we all come out to the Rim."

"Men," she said, "even the most brilliant men, are such fools where women are concerned. I wish . . ."

"You wish what, Peggy?"

"Oh, I . . . I don't know, Peter it's . . ."

*I wish that you'd get the hell out of here, I thought. I wish that I could get some sleep.*

"Have you a drink?" she asked. "A nightcap."

"In that locker," I told her, "there's a bottle of brandy. Medicinal. Get out two glasses and I'll have a drink with you. I could use some sleep myself."

She splashed brandy generously into the glasses, handed one to me.

"Down the hatch," I said.

"Down the hatch," she repeated. Then, the alcohol having destroyed her inhibitions, she demanded, "What haven't I got, Peter?"

I knew what she meant. "As far as I can see," I told her, "you have all the standard equipment. As far as I can see."



She said abruptly, "She's with him. In his cabin."

I felt a stab of jealousy. "Who?" I asked.

"Sandra."

So they managed to keep it a secret in *Rim Dragon*, I thought.

I said, "But they've known each other for years."

"And I'm just the small girl around the ship. The newcomer. The outsider."

"Miss Simmons," I said severely, "people who affix their autographs to the Articles of Agreement are engaged for one reason only—to take the ship from Point A to Point B as required by the lawful commands of the Master. Who falls for whom is entirely outside the scope of the Merchant Shipping Act . . ."

"There's no need to get angry. I didn't mean . . ."

"Forget it. I guess I'm just tired."

"Of course, I'd better get some sleep myself." She set her empty glass down gently on the table. Her face was pale.

She said, "I'm sorry to have troubled you. Goodnight."

"Goodnight," I replied.

She left then, closing the door quietly behind her.

#### CHAPTER 10

THE next morning Sandra was in one of her housewifely moods; they had been the occa-

sion for jocular comment, now and again, in *Rim Dragon*. She called each of us individually, with tea and toast. Now that I knew the reasons for these spasms of domesticity I wasn't any happier.

By the time that the breakfast gong sounded, I was showered and shaved and dressed in the rig of the day and feeling a little better. This was our first real meal aboard the ship and something of a ceremonious occasion. Ralph was at the head of the table and rather conscious, I could see, of the gleaming new braid on his epaulettes. I sat down at his right, with Sandra, when she wasn't bustling to and from the pantry, opposite me. The others took their places, Peggy Simmons, as the most junior member of the ship's company, sitting at the foot of the table. She blushed when I said Good Morning to her. I hoped that none of the others noticed, although Doc Jenkins, who never missed much of what was going on, leered in my direction.

"This," said Ralph rather stuffily before we could make a start on the eggs and bacon, "is a momentous occasion."

"We still have to get off the ground," Jenkins told him.

"Off the water, you mean," I amended.

"Even so . . ." began Ralph severely.

"Good morning to you all," said a familiar voice. We turned to see that Grimes had just entered the wardroom.

We got to our feet.

"Carry on," he said. "Don't mind me."

"Some breakfast, sir?" asked Ralph.

"No thank you. But some coffee, if I may, Captain."

He pulled up a chair and Sandra attended to his needs.

He said, "You'll forgive me for talking shop, but I take it that you're secured for Space?"

"We are, sir," Ralph told him.

"Good. Well, I have no wish to interfere with your arrangements, but there must be no delay. While you're eating, I'll bring you up to date." He patted his lips with the napkin Sandra had given him. "Throughout my career I've never been overly fussy about treading on toes, but I seem to have been trampling on some very tender ones of late. This is the way of it. My spies inform me that this very morning, Metropolitan Standard Time, the *Flying Cloud* issue is going to be raised in the Senate. The Honorable Member for Spelerville will demand an inquiry into the squandering of public money on the construction of an utterly impracticable spaceship. And his cobber, the Honorable Member for Ironhill East, will back him up and de-

mand that the ship be held pending the inquiry . . ."

"Amalgamated Rockets," said Martha Wayne. "And Interstellar Drives, Incorporated."

"Precisely," agreed Grimes. "Well, I don't think that they'll be able to get things moving prior to your take-off, Captain—but if you should have to return to surface for any reason, or even if you hang in orbit, there's a grave risk that you'll be held. I want there to be no hitches."

"There will be none," said Ralph stiffly.

"Good. And when do you intend getting upstairs?"

"At the advertized time, sir. 0900 hrs."

"And you're quite happy about everything?"

"Yes, sir. Even so . . ."

"Every spaceman always feels that 'even so'—otherwise he wouldn't be worth a damn as a spaceman. I suppose that I'll still be around when you return. I hope so. But I shall be getting your voyage reports by way of the psionic radio . . ."

"I'm surprised, Commodore," said Martha Wayne, "that the ship hasn't been fitted with the Carlotti equipment."

"It wouldn't work," Grimes told her. "It will run only in conjunction with the Mannschenn Drive." He turned to the telepath. "So you're the key man, Mr. Smethwick."

Claude grinned feebly and said, "As long as you don't expect me to bash a key, sir."

We all laughed. His ineptitude with anything mechanical was notorious.

Grimes got to his feet reluctantly. "I'll not get in your hair any longer. You all have jobs to do." He said, as he shook hands with Ralph, "You've a good ship, Listowel. And a good crew. Look after them both."

"I'll do my best," promised Ralph.

He swung away abruptly, walked quickly out of the wardroom. I hurried after him to escort him to the gangway.

At the airlock he shook hands with me again. He said quietly, "I envy you, Mr. Malcolm. I envy you. If things had been different I'd have been sailing in her. But under the circumstances . . ."

"There are times," I said, "when I envy those who have family ties."

He allowed himself to grin. "You have something there, young man. After all, one can't have everything. I've a wife and a son, and you have the first of the interstellar lightjammers. I guess that we shall each of us have to make the best of what we have got. Anyhow, look after yourself."

I assured him that I would and, as soon as he was ashore, went back inside the ship.

THE take-off was a remarkably painless procedure.

When the ship was buttoned up and we were at our stations, the linesmen let go our moorings fore and aft. The little winches, obedient to the pressing of buttons in the control room, functioned perfectly. On the screen of the closed circuit TV I watched the lines snaking in through the fairleads, saw the cover plates slide into place as the eyes vanished inside our hull. There was no need for any fancy maneuvers; the wind pushed us gently away from the wharf.

"Ballast," ordered Ralph. "Pump 3 and 5."

"Pump 3 and 5," I repeated, opening valves and pressing the starter buttons.

I heard the throbbing of the pumps, watched the mercury fall in the graduated columns of the draught indicator, a twin to the one in the Super-cargo's office. But we still had negative lift, although we were now floating on the surface like a huge bubble. There was a new feel to the ship, an uneasiness, an expectancy as she stirred and rolled to the low swell. And still the mercury dropped in the transparent tubes until, abruptly, the pulsation of the pumps cut out.

"Number 4, sir?" I asked.

"No, Peter. Not yet. Extrude atmospheric control surfaces."

"Yes, sir."

On the screen I saw the stubby wings extend telescopically from the shining hull.

"I thought that you just pumped all ballast and went straight up," said Martha Wayne, who was seated at the radio telephone.

"We could," said Ralph. "We could; but, as I see it, the secret of handling these ships is always to keep some weight up your sleeve. (After all, we shall have to make a landing on Grol-lor.) I intend to see if I can get her upstairs on aerodynamic lift." He turned to me. "I don't think that it's really necessary to keep Sandra and Doc on stations in the storeroom and the farm. After all, this isn't a rocket blast-off, and they're supposed to be learning how to handle this scow. Get them up here, will you?"

"And Claude and Peggy?" I asked.

"No. Claude is hopeless at anything but his job, and Miss Simmons had better keep her eye on her mechanical toys."

I gave the necessary orders on the intercom, and while I was doing so the speaker of the RT crackled into life. "Spaceport Control to *Flying Cloud*," we heard. "Spaceport Control to *Flying Cloud*. What is the delay? I repeat—what is the delay?"

The voice was familiar; it belonged to Commodore Grimes. And it was anxious.

"Pass me the mike," said Ralph. He reported quietly, "*Flying Cloud* to Spaceport Control. There is no delay. Request permission to take off."

"Take off then, before the barnacles start growing on your bottom!" blustered Grimes.

Ralph grinned, handed the microphone back to Martha. He waited until Sandra and Doc, who had just come into Control, had belted themselves into their chairs, then put both hands on the large wheel. "Full ahead port," he ordered. I pressed the starting button, moved the handle hard over, and Ralph turned his wheel to starboard. "Full ahead starboard," he ordered.

The ship came round easily, heading out for the open sea. From the transparent bubble that was the control room we could now see nothing but grey water and grey sky, and the dark line of the horizon towards which we were steering, but on the screen of closed circuit TV we could watch the huddle of spaceport buildings and the wharf, to which the little blimp was still moored, receding.

With his left hand Ralph held *Flying Cloud* steady on course; his right moved over the controls on the steering column. And the motion was different now. The ship was no longer rolling or pitching, but, from under us, came the rhythmic

slap, slap of the small waves striking our bottom as we lifted clear of the surface. And then that was gone and there was only the clicking of our compass and the muffled, almost inaudible throbbing of our screws.

From the RT came Grimes' voice, "Good sailing, *Flying Cloud*. Good sailing!"

"Tell him 'thank you'," said Ralph to Martha. Then, characteristically, "Even so, we haven't started to sail yet."

#### CHAPTER 11

WE should have spent more time in the atmosphere than we did, getting the feel of the ship. But there was the broadcast that Martha picked up on the RT, the daily transmission of proceedings in the Senate. The Honorable Member for Spelterville was in good form. We heard *Flying Cloud* described in one sentence as a futuristic fictioneer's nightmare, and in the next as an anachronistic reversion to the dark ages of ocean transport. And then, just to make his listeners' blood run cold, he described in great detail what would happen should she chance to crash in a densely populated area. The casing around the sphere of anti-iron would be ruptured and, the anti-matter coming into contact with normal matter, there would be one hell of a Big Bang. Furthermore, he

went on, there was the strong possibility of a chain reaction that would destroy the entire planet.

It would all have been very amusing—but there were far too many cries of approval and support from both Government and Opposition benches—especially when the Honorable Member, after having divulged the information that *Flying Cloud* was already airborne, demanded that the Government act now.

Ralph, as he listened, looked worried. He said, "Miss Wayne, I think that our receiver has broken down, hasn't it?"

She grinned back at him. "It has. Shall I pull a fuse?"

"Don't bother," "If we get a direct order from the Commodore to return to port we shall do so, I suppose. Otherwise . . ."

He had handed over the controls to Doc Jenkins and myself; I was steering and Doc was functioning, not too inefficiently, as Altitude Coxswain. We were rising in a tight spiral, and below us was a snowy, almost featureless field of alto-cumulus. Above us was the sky, clear and dark, with the great lens of the Galaxy already visible although the sun had yet to set. So far all had gone well and smoothly, although it was obvious that in order to break free of the atmosphere we should have to valve more ballast.

Suddenly Sandra cried out, pointing downwards.

We all looked through the transparent deck of the Control Room, saw that something small and black had broken through the overcast. A tiny triangle it was, a dart, rather, and at its base was a streak of blue fire bright even against the gleaming whiteness of the cloud. Ralph managed to bring the big, mounted binoculars to bear.

"Air Force markings," he muttered. "One of the rocket fighters."

Somebody muttered something about "bloody fly-boys".

"Better have the transceiver working," ordered Ralph.

Hard on his words came a voice from RT. "Officer Commanding Defense Wing Seven to Master of *Flying Cloud*. Return at once to your berth. Return at once to your berth."

"Master of *Flying Cloud* to unidentified aircraft," replied Ralph coldly. "Your message received."

The plane was closer now, gaining on us rapidly. I watched it until a sharp reprimand from Ralph caused me to return my attention to the steering. But I could still listen, and I heard the airman say, "Return at once to your berth. That is an order."

"And if I refuse?"

"Then I shall be obliged to shoot you down." This was fol-

lowed by a rather unpleasant chuckle. "After all, Captain, you're a big target and a slow one."

"And if you do shoot us down," said Ralph reasonably, "what then? We are liable to fall *anywhere*. And you know that the anti-iron that we carry makes us an atomic bomb far more powerful than any fission or fusion device ever exploded by Man to date." He covered the microphone with his hand, remarking, "That's given him something to think about. But he can't shoot us down, anyhow. If he punctures the ballast tanks or knocks a few pieces off the hull we lose our negative lift . . . And if he should rupture the casing around the anti-iron . . ."

"What then?" asked Martha Wayne.

"It'll be the last thing he'll ever do—and the last thing that we shall ever experience."

"He's getting bloody close," grumbled Doc. "I can see the rockets mounted on his wings, and what look like a couple of cannon . . ."

"Comply with my orders!" barked the voice from the RT.

"Sandra," said Ralph quietly, "stand by the ballast controls."

"I give you ten seconds," we heard. "I have all the latest Met. reports and forecasts. If I shoot you down here you will fall somewhere inside the ice cap. There's

no risk of your dropping where you'll do any damage. Ten . . . nine . . . eight . . ."

"Jettison," ordered Ralph quietly.

"Valves open," reported Sandra.

Looking down, I could see the water gushing from our exhausts—a steady stream that thinned to a fine spray as it fell. I could see, too, the deadly black shape, the spearhead on its shaft of fire that was driving straight for our belly. And I saw the twinkle of flame at the gun muzzles as the automatic cannon opened up, the tracer that arched towards us with deceptive laziness. So he wasn't using his air to air missiles—yet. That was something to be thankful for.

The ship shuddered—and I realized, dimly, that we had been hit. There was an alarm bell shrilling somewhere, there was the thin, high scream of escaping atmosphere. There was the thudding of airtight doors slamming shut and, before the fans stopped, there was the acrid reek of high explosive drifting through the ducts. Then, with incredible swiftness, the aircraft was falling away from us, diminishing to the merest speck against the gleaming expanse of cloud. She belatedly fired her rockets, but they couldn't reach us now. We were up and clear, hurled into the interstellar emp-

teness by our antigravity. We were up and clear, and already Lorn was no more than a great ball beneath us, a pearly sphere glowing against the blackness of Space. We were up and clear and outward bound—but until we could do something about getting the ship under control we were no more than a derelict.

**THINGS** could have been worse.

Nobody was injured, although Peggy had been obliged to scramble, but fast, into a spacesuit. There were several bad punctures in the pressure hull, but these could be patched. (There was a consignment of steel plates in our cargo, our use of them in this emergency would be covered by General Average.) The loss of atmosphere could be made good from our reserve bottles. It was unfortunate that we were now in a condition of positive buoyancy rather than the neutral buoyancy that Ralph had planned for the voyage—but, he assured us, he had already worked out a landing technique for use in such circumstances. (Whether or not it would prove practicable we still had to find out.)

So, clad in space armor and armed with welding torches, Peggy and I turned to render the ship airtight once more. As Mate I was in official charge of re-

pairs, but I soon realized that my actual status was that of a welder's helper. It was Peggy Simmons who did most of the work. A tool in her hands was an extension of her body—or, even, an extension of her personality. She stitched metal to metal with delicate precision.

I watched her with something akin to envy—and it was more than her manual dexterity that I envied. She had something that occupied all her attention. I had not. Although it was foolish, every now and then I had to throw back the welder's mask and look about me. I was far from happy. This was not the first time that I had been Outside in Deep Space—but it was the first time that I had been Outside on the Rim. It was the *emptiness* that was so frightening. There was our sun, and there was Lorn (and it seemed to me that they were diminishing visibly as I watched) and there was the distant, dim-glowing Galactic lens—and there was *nothing*. We were drifting towards the Edge of Night in a crippled ship, and we should never (I thought) return to comfort and security.

I heard Peggy's satisfied grunt in my helmet phones, wrenched my regard from the horrid fascination of the Ultimate Emptiness. She had finished the last piece of welding, I saw. She straightened up with a

loud sigh. She stood there, anchored by the magnetic soles of her boots to the hull, a most unfeminine figure in her bulky suit. She reached out to me, and the metallic fingers of her glove grated on my shoulder plate. She pulled me to her, touched her helmet to mine. I heard her whisper, "Switch off."

I didn't understand what she wanted at first—and then, after the third repetition, nudged the switch of my suit radio with my chin. She said, her voice faint and barely audible, "Do you think that this will make any difference?"

"Of course," I assured her. "We can bring pressure up to normal throughout the ship now . . ."

"I didn't mean *that!*" she exclaimed indignantly.

"Then what the hell did you mean?" I demanded.

"Do you think that this will make any difference to Ralph's—the Captain's—attitude towards me? After all, the other two women weren't much use, were they?"

"Neither was I," I admitted sourly.

"But you're a man." She paused. "Seriously, Peter, do you think that this repair job will help? With Ralph, I mean."

"Seriously, Peggy," I told her, "it's time that we were getting



back inside. The others are probably watching us and wondering what the hell we're playing at." I added, "There's never been a case of seduction in hard vacuum yet—but there's always a first time for everything."

"Don't be funny!" she flared. Then, her voice softening, "There's an old saying: The way to a man's heart is through his stomach. It follows that the way to a space captain's heart is through his ship."

"Could be," I admitted. "Could be. But Ralph won't love either of us for dawdling out here when he's itching to clap on sail. Come on, let's report that the job's finished and get back in." I switched on my suit radio again.

Before I could speak I heard Ralph's voice. Even the tinny quality of the helmet phones couldn't disguise his bad temper. "What the hell is keeping you? Mr. Malcolm, are the repairs finished? If so, report at once and then return inboard."

"Repairs completed, sir," I said.

"Then let's not waste any more time," suggested Ralph coldly.

"We didn't waste any more time. Carefully, sliding our feet over the metal skin, we inched towards the open airlock valve. Peggy went in first and I handed the tools and the unused materials to her. I followed her into the

little compartment, and I was pleased when the door slid shut, cutting out the sight of the black emptiness.

The needle on the illuminated dial quivered, then jerked abruptly to the ship's working pressure.

WE were all of us in the Control Room—all save Peggy, who had been ordered, somewhat brusquely, to look after her motors. From our sharp prow the long, telescopic mast had already been protruded, the metal spar on the end of which was mounted the TV camera. On the big screen we could see the image of *Flying Cloud* as she appeared from ahead. I thought that it was a pity that we did not have other cameras that would allow us to see her in profile, to appreciate the gleaming slenderness of her.

"The first problem," said Ralph, in his best lecture room manner, "is to swing the ship. As you are all, no doubt, aware, we possess no gyroscopes. Even so, such devices are not essential. The Master of a windjammer never had gyroscopes to aid him in setting and steering a course..."

"He had a rudder," I said, "acting upon and acted upon by the fluid medium through which his hull progressed."

Ralph glared at me. "A resourceful windjammer Master,"

he stated flatly, "was not utterly dependent upon his rudder. Bear in mind the fact that his ship was not, repeat not, a submarine and, therefore, moved through no less than two fluid mediums, air and water. His rudder, as you have been so good to tell us, acted upon and was acted upon by the water in which it was immersed. But his sails acted upon and were acted upon by the air." He paused for breath. "We, in this vessel, may consider light a fluid medium. Now, if you will observe carefully . . ."

We observed. We watched Ralph's capable hands playing over the control panel. We watched the TV screen. We saw the spars extend from the hull so that the ship, briefly, had the appearance of some spherical, spiny monster. And then the roller reefing gear came into play and the sails were unfurled—on one side a dazzling white, on the other jet black. We could feel the gentle centrifugal force as the ship turned about her short axis, bringing the Lorn sun dead astern.

Then spars rotated and, as far as that camera mounted at the end of its telescopic mast was concerned, the sails were invisible. Their white surfaces were all presented to the Lorn sun, to the steady photon gale. We were running free, racing before the interstellar wind.

I realized that Ralph was singing softly.

*"Way, hey, and up she rises,  
Way, hey, and up she rises,  
Way, hey, and up she rises . . .  
Early in the morning!"*

## CHAPTER 12

SO there we were, bowling along under full sail, running the easting down. In some ways the Erikson Drive was a vast improvement over the Mannschenn Drive. There was not that continuous high whine of the ever-precressing gyroscopes, there was not that uneasy feeling of *deja vu* that is a side effect of the Mannschenn Drive's temporal precession field. Too, we could look out of the Control Room and see a reasonable picture of the Universe as it is and not, in the case of the Galactic Lens, something like a Klein Flask fabricated by a drunken glass blower.

She was an easy ship, once the course had been set, once she was running free before the photon gale. She was an easy ship—as a ship, as an assemblage of steel and plastic and fissioning uranium. But a ship is more than the metals and chemicals that have gone into her construction. In the final analysis it is the crew that make the ship—and *Flying Cloud* was not happy.

It was the strong element of sexual jealousy that was the

trouble. I did my best to keep my own yardarm clear, but I could observe—and feel jealous myself. It was obvious that Sandra was Captain's lady. It was obvious, too, that both Martha Wayne and Peggy Simmons had aspired to that position and that both were jealous. And Doc Jenkins couldn't hide the fact, for all his cynicism, that he would have welcomed Martha's attentions. The only one who was really amused by it all was Smethwick. He drifted into the Control Room during my watch and said, "Ours is an 'appy ship."

"Are you snooping?" I demanded sharply. "If you are, Claude, I'll see to it, personally, that you're booted out of the service."

He looked hurt. "No, I'm not snooping. Apart from the Regulations, it's a thing I wouldn't dream of doing. But even *you* must be sensitive to the atmosphere, and you're not a telepath."

"Yes," I agreed. "I am sensitive." I offered him a cigarette, took and struck one myself. "But what's fresh? Anything?"

"The flap seems to have died down on Lorn," he told me. "We're a *fait accompli*. Old Grimes got Livitski—he's the new Port Forlorn Psionic Radio Officer—to push a message through to wish us well and to tell us that he has everything under control at his end."

"Have you infomed the Master?" I asked.

"He's in his quarters," he said. "I don't think that he wants to be disturbed."

"Oh," I said.

We sat in silence—there was still enough acceleration to enable us to do so without using seat belts—smoking. I looked out of the transparency at the blackness, towards the faint, far spark that was the Grollor sun. Claude looked at nothing. I heard the sound of feet on the Control Room deck, turned and saw that the faint noise had been made by Peggy Simmons. She said, "I'm sorry. I . . . I thought that you were alone, Peter . . ."

"Don't let me interfere with love's young dream," grinned Smethwick, getting to his feet. "I was just leaving."

PEGGY dropped into the chair just vacated by the telepath and accepted a cigarette from my pack. I waited until Claude was gone, then asked, "What's the trouble, Peggy?"

"Nothing," she said. "Nothing mechanical, that is. Although I should check some of the wiring where the shell splinters pierced the inner sheathing."

"Then why don't you?" I asked.

"Because," she told me, "for the first few days in Space one has more important things to

worry about. There's the Pile, and the auxiliary machinery, and . . ."

"Surely the wiring is part of the auxiliary machinery," I pointed out.

"Not this wiring. It's the power supply to the trimming and reefing gear—and we shall not be using that for a while, not until we make landfall."

"Planetfall," I corrected.

"Ralph says landfall," she told me.

"He would," I said. "He must have brought at least a couple of trunks full of books about wind-jammers—fact, fiction and poetry—away with him. Mind you, some of it is *good*." I quoted,

*"I must go down to the sea  
again,  
To the lonely sea and the sky,  
And all I ask is a tall ship  
And a star to steer her by . . ."*

I gestured widely towards the Grollor sun, the distant spark that, thanks to Doppler Effect, was shining with a steely glitter instead of its normal ruddiness. I said, "There's his star to steer by." I thumped the arm of my chair. "And here's his tall ship."

"And so he has everything he wants," she said.

"Everything." I decided to be blunt. "He's got his tall ship, and he's got his star to steer by, and he's got his woman."

"But," she said, "I could give him so much more."

"Peggy," I admonished, "don't kid yourself. You're attractive, and you're capable—but Sandra is more than attractive. And she's a good cook. Take my advice, forget Ralph. We're probably in enough trouble already without having triangles added to our worries."

She took a cigarette from my pack, struck it and put it to her mouth. She stared at the eddying wisps of smoke. She said, "That poetry you quoted. Tall ships and stars. That's what Ralph really wants, isn't it?"

"Tall ships and stars and the trimmings," I said. Her face lit up. "I can give him *real* trimmings. I'm the woman who can make Ralph, and his ship, go down in history."

"Judging by the flap when we shoved off," I said, "they already have."

She said, "Correct me if I'm wrong—but the Erikson Drive, as it stands, will never be a commercial success. It takes far too long for a cargo, even a non-perishable cargo for which there's no mad rush—to be carted from Point A to Point B. And there's the problem of manning, too. As far as this ship was concerned, Uncle Andy was able to assemble a bunch of misfits with no close ties for the job, people who wouldn't give a damn if the

round voyage lasted a couple of objective centuries. But it mightn't be so easy to find another crew for another light-jammer. Agreed?"

"Agreed," I said, after a pause.

She went on, "I'm new to Space, but I've read plenty. I'm no physicist, but I have a rough idea of the *modus operandi* of the various interstellar drives. And, so far, there's been no Faster Than Light Drive."

"What!" I exclaimed.

"No, there hasn't. I'm right, Peter. The basic idea of the Ehrenhaft Drive was that of a magnetic particle trying to be in two places at the same time in a magnetic field or current, the ship being the particle. But, as far as I can gather, Space was warped so that she could do just that. I couldn't follow the math, but I got the general drift of it. And then, of course, there's the Mannschenn Drive—but, there, the apparent FTL speeds are achieved by tinkering with Time."

"H'm," I grunted. "H'm."

"Getting away from machinery," she said. "and back to personalities, Ralph loves his ship. I'm sure that if he had to make a choice between Sandra and *Flying Cloud* it wouldn't be *Flying Cloud* left in the lurch. But . . . But what do you think he'd feel about a woman who made him

the Captain of the first *real* FTL starwagon?"

I said, "You'd better see Doc on your way aft. He stocks quite a good line in sedative mixtures."

She said, "You're laughing at me."

"I'm not," I assured her. "But, Peggy, even I, and I'm no physicist, can tell you that it's quite impossible to exceed the speed of light. As you have already pointed out, we can cheat, but that's all. And in *this* ship we can't cheat, even. We can no more outrun light than a windjammer could outrun the wind that was her motive power." I pointed to a dial on the panel before me. "That's our Log. It works by Doppler Effect. At the moment our speed is Lume 0.345 and a few odd decimals. It's building up all the time, and fast. By the end of the watch it should be about Lume 0.6 . . ."

She said, "A fantastic acceleration."

"Isn't it? By rights we should be spread over the deck plates like strawberry jam. But, thanks to the anti-gravity, this is almost an inertialess drive. Anyhow, thanks to our utterly weightless condition, we may achieve Lume 0.9 recurring. But that's as high as we can possibly get."

"I see," she said in a tone of voice that conveyed the impression that (a) she didn't and (b)

didn't want to. She added, "But . . ." She shrugged and said, "Oh, never mind."

She got up to leave.

"Thanks for dropping in," I said.

"And thanks for the fatherly advice," she said.

"Think nothing of it," I told her generously.

"I shan't," she said, with what I belatedly realized was deliberate ambiguity.

And then she was gone.

### CHAPTER 13

IT was a couple of mornings later—as measured by our chronometer—and, after a not very good breakfast, I was making rounds. It's odd how that unappetizing meal sticks in my memory. Sandra was Acting Third Mate now, and Ralph had decreed that Martha Wayne take over as Catering Officer. And Martha, as the old saying goes, couldn't boil water without burning it.

Anyhow, I was not in a good mood as I made my way aft from the wardroom. *Flying Cloud* was still accelerating slightly, so aft was "down". Rather to my disappointment I discovered nothing with which to find fault in the "farm"—the compartment housing the hydroponic tanks and the yeast and tissue culture vats. I hurried through the Anti-Matter Room—frankly, that huge,

spherical casing surrounded by great horseshoe magnets always gave me the shivers. I knew what was inside it, and knew that should it ever make contact with normal matter we should all go up in a flare of uncontrolled and uncontrollable energy. In the auxiliary machinery space I did start finding fault. It was obvious that Peggy, as yet, had done nothing about removing the splinter-pierced panels of the internal sheathing to inspect the wiring.

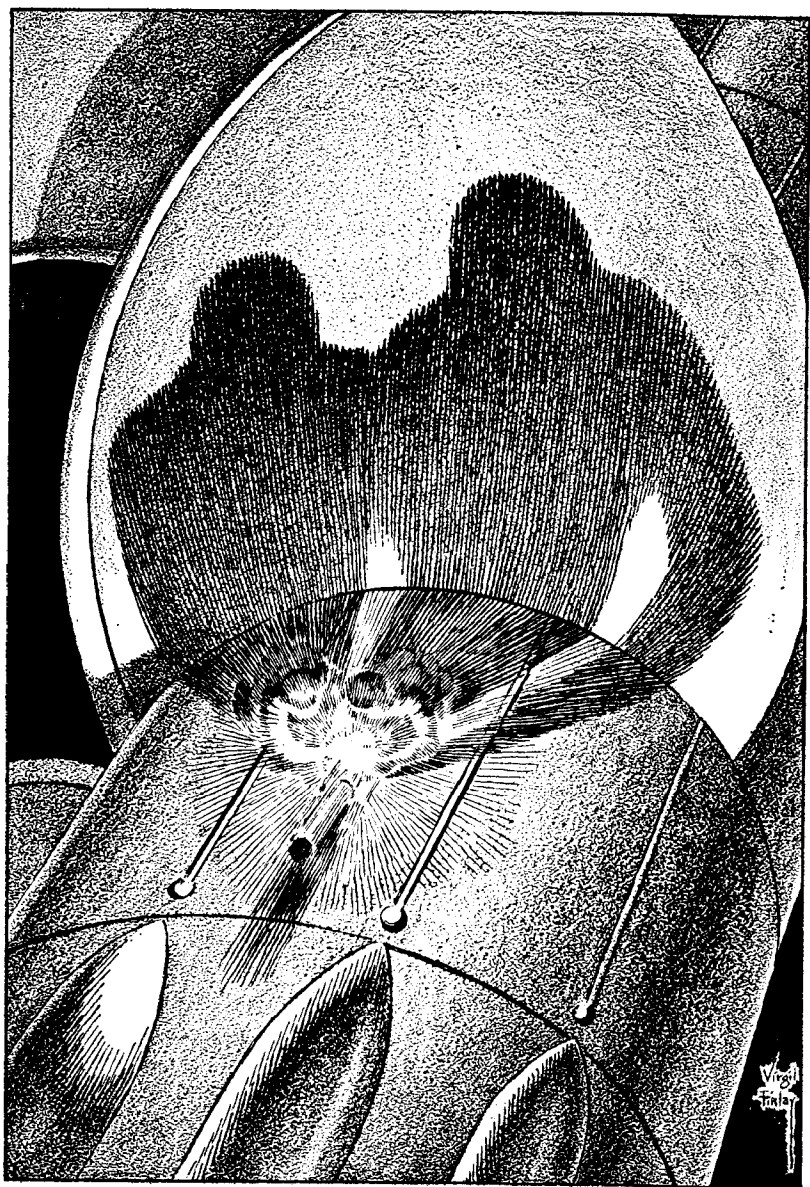
But there was no sign of Peggy.

I continued aft, through the Reactor Room and then into the tunnel that led to the extreme stern. As I clambered down the ladder I heard the clinking of tools and the sound of a voice upraised in song. It was Doc Jenkins' not unpleasant tenor.

I dropped the last few feet into the transom space, landing with a faint thud. Doc Jenkins and Peggy looked up from what they were doing. Doc was wearing only a pair of shorts and his podgy torso was streaked with grime and perspiration. Peggy was clad in disreputable overalls. She was holding a welding torch.

She said, rather guiltily, "Good morning, Peter."

"Good morning," I replied automatically. Then, "I know that I'm only the Mate, but might I



inquire what you two are up to?"

"We're going to make this wagon roll and go," replied Jenkins happily.

"What do you mean?" I asked coldly.

I looked around the cramped compartment, saw two discarded spacesuits that had been flung carelessly on to the deck. And I saw what looked like the breech of a gun protruding from the plating. Around its circumference the welding was still bright. I looked from it to, once again, the spacesuits.

"Have you been Outside?" I demanded.

"No," said Peggy.

"Don't worry, Peter," said Jenkins. "We didn't lose any atmosphere. We sealed the transom space off before we went to work, and put the pump on it . . ."

"Remote control," said Peggy, "from inside."

"*And you pierced the hull?*" I asked with mounting anger.

"Only a small hole," admitted the Doctor.

"Damn it!" I flared. "This is too much. Only four days out and you're already space happy. Burning holes in the shell plating and risking all our lives. And I still don't know what it's all about. When Ralph hears . . ."

"He'll be pleased," said Peggy simply.

"He'll be pleased, all right. He'll roll on the deck in uncontrollable ecstasy. He'll have your guts for a necktie, both of you, and then boot you out of the airlock without a spacesuit."

"Be reasonable, Peter," admonished Jenkins.

"Be reasonable? I am being reasonable. Peggy here has work that she should be doing, instead of which I find her engaged in some fantastic act of sabotage aided and abetted by you, one of the ship's executive officers."

"Come off it, Peter," said the Doc. "I'm Second Mate of this wagon, and I signed the Articles as such, and one of the clauses says that Deck and Engine Room Departments should cooperate."

"Never mind this Second Mate business," I told him. "As Ship's Surgeon, you're still a member of the Deck Department, ranking with, but below, the Mate. And as far as I'm concerned, the prime function of the Engine Room Department is to do as it's told."

"Then why don't you tell me something?" asked Peggy, sweetly reasonable.

"I will," I promised. "I will. But, to begin with, you will tell me something. You will tell me just what the hell you two are up to down here."

"Is that a lawful command?" asked Peggy.



"I suppose so," admitted Jenkins grudgingly.

"All right," she said slowly. "I'll tell you. What you see . . ." she kicked the breech of the cannon with a heavy shoe . . . "is the means whereby we shall exceed the speed of light."

"But it's impossible," I said.

"How do you know?" she countered.

"It's common knowledge," I sneered.

"Once," she said, "it was common knowledge that the Sun went round the Earth . . ."

But I was giving her only half my attention. Out of the corner of my eyes I was watching Doc Jenkins. He was edging gradually towards the switch of the power point into which the welding tool was plugged. I shrugged. I didn't see why he had to be so surreptitious about it. If Peggy wanted to finish whatever welding she had been doing when I had disturbed them, what did it matter?

Or perhaps it did matter.

I said, "I suppose this welded seam is tight?"

"Of course," she said.

"Then we'll get back amidships. You've plenty of work to do in the auxiliary motor room."

"I have," she admitted.

Then my curiosity got the better of me. "But just how," I demanded, "did you ever hope to attain FTL?"

"This," she said, gesturing with the torch towards the breech of the gun, "is an auxiliary rocket. There is already a charge of solid propellant—Doc mixed it for me—in the firing chamber. We were going to connect up the wiring to the detonator at the time you interrupted us . . ."

"It's just as well that I did interrupt you," I said. "But how was it supposed to work?"

"I thought that it would be obvious. The ship is already proceeding at almost the speed of light. The rocket is just to give her the extra nudge . . ."

I couldn't help laughing. "Peggy, Peggy, how naive can you be? And with homemade solid propellant yet . . ."

"Solid propellants have their advantages," she said.

"Such as?" I asked scornfully.

"This!" she snapped.

The welding torch flared blindingly. I realized her intention, but too late. As I tried to wrest the tool from her hands the metal casing of the firing chamber was already cherry red.

I felt rather than heard the *whoomph* of the exploding powder . . .

And . . .

#### CHAPTER 14

**E**VEN so," Ralph was saying, the tucker in this wagon leaves much to be desired."

I looked up irritably from the simmering pot of lamb curry on the stove top—and then, obeying an odd impulse, looked down again, stared at the savory stew of meat and vegetables and hot spices, at my hand, still going through the stirring motions with the spoon.

I asked myself, *What am I doing here?*

"You have about three pet dishes," went on Ralph. "I admit that you do them well. But they're all that you do well . . ."

This time I did look up at him. *What was he doing in civilian shirt and shorts? Then, chasing the thought, But why should the Federation Government's observer, even though he is a full Commander in the Survey Service, be wearing a uniform?*

"Sandra's getting browned off with the lack of variety," said Ralph.

"Mrs. Malcolm, you mean," I corrected him coldly.

"Captain Malcolm, if you insist," he corrected me, grinning.

I shrugged. "All right. I'm only the Catering Officer, and she's the Captain. At the same time—I *am* the Catering Officer, and she's my wife."

"Such a set-up," said Ralph, "would never be tolerated in a Federation ship. To be frank, I came out to the Rim as much to see how the Feminists managed

as to investigate the potentialities of this fancy new Drive of yours. And this ship, cut off from the Universe for objective years, is the ideal microcosm."

"We get by, out here on the Rim," I said shortly.

"Even so," he said, "you're not a Rim Worlder yourself. You're none of you Rim Worlders, born and bred, except the Engineer and that tame telepath of yours. I can understand the women coming out here, but not the men. It must rankle when you're allowed to come into Space only in a menial capacity."

"Our boss cockie, Commodore Grimes, is a man," I said. "And most of the Rim Runners fleet is manned by the male sex. Anyhow, there's nothing menial in being a cook. I'm far happier than I was as Purser in the Waverley Royal Mail. Furthermore," I said, warming up to the subject, "all the best chefs are men."

Ralph wiped a splatter of curry from his shirt. (I had gestured with my spoon.) "But it doesn't follow," he said, "that all men are the best chefs."

"Everybody likes my curry," I told him.

"But not all the time. Not for every meal," he said. "Well, Malcolm, I'll leave you to it. And since we have to eat your curry, you might see that the rice isn't so soggy this time."

Ignoring him, I brought the

spoon to my lips, tasted. It was not a bad curry, I decided. It wasn't a bad curry at all. Served with the sliced cucumber and the shredded coconut and the chopped banana, together with the imported mango chutney from Caribbea, it would be edible. Of course, there should be Bombay Duck. I wondered, as I had often wondered before, if it would be possible to convert the fish that flourished in our algae vats into that somewhat odorous delicacy.

Again I was interrupted.

"More curry?" complained Claude Smethwick.

"It's good," I told him. I scooped up a spoonful. "Taste."

"Not bad," he admitted. "If you like curry, that is. But I'm concerned about more important things. Peter, there's something *wrong* about this ship. You're the only one that I can talk to about it. Commander Listowel's an outsider, and Doc has gone on one of his verse and vodka jags, and the others are . . . *women*."

"They can't help it," I said.

"I know they can't—but they look at things differently from the way that we do. Apart from anything else, every one of them is chasing after that Survey Service Commander . . ."

"Every one?" I asked coldly.

"Not Sandra, of course," he assured me hastily. (Too hast-

ily?) "But Sandra's got all the worries of the ship—after all, she is Captain of the first interstellar lightjammer—on her shoulders, and Martha and Peggy are trying hard to get into Listowel's good graces—and so there's only you."

"I'm flattered," I said, stirring the curry. "Carry on, anyway."

"You know the *deja vu* feeling that you get when the Mannschen Drive starts up? Well, it's something like that. But it's not that . . ."

"I think I know what you mean . . ." I said slowly.

HE went on, "You'll think that I'm crazy, I know. But that doesn't matter—all you so-called normals think that *psi* people are at least half way round the bend. But I've a theory . . . Couldn't it be that out here, on the Rim, on the very edge of this expanding Galaxy, there's a tendency for alternative Time Tracks to merge? For example, just suppose that the Feminist ships had never got out here . . ."

"But they did," I said.

"But they could very easily not have. After all, it was back in the days of the Ehrenhaft Drive, the gaussjammers. And you've read your history, and you know how many of those cranky brutes got slung away to hell and gone off course by magnetic storms."

"So in this Alternative Universe of yours," I said tolerantly, "the Rim Worlds never got colonized."

"I didn't say that. You've only to look at the personnel of this ship—all outsiders but Peggy and myself, and neither Peggy nor I can claim descent from the First Families. My ancestors came out long after the Feminist Movement had fizzled on Earth, and so did Peggy's . . ."

I stirred the curry thoughtfully. "So on another Time Track there's another *Aeriel*, the first of her kind in Space, and another Peter Malcolm in the throes of cooking up a really first class curry for his unappreciative shipmates . . ."

"Could be," he said. "Or the ship could have a different name, or we could be serving in her in different capacities—all but myself, of course."

I burst into sing,

*"Oh, I am the Cook, and the  
Captain bold,  
And the Mate of the Nancy  
brig,  
And the Bo's'n tight, and the  
Midshipmite,  
And the crew of the Captain's  
gig!"*

"But not," I was interrupted, "the Engineer."

I turned away from the stove.

"Oh, it's you, Peggy."

"Who else?" She took the spoon from my hand, raised it to

her lips, blew on it. She sipped appreciatively. "Not bad, not bad . . ." She absentmindedly put the spoon into a side pocket that already held a wrench and a hammer. I snatched it back, carefully wiped it and returned it to the pot.

She asked, her voice deliberately casual, "Have you seen Ralph?"

"I think he's gone up to Control," I told her.

She said sulkily, "He's been promising to let me show him the auxiliary motor room for the last three days."

"After all," I consoled her, "he's not an Engineer Commander."

"But . . ."

"Curry *again*?" complained a fresh voice.

I resumed my stirring with an unnecessary clatter. I muttered mutinously, "If my galley is going to be turned into the ship's Social Club there won't be *anything*. But aren't you supposed to be on watch, Miss Wayne?"

"The Old Woman relieved me," she said. "She's showing Ralph just how a lightjammer should be handled." She leaned back against a bench, slimly elegant in her tailored shirt and shorts, nibbling a piece of celery that she had picked up from the chopping board. "If the Federation Survey Service doesn't build

a fleet of Improved Erikson Drive wagons it won't be Sandra's fault."

"Love me, love my ship," muttered Peggy.

"What was that?" I asked sharply.

"Nothing," she said.

Both women looked at me in silence, and I was suddenly afraid that what I could read in their eyes was pity.

#### CHAPTER 15

I WAS relaxing in the easy chair in the Captain's day room, smoking a cigarette and listening to a recording of the old-time sea chanties of distant Earth. I wondered what those ancient sailormen would have made of this fabrication of metal and plastic, with atomic fire in her belly, spreading her wings in the empty gulf between the stars, running free before the photon gale. Then I heard the door between bathroom and bedroom open, turned my head. Sandra, fresh from her shower, walked slowly to the chair at her dressing table, sat down before the mirror. I had seen her this way many times before. (But had I?) But this was the first time. (But how could it be?) I felt the stirrings of desire.

I got up, walked through to the bedroom. I put my hands gently on her smooth shoulders, kissed her gently behind the ear.

"No," she said. "No, don't."

"But . . ."

"I've done my hair," she said, "and I don't want it messed up."

"Damn it all," I told her, "we are married."

*But are we?* I asked myself.

"Take your hands off me," she ordered coldly.

I did so, and looked at her and at her reflection in the mirror. She was beautiful.

"Don't *maul* me," she said.

"Sorry," I muttered.

I went to sit on the bed.

"Haven't you anything better to do?" she asked.

"No," I said.

She made a sound that can only be described as a snarl and then, ignoring me, went on with her toilet. There was a session with the whirring hair dryer, after which she affixed glittering clips to the lobes of her ears. She got up then and walked to the wardrobe, ignoring me. She took out a uniform shirt of thin black silk, a pair of black shorts and a pair of stilleto heeled black sandals. Her back to me, she shrugged into the shirt and then pulled the shorts up over her long, slim legs. She sat on the bed (and I might as well not have been there) and buckled the sandals over her slender feet. She returned to the mirror and applied lip rouge.

"Going ashore?" I asked sarcastically.

"If you must know," she told me, "Commander Listowel has a fine collection of films made by the Survey Service on worlds with non-human cultures."

"Good," I said. "I'll brush my hair and wash behind the ears."

"You," she said, "were not invited."

"But . . ."

Her manner softened—but briefly, very briefly. "I'm sorry, Peter, but when senior officers of different space services want to talk shop they don't want juniors in their hair."

"I see," I said.

She got up from the chair. In the form-moulding shirt, the abbreviated shorts, she looked more desirable than when she had come from the shower. I was acutely conscious that under the skimpy garments there was a woman. *My* woman. (Or was she? Had she ever been?)

"Thank you," I said.

"You needn't wait up for me," she said.

"You're rather sweet," she said, "in your own way."

I WATCHED her go, then struck another cigarette and stuck it in my mouth. I knew now what was happening. I'd seen it happen before, to other people, but that didn't make it any the better. Ashore it would have been bad enough—but here, in Deep Space, with Sandra the

absolute monarch of this little, artificial world, there was nothing at all that I could do. Ashore, even in a Feminist culture, a man can take strong action against an erring wife and her paramour. But if I took action here I should be classed as a mutineer.

But there must be something that I could do about it.

There must be *something*.

How much did Martha know? How much did Peggy know?

Women know women as no man can ever know them. There is that freemasonry, the Lodge into which no male may ever intrude.

Peggy, I thought, would be the best bet. As a woman Martha might hate Sandra's guts, but as Mate she would be loyal to the Captain. Peggy, brought up in the workshop rather than the wardroom, would be less overawed by gold braid and Queen Mother's Regulations.

I still didn't like it, but I was feeling desperate. I put out my cigarette and headed for Peggy's room.

I tapped at the door. She called out, "Come in."

I stepped into the cabin—then started to back out. She was prone on her bunk, absorbing the radiation of a sun lamp.

I stammered, "I can come back another time."

"There's no need. Come in. Shut the door."

I shut the door, then sat down heavily in the chair.

"Do you mind if I smoke?"

She said, "I don't care if you burst into flame."

"Not very original," I told her. "And not very funny." I struck a cigarette. She stretched a shapelessly arm and took it from me. I struck another cigarette, took a deep puff.

For a while we smoked in silence. Finally, I asked, "Aren't you done on that side?"

She said, "No."

More silence. This time, she broke it.

"Why did you come to see me, Peter?"

I said, "I thought you might be able to help."

"And why should I want to help you?"

"Just enlightened self-interest," I said. "You want Listowel. (God knows why.) I want Sandra back. If you get that stuffed shirt Commander it'll leave my everloving wife at a loose end—and I don't think, somehow, that she'll make a pass at either Doc Jenkins or poor old Claude . . ."

"All right," she said. "You help me, and I help you. If the Old Woman returns to her husband that leaves Ralph all on his ownsome. Then Martha and I can fight it out between us."

"This mutual aid . . ." I said.

"It's all rather complicated," Peggy told me. She threw the

end of her cigarette into the disposer. "It all hinges on the fact that Sandra puts the ship first. And I think—mind you, it's not a certainty—that you can get yourself well into her good books. How would it be if you could say, 'Look, darling, I've made you the Captain of the first FTL ship in history,?'"

"This ship is not faster than light," I said. "But the Mannschenn Drive ships are, and the Ehrenhaft Drive wagons, what few there are left of them."

"Is that so?" she countered.

"Of course," I said.

"Oh." She paused for a second or so, then said slowly, "Correct me if I'm wrong, but the Erikson Drive, as it stands, will never be a commercial success. It takes far too long for a cargo, even a non-perishable cargo for which there's no mad rush, to be carted from Point A to Point B. And there's the problem of manning, too. As far as this ship was concerned, Auntie Susan was able to assemble a bunch of misfits with no close ties for the job, people who wouldn't give a damn if the round voyage lasted a couple or three centuries—objective centuries, that is. Or even subjective. But it mightn't be so easy to find another crew for another lightjammer. Agreed?"

I said, "You drifted away from the script."

"What do you mean?" she

asked. Her face looked frightened.

"Nothing," I said. "Nothing. It's just that I seem to have heard you say almost the same words before."

SHE said but doubtfully, "You're Space-happy, Peter." Then she went on, "I'm new in Space, relatively new, compared to the rest of you, but I've read plenty. I'm no physicist, but I have a rough idea of the *modus operandi* of the various interstellar drives. And, so far, there's been no Faster Than Light Drive."

"What!" I exclaimed.

"No, there hasn't. I'm right, Peter. The basic idea of the Ehrenhaft Drive was that of a magnetic particle trying to be in two places at the same time in a magnetic field or current, the ship being the particle. But, as far as I can gather, Space was warped so that she could do just that. I couldn't follow the math, but I got the general drift of it. And then, of course, there's the Mannschenn Drive—but, there, the apparent FTL speeds are achieved by tinkering with Time . . ."

"H'm," I grunted. "H'm."

"Getting away from machinery," she said, "and back to personalities, Sandra loves her ship. I'm sure that if she had to make a choice between Ralph and

*Aeriel* it wouldn't be *Aeriel* left in the lurch. Or if she had to make a choice between you and *Aeriel* . . . But . . . But what do you think she'd feel about the man who made her Captain of the first *real* FTL starwagon?"

I said, "You'd better see Doc when he comes off watch. He stocks quite a good line in sedative mixtures."

She said, "You're turning down a good chance, perhaps your only chance, Peter."

"Damn it all," I said, "even I, and I'm no physicist, can tell you that it's quite impossible to exceed the speed of light. As you have already pointed out, we can cheat, but that's all. And in this ship we can't cheat, even. We can no more outrun light than a windjammer could outrun the wind that was her motive power." I started to point towards something that wasn't there. "That's our Log. It works by Doppler Effect. At the moment our speed is . . ."

She looked at me hard, a puzzled expression on her face. "A log? Here? What the hell's wrong with you, Peter?"

I said, "I don't know."

She said, "There's something screwy about this ship. But definitely. Anyhow, let me finish what I was going to say. I maintain that we can give it a go—exceeding the speed of light, I mean."



"But it's impossible," I said.  
"How do you know?" she countered.

"It's common knowledge," I sneered.

"Once it was common knowledge that the Sun went round the Earth."

"Oh, all right," I grunted.  
"But tell me, please, just how do you expect to attain FTL speeds?"

"With an auxiliary rocket," she said. "Just a stovepipe, sticking out from the back end of the ship. I can make it—and you, with your access to the chemicals for the hydroponics tanks, can make the solid propellant, the black powder . . . We're doing about Lume 0.9 recurring at the moment, all we need is a nudge . . ."

I couldn't help laughing.  
"Peggy, Peggy, how naive can you be? And with homemade solid propellant yet . . ."

"You can make it," she said.  
"And it's to your advantage."

I looked at her. During our discussion she had turned over. I said, "I'm not sure that I'm really interested in getting Sandra back . . ."

She flopped back again on her belly in a flurry of limbs.

She said coldly, "Let's not forget the purpose of this discussion. Frankly, it was my intention to bribe you with the body beautiful to play along with me

on this FTL project, but it wouldn't be right. You want Sandra back, and I want Ralph. Let's keep it that way, shall we?"

"But . . ."

"On your bicycle, spaceman. Come and see me again when you've a couple or three pounds of black powder made up. And if you can't make it, then Martha and I will figure out some other way."

I asked, "She's in on this?"

"Of course," said Peggy scornfully. "We have our differences, but she's a good Mate. I'd never be able to cut a hole in the stern for my auxiliary rocket unless she approved. Now on your way. And don't come back until you have that powder."

## CHAPTER 16

I DON'T know whether or not you have ever tried to make black powder, but I can tell you this, it's easier talking about it than doing it. You want flowers of sulphur, and you want charcoal (or carbon) and you want saltpeter. At first I made the mistake of trying to mix the ingredients dry, and all I got was a greyish dust that burned with a half-hearted fizzle. Then I substituted potassium chlorate for the sodium nitrate, and my sample went off prematurely and took my eyebrows with it. I came to the conclusion then, that

the powder would have to be properly mixed, with water, and then dried out—using, of course, the recommended ingredients. And it worked out, even though I dried the sludge by exposure to vacuum instead of in the sun, as was done (I suppose) by the first cannoneers.

Anyhow, it was as well that I had something to occupy my mind. It was obvious, far too obvious, what was going on between Listowel and Sandra. Peggy's scheme was a hare-brained one, but it might just get results. I had little doubt that it would get results—but what those results would be I could not imagine. Meanwhile, everybody in *Aerial* continued to do his or her appointed duty, even though the ship was fast becoming a seething cauldron of sexual jealousies.

And then, one night (as reckoned by our chronometer) I had the last batch of gunpowder mixed and dried. There was a five gallon can full of the stuff. I picked it up, let myself out of the galley and made my way to the officers' flat. As I entered the alleyway I saw Doc Jenkins knocking on the door of Martha Wayne's cabin. I wondered who was in Control, then wished that I hadn't wondered. The Control Room would be well manned, of course. There would be the Captain, and there would be that

blasted Survey Service Commander, the pair of them looking at the stars and feeling romantic.

"Ah," said Jenkins, noticing me, "the Commissioned Cook. In person. Singing and dancing."

"Neither singing nor dancing," I said grimly.

"And what have you got in the can, Petey boy? You know that I have the monopoly on jungle juice."

"Nothing to drink," I said.

"Then what is it?"

"Something for Peggy."

"Something for Peggy," he mimicked. "Something for Peggy . . ." He quoted:

*"When in danger or in fear,  
Always blame the engineer."*

I tried to edge past him, but he put out his hand and grabbed my arm. In spite of his flabby appearance he was strong. And I was afraid to struggle; there was the possibility that the can of black powder might get a hard knock if I did so. (I knew that in theory it was quite safe, but I still didn't trust the stuff.)

"Not so fast," he said. "Not so fast. There's something going on aboard this ship, and as one of the executive officers, as well as being the Surgeon, it's my duty to find out what it is."

The door of the Chief Officer's cabin slid open. Martha stood there looking at us. "Come in,"

she ordered sharply. "Both of you."

We obeyed. Martha shut the door behind us, motioned us to chairs. We sat down. With a certain relief I put the can of powder gently on the carpeted deck—and then, before I could stop him, Doc snatched it up. He shook it.

He demanded, "What's in this?"

"Some powder," I said lamely.

"Powder?" He worried the lid off the container. "Powder? What sort of powder?"

"Abrasive powder," I lied. "Peggy gave me the formula and asked me to cook some up for her."

"Oh." He put the can, lid still off, down beside his chair, away from me. He took a cigarette from the box on Martha's desk, struck it, put it to his lips. He inhaled deeply, inhaled again. The burning end glowed brightly, the ash lengthened as we watched. He made as though to use the open can as an ash tray.

MARTHA'S hand flashed out, smacked the cigarette from his fingers sent it flying across the cabin in a flurry of sparks.

Jenkins looked hurt. "What was that in aid of?"

She said, "You were going to spoil the . . . mixture."

"How? If it's abrasive powder,

a little ash might improve it."

"Not this mixture," she said.

"No," I supported her. "No, It wouldn't."

"I'm not altogether a fool," grumbled Jenkins.

"No?" asked Martha sweetly.

"No?" She extended a slender leg, and with her slim foot gently shoved the can out of harm's way. "No?"

"No!" he almost shouted.

"I've lived on primitive worlds, Martha, planets where military science has been in its infancy. And here's Peter, lugging around a dirty great cannister of villainous saltpeter, and there's Peggy, sweating and slaving over something that looks like a breech-loading cannon." He snorted. "If it were a couple of dwelling pieces it would make sense. Pistols for two and coffee for one. And then after the Commissioned Cook and the bold Commander had settled their differences, you and Peggy could do battle, at twenty paces, for the favors of the survivor.

"But a cannon . . . It doesn't make sense."

"No, it doesn't," agreed Martha. She got up, went to a locker. I thought that she was going to offer us drinks. There were racked bottles there, and glasses. And there was a drawer under the liquor compartment, which she pulled open. She took from it a nasty looking automatic.

She said, "I'm sorry, Doc, but you know too much. We have to keep you quiet for the next few hours. And you, Peter, see about tying him up and gagging him, will you?" She motioned with the pistol. "Down, boy, down. I won't shoot to kill—but you wouldn't like your kneecaps shattered, would you?"

Jenkins subsided. He looked scared—and, at the same time, oddly amused. "But I don't know too much," he expostulated. "I don't know enough."

Martha allowed a brief smile to flicker over her full mouth. She glanced at me fleetingly. "Shall we tell him, Peter?"

I said, "It wouldn't do any harm. Now."

Martha sat down again, the hand with the pistol resting on one slender thigh. It remained pointing directly at Jenkins. Her finger never strayed from the trigger.

"All right," she said. "I'll put you in the picture. As you are aware, there's a considerable amount of ill-feeling aboard this vessel."

"How right you are!" exclaimed Jenkins.

"We think that the Captain is behaving in a manner prejudicial to good order and discipline."

He chuckled softly. "Mutiny, is it? In all my years in SOT I've never seen one . . . But

why that absurd, archaic canon? After all, you've access to the ship's firearms." He added, "As you've just proved, Martha."

"Its not mutiny," she snapped.

"Have I another guess?"

She told him, "You can guess all the way from here to Grollor, but you'll never guess right."

"No?" He made as though to rise from his chair, but her gun hand twitched suggestively. "No? Then why not tell me and get it over with."

"If you must know," she said tiredly, "it's a way—it might work and it might not—to distract Sandra's attention from Ralph. She's more in love with her ship than with anybody in the ship, but if Peter were to be able to say, 'Look, darling, thanks to me you are now the Captain of the first real FTL starwagon,' she'd be eating out of his hand."

He stared at me in mock admiration. "I didn't know you had it in you, Peter."

"He hasn't," said Martha. "It was Peggy and I who cooked up the scheme. We don't know if it will succeed or not—but *something* is bound to happen when Peggy's solid rocket gives the ship just that extra nudge."

"And all these years," whispered Jenkins, "I've regarded you as just a stuffed shirt—mind you, a well stuffed shirt—

and Peggy as a barely literate mechanic. But there's a streak of wild poetry in you, in both of you. Mark you, I don't think that Listowel is worth the trouble—but throwing your bonnet over the windmill is always worthwhile. This crazy scheme appeals to me . . . I'm with it, Martha, and I'm with you. I've been dreaming about something on those lines myself, but not so practically as you have done . . ."

His hand went to the side pocket of his shorts—and Martha's hand, holding the pistol, lifted to cover him. But it was a folded sheet of paper that he pulled out.

"Martha," he pleaded, "put the *Outer Reaches Suite* on your playmaster, will you? Or get Peter to put it on, if you don't trust me. And, if you would be so good, something to wet my whistle . . ."

"Fix it, Peter," she ordered.

I fixed it, first of all pouring a stiff whisky on the rocks for each of us, then adjusting the controls of the gleaming instrument. The first notes of the Suite drifted into the cabin. It wasn't music that I have ever cared for. There was too much of loneliness in it, too much of the blackness and the emptiness—the emptiness that, somehow, was not empty, that was peopled with the dim, flimsy ghosts of the might-have-been.

Jenkins drained his glass, then unfolded the piece of paper, blinked at it.

*"Down the year  
And the light years,  
Wings wide spread  
To the silent gale . . .  
Wide wings beating  
The wall between  
Our reality and our reality  
And realities undreamed . . .  
Or dreamed?  
Down the years  
And the darkness . . ."*

He broke off abruptly, and Martha stiffened, her Minetti swinging to cover the open door. Peggy was there, demanding irritably, "Aren't you people going to lend a hand? Do I do all the work in this bloody ship?" She saw Doc, muttered, "Sorry. Did not know you had company."

"*We have company, Peggy,*" corrected Martha.

"You mean he . . ."

"Yes. He knows."

"Yes, indeed," agree Doc happily. "And I'll help you to beat your wings against the wall."

"What wall?" demanded Peggy disgustedly.

#### CHAPTER 18

IT was odd that we now trusted Doc without any question. Or was it so odd? There were those half memories, there was the haunting feeling that we had done all this before. Anyhow, we poured Peggy a drink, had

another one ourselves, and then made our way aft. In the workshop we picked up the thing that Peggy had been making. It did look like a cannon, and not a small one, either. It was fortunate that our acceleration was now extremely gentle, otherwise it would have been impossible for us to handle that heavy steel tube without rigging tackles.

We got it down, at last, to the transom space and dropped it on the after bulkhead. Martha climbed back, with Peggy and myself, into the air screw motor room; Doc stayed below. While Peggy and I climbed into spacesuits Martha passed the other equipment down to Jenkins—the welding and cutting tools, the can of powder. And then Doc came up and Peggy and I, armored against cold and vacuum, took his place.

Over our heads the airtight door slid shut. I heard the faint whirr of the pump that Peggy had installed in the motor room, realized that the atmosphere was being evacuated from our compartment. I saw the needle of the gauge on the wrist of my suit falling, watched it continue to drop even when I could no longer hear anything.

Peggy's voice in my helmet phones was surprisingly loud.

She said, "Let's get cracking."

It was Peggy who did most of the work. A tool in her hands was

an extension of her body—or, even, an extension of her personality. The blue-flaring torch cut a neat round hole in the bulkhead and then, after I had lifted the circle of still glowing steel away and clear, in the shell plating beyond. This section I kicked out, watched fascinated as it diminished slowly, a tiny, twinkling star against the utter blackness. Peggy, irritably, pulled me back to the work in hand. Together we maneuvered the rocket tube into place. It was a tight fit, but not too tight. And then Peggy stitched metal to metal with the delicate precision that an ancestress might have displayed with needle, thread and fine fabric.

I watched her with something akin to envy—and it was more than her manual dexterity that I envied. She had something that occupied all her attention, I had not. I had time to doubt, and to wonder. At the back of my mind a nagging, insistent voice was saying, *No good will come of this.*

I heard Peggy's satisfied grunt in my helmet phones, saw that the job was finished. She unscrewed the breech of the tube, flipped it back on its hinge. She picked up a wad of rags, shoved it down the barrel, but not too far down. I managed to get the lid off the powder canister, handed it to her. She poured the black grains on to the

wad. Her guess as to the positioning of it had been a good one; only a spoonful of gunpowder remained in the can. This she transferred to a tubular recess in the middle of the breech block, stoppering it with another scrap of rag. She replaced the block then, gasping slightly as she gave it that extra half turn to insure that it was well and tightly home.

"O.K., Martha," she said. "You can let the air back in."

"Valve open," Martha's voice said tinnily from the phones.

I watched the needle of my wrist gauge start to rise, heard, after a while, the thin, high screaming of the intruding atmosphere. And then the airtight door over our heads opened and I saw Martha and Doc framed in the opening, looking not at us but at what we had done. After a second's hesitation they joined us in the transom space. Martha helped Peggy off with her helmet; Doc removed mine for me.

"A neat job," said Martha.

"It will do," said Peggy.

"I hope," added Doc, but he did not seem unduly worried.

"You wire her up," said Peggy to Martha. "I can't do it in these damn' gloves."

"Anything to oblige," murmured Martha. She handed the double cable that she had brought down with her to Jenkins, started to loosen the

thumbscrews on the breech block.

I KNOW that I'm only the Captain," said a cold, a very cold voice, "but might I inquire what the hell you're up to?"

"We're going to make this wagon roll and go," replied Jenkins happily.

I looked up from the make-shift rocket, saw that Sandra and Listowel were standing in the motor room, looking down at us through the doorway. Sandra was icily furious. Listowel looked mildly interested.

Sandra's finger pointed first at Peggy, then at myself. "Spacesuits . . . Have you been Outside?" she demanded.

"No," said Peggy.

"Don't worry, Skipper," said Jenkins. "We didn't lose any atmosphere. We sealed the transom space off before Peggy and Peter went to work, and put the pump on it . . ."

"*But you pierced the hull,*" she said with mounting anger.

"Only a *small hole,*" admitted Jenkins.

"This," she grated, "is too much. Only a couple of weeks out and you're already space happy. Burning holes in the pressure plating and risking all our lives. Are you mad?"

"No," stated Doc. "And when you find out what it's about you'll be pleased . . ."

"Pleased? I shall be pleased all right. I shall roll on the deck in uncontrollable ecstasy. And I'll have your guts for a necktie, and then I'll boot you out of the airlock without spacesuits. I'll . . ."

"Be reasonable, Sandra," admonished Listowel rashly.

"Reasonable? I am being reasonable. All these officers have work that they should be doing, instead of which I find them engaged in some fantastic act of sabotage . . ."

"Sandra," I put in, "I can explain . . ."

"*You?* You ineffectual puppy!" I saw with shock that there was a pistol in her hand. "Come up out of there, all of you. That is an order." She turned to her companion. "Commander Listowel, as Captain of this vessel I request your aid in dealing with these mutineers."

"But," I began.

"Drop whatever you're doing," she snapped, "and come up."

"Better do as she says," grumbled Peggy. She picked up her welding torch.

"Just let us tell you what it's all about, Skipper," pleaded Jenkins, edging towards the power point into which the torch was plugged.

"No," said Sandra flatly.

"But . . ." murmured Peggy, her voice trailing off.

There was the sharp click of a switch and the torch flared blindingly. I realized Peggy's intention, but too late. As I tried to wrest the tool from her hands (*but why? but why?*) the metal casing of the firing chamber was already cherry red.

I felt rather than heard the *whoomph* of the exploding powder . . .

And . . .

## CHAPTER 19

HER body against mine was warm and resilient, yielding—and then, at the finish, almost violently possessive. There was the flaring intensity of sensation, prolonged to the limits of endurance, and the long, long fall down into the soft darkness of the sweetest sleep of all.

And yet . . .

"Sandra . . ." I started to say, before my eyes were properly focussed on the face beside mine on the pillow.

She snapped back into full consciousness, stared at me coldly.

"What was that, Peter? I've suspected that . . ."

"I don't know, Peggy," I muttered. "I don't know . . ."

*I don't know, I thought. I don't know. But I remember . . . What do I remember? Some crazy dream about another ship, another lightjammer, with Sandra as the Captain and myself as*



*Catering Officer and Ralph as some sort of outsider . . . And I was married to Sandra, in this dream, and I'd lost her, and I was trying to win her back with Peggy's help . . . There was something about a solid fuel rocket . . .*

"What is it, Peter?" she asked sharply.

"A dream," I told her. "It must have been a dream . . ."

I unsnapped the elastic webbing that held us to the bunk, floated away from it and from Peggy to the center of the cabin. I looked around me, noting details in the dim light, trying to reassure myself of its reality, of our reality. It was all so familiar, and all so old. The ghosts of those who had lived here, who had loved here and hated here, generation after generation, seemed to whisper to me, *This is Thermopylae. This is all the world you have ever known, ever will know . . .*

It was all so unfamiliar.

And Peggy . . .

I turned to look at her as she lay on the bed, still held there by the webbing, the bands startlingly white against her golden skin. She was real enough. Her naked beauty was part of my memories—all my memories.

"Peter," she said. "Peter, come back."

From nowhere a tag of poetry drifted into my mind.

*". . . and home there's no re-  
turning.*

*The Spartans on the sea-wet  
rock sat down and combed  
their hair."*

It made an odd sort of sense.

Thermopylae—the last stand of the Spartans, back in the early dawn of Terran history . . . *Thermopylae*—one of the great windjammers that sailed Earth's seas . . . *Thermopylae*—the last stand of the Spartacists . . .

"Come back," she called pleadingly.

"I'm here," I told her. "I'm here. It was just that I had a little trouble getting myself oriented . . ."

Stretching my right leg I was just able to touch the bulkhead with the tip of my big toe, shoved gently. I drifted back in the general direction of the bed. Peggy extended her arm and caught me, pulled me to her.

"Born in the ship," she scolded, "raised in the ship, and you still haven't the sense to put your sandals on . . ."

"There was that . . . strangeness . . ." I faltered.

"If that's what I do to you, my boy, I'd better see about getting a divorce. There's nothing strange about us. I'm a perfectly prosaic Plumber, and you're a prurient Purser, and our names start with a P as well as our ratings, so we're obviously made for each other. At least, I

thought so until just now . . . But when the bridegroom, on his wedding night, starts calling his blushing bride by another woman's name it's rather much . . ." She smiled tantalizingly. "Of course, I had quite a crush on Ralph once—not that he'd ever notice me. Plumbers are rather beneath the Captain's notice. He reminds me so much of my father . . ." Her face sobered. "I wonder what it would be like to live on a real world, a planet, with ample living room and with no necessity to stash parents away in the Deep Freeze when they've lived their allotted span? I wonder if our fathers and mothers, and their fathers and mothers, will ever be revived to walk on grass and breathe fresh air . . . I wonder if we shall ever be revived after we're put away to make room for *our* children . . ." She reached out for something from the bedside locker—and suddenly her expression was one of puzzlement and disappointment. She whispered, "I wanted a cigarette . . . I wanted a cigarette to smoke and to wave in the air as I talked . . ."

I asked, "What is a cigarette?"

"I . . . I don't know . . . I think it would be one of those tiny, white smouldering tubes that characters are always playing with in the old films . . .

Those men and women who played out their dramas on worlds like Earth and Austral and Caribbea, or aboard ships that could cross the Galaxy in a matter of months." She said intensely, "At times I hate the Spartacists. It was all very well for them, the disgruntled technicians and scientists who thought that they had become the slaves of capital and organized labor—whatever *they* were and who staged their futile slave revolt, and built this crazy ship because they hadn't the money or materials to construct a Mannschenn Drive job—whatever *that* was. It was all very well for *them*, the romantic Burnhamites, pushing out under full sail for the Rim Stars—but what about us? Born in this tin coffin, living in this tin coffin and, at the end, put to sleep in this tin coffin—unless we die first—in the hope of a glorious resurrection on some fair planet circling a dim, distant sun. And we've never known the feel of grass under our bare feet, never known the kiss of the sun and the breeze on our skins, making do with fans and UV lamps, taking our exercise in the centrifuge instead of on the playing field or in the swimming pool, subsisting on algae and on tissue cultures that have long since lost any flavor they once had.

"Why, even on Lorn . . ."

"Even on Lorn?" I echoed.

"What am I saying?" she whispered. "What am I saying? Where is Lorn?"

LORN, Faraway, Ultimo and Thule . . ." I murmured. "And the worlds of the Eastern Circuit—Tharn and Grollor, Mellise and Stree . . . Tharn, with the dirt streets in the towns, and the traders' stalls under the flaring gas jets as the evening falls, and the taverns with good liquor and good company . . . Mellise, and the long swell rolling in from half way across the world, breaking on the white beaches of the archipelago . . ."

"What's happened to us?" she cried. Then, "What have we lost?"

"How can we have lost," I asked, "what we have never known?"

"Dreams," she whispered. "Dreams . . . Or the alternative time tracks that Claude is always talking about . . . Somewhere, or somewhen, another Peter and Peggy have walked the white beaches of Mellise, have swum together in the warm sea . . . Somewhen we have strolled together along a street on Tharn, and you have bought for me a bracelet of beaten silver . . ."

"Dreams," I said. "But you are the reality, and you are beautiful . . ."

As I kissed her my desire

mounted. But there was a part of myself holding back, there was a cold voice at the back of my mind that said, *You are doing this to forget. You are doing this to forget the worlds and the ships and the women that you have known . . .* And, coldly, I answered myself with the question, *Is there a better way of forgetting? And why should one not forget a foolish dream?*

Her urgent mouth was on mine and her arms were about me, and forgetfulness was sweet and reality was all we need ever ask, and . . .

A giant hand slammed us from the bunk, snapping the webbing, hurling us against the bulkhead. The single dim light went out. We sprawled against the cold, metal surface, held there by some pseudo-gravity, desperately to each other. Dimly I heard the incessant shrilling of alarm bells and, somewhere, somebody screaming. Felt rather than heard was the thudding shut of airtight doors.

The pressure against us relaxed and, slowly, we drifted into the center of the cabin. I held Peggy to me tightly. I could hear her breathing, could feel her chest rising and falling against my own. She stirred feebly.

"Peggy, are you all right?" I cried. "Darling, are you all right?"

"I . . . I think so . . ." she replied faintly. Then, with a flash of the old humor, "Do you have to be so rough?"

There was a crackling sound and then, from the bulkhead Ralph, calm as always, authoritative.

"This is the Captain. We have been in collision with a meteor swarm. Will all surviving personnel report to the Control Room, please? All surviving personnel report to the Control Room."

"We'd better do as the man says," said Peggy shakily, "even though it means dressing in the dark . . ."

#### CHAPTER 20

WE were in the Control Room—those of us who had survived.

We had made our rounds, armored against cold and vacuum. We had seen the results of our collision with the meteor swarm, the rending and melting of tough metal and plastic, the effects of sudden decompression on human flesh. We had seen too much. Speaking for myself, it was only the uncanny half knowledge that was only an evil dream that enabled me to keep a hold on my sanity.

We were in the Control Room—the seven of us.

There was Ralph Listowel, Acting Captain, strapped in his

seat before the useless controls. Beside him, anchored to the deck by the magnetic soles of her sandals, stood Sandra, Acting Mate. And there was Jenkins, Ship's Surgeon, and very close to him stood Martha Wayne, Ship's Chronicler. There was Peggy, Ship's Plumber. There was Claude Smethwick, always the odd man out. There was myself.

We had survived.

We had made our rounds of the stricken *Thermopylae* and had found no other survivors. All the accommodation abaft officers' country had been holed, as had been the Dormitory, the "Deep Freeze", in which our parents—and their parents, and *their* parents—had been laid away, in stasis, to await planet-fall. But they had never known what had hit them. They were luckier than our generation, for whom there must have been a long second or so of agonized realization, the horror of bursting lungs and viscera, before the end.

"Report," ordered Ralph tiredly.

There was a long silence, which Jenkins was the first to break. He said, "We suited up, and went through the ship. She's like a colander. There are no other survivors."

"None?" asked Ralph.

"No, Skipper. Do you wish details?"

"No," said Ralph, heavily.

"I made rounds with David," said Sandra. "The Deep Freeze has had it. So has all the accommodation abaft officers' country. So has most of the accommodation forward of the bulkhead. Second Mate, Third Mate, Engineers, Catering Officer—all dead. Very dead . . ."

"And Outside?" asked Ralph.

"I saw what I could from the blisters. It's a mess. Spars buckled. Twenty odd square miles of sail in ribbons . . ."

"Report," said Ralph, looking at me.

I told him, "I've been through the Farm. We haven't got a Farm any more. The Tank Room and the Tissue Culture Room were both holed. Of course, the deep frozen, dehydrated tissue cultures will keep us going for some time . . ."

"If we had air and water they would," said Jenkins glumly. "But we haven't."

"There are the cylinders of reserve oxygen," I pointed out.

"And how do we get rid of the carbon dioxide?" asked the Doctor.

"Chemicals . . ." suggested Peggy vaguely.

"What chemicals?" he demanded. He went on, "Oh, we can keep alive for a few days, or a few weeks—but we shall merely be postponing the inevitable. Better to end it now, Skipper.

I've the drugs for the job. It will be quite painless. It could even be pleasant . . ."

Ralph turned to Peggy. "Report."

She said, "The Generator Room's wrecked. The only power we have at our disposal is from the batteries."

"And their life?"

"If we practice the utmost economy, perhaps two hundred hours. But I may be able to get a jenny repaired . . ."

"And burn up our oxygen reserve running it," said Ralph. Then, to Smethwick, "Report."

"I've tried," the telepath whispered. "I've tried. But there's no contact anywhere. We are alone, lost and alone. But . . ."

"But?" echoed Ralph.

"I . . . I'm not sure . . ." Then, suddenly, Smethwick seemed to gain stature, to change his personality almost. Always, until now, the shyest and most retiring of men, he dominated us by his vehemence. "Don't *you* have the memories—the memories of the lives you've lived elsewhere, elsewhen? Haven't you any recollection of yourself as Captain Listowel, of the Rim Runners' fleet, as Commander Listowel, of the Federation Survey Service? And the rest of you," he went on, "don't *you* remember? This isn't the only life—nor is it the only death . . ."

"Lorn and Faraway . . ." I said softly.

"Ultimo and Thule . . ." whispered Martha.

"And the planets of the Eastern Circuit," said Sandra flatly.

"You remember," cried Smethwick. "Of course you remember. I'm snooping now. I admit it. You can do what you like to me, but I'm snooping. I'm peeping into your minds. And it all adds up, what I can read of your memories, your half memories. There's the pattern, the unbreakable pattern. All the time, every time, it's been just the seven of us—aboard *Flying Cloud*, aboard *Aeriel*, and now aboard *Thermopylae* . . .

"There's the pattern . . . We've tried to break free from it, but we have never succeeded. But we have changed it—every time we have changed it—and we can change it again. Whether for better or for worse I cannot say—but it can hardly be for worse now."

RALPH was looking at Sandra—and once, I knew, the way that she was looking back at him would have aroused my intense jealousy. "Yes," he said slowly. "I remember . . . Hazily . . . Even so, wasn't there some trouble with Peter?"

I was holding Peggy close to me. "There was," I said. "But not any more."

"And what about you, Martha?" asked Sandra. "Do you remember?"

"I do," she said, "but I'm perfectly happy the way that things are now. Both David and I are happy—so happy, in fact, that I don't welcome the idea of euthanasia . . ."

"Go on," urged Smethwick. "Go on. Remember!"

"I made a rocket," muttered Peggy hesitantly. "Didn't I?"

"And I mixed a batch of solid fuel," I supported her.

"No," contradicted Doc. "I did."

"Someone did," stated Ralph, looking rather hostile.

"Too right," said Sandra. "And whoever it was put us in the jam that we're in now. I was quite happy as Catering-Officer-cum-Third-Mate of *Flying Cloud*, and quite happy as Captain of *Aeriel*, and I rather resent finding myself Chief Officer of a dismantled derelict, with only a few days to live."

"You might have been happy," I told her, "but you must admit that the way things were aboard *Aeriel* did not, repeat not, contribute to my happiness."

"My marriage to you was a big mistake," she said.

"Wasn't it just!" I agreed. "On my part. I should have known better. Give a woman a position of authority and she at once abuses it."

"I resent that," said Sandra. "Resent away," I told her, "if it makes you any happier. Resenting seems to be your specialty, darling."

"But you were such a lousy cook," she said.

"Like hell I was" I flared. "I'm a good cook, and you know it. *Aeriel* fed a damn' sight better than *Flying Cloud* ever did."

"I suppose," she said, "that you mixed gunpowder in with your curry."

"You wouldn't know the difference," I sneered.

"Who would?" she sneered back.

"I think his curry is good," said Peggy loyally.

"You would," snapped Sandra.

"The rocket!" Claude was screaming. "*The rocket!*"

I told him what to do with the rocket, tail fins and all. I said to Sandra, "It's high time that we got things sorted out. You behaved very shabbily. Even you must admit that. I've nothing against Ralph—in fact I think that he's more to be pitied than blamed. But if it hadn't been for the way that *you* carried on aboard both *Flying Cloud* and *Aeriel* there wouldn't have been any rockets. There wouldn't have been any misguided attempts to break the Light Barrier."

"So it's all my fault," she said sarcastically.

"Of course," I told her.

"And that refugee from a bicycle shop, to whom you happen to be married at the moment, has nothing at all to do with it. Oh, no. And neither has the incompetent pill peddler who mixed the first batch of powder. And neither have you, who mixed the second. But, as far as I'm concerned, what really rankles is this. I don't mind all this switching from one Time Track to another—after all, variety is the spice of life. What I do object to is being the victim of the blundering machinations of the same bunch of dimwits every time. It's too much. Really, it's too much."

"My heart fair bleeds for you," I said. "But let me suggest that on the next Time Track you get you to a nunnery. Preferably a Trappist one. If there are such institutions."

Her face was white with passion. Her hand flashed out, caught me a stinging blow across the mouth. My feet lost their magnetic contact with the deck and I floated backwards, fetching up hard against the bulkhead.

Peggy, her voice bitter, said, "You deserved that."

"No," said Martha. "No. Everything has been Sandra's fault."

"Pipe down," ordered Ralph. "And you, Malcolm, please refrain from making any more slanderous attacks on my wife."

"My wife," I corrected him.

"Not in this continuum," he pointed out. "But what happened in the alternative universes has a certain bearing upon our present predicament. Thanks to your otherwise unpardonable outburst, we can remember now . . ."

"And about time you did," said Claude.

"We can't all be perfect," stated Ralph, with mild sarcasm. "Even so, we can try. We know the way out now—and, this time, we're all of us involved. *All* of us. We must break the Light Barrier once more, and the only way that we can do it is by giving this wagon that extra push. Has anybody any suggestions?"

Martha said slowly, "We must have been close to Lume One when the meteors hit us. But the impact was at right angles to our trajectory . . ."

"Work it out by the parallelogram of forces," Ralph told her. "If you really want to, that is. But we have the Döppler Log—it's still working—and that gives us the answer without any mucking about with slipsticks. Even though we are a dismasted derelict we're still bowling along at a good rate of knots. But it'll take more than a powder-fuelled rocket to give us the boost."

"There's the reserve oxygen," I said.

"And there's plenty of alco-

hol," added Jenkins, helpfully.

"And Peggy's a plumber in this incarnation," said Sandra.

"So . . ." said Ralph.

## CHAPTER 21

IT was dark outside and, in spite of the heating units and insulation of our suits, bitterly cold. Astern of us was the dull-glowing Galactic Lens, a monstrous ember in the black ash of the Ultimate Night. Ahead of us, flaring with an unnatural steely brilliance, was one of the distant island nebulae. But we were in no mood for astronomical sight-seeing. Almost at once our attention was caught and held by the horrible tangle of twisted wreckage that extended all the way from the stern, where we were standing, to the stem of the huge ship, that stood out sharply and shockingly in the harsh glare of our working lights—the buckled spars, the vast, disorderly expanse of tattered sail and snapped cordage, the rent and battered shell plating. But we did not look long—nor did we want to. There was work to do—burning and welding, manhandling the massive pipe sections into place, heating and beating the twisted plating of the stern so that it conformed, more or less, to our plans.

Peggy took charge—and it was Peggy, too, who did most of the work. A tool in her hands



was an extension of her body—or, even, an extension of her personality. She stitched metal to metal with the delicate precision that an ancestress might have displayed with needle, thread and fine fabric. I watched her with envy, and it was not only her manual dexterity that I envied. She was so sure of herself, so certain. And I was not certain. Oh, I had no doubts that this was the only way out of our predicament—but once we had won through to an alternative time track should we be any better off? In *Thermopylae* we had achieved what seemed to be a stable grouping, like paired with like, but would it, could it last?

I looked at Peggy, and I hoped with all my heart that it would.

I heard her satisfied, peculiarly feminine grunt in my helmet phones. She said flatly, "That's that."

"Even so," murmured Ralph doubtfully, "Will it hold?"

"Long enough," she told him cheerfully. "Long enough. After all, Ralph, this isn't the first time . . ."

"No," said Sandra, a nasty edge to her voice, "it isn't."

"That will do," ordered her husband coldly.

"And now we'll connect up the tanks and bottles," said Peggy.

We clambered back inside through the rents in the shell plating, back into the wrecked

lazarette. Intended for use as a sick bay by the ship's builders it had become, over the generations, a storeroom, a repository for things that never had been used, that never would be used, that had been stashed away in the belief that somebody, sooner or later, would find a use for them. We had found the piping there, a fine assortment, large and small bore. Some had been damaged by the meteor swarm, most of it had not. Its being there had saved us time and labor.

THE oxygen cylinders and the tanks of alcohol we had to lug through the ship, however, from the centrally situated storage compartments. The work was heavy and awkward, but that wasn't the worst part of it. The trouble was that we were obliged to see again the torn, frozen bodies of our late shipmates. And there was that sense of responsibility that was so hard to shake off. If it hadn't been for the pattern, as we were thinking of it, if it hadn't been for the odd design which made it, somehow, imperative that the seven of us, and only the seven of us, should be attempting to break the Light Barrier by means of rocket power, would *Thermopylae* have come to grief? And had we, of our own volition, established the pattern? Or were we no more than puppets?

But we worked on. We were still alive, and we had every inducement to stay that way. We convinced ourselves that we were in, but not of, *Thermopylae*. We felt that we were innocent bystanders involved, by blind chance, in a catastrophe not of our making, not of our concern. All that concerned us was getting the hell out, and that as soon as possible. My parents, I knew, were among those who had perished when the cosmic debris destroyed the Deep Freeze. But my parents, I knew with even greater certainty, were solid citizens of Dunedin, capital of the Empire of Waverley, who, without fail, sent me a canned haggis every year in the pious hope that it would arrive at or before Hogmanay. Then there was the carrot cat Susan. I had known her before I met Peggy. I had known her very well indeed. I had seen her—what was left of her—as I helped lug the oxygen cylinders back aft from the stores. And I told myself, *That pitiful, broken body means nothing to me. When I was in Flying Cloud, when I was in Aerial, I never knew anybody called Susan . . .*

I told myself that . . .

But we worked, all of us, fetching and carrying at Peggy's command, sweating in our suits, gasping in the stale air. We watched the makeshift contraption growing as we worked—the

alcohol tanks with the oxygen bottles attached to them to drive the fluid into the firing chamber, the other oxygen bottles that would feed directly into the rocket motor. It was a dreadfully inefficient set-up, but it didn't matter. Mass Ratio didn't worry us. We weren't concerned with Escape Velocity; all that we wanted was that extra nudge, the push that would drive us faster than light, that would expel us from this continuum in which we didn't belong.

We worked—stumbling, fumbling automatons, breathing our own stinks, our skin chafed and sore inside our suits. We worked, tired and hungry and thirsty as we were. There was the urgency, there was the feeling that if we failed to meet the deadline we should be marooned here, doomed to die in a little, ruined world not of our making. We worked, half blinded by the actinic flaring of Peggy's torch, cursing the tools that slipped from our clumsy, gloved hands, cursing each other for clumsiness and failure to cooperate.

But we worked.

And, astern of us, the target at which the cannon of our jury rocket was aimed, we could see the dull-glowing Galactic Lens, the smear of smoky crimson against the darkness. Whatever happened, we all knew, there was no return, ever, to the warmth

and light of the Center. We belonged on the Rim. Aboard *Flying Cloud*, aboard *Aeriel*, aboard *Thermopylae*—we belonged on the Rim . . .

"Now," Peggy was saying. "Now. Stand by, all of you . . ."

"Wait!" Ralph's voice was sharp. "There'll be acceleration. Unless we've secured ourselves we shall fall through the holes in the plating—and that will be the end."

"Then secure yourselves," said Peggy.

I shuffled to where she was standing, got one arm around a stanchion, the other around her waist. I saw that the others were similarly disposing themselves. Peggy, with both hands free, opened two valves. From the venturi of the rocket jetted a white vapor. Then her right hand went out to a crude switch—and, abruptly, the white vapor became a torrent of fire.

*It won't work*, I thought. *It won't work. Not this time . . .*

Desperately I clung to the stanchion, fighting the pseudo gravity of our acceleration. I tried not to look down through the rents in the shell plating, tried to ignore the light-years-deep chasm beneath us. I clung with desperation to the stanchion and, even more desperately to Peggy, who needed both hands to adjust the valves.

The weight on my arms, as ac-

celeration mounted, became intolerable, but I knew that I must not, could not, would not let go.

Then I felt the ominous vibration as the stanchion started to give.

## CHAPTER 22

A HEAD of us had been the spark of luminescence that was a planet, astern of us the disc of fire that was a sun. We had done the things that had to be done—mechanically, not too inefficiently. But I was still seeing, in my mind's eye, the dull-glowing lens of the Galaxy, smoky crimson against the sooty depths of the Ultimate Night, still feeling, in my left hand and arm, the strain—the strain, and the crepitation of the weakening, snapping stanchion. What was real and what was unreal? Was this world towards which we were headed some sort of latter day Fiddlers' Green, a heaven (or hell?) for the souls of departed spacemen?

But we had done the right things, shortening sail, trimming sail, rotating the spars so that the black surfaces of some of the vanes were presented to the major luminary, so that their reflecting surfaces were catching the reflected light from the planet. We had slowed down sufficiently for the making of a safe approach.

I reached out for the big bin-

oculars on their universally jointed mount. I thought, *I'll play this for real. But it must be real. Or must it?* Slowly, carefully, I adjusted the focus. What had been, only short hours ago, little more than a point of light was now a great, shining sphere. I stared at it stupidly. About a third of the planetary surface was cloud covered, mainly in the polar regions. I could observe clearly the seas and the continents—blue and brown and green, the snowclad peaks of the mountain ranges a sparkling white—the seas and the continents, the utterly unfamiliar configurations of land and water.

"What world is it?" asked Ralph again, addressing me directly this time.

"I don't know," I admitted, adding wryly, "But navigation in this ship—or these ships?—has been rather a lost art of late . . ."

"But not, unfortunately, rocketry," observed Sandra cattily.

"Pipe down," growled Ralph. "Pipe down. We've all of us come through, somehow, and we're back where we belong, in *Flying Cloud*. All we have to do now is to make a landing."

"But where, lord and master?" asked Sandra, too sweetly. "But where?"

"Does it matter?" he growled. "That looks to be a very pleasant world. Frankly, I shall be happy to set this scow down on any

convenient stretch of calm water. After we're rested we'll see about getting our bearings . . ."

"In Space?" she asked. "Or in Time? Or both?"

"Does it matter?" he almost shouted. Then—"It's time we heard something from our tame telepath."

I said, "His amplifier up and died on him."

"I hope he hasn't dumped it," said Sandra, "although I never did fancy dog's brain in aspic. But Peter could make a curry of it."

"I'm not the Cook," I told her coldly. "Not on this Time Track. And neither, my dear, are *you* the Captain."

Ralph glared at us, then turned to the journalist. "Any luck, Martha?"

"Yes," she said, fiddling with the controls of her transceiver. "There *are* people there, and they're advanced enough to run to radio. Their language is strange—to me, at any rate—but their music is human enough, even though it is too corny for *my* taste . . ." She switched over from headphone to speaker. There was a man singing, in a pleasant baritone, accompanied by some stringed instrument. The melody was hauntingly familiar, although the words were in that unknown tongue. Then, in spite of the shifts in key and distortions of rhythm, I had it.

*Goodbye, I'll run  
To seek another sun  
Where I  
May find  
There are worlds more kind  
Than the ones left behind . . .*  
I said, "The Rim Runners'  
March . . ."

"You could be right," said Ralph doubtfully. Then, with growing assurance, "You could be right. Even so, that piece of music is not the exclusive property of Rim Runners. It's old, old—and nobody knows how many times it's had fresh lyrics tacked on to it. But hearing it, on *their* radio, is evidence that Terran ships have been in contact with this world. The Survey Service, perhaps, or some off-course star tramp . . . But I think that we can expect a friendly reception, assistance, even . . ." He was beginning to look more cheerful. "All right. We'll get the rest of the way off this wagon now. This is the ideal approach, towards the sunlit hemisphere of the planet. You know the drill, all of you. Trim sails—black surfaces towards the sun, reflecting surfaces towards the source of reflected light. Start the pumps as soon as they have some atmosphere to work on . . ."

**H**IS strong, capable hands played over the control panel. I watched the tell-tale screen. There was the ship as seen from

directly ahead, as scanned by the camera at the end of its long bowsprit, eclipsing the sun and, surrounding her, the geometric array of vanes and spars, some blindingly white, some sooty black. I watched—but there was no change in the design. I heard Ralph curse softly, looked back to him. The control panel was alive with red lights.

The intercom speaker crackled and from it issued Peggy's voice. "The wiring's gone. The power supply to the trimming motors. Burned out."

"Manual trimming," ordered Ralph sharply. "Get along to the Trimming Motor Room, all of you. And fast."

I was first out of the Control Room, with Sandra, Doc Jenkins and Martha hard on my heels. We shuffled through the alleyways at speed, keeping the magnetized soles of our sandals in contact with the deck, knowing that to fall free would be to waste time rather than to gain it. But it was a nightmarish means of progression. As we passed the Psionic Radio Room we ran into Claude Smethwick, who had just come out into the alleyway. I grabbed his arm, hustled him along with us, refused to listen to what he was trying to tell me.

The Trimming Motor Room stank of burned insulation, of overheated and melted metal and

plastic, of ozone. Peggy was there, frantically stripping panels from the bulkhead sheathing, laying bare the damaged wiring. I heard Sandra say, "If you'd done this before, Miss Cummings, instead of playing around with homemade fireworks . . ."

"Shut up!" I shouted. Then, "Peggy, put the manual controls in gear!"

"Peter," Claude Smethwick was babbling. "Peter, I've made contact. This world . . ."

"Later," I snapped. "Tell me later. We have to get the way off the ship."

"But . . ."

"Get your paws on to that wheel, all of you! Now . . . Now . . . *Together!*" The hand gear was stubborn and our actions, at first, clumsy and uncoordinated. "*Together!*" I shouted again.

The worst of it all was that we were having to work in Free Fall conditions. All that held us to the deck was the magnetism of the soles of our sandals. We had no purchase. Yet, at last, the big wheel started to turn—slowly, slowly. I wondered how much time remained to us before we should plunge, a blazing meteorite, down through the planet's atmosphere.

I snatched a glance at the indicator, gasped, "Belay, there. Belay." So far, so good. The main drivers were trimmed. The auxiliary vanes still presented a

greater reflecting surface to the sun than did the mains'ls to the reflected light of the planet, but things were coming under control, the feeling of nightmarish urgency was abating.

Ralph's voice came through the intercom. "Trim 1 and 2 spinnakers. Then stand by."

"Turn back!" bawled Claude Smethwick. "We must turn back!"

"Why, Mr. Smethwick?" asked Ralph's disembodied voice coldly.

"I've been trying to tell you, but nobody will listen. I've been in touch with the telepaths on that planet. It's Llanith, one of the anti-matter worlds. And they say, 'Turn back! Turn back!'"

"Mr. Malcolm," snapped Ralph. "Trim all sails!"

Again we strained and sweated, again we were driven by the nightmarish sense of urgency. The first pair of spinnakers was trimmed—and then, with the second pair of auxiliary vanes rotated barely a degree on their spars, the hand gear seized up. Peggy said nothing, just relinquished her hold on the wheel and walked rapidly to the space-suit locker.

I demanded, "Where are you off to?"

She said, "I have to go Outside."

"If there's time," muttered Sandra. "If there's time. Why

don't you make another rocket, dearie?"

"What's the delay?" Ralph was demanding. "What's the delay?" Then, his voice suddenly soft, "Goodbye, all of you. It's been good knowing you. Goodbye, Sandra . . ."

She said fiercely, "I might be able to make it to Control in time . . ."

Dropping our hands from the useless wheel we watched her go. "Very touching," whispered Jenkins. "Very touching . . ." But, in spite of the slight edge of sarcasm to his voice, he was holding Martha Wayne very closely.

I said to Peggy, "This seems to be it. A pity, since everything's been tidied up so nicely."

She pushed the spacesuit back into its locker, came to stand beside me. She said, putting her hand in mine, "But this mightn't be the end, my dear. Even if there's no after life, we know that we're still living in the alternative universes . . ."

"Or dying . . ." said Jenkins glumly.

And then—it's odd the way that the human brain works in a crisis—a snatch of archaic verse that I must have learned as a child rose from the depths of my memory, flashed across my mind.

*And fast through the mid-*  
*night dark and drear,*

*Through the whistling sleet*  
*and snow,*

*Like a sheeted ghost the ves-*  
*sel swept*

*On the reef of Norman's*  
*woe . . .*

But the crew of the schooner *Hesperus* had died a cold death—ours would be a fiery one. I hoped that it would be sudden.

The ship lurched and shuddered, as though she had, in actual fact, driven on to a reef. There was a rending, tearing noise, felt as well as heard—the spars and sails, I realized, bearing the brunt of our impact with planet's atmosphere, braking us, slowing us down. There was the thin, high scream of air rushing over and through projections on our hull, gaps in our shell plating. The temperature rose sharply. I held Peggy to me tightly, thinking, *This is it.*

The screaming died to a faint whistle, was drowned by a new sound, the throbbing of the air compressors.

Ralph's voice from the bulkhead speaker was faint and shaky, yet reassuring. He said, "All hands report to the Control Room. All hands report to Control—to splice the main brace. And then we'll make it Landing Stations."

#### CHAPTER 23

IT'S not at all a bad sort of world, this Llanith, and I rather think that Peggy and I shall be staying here, even

though Ralph and the local scientists are sure that they'll be able to work out just what did happen, just how *Flying Cloud* made the transition from normal matter to anti-matter, or *vice versa*. The Commodore will not have achieved the economical means of interstellar travel of his dreams, but we shall have presented him with something better, much better. There's little doubt that commerce and cultural exchange between the Llanithi Consortium and the Rim Worlds Federation will soon be practicable. And Peggy and I will have an edge on those who, in the not too distant future, will come to learn and to teach and to trade.

Meanwhile, Ralph has suggested that each of us tell the story, in his own words, of what happened. The stories, he says, will be of great value to the scientists, both on Llanith and back home on Lorn. It seems that there may have been other forces besides physical ones at play, that psychology may have come into it, and psionics. Be that as it may, it seems obvious—to Peggy and I, at any rate—that the attempt to exceed the speed of light was the governing factor.

Not that we worry much about it.

We're doing nicely, very nicely, the pair of us. My restaurant

is better than paying its way; even though the Llanithi had never dreamed of such highly spiced dishes as curry they're fast acquiring the taste for them. And the bicycles—another novelty—that Peggy makes in her little factory are selling like hot cakes.

Doc and Martha are settling down, too. There's quite a demand for the sort of verse and music that they can turn out without really trying. And when they get tired of composing they pick up their brushes and dazzle the natives with Neo-Abstractionism. And Claude? He gets by. A telepath can find himself at home anywhere where there are others of his kind. If the Llanithi were purple octopi—which they aren't, of course—he'd be equally happy.

It's only Ralph and Sandra who aren't fitting in. Each of them possesses a rather overdeveloped sense of duty—although I am inclined to wonder if Sandra, in her case, isn't really hoping to find her way back to that Time Track on which the Matriarchate ruled the Rim Worlds and on which she was Captain of her own ship.

If she ever does, I shall be neither her husband nor her Cook. This Universe suits me.

**The End—So Far as This  
Continuum Is Concerned.**



## EDITORIAL

(Continued from page 5)

This would be, in effect, an artificial gill. To prevent the lungs from collapsing under water, Cousteau would pack the ribcage with a non-compressible plastic. He adds: "An even better way to produce *Homo aquaticus* would be to make a real manfish. He would inhale water instead of air, as a fish does. There is nothing freakish about the idea. During the first nine months of human life we grow while immersed in fluid in the womb."

Ultimately, Cousteau predicted at the recent meeting of the World Congress on Underwater Activities, a new kind of man will evolve: to be born and live in submerged towns, and to work and take pleasure in the sea. Some zoologists accepted this without surprise. One British expert, pointing out that man had come out of the sea, would merely be completing an evolutionary cycle when it reached the aquatic stage again and returned to the sea as *Homo aquaticus*. Others, of course, ridiculed Cousteau's prophecy with the usual cry of "science-fiction."

"What's wrong with science-fiction as a presentiment of reality?" Cousteau replied. "Ever since Jules Verne, and lots of people before him, the human imagination has projected what is to come."  
—NL

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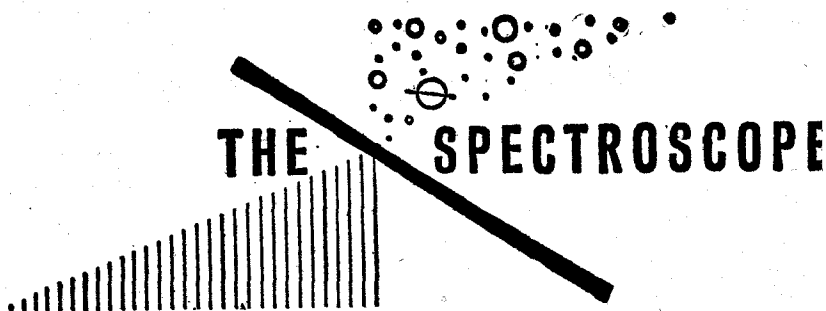
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# THE SPECTROSCOPE

By S. E. COTTS

**The Beast.** By A. E. van Vogt. 207 pp. Doubleday & Co., Inc., \$3.50.

Whatever happened to A. E. van Vogt? You remember, that highly original writer who was responsible for the "Weapon Shop" books. Well, wherever he is, there is little trace of his vintage imagination in this novel, *The Beast*, composed of a few shorter pieces that first saw the light of day in magazine form almost twenty years ago. Sometimes it is good to resurrect old works, but in this case the noble gesture boomeranged. Perhaps *The Beast* might have passed as acceptable were it by a younger, more untried author, but it is almost impossible (and not desirable, anyway) to separate an established and prolific writer from his past accomplishments when judging his succeeding works.

The main trouble with this book is that too many different types of events and discoveries

occur in it where one or two (because each is so immense) would have been ample to follow through fully.

The hero or indefatigable superman of this book is an ex-Air Force man, Jim Pendrake, who returned from the China War of 1970 minus his right arm. Separated from his wife, Eleanor, and living out his days in idleness, he is jolted out of his melancholy by the discovery of an engine, half-buried on a country hillside. His first thought is to sell it for scrap, but then he discovers it is like no other engine he has ever heard of or seen. After being exposed to it, he finds his right arm growing back. Up to this point, things are more or less in order, even though one hopes in vain that the workings of the engine will be delved into further.

But then the story ranges from Pendrake's imprisonment by a secret group of idealists who supply him with a new

house, job, and brand new memories to the second amputation and regrowth of his arm; from the discovery of toti-potent cells and immortality to his kidnapping by the East Germans and his adventures deep under the surface of the moon; from his acquaintance with the leader of some characters from the Old West who happens to be an intelligent Neanderthal named Big Oaf to his discovery of another one of the engines and its use as a matter transmitter, etc., etc. The regularity with which Pendrake gets in and out of these crises suggests that the most suitable use of the material would be as a Grade C movie serial, not as a novel. In fact, one keeps hoping that the whole thing will turn out to be a spoof while at the same time realizing that if one can't make up one's mind whether something is a joke, then it must be a pretty bad one.

In order to provide for a willing suspension of disbelief on the part of the reader, the author must achieve certain goals—either he must explain the occurrences by scientific means, philosophical means, or by imposing a coherent and well-thought-out sociological thesis, etc., or by so engaging the emotions that the reader is almost hypnotized into accepting something illogical or unexplained through sympathy

toward the characters. Without such elements (or other similar ones) either singly or in combination, any book of this type is bound to fall flat.

**The Best from Fantasy and Science Fiction (Twelfth Series).**  
*Edited by Avram Davidson. 225 pp. Doubleday & Co., Inc. \$3.95.*

This is the first S&SF anthology to appear since Avram Davidson took over the editorship from Robert Mills, and probably the highest compliment I can pay to Mr. Davidson is to say that I hardly notice the change. This may not sound like a compliment to the uninitiated, but most fans know that this series has always offered quality writing.

Included are fifteen stories, five by authors new to this collection. They are well arranged, with almost consistent alternation in mood between grim and witty ones. In fact, one of the new authors, Sasha Gilien, in "Two's a Crowd," manages to combine both qualities in one effort by a prevailingly light treatment of a story with somber implications. Well, what do *you* think would happen if there was a foul-up Up There and two spirits or guardians, one Extrovert and one Introvert, got assigned to the same poor human?

Probably the best single story in the book is Theodore Thomas'

short shocker, "Test," because it combines skill of execution, exactly the right number of words, and a brain teaser of an ending. (As a rule I am opposed to trick endings, but this is a fine exception.) But though my nomination for the best comes from the grim column, the light stories make the better showing when taken as a group. They are all enjoyable and reach their modest goals successfully, even though they certainly won't endure forever. The more serious group, on the other hand, though containing, as I pointed out, the "best" story, also contains several examples of my pet peeve—the pretentious story that falls flat on its face. I am not saying that a writer should never set his sights high, or strive for a larger canvas than he used previously. But what is useful as an exercise to improve and stretch his craft should not necessarily be imposed on an audience. From the reader's point of view, the modest success can be very satisfying, while a high-flown failure can be downright embarrassing. There are three unfortunate examples of this in the current volume and, difficult as it is to say so, two are by authors for whom I have always had the highest respect, namely James Blish and Brian Aldiss. Blish's story, "Who's in Charge Here?" a bit of New Yorkana, starts out

by setting a mood seemingly fraught with possibilities, but in which nothing really happens. Blish seems to mean something sinister, but my main feeling in the end is that it is an idea which would be perfect for the kind of exploration Ray Bradbury does. The Aldiss story, "A Kind of Artistry," is much longer and more ambitious. Set on the sparsely populated Earth of the future (a matriarchal society) it details the confusions, loves and resentments of Derek Ende as he leaves home on a hazardous mission. There is a lack of focus and clarity here, and without it the exotic and unique elements of the story lack conviction, and all that remains is a story of a mother-dominated man whose ultimate death is neither moving nor meaningful. Two authors of the stature of Blish and Aldiss can afford a temporary aberration. However, in view of the fact that Aldiss' agent says he has recently completed a plotless novel, maybe one should worry about whether Aldiss' lapse is so temporary.

The third unfortunate example of a bad miss comes from one of the younger writers, Vance Aandahl, whose story of the end of Man, "When Lilacs Last in the Dooryard Bloomed," is in such a stiff and pedestrian style as almost to obscure a plot which, though underdeveloped, has po-

tential. When such a poignant poem is used for a story title, it deserves far better treatment. Mr. Aandahl has formidable gifts, and an equally formidable amount to learn.

Still in the serious story column is Edgar Pangborn with "The Golden Horn" which, it seems to me, could be easily expanded. A man recounts the adventures that occurred when he was fourteen and working as a bond-servant in a tavern. His vague dissatisfactions with his lot become crystallized when he finds something beautiful that he wants to do with his life (learn to play the Golden Horn). Though he doesn't run away permanently from the tavern in the story, the reader understands that he will, and that he learns to read and write and play the horn. A bare synopsis does little to give an idea of how good this story is—the economy of means used, the indirect picture built up of the colorless, drab life of the town, the conflict between his upbringing and his inclinations. Though "The Golden Horn" is almost novelet length, it is difficult to escape the impression that it ought to be part of something larger.

The lighter stories do not lend themselves to summary very well, depending for their effect

on a kind of buoyancy which is more in the treatment than in the subject. But it is only fair to give out a few credits anyway. There is Ron Goulart's deadpan tale of a man who turns into an elephant on national holidays; Karen Anderson's brief manual on how to raise and care for baby Sphinxes; Avram Davidson's virtuosic treatment of chicanery among the industrial alchemists; Joseph Dickinson's saga of Beans, the first Ape to go to Mars and return to tell the tale, and Will Stanton's episode featuring Korko, probably the only alien who adores gumdrops.

**A Gun for Dinosaur.** *By L. Sprague de Camp. 359 pp. Doubleday & Company, Inc. \$4.50.*

This handsome volume is a well-deserved tribute to one of science fiction's steadiest and most well-rounded contributors. Mr. de Camp has written large quantities of science fiction, as well as straight fantasy, historical fiction, and some notable non-fiction in the science field.

The fourteen stories here are from the period 1949-1957. Included is one of my favorites, "A Gun for Dinosaur," the title story. Its subject, about a safari into the past, has been successfully tackled by other writers, but this version has solid merit.

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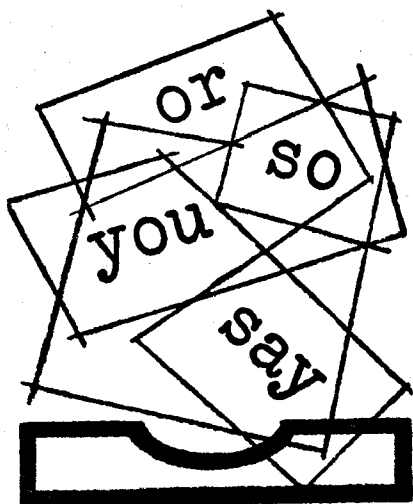
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Dear Editor:

Your July issue was easily the best since I started reading your magazine, a little under four years ago. You have packed the best novel and three of the best short stories I have read this year into one month; I only hope that you haven't exhausted your resources.

"The Programmed People," besides being an exciting adventure story, was, in my opinion, as bitter a commentary against the future as was "Brave New World"—and nearly as effective. The ending was one of sheer power, led up to nicely with suspense.

There is only one word to describe Young's "Redemption"—and that is 'beautiful.' It may sound corny, but that's all I can

say about my nominee for the best short story of the year.

"Yes Men of Venus"—hilarious. Goulart has sliced ERB to death, and then stamped on his legacy with hobnailed boots. A long, loud toast for a beautiful parody.

The Porges story was forgettable, but still readable.

All in all, I am forced to admit that this is the best single issue of any magazine I've ever read since the "Undesired Princess" issue of UNKNOWN.

Chuck Cunningham  
Sewanee Military Academy  
Sewanee, Tenn.

● *Glad we "forced" you.*

Dear Editor:

I have just finished roaring over Ron Goulart's "Yes Men of Venus." Up until now I had hesitated replying to those fans who crucified me for my criticism of Edgar Rice Burroughs, but now Mr. Goulart has done it for me.

Of course I *like* Burroughs—I have read with interest all of his Mars novels, his Pellucidar novels, some of the Tarzan adventures, and some miscellany—and have enjoyed, to some degree or other, most of them. But the sole reason for this is that I love fantasy-adventure, unless it is completely unreadable.

Now, the defenses of ERB a few issues ago were, basically, the following:

1. ERB puts more thought, character, and meaning into his novels than does Otis Adlebert Kline.

2. Burroughs' characters are more effective because they are "larger than life."

3. ERB is more popular; hence, he must be better.

In my opinion, a character is effective when "larger than life" *only* when he is a native of an alien environment—alien, that is to the reader! Hence, Conan is effective because we know nothing, to start with, of the Hyborian Age—until Howard tells us about it! The same goes for Leiber and his Fafhrd-Grey Mouser stories. But take a human and transport him to an alien environment—then he must learn, and the reader learns along with him. This is why he—and the characters he meets—must be realistic. L. Sprague de Camp and Fletcher Pratt accomplished this very nicely in their Harold Shea novels, and de Camp by himself in "The Undesired Princess"—but notice that when de Camp went to a Conan-type world, with a Conan-type character, then, and *only* then, did his

characters become "larger than life". I speak of his fantasy novel "The Tritonian Ring."

Of course, number (3) is pure folly; it is a general statement, beautiful in its simplicity summing up what is wrong with so many Americans today: the attitude of "following the crowd," of conformity, the fear and contempt for original thought.

Getting back to the Goulart parody, what do we have? Ridiculous descriptions; careful explanations for every movement; stilted dialogue; and the inevitable false modesty and almost maddening naiveté and ignorance of the protagonist (I can't call him the "hero," because I certainly don't regard him as one). C'mon, ERBits, what difference can you *actually* see between this story and those of the "master" (!) ?

Charles A. Dixon  
4578 Comanche Drive  
Gainesville, Ga.

● *With so many ERB paperbacks now on the market, we should all have a chance soon to see if ERB can exert his sway over what is a brand new audience for his work.*

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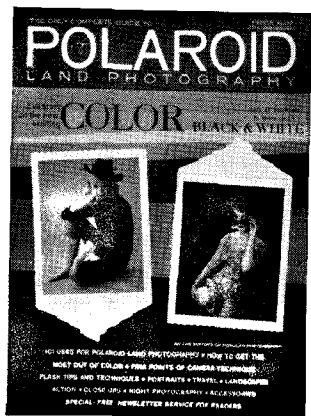
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